

Intergovernmental Oceanographic Commission

Workshop report No. 32

UNU/IOC/Unesco Workshop on International Co-operation in the Development of Marine Science and the Transfer of Technology in the context of the New Ocean Regime

Paris, 27 September - 1 October 1982



Unesco

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

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IN THE DEVELOPMENT OF MARINE SCIENCE AND THE TRANSFER OF
MARINE TECHNOLOGY IN THE CONTEXT OF THE NEW OCEAN REGIME

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SUMMARY REPORT

A Supplement to this Report
containing the papers presented
at the Workshop will be published
in due course.

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F O R E W O R D

The Convention adopted by the Third United Nations Conference on the Law of the Sea (UNCLOS) defines a new international regime inter alia for use of the ocean and its resources. It codifies the need for ensuring that such use is peaceful, that resources are equitably and efficiently utilized, that the marine environment is studied, monitored and protected, and that its living resources are conserved. The Convention is thus a contribution to the realization of a new, more just and equitable international economic and social order, which would meet the interests of mankind as a whole - including both present and future generations - with particular attention to the interests of people in the more disadvantaged countries.

Scientific research is regarded as an essential activity under the new regime. By leading us to a better understanding of the nature of the ocean, of the natural processes in and affecting it and of the resources it contains, marine science provides a basis for resource development and better management of human activities in or affecting the ocean. It is also, of course, the source of the new technologies for exploring, using and monitoring the oceans, their quality and resources.

Given an appropriate legal regime, States nevertheless risk being frustrated in their aspirations to explore and use the ocean, and to do so in accordance with the principles established. The capacity of many of them to participate in marine research is quite inadequate; they are conscious of their lack of specialists and of appropriate infrastructures concerning marine science and technology. Many States still have very limited access even to existing data pools, as well as to instruments. Such States face difficulties in analyzing and evaluating for their purposes relevant information to which they may, in theory, have access.

The Convention reflects an awareness of these problems. It encourages States to co-operate with one another in the development and transfer of marine science and technology. This co-operation can, in principle, be effected both directly and through competent international organizations. There are many ways of doing this, and the most effective ones must be sought in each case. But it is universally agreed that among the means available the conduct of international programmes and the establishment of both a comprehensive network of national research and service centres and international centres are very important.

Several international organizations are currently engaged in promoting those means of co-operation in science and technology transfer. Those organizations of the United Nations System which work together through the Inter-secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) need particular mention in this regard, they are: the UN, Unesco, FAO, WMO and IMO. Some others, notably UNEP and IAEA, also have an interest in certain aspects of marine science and technology.

The IOC is acting as the joint specialized mechanism of the five first mentioned organizations as far as ocean science and technology is concerned, thus playing a central role in this matter. The IOC promotes and co-ordinates scientific research programmes, and related ocean services. These services, it should be noted, include arrangements for international exchanges of oceanographic data (IODE), and an information system for

aquatic sciences and fisheries (ASFIS). IOC also has had for several years a special parallel programme for training, education and mutual assistance (TEMA) among States. More recent than recognition of needs for access to information and for availability of scientific and technical skills has been the awareness that a key to progress in marine science is the existence of appropriate national infrastructures. This awareness has emerged from many years of experience in the world-wide development of marine science and the conduct of international activities. But it has been greatly sharpened by the discussions in UNCLOS and concurrent consideration in the governing bodies of IOC - its Assembly and its Executive Council. Accordingly, the IOC has adopted a Comprehensive Plan to assist its Member States in developing their national capabilities for marine science and ocean services. This has the dual objective of directly helping the developing states with limited or no capacity to achieve their goals in ocean affairs, whatever those may specifically be, and of facilitating their participation in international activities - to the same end, eventually. The Plan is intended also to help participation in international activities, particularly those undertaken within the framework of the IOC itself. In the matter of developing national infrastructures, Unesco's Division of Marine Sciences naturally plays a complementary role.

In identifying and elaborating the ways to improved co-operation, and particularly more effective transfer of marine science and technology, free and concentrated debate is timely. The Workshop, the proceedings of which are reported here, provided an informal forum for such debate. The nature of the subject is such that the involvement of the United Nations University (UNU) is most appropriate and desirable as it can contribute significantly to the objective of TEMA.

Hence the Workshop was organized jointly by UNU and IOC with the Unesco Division of Marine Sciences. From it emerged ideas for strengthening co-operation among States, in the context of the New Ocean Regime, for their individual and collective benefit.

1. OPENING OF THE WORKSHOP

The Workshop was opened by Professor A.R. Kaddoura, Assistant Director General for Science, who welcomed the participants on behalf of the Director General of Unesco. He expressed his thanks to the Rector of the United Nations University (UNU) and to Professor Walter Manshard, Programme Director, for the contributions provided by UNU for the organization of this Workshop.

The successful conclusion of the Third UN Conference on the Law of the Sea is an historical event that represents a major milestone in the development of a new ocean regime. He recalled that in his oral report to the Executive Board of Unesco, the Director General pointed out that the ramifications of the new Convention on the Law of the Sea, when ratified by the Member States of the international community, would be numerous, particularly in regard to the Intergovernmental Oceanographic Commission and emphasized that, as could be seen in the Draft Medium-Term Plan, the Organization and the IOC must use exceptional measures to contribute to the reinforcement of infrastructures in marine scientific research and training so that the Member States may better use and manage their marine resources within the context of the new ocean regime. This regime while offering opportunities to countries to promote a new international economic order, also poses serious problems for those countries that have insufficient capabilities in marine science. This situation was recognized by the Group of 77 at the UN Conference and is reflected in the Resolution on "Development of National Marine Science, Technology and Ocean Services Infrastructure" adopted by the Conference. Professor Kaddoura drew particular attention to the operative paragraph of that Resolution, which calls for action by governments, competent international organizations and aid-giving agencies to foster the transfer of marine science and the scientific basis for improved marine technology. He recalled that Unesco has been actively involved for many years in the promotion of international co-operation in the field of marine research and ocean services, and has attempted to respond to the needs of developing Member States, within its limited resources, through the complementary action of the Intergovernmental Oceanographic Commission and the Unesco Division of Marine Sciences. Unesco therefore attaches great importance to the deliberations of the Workshop on the general problems facing the developing countries in the transfer of marine science and technology and to the suggestions that would emerge on the matter of creating favourable conditions for the achievement of national goals. He hoped that the Workshop would provide guidance on the concept of regional marine science centres foreseen in the new Convention, and a strategy for their eventual establishment. Such guidance would be helpful to Unesco and IOC in their co-operation with other international organizations concerned.

Professor Manshard welcomed the participants on behalf of the United Nations University. He expressed the hope that the discussions would contribute ideas for resolving issues relating to marine scientific research and transfer of knowledge and technology arising from the new ocean regime, taking into account the needs of developing countries. Describing briefly the programme of UNU, he referred to its activities in the field of social science at the global and regional levels, to programmes on water, land and coastal resources and to its encouragement of institutions in developing countries. The UNU is keenly interested in promoting marine scientific research jointly with IOC and the Unesco Division of Marine Sciences, and will be prepared to consider supporting future regional workshops to explore further the concepts and to promote the formation of co-operative networks and regional centres.

Dr Mario Ruivo, Secretary of IOC, recalled briefly the policy of IOC regarding training, education and mutual assistance, and the steps taken by the Commission to cope with new demands of Member States and the world community. He pointed out that IOC has undertaken an evaluation of the implication of the UN Convention on the Law of the Sea on the future functions and structure of the Commission, including its regional subsidiary bodies, which are expected to play an active role in building up regional marine science centres and networks and in the development of common ocean services. With these steps, the Commission intends to assist Member States in their national efforts to develop self-reliance in marine science and technology and to make optimum use of available means for the study and use of the oceans and their resources. He referred to the "Comprehensive Plan for a Major Assistance Programme to Enhance Marine Science Capabilities of Developing Member States" which was approved in principle by the IOC Executive Council at its Fifteenth Session and submitted for consideration and adoption by the Twelfth Session of the IOC Assembly; the main objective of this Plan is to complement national efforts in building up marine science infrastructures so that the developing Member States are able to attain self-reliance in marine science and technology and to achieve national goals in marine affairs.

Dr Dale Krause, Director of the Unesco Division of Marine Sciences, highlighted the activities of his Division. He stated that Unesco's programme of extra-budgetary marine science development had for a decade been doubling every two years. This growth was a result of the higher priority being given by countries generally to marine science and of the consequently increasing involvement of developing countries in marine sciences. A strategy of combining development of marine research programmes, of manpower, and of infrastructures, had proved its effectiveness. This is also needed for strengthening applied areas such as marine technology and ocean engineering, and the management of the coastal environment and its marine resources. He looked forward to close co-operation with the UN system concerning these matters.

2. ARRANGEMENTS FOR THE WORKSHOP

Professor M. Murillo was designated Chairman and Professor Ulf Lie Vice-Chairman. Because of the late arrival of Professor Murillo, Professor Lie led the Workshop on the first day. Professor Elizabeth Mann-Borgese and Dr G. Kesteven served as Rapporteurs. Dr S.M. Haq, IOC Assistant Secretary, served as Technical Secretary for the Workshop. He presented the Agenda, a tentative time-table and the available documentation.

The Agenda is given in Annex I. The List of the Participants is given in Annex II.

Several invited speakers had been asked to prepare background papers on selected topics. These papers were presented at the Workshop by their authors; questions from the other participants were answered and there was a general discussion of them.

The papers presented by the invited speakers will be published as a Supplement to this Workshop Report.

A general discussion followed the presentation of the papers. The Chairman then decided to form three sessional Groups to discuss selected themes and to submit reports to the Workshop as a whole. Group 1

was assigned the theme "The new ocean regime and its implication for co-operation in marine science and technology"; Group 2 "Recent trends in marine science and technology", and Group 3 "Implementation requirements for international co-operation".

3. THE NEW OCEAN REGIME AND ITS IMPLICATIONS FOR CO-OPERATION IN MARINE SCIENCE AND TECHNOLOGY

The need for a new legal regime for the ocean which became pressing in the last decade, was triggered by a number of inter-related developments:

- (i) scientific discoveries in marine geophysics;
- (ii) the penetration of the industrial revolution into the oceans;
- (iii) the growing importance of the oceans in the world economy and of each State;
- (iv) the transformation of international relations due to the emergence of many newly independent States;
- (v) the transition from a system of laissez-faire in the oceans to a system of management for:
 - (a) extended areas under national jurisdiction, which add a new dimension to national development strategies;
 - (b) a sea-bed area beyond national jurisdiction, to be governed by an international authority.

The principal provisions of the UN Convention on the Law of the Sea which address marine scientific research and transfer of technology are in Parts XIII and XIV. Many Articles in other Parts, however, pertain directly or indirectly to these matters.

The regime for scientific research is an integral part of the comprehensive framework of the Law of the Sea. The general rules governing the legal status of maritime areas and the uses of the oceans and their resources provided also the legal foundations of the regime for scientific research. There are, however, some principles specifically related to scientific research embodied in Article 240 and others.

Article 240 stipulates in subparagraph (a) that "marine scientific research shall be conducted exclusively for peaceful purposes" (emphasis added). Article 143 on marine scientific research (hereinafter referred to as "research") in the international seabed area contains a similar provision. These articles reiterate one of the Principles of the Declaration on the Seabed adopted by the General Assembly in 1970. The conduct of research under the Law of the Sea regime for peaceful purposes is only one important aspect of the more general principles of the peaceful uses of resources.*

* Other instruments including specific reference to peaceful use are : the Antarctic Treaty of 1959, the Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water, of 1963; the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, of 1966; the Treaty on the Prohibition of Emplacing Nuclear Weapons and other Weapons of Mass Destruction on the Seabed and Ocean Floor and in the Subsoil thereof, of 1972; and other international treaties in the field of arms limitation and disarmament.

Another important general principle with respect to conduct of research and the development and transfer of technology underlying the new regime for the sea is the principle of co-operation. The duty of States to co-operate with each other was enunciated as a fundamental rule of conduct in international relations by the Declaration of Principles of International Law Concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations. Parts XIII (Marine Scientific Research) and XIV (Development and Transfer of Marine Technology) of the Convention contain several provisions on the promotion of international co-operation in ocean science and its application for the understanding of the characteristics and phenomena of the oceans, for the exploration, exploitation, management and conservation of their resources and for the protection and preservation of the marine environment. Section 3 of Part XIII (Articles 242-244) and Section 2 of Part XIV (Article 270-274) are entitled, "International Co-operation". The provisions for research in the Convention are designed to promote international co-operation.

The jurisdiction, which is conferred on coastal states with regard to EEZ and Continental Shelf increases the control that those States may exercise over the activities in their waters directed to acquisition of knowledge about the characteristics of marine resources and ecosystems in areas under their jurisdiction. Such knowledge is essential for the rational management and utilization of these resources, and the protection and preservation of the marine environment. International co-operation in assisting developing States to acquire the necessary skills and technologies becomes legally binding under the Convention. Article 269 for example explicitly establishes that "States directly or through competent international organizations shall, inter alia, endeavour to: establish programmes of technical co-operation for the effective transfer of all kinds of technology"; and to "promote favourable conditions for the conclusion of agreements, contracts and other similar arrangements under equitable and reasonable conditions".

The Convention also establishes the right of States Parties to carry out marine scientific research in the international Area (Article 143, para. 3). At the same time, the special nature of the regime for the Area entails broad scope of powers and responsibilities to be assigned to the International Seabed Authority in the field of marine scientific research. Such powers should be viewed in connection with competences of that organization regarding the activities in the Area, as well as with operational functions it shall carry through the Enterprise (Art. 158, para. 2, Art. 160 and Annex IV, Statute of the Enterprise). Accordingly the Authority may take measures to acquire technology and scientific knowledge relating to activities in the Area, and therefore, is entitled to undertake marine scientific research concerning the Area and its resources. It shall promote and encourage the conduct of marine scientific research in the Area, co-ordinate and disseminate the results of such research and analysis (Art. 143, para. 2); and encourage the conduct of prospecting in the Area (Annex III. Art. 2, para. 1(e)).

The Convention confirmed and codified some of the principles of international co-operation in scientific research and introduced some new ones. At the same time it vastly expanded the rights and responsibilities of coastal States in matters pertaining to scientific research. It is often assumed that these two trends - the nationalization and the internationalization of scientific research - are contradictory. In reality, they are the two faces of the same coin. International co-operation in

in scientific research can grow and flourish only on the basis of strong national scientific infrastructure. But, given the vastness and ecological unity of open space as well as the very nature of modern research technology, including its high cost, national oceanographic scientific programmes can grow and flourish only through international co-operation. The inter-relation between national and international scientific research is not one in which one loses while the other gains; it is an organic process where the whole and the parts grow together, or wither together.

The Convention on the Law of the Sea, for the first time in the history of International Law, sets forth as a general principle, the rights of all States and competent international organizations to conduct marine scientific research (Art. 238). The significance of this is reinforced by the fact that most of the provisions in Parts XIII and XIV place on equal footing States and competent international organizations with regard to international co-operation. Furthermore, there is a special provision (Article 247) on marine scientific research projects undertaken by or under the auspices of international organizations. This is an important aspect of the regime of scientific research. It emphasizes the advantages of co-ordinated research efforts through projects undertaken or sponsored by international organizations. Article 278 of the Convention provides for closer co-operation among the competent international organizations for "the effective discharge of their functions and responsibilities" in the field of marine scientific research and the development and transfer of technology.

The Convention offers a new platform from which to launch concerted efforts towards the building of a New International Economic Order. The rational management of activitism of ocean space could make a crucially important contribution to these efforts. The Convention recognizes throughout that wise use of ocean space and its resources must be based on sound scientific knowledge. To benefit from the new ocean regime, both in areas under national jurisdiction and through active and full participation through the Authority in the management of the common heritage of mankind, vast improvements are required in the national and international scientific infrastructure, with particular consideration for the needs of developing states. The new ocean regime offers the possibility, and imposes the obligation, for such improvements.

The Convention makes it mandatory that "States, directly or through competent international organizations, shall co-operate in accordance with their capabilities to promote actively the development and transfer of marine science and marine technology on fair and reasonable terms and conditions". They "shall promote the development of the marine scientific and technological capacity of States which may need and request technical assistance in this field, particularly developing States, including landlocked and geographically disadvantaged States, with regard to the exploration, exploitation, conservation and management of marine resources, the protection and preservation of the marine environment, marine scientific research and other activities in the marine environment compatible with the Convention, with a view to accelerating the social and economic development of the developing States" (Article 266, para. 1 and 2). Consideration is given in this connection to co-operation for the development of human resources through training and education of nationals of developing States (Article 268(d)). Particular reference is also made to the development of programmes by the Authority and other competent international organizations for strengthening the research capabilities

of developing and technologically less developed States; and the training of their personnel and the personnel of the Authority in the techniques and applications of research (Article 143, para. 3(d)).

4. RECENT TRENDS IN MARINE SCIENCE AND TECHNOLOGY

While there are very broad aspects of requirements for international co-operation in the development and transfer of technology regarding the ocean and its resources, here are examined primarily the implications of the new regime for the development of marine science, particularly in developing countries. Attention has been given to the need for science to further the development of marine technology, and also to contribute to the general impact of technological change on the investigation of ocean processes.

In the decade since the process of negotiating a comprehensive new law of the sea began there have been radical changes in the conduct of marine science as well as in the scope and nature of some types of activities in or affecting the marine environment. These changes, and continuing trends, must be analyzed and fully taken into account in appraising the needs for and modes of international co-operation in promoting marine science and the development and transfer of marine technology.

The legal process was itself initiated partially in anticipation of developments in the technology of exploration and exploitation of the deep-sea bed, which have now happened. In the same period, there have been important developments in ship design and operation, in the means of extracting energy from the ocean, in fishing methods, in the ability to operate under the sea surface, and in the use of the ocean - deliberately or otherwise, directly and indirectly - as a recipient of wastes from human activities on land. All these, and other continuing developments in multiple use of ocean space have generated the present need for a much greater intensity, diversity and quality of investigation of the marine environment by all nations.

Marine science has changed dramatically with respect to the technologies employed by its practitioners, to the nature of the problems addressed by them and to the diversity of nationalities engaged. Technological developments include:

- exploitation of space technology for remote sensing of the sea surface and the near sub-surface, for accurate position fixing at sea, and for ship-to-ship and ship-to-land communication;
- sensing with acoustic devices;
- sensing and "sampling" with electronic devices which have multiplied by several orders of magnitude the rates at which some kinds of data can be gathered;
- provisions of platforms other than surface vessels, such as moored and drifting instruments and equipment placed on the sea bed;
- research submersibles to carry humans or robots to any depth, and new diving apparatus;

- data processing and computing equipment which makes possible both real-time analysis of numerical data and immensely complex calculation and modelling.

New types of scientific problem that have been addressed vigorously in the last decade range from the examination of recently discovered life-forms and processes in the deep ocean to the effects on more familiar forms of marine life of heavy metals, radionucleides and synthetic biologically active chemicals; from examination of the role of the ocean and of energy exchange at the sea-atmosphere interface in processes of climatic change to the structure and dynamics of the earth's mantle; from the biological modelling of entire ecosystems such as that of the Southern Ocean to the understanding of physical processes of the scale of the deep sea eddies.

The new instruments and methods have made investigation of such problems possible; new forms of activity in the marine environment have made it necessary. And some of these problems have created the need for new methods; other methods have emerged from the more general development of science-based technology.

At the same time far more countries have become aware of a need for competence in marine science and have in fact developed a certain capacity in that field, regarding both qualified and experienced people and the physical means of conducting marine research. With that has come awareness of the scale of the need for international co-operation and experience of the possible modes of such co-operation. An indication of that evolution is given by the fact that in 1967 there were 40 Member States of the IOC of which 16 were developing states, and now there are 110 of which 79 are developing states.

Notwithstanding the fact that more countries now have a capacity to engage in marine research and that their number continues to grow, it must be recognized that precisely because of the technological changes here identified, the gap between the countries most advanced in this field and those that are new to it remains wide and is possibly even widening. This may have unfortunate consequences with respect to the implementation of the 'consent regime', which calls for understanding of the modes of research at the present time and as they are evolving. Such understanding comes best from engagement in the research activities from planning through conduct of them to the processing of data and the evaluation of results.

Other studies prepared by IOC, SCOR and other bodies give indications of likely future priorities for marine research. The most recent and comprehensive of these is the Report on "Ocean Science for the Year 2000" (prepared by expert consultation organized by SCOR/ACMRR with the support of IOC and the Division of Marine Sciences of Unesco - document IOC/INF-505). The Addendum to that document (IOC/INF-505 Add.) offers comments on the nature of marine science and on application and implementation of programmes which are pertinent to many sections of the present report. The scientists involved in that consultation seem to have had attitudes similar to those of participants in this Workshop and the views expressed in the two reports are consequently remarkably convergent.

The revolution in the techniques of marine research which we have outlined is by no means completed. Thus, in considering the consequences for such research of the new legal regime we must realise that continued rapid technological change is to be expected, with unforeseeable consequences

for the pattern of research activities. Thus if marine science is to thrive, and if its potential value to humanity is to be fully realised within the new political framework, considerable flexibility in the interpretation and application of the associated legal provisions will be necessary.

5. ANALYSIS OF THE PROBLEM

There is a wide range in the level of marine science and technology development among the coastal states. The most advanced industrial states have specialized institutions for all aspects of marine affairs, university programmes in marine sciences and technology (at both undergraduate and graduate levels), and continual development of scientific concepts and methods. Applications of scientific results are constantly being found. At the other extreme, some countries have practically no activities in marine science and technology. Most coastal states at present standing between the extremes have only meagre facilities and modest programmes. In general, marine sciences and technology have developed parallel with progress in other scientific, economic and technological fields, but there are some distinct exceptions. Some states which ordinarily are considered to be developing countries are more advanced in marine science and technology than some industrial states.

Rational management of the resources of the ocean requires scientific knowledge and information, for the acquisition of which appropriate facilities, equipment and technology as well as highly qualified human resources must be provided. It also calls for national financial and legal commitments by responsible governmental authorities. Although there is a wide range in the specific needs of individual states, there are some general features:

- (i) recognition by governments of science and technology as factors for development have been inadequate, as recognized by the UN Conference on Science and Technology for Development (Geneva 1979);
- (ii) priority to the ocean and its resources has in many cases been inadequately identified within the context of national development, and no overall marine policy in many countries has yet been established;
- (iii) there is a general lack of recognition of the complexity of the ocean and its resources and of the need to consider them integral
- (iv) there is a contribution between the sectorial structure of governments and the interdisciplinary nature of marine matters; these matters are usually dealt with in governments in a fragmentary way. Insufficient co-operation between the sectors tends to lead to duplication and to inefficient use of available human resources, infrastructure and funding;
- (v) national legislation does not always correspond with the present national and international requirements;
- (vi) the potential benefits from the international co-operation, both bilateral and multilateral, are largely unrealized;
- (vii) in many countries there is little understanding of the opportunities for increasing marine science capabilities which are offered by the UN organizations of the UN system.

The development of a solid scientific and technological sector is of paramount importance for the proper use and exploitation of the sea and its resources. But despite the efforts so far made by developing countries, weaknesses and limitations persist with respect to:

- (i) the number of marine scientists and technologists;
- (ii) the quality of academic programmes and of research projects;
- (iii) the organization of training programmes for marine technicians capable of meeting the demands posed by governmental and private institutions;
- (iv) the availability of appropriate infrastructure laboratories, equipment, libraries, vessels, equipment, maintenance and facilities.

Many developing countries lack the political will or the commitment to give priority to promoting and maintaining their oceanographic programmes on a long-term basis and to allocating resources for these purposes. Efforts often result in duplication and less than best use of available facilities.

The above-mentioned limitations and the limited knowledge of a country's Exclusive Economic Zone make management decisions difficult. They also limit the capacity of the country to participate in co-operative research programmes and collective recommendations for management.

Because of all these difficulties, the efforts of developing countries to formulate national plans are often abortive and thus fail to provide a sound basis for development. These difficulties are serious obstacles to achievement of self-sufficiency and of the capability to select and adopt appropriate technologies.

The scientific and technological development of a nation is a protracted, complex, continuing process. While the new ocean regime calls for urgent responses by coastal states, it is becoming more and more difficult for developing countries to reach desirable levels of competence. Individual scientists also confront this problem. Each of them must contend with many problems such as:

- (i) inadequate recognition of his status reflected in indifference towards his work;
- (ii) poor incentives in remuneration and means to do his job;
- (iii) inadequate working environment;
- (iv) lack of consultation by decision-makers even regarding his line of expertise;
- (v) difficulties in getting funds to attend international scientific meetings for greater professional growth;
- (vi) lack of national journals in which results may be published.

6. IMPLEMENTATION OF REQUIREMENTS FOR INTERNATIONAL CO-OPERATION

6.1 THE ACQUISITION OF COMPETENCE

The development of marine sciences over the next few decades will be marked by the advances in instrumentation that have vastly increased the capacity for observation and measurement. A much expanded array of variables can now be monitored, in situ or remotely. Many variables can now be monitored continuously over long periods. However, it must be emphasized that these advances have become effective, for research, because of the parallel and quite dramatic development of equipment for recording observations, for storing and processing data, and for transmission of data and information.

Advances in instrumentation have important effects on the planning and conduct of research, but they also give freedom to think more largely and they make it possible to develop more powerful models of the structure and dynamics of natural systems. Success in realizing these possibilities will depend, however on the effectiveness of arrangements for international co-operation in the conduct of observational programmes and in the analysis and interpretation of data. Developing and developed countries must have their places in this enterprise, but, as shown in the preceding section, most developing countries have far to go in creating programmes through which they could make their contributions to, and draw benefit from, global programmes they should do. They need to do this in order to be able to deal with their specific local problems, especially those arising from the responsibilities they have accepted with regard to their EEZs.

Thus while a global programme for promoting the development of marine sciences must involve developing and developed countries, it must require a major component directed towards reducing the inequalities in the competences of developing and developed countries. This component must have several related objectives: reinforcing the basic educational background to specialized research; developing institutional arrangements for planning and conduct of research; acquisition of the entire repertoire of modern research instrumentation and the skills for using it.

6.2 CREATING FAVOURABLE CONDITIONS FOR RESEARCH

Mandates for promoting international co-operation at all levels in the development of marine science and technology are given in numerous Articles scattered through several Parts of the Convention. The Workshop did not attempt an exhaustive analysis of these, although that exercise might have been a reasonable approach to the set task. Instead, Article 243 Creation of favourable conditions (for marine scientific research) in Part XIII was taken as a starting point for consideration of experience to date and of proposals for new initiatives regarding the possible modes of co-operation and the means of promoting them. According to this Article, "States and competent international organizations shall co-operate, through the conclusion of bilateral and multilateral agreements, to create favourable conditions for ... and to integrate the efforts of scientists ... in, studying ... processes and phenomena ... in the marine environment ...".

Favourable conditions include an appropriate intellectual climate for creative work, and some assurance of continuity in material means appropriate to the problems to be investigated and the techniques necessarily to be used; adequate opportunities for scientists to exchange ideas (directly and through publications), to learn about new techniques and related research activities by others, and to have their work criticized by their peers. Evidently such conditions cannot be assured through bilateral and multinational agreements of themselves. In the context of the new law of the sea what such agreements can possibly do is contribute to the creation of national capabilities in marine science and help engender mutual confidence among national groups of scientists and among governments. These two processes reinforce each other.

There is a vast array of possible types of agreements under the general formula of Article 243. There probably exist examples of all or most of them. Major categories are agreements between States, between one or more States and an intergovernmental organization, and between international organizations. The negotiators of the convention probably had in mind, when writing here and in other Articles the term "international organization" primarily intergovernmental bodies. However, the participants emphasized the importance, with respect to the intent of Article 243, of the non-governmental international bodies in this field. While recognizing that some of those bodies will need to change in response to the changes in the nature of marine research noted in this report, in paragraphs 16 to 20 (and particularly para. 19), especially by an increased participation of scientists from developing countries in them, agreements between them and intergovernmental organizations and in certain cases States, can contribute substantially to national capabilities and international confidence. The non-governmental bodies range from those concerned with marine science itself, such as the Committees, Unions and Associations assembled in ICSU, to interdisciplinary bodies such as the International Ocean Institute concerned with marine policy and law - including science policy - and training.

Matters to be covered by international agreements of various kinds include:

- education and training of scientists and technicians;
- the flow of scientific information and transfer of knowledge;
- the planning and conduct of research activities;
- the provision of scientific equipment, and exchanges of scientific and technical personnel;
- the further development of existing institutions and networks and creation of new ones when necessary.

Many bilateral agreements would be concerned with only one or two of these matters, while others would cover aspects of all of them. Agreements concluded under one or more Articles of Part XIII Section 3 of the Convention (Conduct and Promotion of Marine Scientific Research) might be expected often to be of the latter kind. Most agreements between developing and other States would be expected to contain provisions regarding education and training, whatever else they covered.

For example, Article 244, in mandating that States "in co-operation with other States and with competent international organizations shall actively promote the ... strengthening of the autonomous marine scientific research capabilities of developing States", establishes that this process include ... "programmes to provide adequate education and training of their technical and scientific personnel".

6.3 INTERNATIONAL CO-OPERATION IN MARINE SCIENCE EDUCATION AND TRAINING

This has been the subject of many studies under the auspices of IOC/TEMA and these have given rise to numerous specific proposals for action. Stimulus for the implementation of these proposals may be derived from specific provisions in the Convention, such as that of Article 275(2) which says that "States, through competent international organizations and the Authority, shall give adequate support to facilitate the establishment and strengthening of national research centres*, (particularly in developing coastal States) so as to provide for advanced training facilities and necessary equipment, skills and know-how...". In addition, under Articles 218 and 249, it seems that among the conditions that may be established by a coastal state regarding consent for other States and competent international organizations to undertake marine research in its Exclusive Economic Zone, or on its Continental Shelf, could be included provisions for training related to the research programmes regarding which consent is sought, of nationals of the coastal State.

Provisions for training are not only concerned with the formation of specialists. There is an urgent need also to convey a wide range of information to administrators who are, or will be, responsible for national activities affected or required by various provisions of the Convention. The initiative reported by the IOI to meet this need was regarded as useful, and the arrangements made have interesting features that might well be considered for application elsewhere. Thus the organization and conduct of the courses is by an international NGO, but there is, throughout, close co-operation with some States and with several of the UN Agencies and other competent intergovernmental organizations. Agreements to provide for special broad training of this kind will be necessary if consciousness of the implications of the marine revolution, of which the Convention is both a mirror and a motor, is to be more widespread. Such consciousness is another favourable social condition for the necessary growth and health of marine science.

A special provision regarding training for deep sea-bed activities, which may call for new forms of agreement, is that in Article 143 wherein "States Parties shall promote international co-operation in marine scientific research in the Area by (inter alia) training their personnel and the personnel of the Authority in the techniques and applications of research"**.

* It was presumed by the participants in the Workshop that the negotiations of the Convention had in mind, when using the phrase, "national centres", institutions at the national level in contrast with international bodies, and did not intend to imply the necessity to centralize activities within States

** Effective implementation of this provision seemed to the Workshop to require the integration of such special arrangements into the more general science and technology education and training.

6.4 INTERNATIONAL TRANSFER OF INFORMATION

Article 244 says that, "States ... in co-operation with other States and with competent international organizations, shall actively promote the flow of scientific data and information and the transfer of knowledge resulting from marine scientific research, especially to developing States ..." paragraph 1 of the same Article makes it clear that this flow includes publication and dissemination of information about research programmes and plans as well as of the results of research. There already exist a number of multi-national agreements regarding such exchanges, ranging from those concerned with the operation of oceanographic data centres and referral centres (in the framework of IODE) to the agreements involving several organs of the United Nations system and States, as well as non-governmental bodies, for the Aquatic Sciences and Fisheries Information Service (ASFIS). The Convention by implication greatly enhances the importance of such agreement.

Several Articles deal with enhancement of the flow of information for specific purposes and applications. Article 242 is particularly important in this regard. It says that a "State ... shall provide, as appropriate, other States with a reasonable opportunity to obtain from it, ... information necessary to prevent and control damage ... to environment". Such information necessarily includes scientific information. Another such Article is Article 119. This says that "Available scientific information ... relevant to the conservation (of the living resources of the high seas) shall be contributed and exchanged on a regular basis through competent international organizations ... with participation by all States concerned", and Article 62 requires such information from those fishing in a coastal nation's EEZ. Article 64, dealing with Highly Migratory Species, and Article 63, dealing with living resources occurring within two or more exclusive economic zones or both within such a zone and in an area beyond and adjacent to it, do not explicitly provide for scientific data exchange. They imply, however, that such exchanges will be arranged since the effective co-ordination of conservation measures that is called for under these articles can hardly be imagined without such exchanges. Arrangement for agreements regarding information pertinent to these and other special needs will normally be a task for specialized international organizations having also management responsibilities. In some cases, however, international organizations with broader scope, such as one or other of the UN bodies, but having no direct management function, may be called upon to assist in the establishment of agreements among two or more states.

6.5 PLANNING AND CONDUCT OF RESEARCH ACTIVITIES

Agreements for international co-operation in these tasks have been an essential feature of the practice of marine science since the beginning of the twentieth century. The Workshop did not foresee new forms of agreements, with the possible exception of the role of the Seabed Authority, arising from the new law of the sea, but it did expect more of them. The extensions of national jurisdiction may give rise to the need for relatively more bi- and multi-lateral agreements than hitherto, and the needs of many States with limited experience of such form of co-operation may be such that they could benefit from the help of multilateral organizations such as the IOC and its regional subsidiary bodies (e.g. Regional Sub-Commission, Programme Groups).

Article 251 says that "States shall seek to promote through competent international organizations the establishment of general criteria and guidelines to assist States in ascertaining the nature and implication of marine scientific research". This activity might be expected to lead to international organizations sponsoring global or regional agreements regarding such criteria. Then, according to Article 255, States "shall endeavour to adopt reasonable rules, regulations and procedures to promote and facilitate marine scientific research conducted ... beyond the territorial sea ... and, as appropriate, ... to promote assistance for ... research vessels", (including facilitating their access to harbours). Not only does the adoption of "reasonable" rules, etc. call for co-operation between coastal States and the flag States of research vessels, but also it is likely to prove desirable that such rules be, as far as is practicable, harmonised internationally. This latter process could be actively promoted by experienced international bodies such as the IOC.

New problems are arising with the deployment of drifting instruments in a world in which much of the ocean area is under national jurisdictions. Such instruments, whether put out in the area over which the researching state has jurisdiction or in the high seas, will frequently move into areas under the jurisdictions of other States. There is an increasingly urgent need to reach agreement on the status and protection of such instruments, including the possibility of experiments using them being conducted under the auspices of competent international organizations.

International agreements regarding the provision of research equipment, like such agreements for exchanges of scientific personnel, can be regarded as special facets of arrangements for planning and conducting research, and equally as essential elements in the creation and development of research institutions and networks.

6.6 THE DEVELOPMENT AND CREATION OF INSTITUTIONS

Much attention has been given to co-operation in the creation and strengthening of national institutions in the "Comprehensive Plan for a Major Assistance Programme to Enhance the Marine Science Capabilities of Developing Countries" (document IOC/EC-XV/8 Annex 5 rev.) drawn up by the IOC*. By 'institutions' was understood the entire range of internal arrangements and facilities for planning, co-ordinating, conducting, appraising the results of research as well as those for ensuring the application of the results of research to the end of "achieving national goals in the field of ocean affairs", and for enabling full participation in global, regional and sub-regional oceanographic research programmes".

International institutions, and especially regional centres, as called for under Articles 276 and 277 of the Convention, were a subject of special attention by the Workshop. The convention calls for the creation of regional organizations, the Authority and national marine scientific research institutions. The special purpose of these is to "stimulate and advance the conduct of research by developing states". In the field of marine science the functions of the regional centres are to include training and education, study relating to the protection and preservation of the marine environment, organizing the collection, exchange, dissemination and evaluation of information of all relevant kinds and - most importantly - the acquisition and processing of scientific data (Articles 276 and 277).

*Adopted by the Twelfth Session of the IOC Assembly, Paris, 3-20 November 1982; Resolution XII-8 "A Comprehensive Plan for a Major Assistance Programme to Enhance the Marine Science Capabilities of Developing Countries".

Multilateral agreements among a number of countries in a certain geographic area are a common feature of the global pattern of marine affairs, and scientific research is a subject of interest to most of them. Many of these agreements relate to co-operation regarding a defined ocean area, but often linguistic, historical, cultural and political considerations determine the participation in and the scope of the agreements. Where many, usually small, island states exist in a region there is a strong impetus to arrange for common facilities of the kinds which none of them could support alone. At the level of fundamental scientific education and research there are already, for example, regional universities in the South Pacific and the Caribbean, and similar arrangements have been discussed for the Western Indian Ocean. It would seem natural to encourage the development of faculties of marine science at such institutions. Corresponding arrangements for the promotion and co-ordination of marine activities are proposed in the "Comprehensive Plan" in the form of National Oceanographic Commissions or equivalent bodies.

As far as they are concerned with marine science, most of the regional agreements have hitherto been limited in their functions to planning and co-ordination of national participation in regional programmes. In some cases the bodies established under the agreements also serve to facilitate relations between States, and they may serve as channels of multi-lateral assistance to their weaker members. Some bodies have a stronger operational role in providing common services to their Members or participating countries. The most common such service is compilation and exchange of oceanographic data and information, but there is a variety of other needs and arrangements to meet them.

Some of the types of service already provided under existing agreements in certain regions are:

- processing of numerical data;
- analysis of samples and identification of materials and specimens;
- libraries, archives, information holding and retrieval of all forms;
- calibration of instruments, standardisation of methods;
- maintenance and repair of equipment.

A steady increase in such provisions, and growing variety of them, are expected. There are already cases where simple services, such as exchange of numerical data, are being upgraded to more complex operations, such as data analysis and testing and development of models for such analysis. Such upgrading has the effect of tending to transform regional 'information' centres into regional centres of research. In fact, there seems to be a general trend for existing bodies established under international agreements to become more directly engaged both in research and in provision of services for research. There are cases where an organization (e.g. IWC and ICES) which previously facilitated the placement of scientists from some of its Members on the research vessels of others, has later become engaged also in the planning and conduct of international investigations using vessels placed at its disposal, and paid for from specially contributed funds.

In some fields of research other than marine science, international research institutions - often regional in scope - have been established and have been highly successful. There have also been failures. notwithstanding those failures and many practical and political difficulties, more international research institutes are being created, planned or proposed now than at any time in the past. Some of these, if they come to fruition, may be of direct assistance in the promotion of marine science although not explicitly directed to it. There is already much experience in the creation and management of such institutions which could be valuable to the marine scientists and administrators in considering new forms of international action to meet demands arising from the new law of the sea and the new scope of marine activities by States and enterprises. There are many institutional forms for centres to perform the functions specified in the Convention. One is to arrange for an existing national institution to serve a regional function and to be appropriately strengthened for that purpose. Such arrangements are not uncommon. However, in an increasing number of situations no one country in a region (or even, for that matter, in the world) has the funds, trained manpower or technical ability to support a certain type of research facility. In the field of marine science, there are now a number of developing countries which have acquired a considerable capacity for the conduct of research but which nevertheless do not have the ability to engage in all the kinds of research from the results of which they could benefit. It is among these countries that one might expect arrangements for the establishment of new specialized regional research institutions to emerge. Existing global bodies such as Unesco and other specialized agencies are in a position to assist in this process, particularly if they make it their business to be well-informed about similar developments in other fields of science.

Any regional institutions will naturally be foci for the provision of common services for national research institutions. As such they will be nodes in communication networks linking those national groups. When as is likely eventually to happen, several regional institutions having similar functions come into existence in a number of regions, they will form a network among themselves. Within any general region, a number of regional institutions having different, complementary functions in the field of marine science will form a network of another type. And regardless of the state of evolution of regional institutions, there will be increasing opportunities for national bodies, both governmental and non-governmental, to improve their capacities by participation in networks involving an enormous variety of types of co-operation and kinds of information flow. Global organizations such as, in particular, the IOC, could seek ways of helping the growth of such networks without tending to impose rigid structures or preconceived patterns on them. A degree of creative disorder is essential for the development of science.

The Workshop gave some consideration to the specific forms of agreements for co-operation in scientific activities at a more 'operational' level than has hitherto been common practice. In particular the method of establishing consortia and joint ventures was commended, and should be explored. An increasing number of such arrangements is coming into being for joint exploration and exploitation of marine resources, particularly by developing coastal states and other states interested in being active within zones of national jurisdiction. There are many opportunities for promoting marine science by including provisions for research in the agreements which govern such ventures. There are already examples of

bilateral fisheries agreements in which such provisions are made, but the Workshop agreed that more opportunities should be pursued. Moreover, there are examples of bilateral joint ventures and consortia being established for the specific purpose of conducting expensive or difficult types of marine research. The JOIDES programme is such an example. It illustrates also that effective consortia for the conduct of research can be formed by international agreements between non-governmental institutions as well as between governments. Such arrangements have so far been confined to groups of technically advanced States or national institutions. Consortia and joint ventures could usefully be explored as a means of making available research vessels and other facilities to groups of developing States, and for establishing regional research institutions of various kinds. An important part of such an exploration should be consideration of the requirements for support from host countries, flag States and port States. Similar arrangements might be an appropriate form for co-operative remote sensing of the marine environment. The further development of IGOSS, especially at the regional level, might be facilitated by the formation of consortia for the provision of science-based ocean services of the types being promoted under the IOC/WMO programme.

Under the broad powers granted to the Sea-bed Authority, joint ventures may be established. These could include among their purposes the development of marine science and the development and transfer of technology.

6.7 THE ROLE OF EXISTING INTERNATIONAL ORGANIZATIONS

The Workshop offered some general suggestions regarding the overall roles of "competent international organizations", with special regard for those of IOC and Unesco. In concentrating efforts to devise a strategy for promoting marine science and technology in developing countries, two main lines should be followed:

- (i) To help establish in those countries the awareness that a sound scientific basis is essential if the opportunities offered and responsibilities laid down by the new ocean regime are to be fully accepted, and that for this sufficient and stable support for marine science is needed. This could be promoted by, inter alia:
 - arranging missions of marine science experts from IOC/Unesco
 - providing information about technical assistance opportunities
 - providing general information on ocean affairs and relevant international co-operation, directed to governments, universities, schools and the public
 - implementing the Comprehensive Plan through modalities such as those suggested in document IOC-XII/8 Annex 10.
- (ii) To help activate the endogenous capabilities and intellectual creativities regarding marine science and technology in those countries, which - while maintaining and protecting their cultural identities - will lead to partnership in oceanography between developing and other countries on equal footing. To this end it is necessary to:

- replace one-way export of technology by the exchange of culture and knowledge
- substitute "innovation" for "imitation" in education
- allow and help the developing countries to decide for themselves which kinds of technology best suit them
- reduce discrepancies in scientific standing and build mutual trust between developing and other countries.

7. ADOPTION OF THE REPORT

The Workshop recommended that its Report be published by IOC in two parts: the Summary Report proper, and a supplement to the Summary Report containing papers presented by the principal speakers at the Workshop.

8. CLOSURE OF THE WORKSHOP

The Chairman closed the Workshop on Friday, 1 October 1982.

ANNEX I

AGENDA

1. Opening of the Workshop
2. Welcome address
3. Conduct of and Arrangements for the Session
4. Background
 - 4.1 Relevant features of the New Ocean Regime
 - 4.2 General problems of the Transfer of Science and Technology with Particular Reference to the Needs of Developing Countries
5. Creating favourable conditions for the development and transfer of marine science and technology
6. Role and functions of competent international organizations in the development and transfer of marine science and technology
7. Adoption of the report
8. Closure of the Workshop

ANNEX II

LIST OF PARTICIPANTS

I. INVITED SPEAKERS

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ANNEX III

LIST OF ACRONYMS

ACMRR (FAO)	Advisory Committee on Marine Resources Research
ASFIS (FAO/IOC/UN(OETB))	Aquatic Sciences and Fisheries Information System
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization of the United Nations
IAEA	International Atomic Energy Agency
ICES	International Council for the Exploration of the Sea
ICSPRO (FAO/IMO/Unesco/ WMO/UN)	Inter-secretariat Committee on Scientific Programme Relating to Oceanography
IGOSS (IOC/WMO)	Integrated Global Ocean Services System
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IODE (IOC)	International Oceanographic Data Exchange
IWC	International Whaling Commission
JOIDES	Joint Oceanographic Institutions for Deep Earth Sampling
SCOR (ICSU)	Scientific Committee on Oceanic Research
TEMA (IOC)	Training, Education and Mutual Assistance in the Marine Sciences
UNCLOS	Third UN Conference on the Law of the Sea
UNEP	United Nations Environment Programme
UNU	United Nations University
WMO	World Meteorological Organization

ANNEX IV

RESOLUTION ON DEVELOPMENT OF NATIONAL MARINE SCIENCE,*
TECHNOLOGY AND OCEAN SERVICE INFRASTRUCTURE

The Third United Nations Conference on the Law of the Sea,

Recognizing that the Convention on the Law of the Sea is intended to establish a new regime for the seas and oceans which will contribute to the realization of a just and equitable international economic order through making provision for the peaceful use of ocean space, the equitable and efficient management and utilization of its resources, and the study, protection and preservation of the marine environment,

Bearing in mind that the new regime must take into account, in particular, the special needs and interests of the developing countries, whether coastal, land-locked, or geographically disadvantaged,

Aware of the rapid advances being made in the field of marine science and technology, and the need for the developing countries, whether coastal, land-locked, or geographically disadvantaged, to share in these achievements if the aforementioned goals are to be met,

Convinced that, unless urgent measures are taken, the marine scientific and technological gap between the developed and the developing countries will widen further and thus endanger the very foundations of the new regime,

Believing that optimum utilization of the new opportunities for social and economic development offered by the new regime will be facilitated through action at the national and international level aimed at strengthening national capabilities in marine science, technology and ocean services, particularly in the developing countries, with a view to ensuring the rapid absorption and efficient application of technology and scientific knowledge available to them,

Considering that national and regional marine scientific and technological centres would be the principle institutions through which States and, in particular, the developing countries, foster and conduct marine scientific research, and receive and disseminate marine technology,

Recognizing the special role of the competent international organizations envisaged by the Convention on the Law of the Sea, especially in relation to the establishment and development of national and regional marine scientific and technological centres,

Noting that present efforts undertaken within the United Nations system in training, education and assistance in the field of marine science and technology and ocean services are far below current requirements and would be particularly inadequate to meet the demands generated through operation of the Convention on the Law of the Sea,

* The Resolution was adopted by the Third UN Conference on the Law of the Sea at its 182nd Meeting on 30 April 1982 .

Welcoming recent initiatives within international organizations to promote and co-ordinate their major international assistance programmes aimed at strengthening marine science infrastructures in developing countries,

1. Calls upon all Member States to determine their appropriate priorities in their development plans for the strengthening of their marine science, technology and ocean services;
2. Calls upon the developing countries to establish programmes for the promotion of technical co-operation among themselves in the field of marine science, technology and ocean service development;
3. Urges the industrialized countries to assist the developing countries in the preparation and implementation of their marine science, technology and ocean service development programmes;
4. Recommends that the World Bank, the regional banks, the United Nations Development Programme, the United Nations Financing System for Science and Technology and other multi-lateral funding agencies augment and co-ordinate their operations for the provision of funds to developing countries for the preparation and implementation of major programmes of assistance in strengthening their marine science, technology and ocean services;
5. Recommends that all competent international organizations within the United Nations system expand programmes within their respective fields of competence for assistance to developing countries in the field of marine science technology and ocean services and co-ordinate their efforts on a system-wide basis in the implementation of such programmes, paying particular attention to the special needs of the developing countries, whether coastal, land-locked or geographically disadvantaged;
6. Requests the Secretary-General of the United Nations to transmit this resolution to the General Assembly at its thirty-seventh session.

ANNEX V

Resolution XII-8

**A COMPREHENSIVE PLAN FOR A MAJOR ASSISTANCE PROGRAMME TO ENHANCE
THE MARINE SCIENCE CAPABILITIES OF DEVELOPING COUNTRIES ***

The Intergovernmental Oceanographic Commission,

Recognizing that marine science and technology constitute an essential basis for the peaceful and rational use of the oceans and their resources, and the protection and the preservation of the marine environment,

Recognizing further that adequate national capacities in the marine sciences will facilitate effective transfer and use of knowledge and technology, as well as effective international co-operation on global, regional and subregional levels, and full participation in the programmes of the Commission,

Considering that an urgent need exists to bridge the scientific and technological gaps between the industrialized and developing countries,

Recalling resolution 2/06 of the twenty-first session of the General Conference of Unesco which recommended that the Director-General of Unesco give special attention to the need to strengthen Unesco's 'intergovernmental programme in the marine sciences and ocean services, in order to assist Member States, in particular, developing countries, to cope with the demands placed on them in connection with the new ocean regime emerging from the Third United Nations Conference on the Law of the Sea',

Recalling further the resolution adopted by the Third United Nations Conference on the Law of the Sea (contained in United Nations document No. A/CONF. 62/L. 127) on 'Development of National Science, Technology and Ocean Service Infrastructures' which, inter alia, recommends that all competent international organizations expand programmes within their respective fields of competence in marine science, technology and ocean services, and recommends that bilateral and multilateral funding agencies augment and co-ordinate their operations for the provision of funds to developing countries for the preparation and implementation of the aforementioned programmes,

Having reviewed the 'Comprehensive Plan for a Major Assistance Programme to Enhance the Marine Science Capabilities of Developing Countries' (document IOC/EC-XV/8 Annex 5 rev.) which was prepared in response to Resolution EC-XIII, 15,

Recalling Resolution EC-XV, 5, which: recommended to the Assembly that it consider the adoption of the Comprehensive Plan; further recommended the developing Member States to make every possible effort to develop further, or, as appropriate, establish national oceanographic co-ordinating bodies or their equivalent, to facilitate the transfer of knowledge and technology they require; and urged the member organizations of ICSPRO to provide all possible support to the implementation of the Comprehensive Plan,

A

Adopts the Comprehensive Plan, as well as the guidelines provided in the document on modalities for its implementation (document IOC-XII/8 Annex 10);

Invites the Director-General of Unesco to take any actions that he, deems appropriate to enhance the promotion and implementation of the Comprehensive Plan and in particular to:

- (i) place it before the Executive Board and the twenty-second session of the General Conference of Unesco;

* The Resolution was adopted by the Twelfth Session of the IOC Assembly, held in Paris, 3-19 November 1982.

- (ii) mobilize needed extra-budgetary financial and other resources required for its preparatory phase;
- (iii) bring to the notice of the bilateral and multilateral international funding agencies, and subsequently to host a high-level consultation to provide them with information on the concept and content of the Plan and to identify, so far as possible, ways and means by which they can assist in its implementation.

B

Requests the TEMA ad hoc Group for Implementation and Co-ordination, supplemented as necessary by advisers from donor Member States and with the collaboration of appropriate units of Unesco, in particular the Division of Marine Sciences (OCE), to assist as required with preparations for the proposed consultation referred to in section A (iii) above;

Decides to proceed with the implementation of those elements of the Comprehensive Plan, as part of the TEMA activities of the Commission, for which budgetary and administrative resources can be made available, and to prepare, on a trial basis, a limited number of Marine Science Country Profiles, in consultation with appropriate United Nations and other international organizations.

C

Urges the Member States of the Commission:

- (i) to establish and maintain appropriate mechanisms for the formulation of national marine science policies;
- (ii) to improve or establish, as required, National Oceanographic Commissions or equivalent bodies, composed, as appropriate, of representatives of interested government departments, universities and research institutions actively involved in marine science and technology and other related aspects of ocean affairs; to maintain liaison with national users of the results of marine scientific research; to work closely with other national institutions and international organizations concerned with this multidisciplinary field; and to develop and support marine science activities, using the mechanisms proposed in the Comprehensive Plan, ensuring the close involvement of their national scientific community;
- (iii) to give priority to the marine sciences as an essential element in the development of socio-economic activities and to take the initiative of applying to UNDP, the United Nations Financing System for Science and Technology for Development (UNFSSTD) and other sources of funding in support of projects to be developed under the Comprehensive Plan.