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9. ABSTRACT Representatives from U.S. universities concerned with international educational assistance in the marine sector gathered at the University of Rhode Island in December 1977 to discuss their common interests. Some of the topics reviewed were nearshore and artisan fisheries, aquaculture, coastal land and nearshore management, high seas fisheries, oceanographic research, and seabed resources. A major objective was to place emphasis on educational needs in contrast to the tendency of supporting organizations to undertake projects with an inadequate educational back-up. Other objectives were: to appraise the capacity of U.S. universities to assist LDCs in developing their marine resources; to involve representatives from universities and other supporting groups in discussing a strategy that might aid LDC in-country capabilities; and to agree on initial guidelines and action plans. The paper also deals with the active aspects of university participation in international education in marine resources; these include degree programs, non-degree course and curriculum offerings, professional reorientation endeavors, information exchange, aid to overseas institutions, and inter-university arrangements. The summary concludes with a discussion of the problems facing a university involved in educational endeavors for the LDCs and a discussion of the funding required for such activities.

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seminar report

The U.S. University Role In Education for Marine Resources Development in the LDCs

NELSON MARSHALL¹

Introduction

This is a summary report of a workshop convened at the Alton Jones Campus of the University of Rhode Island, November 30 and December 1-2, 1977 with the following objectives in mind:

- to appraise the U.S. universities' capacity and the means for contributing to a greater local capability within the Less Developed Countries (LDCs) for developing their marine resources
- to involve in this concern representatives from selected universities and from other supporting groups, in order to discuss a strategy that might best serve in aiding LDC in-country capabilities
- to agree on initial guidelines and action plans for U.S. university activities in this area.

A major objective was to place an emphasis on educational needs in contrast to the tendency of federal administrators and supporting organizations to undertake projects with inadequate educational back-up.

Harlan C. Lampe of the University of Rhode Island served as co-chairman of the workshop along with the author of this report. Work groups were headed by John Liston of the University of Washington, Victor T. Neal of Oregon State University and Frank Williams of the University of Miami. Support for participants from the university community was made available by the Agricultural Development Council's Research and Training Network. Two URI organizations, the Center for Ocean Management Studies and the International Center for Marine Resource De-

velopment, provided administrative and other assistance.

Never before had representatives from U.S. universities concerned with international educational assistance in the marine sector gathered to discuss their common interests. Nor had the diverse federal agency and other sponsors previously had an opportunity for such discussions with practitioners from the university community. In the workshop it became increasingly clear that it is important to continue these discussions of mutual educational objectives, to enhance communication among the universities, and, to improve arrangements for working with one another. Too often, there is a tendency among universities and agencies to function independently and competitively.

The scope of the workshop is seen in the topics that were presented and discussed, in the focus on the educational task with respect to LDC needs, and in the discussion of our present skills and capacity to respond to these needs. The following topics were reviewed:

- Nearshore and Artisan Fisheries
- Aquaculture
- Coastal Land and Nearshore Management, Including Pollution Control
- High Seas Fisheries
- Oceanographic Research (inshore and offshore)
- Seabed Resources

The group discussed plans for encouraging participation by U.S. universities; such as those unfolding under Title XII, programs of the U.S. Agency for International Development, relevant support by the National Science Foundation, and the Sea Grant

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International Program. The presence of representatives from the FAO Fisheries Department, the Intergovernmental Oceanographic Commission, and the United Nations Office of Ocean Economics and Technology helped orient our deliberations to the concerns of these international bodies.

Pertinent literature in the areas under consideration was available to the workshop participants, and during the presentations and discussions the international marine efforts of the institutions represented were reviewed. With this as background, and with a number of participants well-versed in overseas work, the group did not hesitate to tackle the fundamental questions for which it had convened, bearing in mind the following overall considerations:

The professional, academic and technical capability in the LDCs in the marine resources sector, including fisheries, lags considerably behind the indigenous capability available in many other fields, particularly agriculture. This is a reflection of the values placed by assistance agencies on other components of the overall need. Such neglect ignores the potential of aquatic resources to help fulfill protein needs. We must move ahead with efforts to increase the contribution of fisheries and aquaculture in overall resource development.¹ Equally important is the fact that the less-developed nations are suddenly being thrust into a new international setting characterized most dramatically by the common adoption of extended jurisdiction to a distance of 200 nautical miles offshore. The accompanying opportunities, demands and responsibilities for marine resource and coastal management, and for environmental and pollution control are very great; yet most LDCs are poorly equipped technically to manage their new marine holdings. Again, this is the result of past assistance policies which have neglected education in the marine sector. Expertise is needed to assure a better and proper use of the resources, to deal with foreign industrial enterprises interested in appropriate contractual arrangements and joint ventures for resource development, and to relate bilaterally and internationally in a more effective way regarding the utilization of offshore resources. In the latter category, we need to relate to the oceanographic groups from other countries wishing to conduct research off the coast of many of the LDCs.

Meeting the education and training needs posed by such changing situations is an inherent part of realizing an effective technology transfer to the LDCs, and the role to be played by U.S. universities is a formidable educational task.

With respect to their marine resources, many

1. This point was reemphasized two weeks later at the AID Fisheries Research Planning Workshop on Title XII when the leadership expressed the fear that aquatic resources will be suboptimal if past perceptions prevail.

developing countries are not aware of the overall nature and magnitude of the challenges before them and the personnel needed to respond effectively.

To date, the institutions of the developed countries have been helping in a relatively scattered manner; some efforts have been quite effective, others less so. To the extent that attempts are being made to encompass needs, there has been a tendency for special groupings (fisheries and aquaculture workers, the social science interests, the oceanographic and research enterprise, and the coastal environment personnel) to consider only those aspects of the LDC needs which lie within their limited spheres of concern. This not only overlooks the potential for a coordination of effort but in some instances may actually encourage the conflicting development of coastal resources.

Being a first attempt at a comprehensive look at education for marine resources development in the LDCs, the group experienced some difficulty with terminology. The participants concerned themselves with a wide range of *both the natural and the social sciences as these bear upon diverse marine resources development*. This is seen in the diverse affiliations of the participants. See attached list.

The participants voiced their special concern that too often overseas projects undertaken by U.S. universities and agencies are poorly done. In the light of the mounting pressure for industrial nations to increase development assistance, the potential for damaging errors that result from poorly planned and poorly executed programs is high. The participants expressed their desire to work toward greater effectiveness in overseas programs by increased collaboration and coordination. Effective coordination of marine resource efforts would, we hope, lead to greater program effectiveness. One means of achieving better coordination among marine resource institutions would be through a Newsletter to be issued several times a year. Other suggestions were to form a special subgroup within the Association of U.S. University directors of International Agricultural Programs (AUSUDIAP), develop a new association within the National Academy of Science Committee structure, or form a special link with some other existing agency, whether regional, national, or international.

The importance of thinking and acting in a concerted manner is emphasized by the substantial changes on the international outreach scene anticipated under Title XII of the Foreign Assistance Act, through the new efforts of the Sea Grant Program with its modest but initial international component, via the international programs of the National Science Foundation, etc. Along with this, but as yet ill-defined, are expectations for scientific exchange and technological transfer as written into the negotiating texts of the Third Law of the Sea Confer-

ence and including many implications for developed country institutions. A new era is emerging both with respect to using the seas and with respect to interacting with developing countries in the changing world economic order.

As the workshop drew to a close, there was common agreement on the need for continuing the discussion of the issues raised in this workshop. An expanded workshop or conference should be planned in order to deal with particular training and education issues of concern to those in both the developed and the developing countries. In particular, LDC representation must be secured if we in the West are to understand their needs, their interest in marine resources development, and their capacity to absorb and maintain appropriate training and research efforts.

WORKSHOP FINDINGS

The first question addressed was why U.S. universities should seek to foster a growing involvement in international marine resource programs.¹ Clearly, most faculty members so involved are motivated by a degree of enlightened self-interest and satisfaction, a degree of altruism and idealism appropriate to the university's *raison d'être*. Also, there is an unavoidable momentum toward such involvement from the pursuit of scientific interests which are universal and, in the case of marine topics, bound to lead us to other shores. Not infrequently satisfaction is derived from the more immediate results of efforts overseas and, in the long run, the involvement becomes mutually gratifying with substantial give and take in working with professional colleagues abroad. Further, under changing rules governing ocean and coastal areas, it is essential to cultivate overseas interests if U.S. institutions are to gain access for oceanographic research within the projected 200 mile limits of foreign countries. In a limited number of situations, as in the rich oil-producing countries, one may anticipate new funding quite in contrast to the usual pattern of an outflow of funds from developed country sources when dealing with LDCs.

Through participation overseas the knowledge and scope of interests of the U.S. university is expanded; industrious foreign students are attracted; good faculty inspired by such endeavors are attracted and retained. The overall impact is a general enrichment of instructional capabilities with an important element of world consciousness in the university offerings. Foresight in undertaking such efforts and generating a growing capability overseas greatly aug-

1. Robert B. Abel's paper, "University Interests", provided a more thorough development of this question. His remarks, presented earlier at an AID workshop on Title XII, reflected discussions with directors of the Sea Grant institutions. Many of his insights are reflected in these Workshop findings.

ments the potential for carrying out both assistance and cooperative research programs. When well-handled, this is part of a spiralling process improving the capacity to solve world problems such as those relating to food supply.

Universities, gaining in stature and capability when involved in overseas work, are meeting one of their noblest responsibilities. They are improving mutual understanding among peoples from distant parts of the world and, in so doing, may positively influence improved U.S. foreign relations.

U.S. universities seem particularly well-suited for such international activities because of the experience and expertise of their faculties, the continuity of their efforts, their general insulation from political pressures, their ability to instill confidence in agencies directing funds to overseas programs, their ability to work well and in a spirit of mutual understanding with institutions abroad, and the fact that they are in the forefront of many marine resources activities. The university role may be quite passive as its general ongoing activities contribute to world knowledge through research, publishing, and the exchange of information. In the workshop, however, the focus was on the more active aspects of university participation in international education in the marine resources domain as the participants tackled specific components of the task under the headings: *degree programs, non-degree course and curriculum offerings, professional reorientation endeavors, information exchange, strengthening overseas institutions, and inter-university arrangements.*

It was recognized throughout that virtually all of these educational pursuits are inseparable from the supporting research endeavors. Inasmuch as the typical U.S. university maintains a public service advisory function as an integral part of its educational mission, and experience in this regard in the marine field has grown very rapidly over the last decade, it was agreed that attention must be given to this extension component of the education process. This is recommended even though extension activities may be largely in the hands of government ministries overseas.

In treating the specific components of these educational tasks, attention was directed repeatedly to *demands imposed on U.S. universities and faculties* if the tasks are to be realized. (Some of these are singled out and presented in a final section under that heading.)

It was noted that it is often difficult for planners and policy makers in the LDCs to identify problems and bring them into focus; thus, considerable advisory efforts should be directed toward this end. In so doing one must make certain that the countries comprehend the consequences of their development aspirations and the relationships of these with their existing, perhaps more traditional, patterns of resource utilization.

Though some in the workshop were not highly

conversant with international education problems as experienced for other disciplines, it became apparent that the principles are similar to those noted for other fields. This suggests that, though parallels cannot be drawn too closely inasmuch as one is often dealing with remote, relatively uncontrolled areas and faces the added problems of the land/sea interface in marine studies, much can be learned by reviewing the past activities abroad in other sectors, particularly in agriculture.

Degree Programs

The range of program offerings of the institutions participating in the workshop as well as those of other institutions not present is generally broad enough for the degree study requirements of students from the LDCs. Quite commonly, however, such offerings are related to the needs of students in a developed country situation and to the ecology of temperate waters and are not altogether appropriate for students from the LDCs, most of which lie in the Tropics. More attention must be directed to understanding the special requirements of LDC students, and, accordingly, to provide some flexibility and adaptations in the offerings. Actually, some such adaptations broaden the outlook of the U.S. students. On the other hand, many current course offerings of a basic character are quite suitable and require no special accommodations. It was also noted that by their very nature marine resource problems often call for more of an interdisciplinary treatment than is commonly required in other fields.

The university representatives present were agreed that degree standards should not be lowered to favor LDC students. At the same time, there may be cases when admission requirements might be adjusted for students from the LDCs in view of their other supporting strengths, their need, and their motivation. It was suggested that applicants should be favored who possess assured positions at home and who are likely to return to their own countries after completing the degree program. In order to meet normal admission requirements, some students may need extra time and specially designed programs in order to overcome deficiencies in English or math. The foreign student may need to extend his study period in the U.S. in order to complete graduate degree requirements. In assessing foreign student qualifications, it is recognized that TOEFL scores can be misleading and that GRE scores will for a variety of reasons seldom match those of U.S. students. The continuing heavy flow of foreign students to the U.S. places an additional burden on overtaxed admissions offices. To counter some of these difficulties related to evaluating LDC applicants, it was suggested that mechanisms be established to solicit information on student selection. In some situations, a probation study program might be arranged which would terminate in a useful

"certificate" program (see next section) if completion of the degree program ultimately does not prove feasible. Quite obviously, selection is greatly enhanced in those cases where a university has a country program and a direct representative in the country where selection is taking place.

Few generalizations are possible relative to the optimal level of the degree to be pursued. Often the Ph.D. is the desired goal whereas the Master's may suffice and should be stressed for many needs. The Master's degree program takes less time to complete and allows for more rapid turnover and an increased educational output. Not uncommonly, the baccalaureate is the appropriate degree, either in a basic discipline or in one of the programs which offers an undergraduate major in aquatic studies well-supported with basic instruction. Faculties may be tempted to judge the educational requirements needed in various developing country situations and U.S. personnel may appropriately advise such countries as they seek to appraise this question. It was agreed, however, that in the last analysis policy decisions generated within the countries must prevail and that U.S. universities should stand ready to respond with their educational offerings.

Many specific suggestions were made for dealing with the special needs of degree candidates from the LDCs. Again, it was stressed that special English language courses are important for many of the students from foreign countries. Conversely, it may be helpful to provide foreign language instruction for U.S. faculty members who will participate in assistance efforts abroad since a bilingual facility is of great help in advising and working with foreign students and in participating in overseas activities.

Considerable emphasis was placed on assuring that LDC candidates for advanced degrees pursue research that is solid in substance and appropriately cast. It is often desirable to arrange for such a student to conduct thesis research in the home country under supervision by a member of the faculty of the U.S. institution granting the degree or by a faculty member or a close associate located in the foreign country involved. There are problems associated with this concept of thesis research overseas; such as maintaining faculty supervision, the students isolation, the extra costs, etc. These are in contrast to the help, associations and experience that surround students in residence in U.S. institutions. Students employed in their home country when undertaking their thesis research may also face the pressure to do other work.

Arrangements for student home-country research is not the only option. Faculty members can contribute by working closely with the LDC student on a topic relevant to LDC needs but carried out in the United States. Sometimes a research project done cooperatively with a fellow U.S. student will work for

the benefit of both participants. Highly sophisticated equipment, generally not available in the LDCs, may be used for thesis study, but it is important for the student to cultivate the ability to carry out programs at home with more modest means.

In essence, what is needed is broad-based research training relating appropriately to LDC needs and undertaken at a level consistent with the professional demands the student will face at home. The overall standards of student performance must be high if we are to help in establishing a cadre of professionals abroad who will work as peers in association with U.S. colleagues in assistance and research projects.

It was suggested that there might be a clearing house service with respect to training programs that are available and are well-suited to meet the special needs of LDC students. This proposed listing should cover a broad range of opportunities and offer insights on the staff and the capabilities in the U.S. institutions that seek to serve foreign students.

Reflecting on the fact that in the perspective of developed country needs U.S. universities may at present have an excess (perhaps short-lived) degree program capacity in some of the marine fields, it was suggested that support be made available to re-direct some of this surplus capacity to educating for the needs of the LDCs.

Non-Degree Course and Curriculum Offerings

Universities should become involved in offering special programs, both at home and abroad, to meet needs that are less demanding, that stress techniques, that require a shorter time span, and that can be handled free of rigorous admission procedures and other formalities associated with formal degree programs. Government agencies and industry and consulting firms may become usefully involved in such educational endeavors, particularly where the organization's interests and the technical needs coincide. Many non-degree programs offer a suitable certificate or diploma attesting to the special competence attained. Often these certificates are highly valued.

The range of offerings that might fall under this non-degree heading is so broad and the level of training so varied that generalizations are difficult. Among the needs that might more readily be met by special programs are upgrading endeavors such as:

- refresher courses for marine scientists in the LDCs to counter the effects of their isolation from current developments in their disciplines,
- orientation courses for those involved in policy and administrative work in the marine area.

There should also be an emphasis on the need for an enlarged cadre of personnel at the technical level. Short courses and apprenticeship arrangements to meet this need may be as varied as the tasks considered. Such instruction should normally be given in

the LDCs, perhaps on a regional basis, and undertaken cooperatively with LDC lead personnel. A good deal of "on the job" training may be needed for the desired technical competence; for example, in learning how to use special fishing or oceanographic equipment there is no substitute for being at sea and working side by side with a skilled overseer. It was also suggested that some introductory efforts could be undertaken on U.S. vessels when in foreign ports.

It is recognized that non-degree and other specially designed programs are very demanding and labor intensive. Since, for most faculty members, such undertakings are not a major part of their degree program responsibilities, an added effort will be required to do the job properly and to generate additional funding. For such efforts it may be useful to supplement university skills with the unique capabilities available through government and industry, perhaps in joint undertakings.

Some of the topic areas that might be covered by short courses (some aspects of fisheries, coastal dynamics, and pollution) are of public as well as of professional interest. There may also be a place for special instruction aimed at the public in the LDC setting. In general, however, it would seem that an indigenous professional group should assume this in-country educational role.

Finally, there was discussion of special programs between sister universities, one in the U.S. and one overseas. LDC students would take a year or more of special coursework in the U.S. before returning to their home university where they would complete a thesis and take the local university's degree.

Professional Reorientation

The concept explored under this heading is somewhat unique to the marine resources sector. This is apparent in that many current U.S. professionals entered the marine field through a reorientation experience. Agricultural economists became fisheries economists, hydraulic engineers became coastal oceanographers, geographers became marine affairs experts. In any new and rapidly expanding field such adaptations are commonplace in establishing the first generation of professionals. For the LDCs, in general, marine resources work is clearly such a first generation frontier.

Reorientation should be applied to two very different groups. One group with great promise for development programs consists of well qualified professionals interested in moving laterally into marine-related fields. Such reorientation of LDC professionals can be highly efficient when individuals return home and exert a multiplier effect using their training and knowledge to lead others. One drawback is that the former general economist or agricultural economist turned fisheries economist may lack the

recognition and support formerly available as well as the "one-on-one" peer relationships with professionals in the developed countries.

The second group consists of individuals in decision-making positions needing a better understanding of marine problems quite alien to their past experience. For this group, suitable short courses, as mentioned under non-degrees offerings, may fill the need. Again, the impact may be highly significant.

Information Transfer

The lack of availability of current information on marine resources and marine science to workers in the developing nations is a serious obstacle to progress. The impediment to the flow of information operates in both directions depriving all scholars of data from these areas.

Facilitation of information flow should be given a high priority. Systems suggested for this area: computer links, reproduction facilities, newsletters, and translation facilities. Ideally, networks should be established on a worldwide basis. Systems organized by U.N. agencies, for instance the Aquatic Science and Fisheries Information System that is receiving increasing attention by FAO, offer some promise toward meeting this need. Certainly, if U.S. universities work together more effectively as they undertake projects overseas, the flow of information will be greatly enhanced.

Strengthening Institutions Overseas

Strengthening the capabilities of the higher institutions of education overseas in the *sine qua non* for assuring a strong indigenous capacity to respond to development assistance and technological transfer undertakings. Among the specific suggestions offered for enhancing the growth of institutions overseas were: providing visiting faculty, arranging for faculty and student exchanges, offering short and long-term consulting services, engaging in cooperative research activities, and arranging various information exchange processes.

Links with institutions overseas, to be effective, must be maintained over time, a difficult aim to realize under present circumstances when available assistance tends to be directed toward short-term immediate results. Though multinational funding might be available to strengthen interinstitutional arrangements, and though LDC educational institutions might be interested, many governments are only beginning to sense the value of the marine resources and the capabilities necessary to develop them. Education in marine-related fields is still not given a very high priority. The reported policy of the new Sea Grant International Program to assist in such educational institution development overseas may be helpful in this regard.

It was pointed out that representatives of U.S.

universities could accomplish a great deal more toward encouraging overseas institutional cooperation if funds, however modest, were available for quick response. Timely action as advisers and consultants, as co-workers to initiate research, and as short-term visiting staff can often help build and maintain the desired momentum.

Inter-University Arrangements

The introductory statements of this report express the need to interrelate in such a way that participating universities can benefit from insights into one another's program plans and cooperate in activities where beneficial. Over and above such thoughts as to improved communication and general cooperation, it was noted that, where appropriate, small consortiums focusing on a given topic or geographic area may be useful. These can be established as given needs arise. Also, inasmuch as consortiums raise various problems of compatibility and administration, it may often be preferable to function through inter-university agreements with a minimum of formalities.

Related to inter-university arrangements is the need for some sort of national clearing house to portray the nature of marine-oriented education and training offerings in U.S. institutions and to enhance the process of matching a prospective student with the institution that has offerings best suited to his or her capabilities and needs. Participants in the workshop were emphatic in their view that existing listings such as:

Marine Science Teaching at the University Level¹ University Curricula in Marine Sciences and Related Fields, Academic Years 1975-76, 1976-77²

A Directory of University Level Training Programmes in the Aquatic Sciences with Emphasis on Fisheries³ Marine Affairs: Register of Courses and Training Programmes⁴

only partially serve this purpose. They are lacking in qualitative notations on the nature of existing programs. It was noted that the Agricultural Development Council, focusing in placing students from Southeast Asia, renders an outstanding service in this regard relative to the field of Agricultural Economics. It was suggested that by adapting some of ADC's

1. UNESCO Techn. Papers Marine Sci. No. 19, UNESCO, Paris 1974.

2. Interagency Committee on Marine Science and Engineering, Federal Council for Science and Technology, Washington, D.C.

3. Research Information Unit, Fishery Resources and Environment Division FAO, FAO Fisheries Circular No. 342, Rome, 1976.

4. International Survey of Academic and Research Institutes Offering Courses and Training Programs in Marine Technology, Ocean Engineering, Coastal Zone Management, the Application of Economics to the Marine Field, and Coastal Zone Protection, Law and Regulations. Prepared under the auspices of the U.N. Dept. of Economics and Social Affairs in cooperation with the Intergovernmental Oceanographic Commission. U.N. Publications, New York or Geneva, 1976.

methodologies it might be possible to develop a similar service for the marine sector.

Demands on U.S. Universities and Faculties, Problems Unique to the Above Endeavors

Universities face the following problems in becoming involved in educational endeavors for the LDC:¹

Valued faculty members may be away for considerable periods of time. This is significant since only first rate persons should be entrusted with these types of assignments calling for rare blends of technical and social skills. These are often the staff members who can least be spared.

Adjustments must be made in teaching schedules. Techniques must be provided to accommodate foreign nationals who may require "catch-up" assistance.

Attention must be directed to special cultural problems such as language and religious barriers.

Resources must be siphoned off to teach foreigners while many believe all such energy ought to be used to teach American youth.

There are risks of becoming involved inadvertently in expensive and counter-productive activities in the developing countries.

The fluctuating demands for such services compound the above problems. U.S. institutions cannot afford, either in terms of talent available or in terms of costs, to sustain a cadre of personnel essentially on call as the occasion demands.

Participation overseas can be very difficult for individual faculty members. If they are rising within the ranks, and in many cases these are the ideal persons to undertake such work, they may not fare well as promotion and tenure decisions are made, especially as they compete with peers, remaining at the home institution who are in a better position to sustain a continuing publication record. Young scholars launching their careers, perhaps just out of graduate school, run the risk of losing close professional contacts at home if they immediately become involved in overseas endeavors. Further, when they do return, perhaps after two years of service, they are generally given little recognition for what they have accomplished.

While the above are referred to as the consequences of participation overseas, somewhat the same drawbacks may apply as energy is spent working with foreign students in one's own institutions, since such activities are time consuming and the student research involved may not be fully appreciated by one's peers. With strong commitments and policies accommodated to the recognition of international work, universities can do a great deal to counter these problems.

Though the workshop was not construed as a forum for elaborating on the funding required, a number of special needs came to the fore and are repeated here for emphasis:

Some of the most efficient efforts are those which call for a one-to-one relationship, for example, working with LDC professionals who wish to move laterally and apply basic capabilities to marine problems. Even so there is no precedent for covering university costs in this regard. Measures to remedy this should be given priority.

Special funding is needed if short courses or other offerings outside the regular curriculums are to be offered. Included is the need for short-term but carefully planned refresher visits whereby LDC scientists working in isolated circumstances can bring themselves up-to-date with advances in their respective fields.

Supplementary funding is needed when tutoring and other services are necessary for LDC students, especially in seeking to handle students possessing marginal qualifications.

Since LDC students are using equipment at the regular charge rates which are subsidized, at least in part, by the host universities, a special facilities or "bench" fee should be included in overseas student funding. Aspects of the research which are peculiar to the needs of LDC students may involve extra costs which should be covered. An appropriate way to surmount such extra costs is to have on-going supported research programs in the participating universities that are highly relevant to LDC needs and into which the LDC students can be absorbed.

Clearly related to the above are the added costs if U.S. university faculty members are to advise LDC students on research undertaken in their home countries.

Service costs incurred by our respective offices for international students should be similarly covered.

Support is needed for special English instruction in the early orientation stages of a foreign student's program.

Foreign language instruction should be supported for U.S. university faculty members who are to work abroad or will otherwise work intensively with foreign students and personnel.

Funds are needed to encourage a ready response capability when called upon by overseas institutions. At present, opportunities to be of help in program planning and projections are lost because travel funds are not available when the assistance is requested. The Scientists and Engineers in Economic Development Program of NSF was mentioned as a mechanism which might be helpful if extended and adapted for coverage in marine resources work, but even this would not meet the need for quick response.

1. See earlier footnote on Page 3.

Background Papers

1. "Proceedings of a Conference on U.S. Marine Scientific Assistance," 2nd ed. 1975. Ocean Affairs Board. National Academy of Sciences, Washington, D.C.
2. Report of the Marine Science Workshop held by the Johns Hopkins University, Bologna, Italy, 1973. The Johns Hopkins University, School of Advanced International Studies, Washington, D.C.
3. "Marine Science Teaching at the University Level. 1974." *Report of the UNESCO Workshop on University Curricula*, UNESCO Technical Papers in Marine Science, 1973, No. 19.
4. Tandberg, Olaf Ge. (ed.), "Promotion of Marine Science in Developing Countries." Documenta Kungl. Vetenskapsakademien, 1977, No. 15.
5. Kildow, Judith, T., Executive Summary of a Conceptual Study of Marine Technology Sharing, 1974, Mimeo.
6. Marshall, Nelson, "Relating to Overseas Universities in Marine Resources Development—a Critique of the University of Rhode Island Experience," 1977, Mimeo.
7. Ross, David A. and Leah, J. Smith, "Training and Technical Assistance in Marine Science—A Viable Transfer Product." *Ocean Development and International Law Journal*, 1974, Vol. 2, pp. 219-253.

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1. Resource person, present only briefly to explain Title XII deliberations.

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