WH01-77-63



ж=1 1 1 н

#### WHOI-77-63

#### TOWARDS A MARINE POLICY IN LATIN AMERICA

Bу

Francisco J. Palacio

## WOODS HOLE OCEANOGRAPHIC INSTITUTION Woods Hole, Massachusetts 02543

#### October 1977

#### TECHNICAL REPORT

Approved for Distribution

Prepared with funds from the Pew Memorial Trust and by the Department of Commerce, NOAA Office of Sea Grant under Grant #04-6-158-44106, and the Institution's Marine Policy and Ocean Management Program.

Reproduction in whole or in part is permitted for any purpose of the United States Government. In citing this manuscript in a bibliography, the reference should be followed by the phrase: UNPUBLISHED MANUSCRIPT.

Dr. Robert W. Morse Associate Director and Dean

## Contents

,

Introduction	
Historical Background and Development 2	!
Science Development 2	2
Contemporary Developments in Marine Science - 11	Ļ
International Cooperation 15	;
National Interests 24	1
Economic Overview 24	1
National Approaches 29	)
Future Outlook 32	2
Conclusion 40	5
Tables	9
Bibliography5	1

The purpose of this paper is to stress the need for the adoption in LA of comprehensive policies which consider the ocean as an integral and important part of the process of development. The ability to adopt and implement such policies is directly related to the marine scientific capability of the country and to national awareness of ocean affairs. Effective development of these two aspects can only come about through national commitments. In most LA countries such commitments are unsatisfactory or lacking.

The positions adopted in the U.N. Law of the Sea Conference by LA countries are not equivalent to marine policy definitions. Jurisdictional pronouncements have been essentially the translation of LA fears from resource exploitation by foreign interests before the countries develop themselves the necessary scientific and technological capability. In spite of the contributions by LA jurists to the Law of the Sea, the only joint declaration that has had the power of an international treaty is the 1952 Declaration of Santiago when Peru, Chile, and Ecuador claimed territorial seas of at least 200 miles. The Declarations of Montevideo (1970), Lima (1970) and Santo Domingo (1972) are simply statements of adherence to principles. In addition, only Haiti, Mexico, Dominican Republic and Venezuela have both signed and ratified the four Conventions derived from the 1958 Geneva Conference (Garcia-Amador, 1976).

<sup>\*</sup>The views expressed in this paper imply a personal value position which in no way reflect endorsement by the Woods Hole Oceanographic Institution.

# 2. HISTORICAL BACKGROUND AND DEVELOPMENT 2.1 Science Development

The importance of the lack of effective national commitments for the development of a marine scientific capability and the need for the adoption of marine policies in LA was recognized by Wooster (1973) and by Ayala-Castañares (1973). However, the authors have not elaborated on the underlying causes of the problem.

Basalla (1967) distinguishes three progressively overlapping stages to describe the spread of Western science: a) foreign exploration and investigation; b) the establishment of a dependent colonial science founded on advances made abroad and locally adopted; and c) the completion of the process of transplantation and the development of an independent scientific competence. In regard to marine sciences, most countries are still at the first and occasionally at the second stages. LA dependence on the marine capabilities of the advanced countries is substantial.

The historical aspect of progress in the marine sciences also plays an important role in shaping the development of marine policies. Early stages cannot be discussed here but, undoubtedly, the major thrust of oceanography has taken place since World War II and the acknowledged leader in the field has been the U.S. However, U.S. preeminence may be shifting to the U.S.S.R. (Beckman, Hardt and Franssen, 1976) as the result of the priority given to the ocean in Soviet geopolitics.

The need for ocean science was recognized early by the U.S. Navy during World War II and the field received significant support through the military budget. However, the thrust given by the Navy could not have proceeded effectively without the previous existence of a scientific infrastructure which was the result of early, continued and progressive science policies in the U.S. (UNESCO, 1968). Of particular importance in the U.S. in recent years have been the Marine Resources and Engineering Development and the National Sea Grant Colleges and Programs Acts of 1966. The former Act entrusted the President with the responsibility of planning and coordinating Federal marine activities through a National Council. The Council's philosophy called for the strengthening of the economy by identifying marine resources, fostering marine technology and maritime enterprises, enhancing coastal awareness and sponsoring the education of specialists. The Council laid the foundations for the International Decade of Ocean Exploration, IDOE. In 1970. the National Oceanic and Atmospheric Administration (NOAA) was created within the Department of Commerce; NOAA and the National Science Foundation, which was charged with the responsibility of implementing the U.S.-IDOE program, share a leading role in ocean In 1971 the National Ocean Advisory Committee on Oceans research. and Atmosphere (NACOA) was established to review progress and advise the Secretary of Commerce (Wenk, 1972). The need for an

updated assessment of U.S. marine activities resulted in the Senatorial National Ocean Policy Study approved in 1974 which is currently under way.

Throughout its history the U.S. has made strong commitments to developing scientific capabilities and has effectively capitalized on its discoveries. Its present preeminence in science is the cumulative result of the collective efforts by inquisitive and creative people, government agencies and academic institutions, and their close interactions. The growing role of the U.S. as a maritime power in the 20th century coupled with its defense needs encouraged a determined inquiry into the nature and uses of the oceans. The scientific infrastructure and private and public support allowed for the development and growth of a number of leading oceanographic institutions.

Science policies in various LA countries cannot be reviewed here, but there is no question that science development has not been effectively considered a priority. Scientific progress in LA has taken place more as the result of the determination of a few outstanding people rather than the fruit of national commitments, a scientific climate and financial support. Most advances have been made in medicine reflecting initial and continued interests. Isolation from new developments and a sense of neglect by the scientific community have been identified as important drawbacks since the initial stages of colonial science in Spanish

America (Roche, 1976).

Moslem science had an influence on the Spaniards who used technology rather than develop it. The Spanish colonizers supported botanical studies for medicinal purposes and for the rich trade in spices; furthermore, chemical technology through amalgamation resulted in the lucrative diffusion of silver in Europe. This in turn encouraged a great increase in trans-Atlantic trade. The settlers imported from Spain the goods needed to maintain their European mode of life and thus developed a ranching, planting and mining economy to pay for the imports. This general pattern did not change greatly until the last few decades. The traditional Spanish preference (from the arid Castilian uplands) for pastoral pursuits in conjunction with the Indian communal agriculture resulted in an ex-The systems of "encomiendas" and clusive land-based economy. stock ranching provided a firm social and economic basis for colonization and produced the capital which made possible the largescale mining of precious metals. The Spaniards became accustomed to a lavish use of labor and ambitious projects developed. The Indian population which supplied the labor rapidly declined and African slaves were imported, initially for the sugar plantations. This racial element subsequently became established in the coastal Large-scale farming contributed to the decay of the commuareas. nal agriculture and to the spread of latifundia.

Land for agriculture was not scarce and there was no pressing need to develop marine resources for survival. To this day, agriculture based on inexpensive labor has continued to be the most important asset of LA economy. The economic structure concentrated power on the landed aristocracy and although several LA capitals or major cities were founded originally in the coasts, an awareness of the role of the ocean in harmonious development did not take place. Significant marine enterprises were neglected by the land-based economy ruling classes, especially in the ardent tropical Most efforts were concentrated in areas of more benign coasts. climates. Fishing was relegated to the lower social and economic strata and disdained as a form of servile manual labor. The investment trend has been reversed only in the last three decades: in Peru, initial interests were concentrated in the guano industry and the first national fishing company was established only in 1924; in warm-water countries with rich but relatively low density shrimp resources, for the high-value export markets. Comparatively only Peru has a significant marine fish meal product (96 percent of LA), which accounts for 28 percent of the Nation's merchandise exports. This represents 1.7 percent of the total LA exports, the total value of which is about 43 billion dollars (1970-1972, Inter-American Development Bank, 1975). The entire LA export of crustaceans accounts for another 1 percent, almost half of which comes from Mexico (47 percent), followed by Brazil

(13 percent) and Panama and Venezuela (7 percent each).

As a result of the economic structure contemporary investments in fishing enterprises have been undertaken by land-owner capital and revenues have failed to substantially benefit coastal inhabitants. Recent LA government interest in fishery development, mostly due to FAO advisory work, has been translated into loans from the Inter-American Development Bank for projects in the order of 200 million dollars (Luna, 1974). The initial thrust has been in organizing institutions capable of managing investment projects and promoting future developments of fisheries. Interestingly, the principal factors adverse to fishing development are not resourcedependent but rather due to the inadequacy of marketing channels and processing technology, and to selective product demands. However, fishery projects do not impinge directly upon the development of a marine scientific capability. One important difficulty is the fact that decisions concerning the marine environment and resources are usually made by the ruling classes which have been traditionally unfamiliar with the ocean. Decision-making positions with marine responsibilities usually are appointed through political (or military) patronage rather than on the basis of training or expertise. And unfortunately, in many LA countries the people that are directly dependent upon the ocean are not politically active due to their low social, cultural and economic status.

None of the LA countries has played a significant global maritime role and most of the LA trade is carried by foreign shipping. With few exceptions, LA ports are poorly managed, equipped and inadequately linked to the production areas, although efforts are under way to improve these circumstances (Gilbert, 1974).

None of the military conflicts between South American countries in the 19th and 20th centuries have required the development of a marine military technology, which has been of paramount importance in the major world conflicts of this century. The same lack for a naval technology can be observed for Central America. Most of the disputes have taken place between adjacent republics over land resources and naval power has not played a decisive role. In addition, the Inter-American Defense System and the Organization of American States have provided an effective system for the settlement of disputes.

Historically, education in LA was addressed to the training of the young of the ruling oligarchies and the system was geared toward preparing them for traditional professions which directly or indirectly perpetuated the oligarchy.

Education, since its early establishment by the Catholic Church and throughout the colonial period, was mainly the task of the clergy. After independence, during the early 19th century, the role of the church in education was reduced or eliminated. However, the shift from church to government did not modify its

basic classical nature or its role in training the aristocracy. In addition, the fundamental principle of an educated population as essential to democratic government has not been implemented in LA. Therefore, until recently, there had been little commitment to advanced training. Interestingly, a military career constituted one of the few avenues of social (and economic) mobility in LA, which partially explains the leading role of the armed forces in politics. This is true especially in areas where the other two sources of authority and prestige, the landowners and the Church, have not been effective in addressing fundamental social problems. The landlords did not promote scientific or technological work because inexpensive labor had been abundant and education could upset their rule; the Church tended to be suspicious of science and hindered it; and the military felt no pressing need for it. Finally, in the absence of private support for science development, the bulk of the responsibility lay in the governments which pursued more short-term, politically-valuable enterprises and these have been essentially land-based.

Spain controlled immigration to the colonies in order to maintain the purity of the ruling stock, to preserve the wealth for them, and to protect religion from heretics. Thus the historical circumstances adverse to science development in Spanish America existed well into the 19th century. The spread into the interior of southern South America increased the need for immigrant labor

and as political conditions became more stable and wages replaced slaves, immigration rose rapidly in the latter half of the century. This had a significant influence in modifying the cultural environment and the educational system. The earlier advance of science in Argentina, southern Brazil and Chile can be traced to the European influence and their role in developing new branches of the economy and in the process of industrial expansion. It is in those countries where concern over the oceans developed around the turn of the century, whereas Mexico was influenced by U.S. proximity.

Science education is carried out within the cultural environment and this has been almost exclusively and statically classical in LA. Science education and teaching have been of poor quality and this trait is self-perpetuating; mediocrity is almost unavoidable. The fundamental spirit of inquiry and discovery has not been propagated. Exceptional individuals do not find an adequate environment for scientific activity and cannot function within systems that often stimulate mediocrity. The value of inquisitive work which generates new knowledge which in turn would bring about innovations has been greatly neglected in LA. This may be due to an overall reluctance to change where immutability is an idiosyncratically desirable condition but which is incompatible with development.

The factors adverse to general scientific work, in addition to those mentioned above in reference to the absence of circumstances

that would promote a marine consciousness in LA, have contrived to deter the growth of a marine scientific capability.

## 2.2 Contemporary Developments in Marine Science

Maldonado-Koerdell (1958) published a review of the first steps taken to conduct marine investigations in Argentina, Brazil, Chile, Cuba, Mexico, Peru and Uruguay. Bayer (1969) gave a comprehensive report on the explorations and marine scientific developments in the Caribbean; and Cervigon (1970) provided additional information. A general pattern can be identified in LA: the period of foreign coastal exploration and charting until the end of the 19th century; the establishment of hydrographic offices around the turn of the century; following preliminary observations and natural history collections, the development of biological stations, fishery institutes and geological studies in the latter part of the first half of this century; the subsequent formal establishment of university programs in the marine sciences; and the final participation in international projects at the present time. Evidently, these stages have taken place within the same time scale of the growth of the marine sciences in the U.S. and the U.S.S.R., the difference being in national commitment by these countries.

The first LA congress on marine biology took place in Concepción, Chile in 1949. By the early 1950's considerable concern had grown over marine resources. The 'security zone' concept of the

Declaration of Panama in 1939 had been translated by Chile, Ecuador, Peru, Argentina and El Salvador into a 200-mile jurisdictional claim off their coasts. A need for Inter-American cooperation was recognized by the 10th Inter-American Conference in Caracas in 1954. The document recommended the creation of an Inter-American Oceanographic Institute (later suggested to be located at the Galapagos Islands), under the authority of a central Oceanographic Commission; additional regional centers would study biological, fishery and ecological problems. At this time only Argentina, Brazil, Chile, Cuba, Ecuador, Mexico, Peru and Venezuela in LA were actively interested in these projects. The first meeting of experts in marine biology took place in São Paulo in 1955. Under the auspices of the Panamerican Institute of Geography and History a meeting of a working group on oceanography took place in Washington in March, 1955. It produced a document entitled: "American Oceanography: the Economic Value of Marine Resources," which emphasized the need for cooperation and exploration and identified areas of interest. After the meeting a compilation of data from different countries was un-Preliminary national reports on the resources of the dertaken. continental shelf were presented at a specialized conference in the Dominican Republic in March, 1956. The coordination responsibility of these activities was deposited upon a representative Oceanographic Committee in Mexico in June, 1956, and in October of the same year the first meeting of UNESCO's International Advisory Committee on

Marine Sciences took place in Lima, Peru.

The International Geophysical Year strengthened the value and feasibility of scientific cooperation. By this time the United Nations' agencies had begun to play an important role in scientific efforts. Fishery assistance was furnished by In 1960 UNESCO's semiautonomous coordinating Intergovern-FAO. mental Oceanographic Commission, IOC, was established to advise, promote and catalyze ocean-related endeavors. Also, UNESCO's operational Division of Marine Science, upon request by member states, was charged with the functions of promoting research programs, disseminating information and strengthening national infrastructures with emphasis on education and training. These tasks are performed in cooperation with the UN Development Program. During the 1960's some LA countries which had previously neglected their marine affairs became more actively concerned. Those which had previous expertise strengthened their capabilities and expanded their research efforts; the number of published marine papers in LA also grew. Joint investigations like the ICITA and EASTROPAC were undertaken. Research cruises from the U.S. government and institutions like Miami, Woods Hole and Scripps were conducted in LA waters. Regional conferences, training courses and seminars for marine topics took place, especially in South America. The period of the mid-sixties was also characterized by the creation of National Oceanographic Commissions in various countries for national and international coordination.

Some progress has been made in the marine sciences in LA, but the key factor, and a difficult one to assess, is quality. Under adverse cultural circumstances, deficient or non-functional basic training, and the lack of science policies and governmental support, it is difficult to produce work of exceptional quality. The general and common result is the production of a wasteful second-class science. Furthermore, second-class science is self-perpetuating. Unfortunately, this reality is the rule, with particular reference to marine science, rather than the exception.

As Moravcsik and Ziman (1975) have pointed out, although not in detriment to exceptional people and dedicated organizations, the reality behind the facade of science and technology in developing countries is one of "fragments of a scientific community, disorganized, disunited, of limited professional competence, poverty stricken, intellectually isolated, and directed towards largely romantic goals - or no goals at all." The circumstances in the marine sciences, as one comes into contact with the reality in LA, is well summarized in their statement.

The question arises of the possibility of reversing the general trend in marine science development in LA. Emery (1976a) has addressed the general problem: he plots numbers of geological articles in North America against ten-year intervals. This shows the exponential rate of growth of published articles; the resulting curve is exactly replotted a few decades later. This figure illustrates

Emery's view that if a developing country can later duplicate the growth of U.S. geology as exhibited by the number of publications it would lag farther and farther behind the U.S. with the passage of time in the foreseeable future. One may argue that high-quality articles from developing countries may bring about a change in this pessimistic but realistic historical trend. But under the present state of affairs one cannot disagree with Dr. Emery.

Up to the end of the sixties the fundamental responsibility for marine science development had been an internal national problem in LA. The next stage is characterized by the responsibility being directly or indirectly transferred to United Nations' agencies. Although many benefits have resulted from this transfer (some may disagree), the indispensable governmental commitment to marine science development has been notoriously weak in most LA countries.

#### 2.3 International Cooperation

International marine programs, for their successful implementation, assume the ability to cooperate effectively. Unfortunately, this assumption is not correct for some LA countries due to their limited marine capabilities. This problem is often complicated by the fact that internal national cooperation between various agencies or institutions is limited or only nominal, which reflects the stage of development of the discipline and internal political

problems in several countries. An appreciation of the difficulties may escape an international organization or if it is recognized little can be done due to political considerations.

LA marine activities are evidenced by participation in some of the programs of UNESCO's Intergovernmental Oceanographic Commission's IDOE, or within the IOC-sponsored IOCARIBE regional organization. This participation is summarized in Table I. The Organization of American States, OAS, also has a project-oriented Multinational Program on Marine Sciences, to offer basic support to national interests - the total amount of the resources for the Program does not exceed 300,000 dollars.

The concept of the IDOE (UNESCO, 1974) was developed by the U.S. and was later endorsed by the Soviet Union (Wenk, 1972). It was submitted to the United Nations and approved in 1968 by UN Resolution 2467 D(XXIII) to operate within the framework of a comprehensive long-term program of scientific investigation, later known as LEPOR (UN Resolution 2560 (XXIV); UNESCO, 1970).

The IDOE research programs fall within four major areas: Environmental Forecasting, Environmental Quality, Seabed Assessment and Living Resources. As a result of the initial thrust given to the IDOE by the U.S., this country's National Science Foundation has played an important role in the implementation of the U.S.-IDOE programs. In 1975 the Director of NSF asked the National Advisory Committee on Oceans and Atmosphere to review the progress of IDOE (NACOA, 1975). The Committee found that while the U.S. funding

of about 15 million dollars per year fell short of the originally estimated 100 million dollars necessary to fully implement IDOE, significant success had been achieved especially in reference to Environmental Quality and Forecasting. The aspect of Living Resources had not been as intensively studied mostly due to the desire to avoid overlap in other fisheries research. Considerable progress was made on the study of Continental Margins of the South Atlantic, but private interests had predominated in the area of Seabed Assessment. Budgetary constraints have prevented the pursuit of important original programs such as an ocean monitoring system. In regard to international aspects, it appeared that although an effective machinery had developed for multinational cooperation, the original hopes for a truly international program had not been realized. Furthermore, the growth of oceanographic competence in developing countries had played a smaller role than originally envisioned. Indeed, for the remainder of the IDOE, NACOA's first recommendation was that special emphasis be given to fostering the growth of an oceanographic capability in the developing coastal nations as a means of improving the likelihood and effectiveness of future oceanic studies.

The NACOA report pointed out that while in the U.S. the scientific community was readily responsive to an infusion of funds, other countries were not as ready to respond. The fact is that while in

the U.S. (where the infrastructure existed for the maturation of the IDOE concept) the scientific community could have been active in the marine sciences in the absence of IDOE, other countries, such as most of the Latin American, had not reached a similar level of capability. Cooperation was hampered by this inability to collaborate with, and even use data obtained by more developed countries. The lack of manpower, governmental commitment to oceanic priorities and funding, has thwarted effective LA participation in the IDOE. The unwillingness to commit funds has been clearly evidenced in projects such as the proposed cooperative geological and geophysical studies of the Caribbean, in spite of the fact that the U.S. at the outset pledged to contribute a substantial percentage of the necessary funds.

The IOC as the international coordinator for IDOE and other expeditions has proven its effectiveness in spite of budgetary constraints. The IOC's major funding sources are: UNESCO, the Inter-Secretariat for Scientific Programs Relating to Oceanography (ICSPRO), the Trust Fund and the member states. Out of the 224 million dollar UNESCO budget for the 1977-78 bienium, 1.83 million dollars has been assigned to the IOC and 1.53 million dollars to the Division of Marine Sciences. About 55 percent of this is allocated to staff support. The largest single contribution from other UN sources appears to be about 0.6 million dollars from the UN Environmental Programme, UNEP; the UNDP supports training and

infrastructure development. Contributions to the Trust Fund have amounted to 0.5 million dollars, mostly for specific activities of interest to the few donor countries (significant contributions from: U.S., West Germany, France and Japan). Contributions from members states are not obligatory but these are usually made when a country participates in an IOC program.

All told, the financial resources of IOC and the small size of the Secretariat are inadequate to effectively tackle all Increasing concern over the complexity of its global tasks. functions of the Commission and the difficulty in assessing research proposals and reports, prompted the establishment in 1976 of an IOC Scientific Advisory Board. IOC activities are often criticized (in the developed countries, i.e. Galey, 1973; Day, 1974; Stockman, 1974), and there may be some validity to the arguments that have been raised. However, it must be kept in mind that the IOC function is one of coordination. The ultimate success of an IOC-related program depends upon the member governments. Countries in the process of developing their marine capabilities, such as in LA, place a great deal of responsibility upon the IOC, but in reality their commitments are not commensurate to their fundamental The same can be said about what is expected from other UN needs. programs such as the UNEP which is addressing marine environmental The fact is that the international machinery has programs also. been created and funded by countries that wish to provide an avenue for cooperation and improvement, and the UN agencies are responsive

to requests. There are certainly no antagonists to the development of a marine capability.

At the creation of the IOC, UNESCO's Division of Marine Sciences and at the outset of the IDOE, the need for manpower development was recognized. However, insufficient funds were assigned to this priority and the needs of member countries had not been identified. In addition, government interest had been low; concern began to grow during the span of the Law of the Sea negotiations. At the same time, scientific programs became operational as a result of the thrust given by countries with advanced capabilities. Effective participation by less capable countries was not achieved and this was attributed to the scarcity of manpower. As a result, greater emphasis is now being given to this problem through the following programs: Training, Education and Mutual Assistance in the Marine Sciences (TEMA), and the Voluntary Assistance Program (VAP). The latter calls for a closer country-to-country interaction channeled through the IOC, which in turn reacts as a catalyst, usually on a regional level. In order to identify the needs of less capable countries five regional meetings were held in 1975-76 in Mexico, Montevideo, Casablanca, Manila and Cairo. The regional recommendations provided quidance to future efforts and these were discussed in TEMA-II (New York, July 18-23, 1977). Two needs were emphasized during the meeting: for increased financial support in IOC-TEMA activities, and for the existence of a local infrastructure to promote VAP projects. These, in essence, depend upon national commitments and policy definitions.

In regard to LA, 32 Mexico and 6 Montevideo recommendations emphasized the need for graduate, technical, administrative and managerial training; for vessels, instrumentation, data handling, processing and analysis; and for greater attention to the coastal zone, especially in the In brief, LA countries have emphasized the need Caribbean. for marine science and technology. Again, a high responsibility is placed upon the IOC which in its coordinating capacity cannot fully satisfy these needs. Indeed, in a preparatory meeting to TEMA-II held in February, 1977 in Kiel, doubts were expressed as to the existence of TEMA within IOC without an implementing role. At the same meeting, the available financial resources under UNESCO's regular program were considered insufficient and the IOC-VAP scheme was regarded as being the most promising avenue for implementing IOC-TEMA programs.

Clearly, governments created national IOC coordinating offices mostly as a result of growing international activities. National failures to promote marine scientific development as a consequence of a progressive process linked to the adoption of general science policies resulted in inadequate participation in oceanic enterprises. An analysis of this problem identified the causes and shortcomings, which were well known before participation in the enterprises was undertaken. And now the responsibility of addressing the fundamental problem within the countries is bestowed upon the insufficiently funded and coordinating IOC. The IOC must now

promote regional cooperation and support for less capable countries; however, the latter originally created the IOC as a body that would transcend its progenitors. It would appear that much money, time and effort could have been saved if strengthening of national marine capabilities had preceded the IDOE as a result of the definition of national priorities. This aspect will undoubtedly be of paramount importance in the post-IDOE period of the 1980's. At present, doubts may be raised as to the true internationality of the research programs and their administration. But the communication and scientific advances made within the IDOE, and the successes of IOC and UNESCO's Division of Marine Sciences makes any speculation irrelevant.

The point in fact is that the development of a marine scientific competence with all its cultural consequences in the societies is basically the result of national commitments. No infusion of funds or technical support from international organizations can produce effective benefits without the national willingness to utilize the available means to achieve the capability goals.

The IOC association for the Caribbean and adjacent regions, IOCARIBE, was established in July 1976 to succeed CICAR (Cooperative Investigations of the Caribbean and Adjacent Regions), in order to continue the cooperation that had developed during the latter. There is a trend toward regional management of projects and the task of IOCARIBE is to oversee all marine scientific and

IOC activities in the Caribbean Sea. CICAR was never very cooperative nor investigative as an international project of the member countries. Most of the quality work in physical and chemical oceanography was related to the participation of competent countries, mainly the U.S. The low level of competence of most of the member countries has been well recognized. The greatest weakness of CICAR was in the field of fisheries and marine biology. CICAR, however, stimulated awareness, individual national work and communication; and it underlined the need for manpower development. Furthermore, the U.S., the U.K. and the Netherlands concentrated work in the Caribbean which would probably not have been done in the ab-IOCARIBE is not considered a continuation of sence of CICAR. CICAR in its exploratory context but as a project-oriented coordinating body which emphasizes TEMA activities and collaborates with other ICSPRO agencies like FAO, UNDP and UNEP due to overlapping areas of interest. Nine initial projects have been outlined which fall into the three categories of living resources, geology and environmental quality. The UNEP is especially active in the latter and a workshop was held in Trinidad in December, 1976 to identify the main problems. Special concern has also been expressed over coastal area development and management by the UN Office of Ocean Economics and Technology. There is certainly concurrence of efforts by UN agencies, the Organization of American States and the Economic Commission for Latin America. The

scientific, technological and economic benefits from these efforts do not depend directly upon IOC coordination or the work done by other agencies. Long-term success depends on the development of manpower (and its utilization), and in the marine commitment by governments in the area. International agencies can help but they cannot do the fundamentally significant work.

#### 3. NATIONAL INTERESTS

### 3.1 Economic Overview

The priority given to economic development in LA is inseparable from the consideration of ocean policies. Consequently, it is useful to examine the economic value of the ocean to the U.S. (for which comprehensive information exists) as a valuable <u>reference</u> point and only as indicative of a particular trend in the U.S. A report has been prepared for the Senate's National Ocean Policy Study by Robert A. Nathan Associates, Inc. (1974). Ocean resources are divided into: mineral, living and non-extractive; the results are summarized in Table II and below. All figures are given in 1973 dollars, and should be considered as order-of-magnitude estimates.

The level of primary output of all U.S. controlled ocean resources was about \$7.5-7.8 billion for 1972-73; for 1985 the value is projected at \$23-26 billion and for 2000 at \$33-44 billion. At the present time, the outputs of living resources are smallest and only represent about 10 percent of the total value; mineral resources and non-extractive uses are equally important. Expectations for 1985 indicate that the percentage value of living resources will decline; mineral resources will grow about fourfold and non-extractive uses will double. Expectations for 2000 indicate a comparable value for nonliving resources.

In every time period oil and gas represent over 90 percent of total mineral output and these are expected to be more important than any other single resource, especially with increasing costs. Magnesium and manganese nodules have a prospective annual value of over \$100 million. Food fish constitute about 95 percent of the total value for living resources. Values for non-extractive uses have a more uniform distribution, and transportation and recreation show important percentages. Offshore nuclear power plants expressed as energy values are expected to have a high value by the end of the century and probably will be surpassed only by values of oil, gas and transportation.

Considerable importance is being given to sea-bed resources, mainly manganese nodules. In fact, Committee I of the U.N. Conference on the Law of the Sea, UNCLOS, is devoted to the study of the international aspects of the exploitation of these resources. Emery (1976b) has made an important evaluation of the issue. The origin of the problem lies in the misconception regarding the

expected economic returns from mining manganese nodules, mainly in the Pacific Ocean. The important components of these nodules are copper, nickel and cobalt, which are necessary at high levels of industrial production. For instance, U.S. imports are reported to comprise 20-15 percent of the new copper; 89-71 percent of the new nickel and 98 percent of the new cobalt (Schrek, 1973 and U.S. Government, 1977, respectively). The economics of their mining is controlled by two factors: a) the difference between seabed and land costs, and b) the politics of ownership, national and international. Emery has estimated that the total international production of the three main elements represents an annual value of 10 billion dollars; and if the seabed production penetrates the markets, their combined value would be in the order of 1 billion dollars. Assuming a high 10 percent profit, the total revenue would be about 100 million dollars. If a UN Seabed Authority is established to equally distribute the revenues among some 142 countries the annual return would roughly amount to 700,000 dollars. Or if it is divided according to population, the per capita income would be less than one U.S. cent. Clearly, the revenues are negligible on a global level and direct international cooperation between the nations that can supply raw materials and those industrialized that can process them is needed.

If a general conclusion can be derived from the expected U.S. trends it would indicate that under the present regime the oceans will play an increasing role in the production of fuel and energy.

The value of marine transportation will also be significant in the future. The current pattern of fishery production may increase about 3-4 times. Present world catches fluctuate around roughly 70 million tons and the annual potential yield of conventional species has been estimated at about 118 million tons for 1985. The future potential lies in areas like improved marketing, adequate intermediate technology and management, in the exploitation of non-conventional species (i.e. Antarctic krill, cephalopods and currently discarded species), and in the contributions from energy and cost efficient mariculture practices. A key element is the understanding and preservation of the environmental phenomena that support the bioproductivity. Finally, an important component of the future scenario will be the aspect of non-extractive uses which will center around coastal areas.

The role of the ocean as a waste receptacle was not quantified due to the diversity of circumstances which surround this very important problem, and the environmental consequences of waste deposition have not been fully assessed. The greatest danger appears to lie in the concentration of harmful wastes in productive and valuable coastal areas that lack rapid turnover mechanisms. Their bioproductivity and desirability may be seriously impaired.

LA interests in the ocean are primarily focused on the development of fishery resources for protein, high export value and employment. The region accounts for an average of about 10 million tons

in a normal fishing year (depending on Peruvian catches), that is, roughly 14 percent of the total world catch. Close to 75 percent of the catches comes from Peru and Chile. Cnly about one-third of the total LA production is intended for direct human consumption; the remainder is exported for animal consumption with a low efficiency rate of conversion to meat of about 1/10th. Estimates by FAO and the Inter-American Development Bank, IDB, (Luna, 1974) indicate that the fishery production could increase in LA by about 8 million tons per year. However, fishery projects represent less than 10 percent of the growing annual portfolio of the IDB. The potential landings of up to 18 million tons would make a significant contribution to alleviate protein deficiencies by regional consumption (as opposed to exports) through improved technology and management, and the study of the factors that impinge upon the biological productivity. The latter is an extremely important aspect due to the negative effects brought about by industrialization and coastal develop-These are proceeding in disregard of the experience of alment. ready industrialized countries. The lack of a marine awareness and capability hampers the effective consideration of the environmental problems posed by unbalanced development priorities.

The value of mineral resources is well recognized and need not be emphasized here. Emery (1976c) has made interesting observations on some characteristics of nations and has pointed out that "most minerals are so widespread that differences in the mineral economies

of large regions are due much less to the presence or absence of the minerals than to the educational and political climates for finding and using them".

Finally, the recognition of the value of non-extractive uses (including aquaculture potential in coastal areas near mangrove lagoons) of the marine environment have not adequately permeated through the decision-making levels in LA. One of the key issues is the quality of the marine environment. The question arises as to the economical rationality of less stringent standards in developing countries as compared to those of more advanced countries. Pearson (1976) contends that the governing principle for optimal levels of pollution abatement is to establish standards such that the marginal costs of control are equivalent to the marginal economic value of the damages avoided. Standards could then be set in terms of local characteristics and international standards could, in fact, be inadequate. Most LA countries, however, have not assessed the value of their coastal environments and consequently lack adequate elements of judgment that could guide them in the formulation of their policies.

#### 3.2 National Approaches

There is growing concern among LA countries over their marine affairs, especially due to the current negotiations of UNCLOS. National interests of individual countries cannot be discussed here and quite often comprehensive information is scarce. However, a general pattern of approaching marine activities can be identified

and examples of the approaches will be mentioned briefly.

Major differences lie in the aspect of administrative organization and the allocation of funds. In some cases, the activities basically represent a list of short, medium and long-term projects, resulting from the work of oceanographic and/or fishery bureaus. However, there is uncertainty as to the implementation feasibility of the projects in terms of their logistics (tasks, functions and capabilities) due to manpower and financial shortcomings.

Before continuing, I must stress that agriculture represents the backbone of LA economy, followed by industrial production (IDB, 1975). In the fifties, LA was characterized by the predominance of goals such as import substitutions and industrialization; in the sixties, by national planning and economic integration; and the present trend is toward regional planning (Utria, 1972). To this end, numerous regional agencies have been established in most LA countries with minimal or no effect on marine activities. Gilbert (1974) contends that the agencies have tended to foster industrial growth at the expense of agricultural development, an area which by its potential, especially in the tropical regions, requires important attention (Hopper, 1976). Gilbert also points out that the planning offices have not been effective in curing the fundamental problems and that political support for regional development has been ambivalent.

He concludes that the problems are related to the difficulty in reversing the social and class structural forces which are polarized in LA, and that the final analysis indicates that the developmental problems are a question of political commitment. If the important aspect of agricultural production has not been addressed as effectively as it deserves due to social and political factors, it is not surprising that marine commitments have been inadequate. But whereas agriculture-related problems stem from centuries-old structural difficulties, these do not appear to be operational against the development of a marine awareness and capability.

I classify national approaches to marine affairs in LA into five categories according to published documents, unpublished reports and personal communication with government agencies. The categories are: A) Integral, in which a country is committed to the incorporation of the ocean into its overall development plans: Chile (CONICYT, 1976; Gallardo, 1976). B) <u>Scientific Infrastructure</u>, in which countries seek to improve their capabilities through the general development of scientific excellence: Brazil (Conselho Nacional de Desenvolvimiento Cientifico e Tecnologico, 1976), and Mexico (CONACYT, 1976; UNAM, 1976). C) <u>Coordinating</u>, in which marine activities are basically promoted through a governmental commission: Colombia (DIMAR, 1973) and Argentina. D) <u>Fishery</u>, where a country's efforts are significantly directed toward the exploitation of fishery resources: Peru, Ecuador, Panama, Uruguay.

E) <u>Primary</u>, in which marine activities are limited, mostly restricted to developing fishery potential.

### 4. FUTURE OUTLOOK

The ultimate success of all science and technology lies in the discovery of the qualities of our world and in our ability to utilize this knowledge to widen the vital spectrum of man within the constraints of nature and man's spiritual aspirations. There are numerous problems that a scientific inquiry can address for beneficial purposes and the ocean offers multiple possibilities, including the intellectual pursuit of understanding its role within the biosphere. Some of the possibilities have recently been mentioned by Smith and Ross (1976).

There are currently two leading countries in the field of marine sciences: the U.S. and the U.S.S.R. From the late 18th century the U.S. has been a maritime power. The U.S. achieved its preeminence in the marine sciences as a result of the existence of a scientific community capable of tackling the practical marine problems posed by wars. These events prompted the expansion of marine investigations in a variety of areas in which acoustic studies have played a significant role (Hersey, 1977). In the process of growing financial support within an expanding economy numerous inquiries were undertaken, some of which did not appear to strengthen the economy. Some politicians felt that the expenditures for marine scientific activities had little impact on

the general social and economic growth of the country and due to various circumstances the period of the 1970's has been characterized by shrinking funds for marine science. The U.S. is, except in reference to fisheries, significantly more dependent on the oceans than is the Soviet Union for economic prosperity and security (Beckman, Hardt and Franssen, 1976).

The Soviet Union, on the other hand, has had a different pattern of development of its marine scientific capabilities. It has been traditionally a land power and is not dependent on the sea for transport of strategic materials and oil; it has a significant need only for marine fish protein. This explains the emphasis on pragmatic fisheries-related oceanographic research. However, its ocean policy has been aimed at challenging the U.S. and western industrialized nations due to their vulnerability through imports via the sea. The U.S.S.R. also seeks to share in the control of ocean resources as a means of countering the economic strength of the West. As a result, the Soviet Union has emphasized scientific and engineering manpower training for oceanography since the implementation of its accelerated ocean program in the 1950's (Beckman, Hardt and Franssen, 1976).

Evidently, the development of a marine capability in LA must proceed in a different manner than it has in the U.S. or the Soviet Union. LA faces a different challenge and has different needs in

the incorporation of the ocean into its development process. Thus, LA must adopt an autochthonous series of marine policies which take into account a diversity of factors in accordance with national and regional economic, social, ecologic and political characteristics. The question arises as to the ability of LA to develop such policies at this time. There is reason for doubt due to two main reasons: first, because a marine scientific maturity has not been attained; and second, because a marine awareness, or better, a marine philosophy which considers the ocean as a system in harmony with nature, is lacking.

In reference to the scientific aspect, recent LA recommendations for IOC-TEMA and VAP simply indicate the requests that have been presented before UNESCO or advanced countries for support aimed at improving research capabilities, the direction of which has not been generally identified as the result of national ocean policy definitions. In this sense, it is easier to provide countries with assistance rather than to convince them that an initial evaluation of national goals and priorities should be undertaken. A marine awareness has not developed in LA mostly due to the abundance of land resources which have not been fully explored or exploited; because the ocean has not played a significant military role; and because an average level of material comfort has not been reached which would promote the consideration of aspects pertaining

to the quality of life in relation to the ocean.

Thus, it could reasonably be argued that because most LA countries have not reached a marine scientific maturity their ability to undertake ocean policy evaluations is To the present time no national or international tenuous. program has focused on providing LA countries with marine policy alternatives. It is in this area where international assistance is most valuable; but this view in no way diminishes the need for indigenous scientific development. Advice from advanced countries can proceed in a manner which I shall call "Policy Transfer" to promote useful, creative and productive activities as opposed to the fashionable "technology transfer". To accept the view that the fundamental problem in ocean affairs is only one of transfer of technology is to pursue a course of inertia. Unfortunately, this seems to be the major concern and route of most LA countries.

Usually policy definitions are the result of a progressive acquaintance with the substance of the issues and a subsequent consideration of alternatives for the future. But LA countries do not need to repeat all stages of the development of expertise in the advanced countries. They can benefit from the experience of the latter through Policy Transfer, although this does not imply the copying of objectives developed under a different set of circumstances. The greatest benefit lies in transferring the

understanding of the implications of certain courses of action previously or currently undertaken by other countries, the bases for decisions.

The stage of national ocean policy definitions is not only a necessary stage but a strong foundation for the building of the future. It seems that an immediate course of action lies in the summoning of national ocean studies, discussions and evaluations. These could identify national and regional concerns and goals which could result in overall commitments as opposed to unsatisfactory marginal participation in polarized international marine programs. The current Law of the Sea negotiations are not an obstacle (they may not even be an effective answer to ocean problems), and indeed policy definitions could clarify areas of future cooperation. UN agencies and advanced oceanographic institutions can offer support and scientific expertise for such policy assessments. The identification of national positions could provide the foundations for a Latin American Conference on Marine Policy which could focus on the essentials of the role of the ocean in development. But this development need not be visualized solely in economic terms but within the broad scope of improved material, social, cultural and spiritual aspects.

The nature of the oceans requires commitments which transcend national boundaries. In this respect two points must be emphasized: first, the need for close cooperation between LA countries, and

second, the concern of many more people. LA, in spite of its contrasts, is composed of people with relatively the same cultural backgrounds. LA became administratively subdivided mostly as a matter of geography and difficulties in communications rather than of intrinsic differences. Petty regionalisms have much damage to the countries which have begun to cooperate only in recent years. Whereas the U.S. and the U.S.S.R., regardless of their political, social and economic systems have thrived by the fusion of people from diverse and often contrasting backgrounds, LA has been encumbered by provincialisms. This has resulted in a weakening of the region's economic strength and potential. Thus, overseas powers have effectively exploited a divided continent with local citizens mostly worried about minor amenities and conflicts of the ruling elites. The success in overcoming the problems of the present and of the future lies in the humanistic elimination of inconsequential national frontiers. And an integrated approach to the attainment of a marine capability and awareness is necessary.

The growth of a marine scientific maturity and philosophy requires the concern of many more people across all the sectors of the population in LA. Deficiencies have been attributed to the lack of governmental commitment but this reflects only the general lack of awareness or concern of the population and its leaders. At present, the national responsibility of action lies in those few who realize the importance of the oceans. Much more could also be done

by the international marine scientific community. A great deal of enthusiasm, energy and persistence is needed to reach the decision-making levels in LA. Most of the people who are currently working on marine affairs in LA are insufficiently aggressive in communicating their concerns to an uninformed population. In the research areas people passively await the allocation of exiguous funds from the bureaucracy. And if scientific immaturity is added to adverse means, work of quality can scarcely be produced and this discourages further support. Quite often, it is surprising that work of merit takes place at all. Inertia and resignation before surmountable inadequate conditions are the responsible entities.

A great deal of assistance can be provided by international agencies but the ultimate responsibility lies in the concerned nationals, without which such assistance will be, in effect, dissipated. Failure to promote internal conditions for the growth of a marine capability will result in a negative scientific atmosphere and this will affect morale (Moravcsik, 1975). Low morale and pessimism will cause deterioration of any scientific excellence, which has historically become closely related to political and economic strength. Finally, in the past, much harm has resulted in LA by the concentration within the ruling elites of the economic, cultural and political hierarchies. However, this circumstance can be used positively in the energetic promotion of a marine awareness.

The adoption of marine policies in LA by national introspection

and assessment, and subsequent regional integration with the advice from a mechanism of Policy Transfer seems to be a logical course of action. However, it is possible that this course of action will not be pursued in the immediate future. Thus, alternative approaches should be suggested.

Before continuing, I must stress that my views are biased. I believe that LA has substantial intellectual resources and that a great deal must be done to provide the circumstances for their expression. The historical stage of the development of these resources within troubled economies, depressive social structures and political turmoil may promote the search for better solutions for the problems of our times than those that have been derived elsewhere.

Two courses of action can be delineated. First, short-term manpower development which should strive to create a marine scientific capability; and second, a long-term citizen development that would promote the growth of a marine awareness or philosophy.

<u>Marine Science</u>- Manpower development could be accomplished not only in the context of traditional marine scientific training but also with important emphasis on science policies. The latter will also allow young scientists to consider the avenues of action necessary for creating or stimulating the conditions in which creative and productive marine activities can take place. This approach also requires the familiarization by student advisers of the problems which the doctoral candidate and his community face

The most effective way to proceed appears to be at home. the establishment of sister-institution agreements which could provide the important elements of continuity, communication, documentation, joint research, strengthening of morale and quality control. The sister-institution agreement could be planned with one, or even two academic or research centers in which temporary faculty appointments could be made available for staff from the advanced center and eventually from within LA. Temporary appointments for LA researchers within the expert institutions could stimulate innovation, creativity and communication. The possibility if an Inter-American Center for Marine Research should be considered within the context of a seasonal or periodic meeting place mostly for LA scientists in which regional problems can be discussed, resources shared and the feeling of scientific isolation can be overcome. The ensuing integration of the marine scientific community through the Center (not necessarily a physical structure, although the establishment of one could be envisioned) can be translated into effective influence upon decision-makers; and to provide them with factual information for the evaluation of alternatives. The national training of personnel does not assure the permanent demand for their services in the capacity for which they were trained. Thus, the Center could provide a pool of trained LA manpower from which a country could draw a person with expertise in a specific area. The Center could identify areas of training in

the context of the job market and make the necessary recommendations for adjustments to problems and trends. Finally, training not restricted to a degree program could be developed for persons with a recognized experience who may need an advanced institution's expertise or logistic capability to pursue specific research and policy interests. One such program is being considered now at the Woods Hole Oceanographic Institution. Finally, it must be emphasized that planning for marine sciences in LA is not a substitute for the undertaking of scientific investigations. Indeed, much effort is being devoted to planning and much less to doing. Thoughtful and pertinent observations on these issues can be found in: Dar and Levis (1975); Kesteven and Parrish (1975); Marshall (1974); Moravcsik (1975); Moravcsik and Ziman (1975); Pereyra (1974); Pontecorvo (1973); Sarr (1976); Voss (1974) and Ziman (1969, 1971). I must point out that the approach mentioned above stresses direct scientist to scientist communication rather than going through bureaucratic channels.

<u>Marine Philosophy</u>- This long-term objective requires planning for education, research logistics, funding and organization. In pursuing a social marine awareness Goodwin (1976) suggests the need for: a) a marine-literate and active society, b) a public better informed for the rational use and enjoyment of the marine environment, and c) a new breed of public administrators who recognize and ensure a proper balance of land and sea uses, needs and interactions.

In essence, what is needed is a pyramidal social structure in which a marine consciousness through education pervades and which effectively operates as a motivating force for harmonic development. A general marine education is needed in primary, secondary and university instruction; this does not imply a difficult overall change in the educational system; it simply seeks a balancing of information on a wide spectrum of knowledge in which the oceans (and science as an inquisitive activity) is given an adequate, if not primordial importance.

If the LA priority in regard to the ocean is one of economic development the potential cannot be fully realized if lawyers, economists, engineers, chemists, microbiologists, geologists, administrators and others are not given reasonable basic training in marine affairs. The fact is that LA is at a stage of developing manpower mostly to tackle the aspect of living resources, but other aspects of significant value are not being adequately addressed. One serious danger is that if production and revenues of living resources are not greatly increased (due to stock density, natural fluctuations, marketing problems, increased pollution or other problems), governments will be discouraged from supporting and training living resource marine scientists (where high expectations are placed), and the whole spectrum of marine possibilities will be jeopardized.

In addition to a generalized marine education, a marine philosophy cannot be achieved if basic information, facts and their implications, are not provided to the population and decision-makers. The facts are not readily imported and marine <u>research</u> in LA is needed urgently. Although the key to research is the scientific inquisitiveness of creative individuals, the logistics of research is an extremely important factor and strong commitments to science policies are needed.

An important aspect of the logistics of research is commu-In the marine sciences it is effective between the adnication. vanced countries but unsatisfactory with regard to LA. The flow of information proceeds anti-osmotically; high exchange between mature scientific communities and minimal between immature ones. Since marine investigations are a collective undertaking with a common denominator it is inconceivable that scientific communication be left at the state in which they are now. Improved communications concerning marine affairs are needed in order to reach various sectors of the populations and to promote social awareness. The widening of the capacity to inform societies must be viewed as an essential component of attempts to create an international marine consciousness, especially in the developing world. The key question is concern from the scientists in advanced countries and persistence by LA scientists and science administrators.

International agencies have institutionalized contacts but

scientific communication cannot be limited to these in the marine sciences. The spirit of innovation in scientific question can also be expressed in the search for improved ways of reaching not only marine scientists in other countries, but other professionals, educators and administrators.

The physical means for conducting marine investigations are important and often expensive. It is often assumed in LA that the development of marine research is too expensive and as a result it is not funded at all to begin with, or it is funded at a status-face-saving ineffective level. Thus, the needs are not satisfied at all or the purposes of the minimal commitments are defeated at the outset. Often, the possibility of doing good work is hindered by the façade of structured investigations. The word of caution is that scientists should not fall into the vicious circle of not promoting marine research because the government (where research is concentrated in LA, with minimal university and virtually no private support) does not currently (or adequately) fund it; as a result the scientists do not become active in creating a marine awareness. When funds are available, scientists should strive, in addition to quality work, to promote local and national awareness for realistic funding from a variety of sources. Coastal studies could also benefit from a system of taxation upon marine commercial interests whose activities may threaten or may need to protect coastal ecosystems.

No effective marine policies can be implemented in the absence

of adequate organization. At the present time, fragmentation of responsibilities and interagency lack of cooperation are operating in many countries to obstruct the pursuit of needed objectives in marine affairs. Perhaps reorganizations of various departments and agencies is needed to expedite matters. But reorganizations should develop in relation to policy aims. The crucial problem is the development of an informed community which is willing to endorse, through public or private sectors, the pursuit of objectives in marine affairs that will directly or indirectly improve their lives and of those of the coming generations. And this does not seem an unattainable goal in LA.

One final remark. The adoption of ocean policies and the development of an indigenous excellence in marine affairs is an integral aspect of the growth of LA. There are <u>no</u> alternatives. Growing concern over ocean resources; increasing demand upon fragile and valuable coastal areas and ecosystems; threats to the preservation and enhancement of a natural or artificial bioproductivity; legal, policy, aesthetic question; energy demands, and finally the spiritual pursuit of knowledge, all of these demand the growth of a marine scientific maturity and awareness. Hopefully, the need for these will not be realized too late. Or they can be developed as a planned and determined effort on the part of decision-makers, leaders, politicians, scientists, concerned citizens and international

organizations. Management of the oceanic potential should be dictated by intelligent decisions rather than by shortages. The need for wise marine policies will probably be achieved with the passage of time, but the quality of the output depends on the commitment to the input within a crucial time scale. I have moderate optimism for such commitment because the motivating force appears to be lacking or it is restrained by inertia. Indeed, it is easier to remain inert or destroy than to build for the future.

### CONCLUSION

The utilization and preservation of the oceans should be the result of national and regional ocean policies in LA. Thus, national ocean studies should be undertaken to identify areas of economic and social concern upon which such policies should be based. The concept of social ownership of the oceans is fundamental to the overall well-being of the people and private interests should not operate in detriment to it. Developmental strategies in LA should include appraisals of marine ecosystems and the impact of development upon them; at a regional level the strategies should also consider the global role of the ocean in the biosphere. A mechanism of Policy Transfer from developed countries with marine expertise should be implemented.

Self-reliance in ocean affairs is necessary to fully explore and utilize the marine environment and this requires national

commitments. In many cases, the historical spread of western science, and of the young marine sciences in particular, has not reached the decision-making levels or the general public in LA. This is reflected in the generalized concern over technology transfers without the scientific foundations of that technology or the information bases for technology evaluations. Thus national commitments are needed for purposeful marine scientific training with additional emphasis on science policies and for ocean-awareness-creating education throughout various sectors of the population in LA.

If true development resides in the satisfaction of individual and collective material and non-material needs, now and for future generations, LA countries must realize that the ocean plays an important and critical role in the process of growth.

It can be argued with some justification that positive efforts are being made to approach the oceans wisely; but these efforts are inadequate in quantity, quality and effectiveness when compared to what is needed in LA. National commitments are indispensable. Human energy and determination are needed to overcome the problems of today and to build for the future.

The present stage of growth in LA is a crucial one for future generations and it is now when wise marine policies may have their greatest transcendence.

<u>Acknowledgments</u>- I would like to express my gratitude to the Organization of American States, the U.S. State Department and the scientific

and technological or oceanographic offices in LA countries for kindly supplying me with unpublished information. Ivan Valiela, Boston University Marine Program, and K. O. Emery, Woods Hole Oceanographic Institution made valuable corrections and suggestions.

												_																				
																						49	•									
-			IOCAPRIBE				×		*	: ×	×			×	×	;	×		×	×	×		×		×	×	×					
atior	R		nesso mastros	×			×	× :	×																							
ticip ies	о 4	Ļ	Stock Assessmen	×																												
Par untr [OC)	ម ក		Ocean Charting	×			×	×÷	×																							
ographic rican Co UNESCO-1		Living esources	CUEA						*	;		×								×							×					
Amei Amei	ц	י <u>ה</u> דיים ביים	Ocean Minerals																								×					
al O Latin Sourc	pratic	keabed sessmen	Nazca Plate				×	:	×			×											;	×			×					
nation by I (	Explo	S Ass	Continental Margins	×				×	×	;									×								××					
Inter	Ocear	ental ty	спъЕ					×																								
вге т.	ade for	Environne Qualit	Baseline Studies						X	;													;	<			×					
T.A	Dec		CAPP-CATE				×	×												×												
	ional	mental sting	onin la					:	×	4		×											:	×								
	Internat	Environ Foreca	Subtropical Convergence	×																												
	ĺ	· · · · · · · · · · · · · · · · · · ·	IOC Wembership	×				× :	× >	( ×	×	×			>	1 	×		×	×	×		×	X	×	×	××					
				Argentina	Bahamas Barbados	Belize	Bolivia (Land Locked)	Brazil	Chicmbia	Costa Rica	Cuba	llauador	El Salvador	France (Guadeloupe/ Martiniano)	Giatemala Giatemala	Guvana	Haiti	Honduras	Jamaica	Mexico	Netherland Antilles	Nicaragua	Panama	reru	Rep. Dominicana Surinam	Trinidad & Tubago	Uruguay Venezuela					
			•																													

ESTIMATED AND PROJECTED PRIMARY ECONOMIC VALUE TABLE II. OF SELECTED OCEAN RESOURCES TO THE UNITED STATES, BY TYPE OF ACTIVITY, 1972/73-2000, IN TERMS OF GROSS OCEAN RELATED OUTPUTS (From Robert R. Nathan Associates, Inc., 1974).

Activity 1	.972	1973	1985	2000
Mineral resources:				
Petroleum		2.40	9.60	10.50
Natural gas	•	.80	5.80	8.30
Manganese nodules	•		.13	.28
Sulfur		.04	.04	.04
Fresh water	•	.01	.02	.04
Construction materials-	•	.01	.01	.03
Magnesium	•	.14	.21	.31
Other			.01	.02
Total		3.40	15.82	19.52
viving resources:		· · · · · · ·		
Food fish	0.74		0.95- 1.58	1.37-4.01
Industrial fish	.05		.0508	.0514
Botanical resources	(1)		(1)	(1)
Total	.79		1.00- 1.66	1.42-4.15
lonextractive uses:				
Energy			.5881	3.78-6.03
Recreation 0.70-	.97		1.12- 1.50	1.64-2.53
Transportation	2.57		4,40- 6,21	6.88-11.41
Communication	.13		.2636	. 44 8
Receptacle for waste	(2)		(2)	(2)
Total 3.40-	3.67		6.36- 8.88	12.74-20.82
Grand total 7.59-	7.86		23.18-26.36	33.68-44.49

(In billions of 1973 dollars)

1 Insignificant
2 Potentially significant, but unmeasurable.

BIBLIOGRAPHY.

- Ayala-Castañares, A. 1973. The enhancement of marine science capabilities: future directions. Report of the Marine Science Workshop held by the Johns Hopkins University, Bologna, Italy, 15-19 October, 1976. Annex D, p. 61-71.
- Bayer, F. M. 1969. A review of research and exploration in the Caribbean Sea and Adjacent waters. FAO Fish. Rpt. No. 71. 1: 41-88.
- Basalla, G. 1967. The spread of Western Science. Science, 156: 611-622.
- Beckman, N., J. Hardt, and H. Franssen. Eds. 1976. Soviet Oceans Development. Committee Print for the Committee on Commerce and National Ocean Policy study pursuant to S. Res. 222, 94th Congress 2nd Sess. USGPO, Washington, 646 p.
- Cervigon, F. 1970. Las ciencias del mar en America Latina. Lagena, 1970, 25/26: 39-43.
- CONACYT. 1976. Consejo Nacional de Ciencia y Tecnologia 1976. Plan Nacional Indicativo de Ciencia y Tecnologia. Mexico. 376 p.
  CONICYT. 1976. Breve reseña del papel de CONICYT en la planificacion y desarrolla de las Ciencias del Mar en Chile (Periodo 1968-1976). Consejo Nacional de Investigacion Cientifica y Tecnologica. Santiago, Chile. <u>Note</u>: A preliminary draft of a national ocean policy was prepared concurrent to an international ad hoc meeting in October of 1976 to review Chile's marine policies, under the auspices of the Universidad de Chile and Francisco Orrego Vicuña.

Conselho Nacional de Desenvolvimiento Científico y Tecno-

logico. 1976. II PBDCT. II Basic Plan for Scientific and Technological Development. Rio de Janeiro, 186 p.

- Dar, V. and M. Levis. 1974. Effective communication in technology sharing. Ocean Development and Inter. Law J. 2 (4): 379-401.
- DIMAR. 1973. Programa Colombiano de Investigaciones Marinas. Division de Oceanografia, Direccion General Maritima y Portuaria, Armada Nacional, Bogota. Pub. DO-10.
- Emery, K. O. 1976 a. Perspectives in Shelf Sedimentology. p. 581-592. <u>In</u>: D. J. Stanley and D. J. P. Swift, Eds. Marine Sediment Transport and Environmental Management. New York. John Wiley and Sons, Inc.
- Emery, K. O. 1976 b. Limitations for Seafloor Mineral Production. A paper presented to the Korean Academy of Sciences on October 25, 1976. Contribution No. 3863, WHOI, Woods Hole, Mass.
- Emery, K. O. c. Some characteristics of nations. Illinois Business Review 33 (1): 6-8.
- Galey, M. E. 1973. The Intergovernmental Oceanographic Commission: Its capacity to implement an International Decade of Ocean Exploration. Occ. Paper No. 20, Law of the Sea Inst. U. Rhode Island. 44 p.
- Gallardo, V. A. 1976. Chile's National Interests in the Oceans. Universidad de Chile. Inst. Est. Intern., Ser.Publ. Esp., No. 10. Santiago.

- Garcia Amador, F. V. 1976. America Latina y el Desarrollo del Mar. Instituto de Estudios Internacionales, Universidad de Chile. Santiago. 197 p.
- Gilbert, A. 1974. Latin American Development-A Geographic Perspective. Penguin Books. 366 p.
- Goodwin, H. L. 1976. An Introduction to Marine Education (Draft for Comments. To be developed as a policy statement of the U.S. National Sea Grant Program and the Office of Education). The Oceanic Institute, Hawaii, August, 1976.
- Hersey, J. J. 1977. A chronicle of man's use of ocean acoustics. Oceanus, 20 (2):8-21.
- Hopper, W. D. 1976. The Development of Agriculture in Developing Countries. Scientific American, 235 (3): 196-205.
- Inter-American Development Bank, IDB. 1975. Latin America in the World Economy. Washington. 102 p.
- Kay, D. 1974. International Transfer of Marine Technology: The transfer process and international organization. Ocean Development and Inter. Law J., 2 (4): 351-377.
- Luna, J. 1974. Fishery Potential of Latin America. Inter-American Development Bank, Washington. 14 p.
- Maldonado-Koerdell, M. 1958. Panorama de los Estudios Oceanograficos en algunos países americanos. Bibliogr. Bull. of Amer. Geography and Oceanography. Vol. I, Pt. Oceanogr., p. 177-314. Mexico City.

- Marshall, N. 1974. The Program of the International Center for Marine Resource Development (ICMRD) of the University of Rhode Island. <u>In</u>: U.S. Marine Scientific Research Assistance to Foreign States. Proceedings of a Conference, National Academy of Sciences, Washington. p. 92-99.
- Moravcsik, M. J. 1975. Science Development. The building of science in less developed countries. PASITAM Publications, Bloomington, Indiana. 262 p.
- Moravcsik, M. J. and J. M. Ziman. 1975. Paradisia and Dominatia: Science in the Developing World. Foreign Affairs, 53 (4): 699-724.
- National Academy of Sciences, NAS. 1974. U.S. Marine Scientific Research Assistance to Foreign States. Proceedings of a Conference, Washington. 319 p.
- NACOA. 1975. The International Decade of Ocean Exploration. A midterm review. A report to the Director of the National Science Foundation by the National Advisory Committee on Ocean and Atmosphere. Washington. 44 p.
- Nathan Associates, Inc., Robert A. 1974. The Economic Value of the Ocean Resources to the United States. Committee Print for the Committee on Commerce and National Ocean Policy Study pursuant to S. Res. 222, 93d. Congress, 2d. Sess., USGPO, Washington.
- Neal, V. T. 1974. Latin American Educational Programs in Oceanography at Oregon State University. In: U.S. Marine Scientific Research

Assistance to Foreign States. Proceedings of a Conference, National Academy of Sciences, Washington, p. 78-91.

Pearson, C. S. 1976. Issues in Ocean Resource Management.

In: Oceans '76. Marine Technology Society, Washington.

- Pereyra, W. T. 1974. Marine Fisheries Assistance Experience in South America. <u>In</u>: U.S. Marine Scientific Research Assistance to Foreign States. Proceedings of a Conference, Washington. p. 163-172.
- Pontecorvo, G. 1973. Ocean Science and Mutual Assistance: an uneasy alliance. Ocean Development and Inter. Law J., 1 (1): 51-64.
- Roche, M. 1976. Early History of Science in Spanish America. Science, 194: 806-810.
- Sarr, L. 1976. Marine Technology Transfer as Foreign Aid to Less Developed Countries from Oceanographic Institutions in Industrialized Countries: A search for an effective mechanism in the educational sector. Technical Report, WHOI Reference No. 76-84, 52 p. Woods Hole, Mass.
- Schrek, A. E. Ed. 1973. Minerals Yearbook 1971: Bureau of Mines, V. I. Metals, Minerals and Fuels. USGPO, Washington.
- Smith, L.J. and D.A. Ross. 1976. Technological Transfer in Marine Science Interciencia, 1(1): 38-42.
- Stockman, R.H. 1974. The Intergovernmental Oceanographic Commission-An uncertain future. University of Washington Press. 150 p.

- UNAM. 1976. Plan de estudios de especializacion Maestria y Doctorado en Ciencias del Mar. Universidad Nacional Actonoma de Mexico. Mexico. 57 p.
- UNESCO. 1968. National Science Policies of the U.S.A. Origins, development and present status. UNESCO Press.
- UNESCO. 1970. Comprehensive outline of the scope of the Long-Term and Expanded Program of Ocean Exploration and Research. IOC Tech. Ser. No. 7, 82 p.
- UNESCO. 1974. The International Decade of Ocean Exploration (IDOE), 1972-1980. IOC Tech. Ser. No. 13, 87 p.
- U.S. Government. 1977. International Economic Report of the President. Transmitted to Congress January, 1977. 194 p. USGPO. Washington.
- Utria, R.D. 1972. Regional Structure in Latin American Development. <u>In</u>: G. Giesse and J.E. Harday, Eds. Latin American Urban Research, V.II. Sage Publication, Beverly Hills, p. 61-84.
- Wenk, E., Jr. 1972. The Politics of the Ocean. Seattle, University of Washington Press, 590 p.
- Wooster, W. 1973. Marine Science and the Developing Countries. Report of the Marine Science Workshop held by the Johns Hopkins University, Bologna, Italy, 15-19 October, 1976. Annex D, 7 p.
- Voss, G.L. 1974. International Research Cooperation in Marine Biology at RSMAS University of Miami. <u>In</u>: U.S. Marine Scientific Research Assistance to Foreign States. Proceedings of a Conference, National Academy of Sciences, Washington, p. 100-113.

- Ziman, J. 1969. Some problems of the growth and spread of science into developing countries. Proc. Royal Soc., A, 311: 349-369.
- Ziman, J. 1971. The "Winter College" Format. Science, 197: 352-369.

September 1977

## DISTRIBUTION FOR SEA GRANT REPORTS

No. of Copies	Address
3	National Sea Grant Depository
	Pell Marine Science Library
	University of Rhode Island
	Kingston, KI 02881
1	Sea Grant 70's
	Center for Marine Resources
	Texas A&M University
	College Station, TX 77843
5	Office of Sea Grant
-	3300 Whitehaven Street. N.W.
	Washington, D. C. 20235
	ATTN: DR. David Duane
25	Mrs. E. Downs
	Acquisitions Section, IRDB-D823
	Lib. & Info. Serv. Div., NOAA
	6009 Executive Blvd.
	Rockville, MD 20852

BIBLIOGRAPHIC DATA	1. Report No.	2.	3. Recipient's	Accession No.
SHEET	WHOI-77-63	I	5. Report Data	- <u>-</u>
		λ	October	1977
TOWARDS A MARINE	POLICY IN LATIN AMERIC	n	6.	
. Author(s)			8. Performing No.	Organization Rept.
rrancisco J. Pala . Performing Organization	Name and Address		<b>10.</b> Project/T	ask/Work Unit No.
Woods Hole Oceand Woods Hole, MA (	ographic Institution )2543		11. Contract/0 04-6-158	Grant No. -44106
12 Sponsoring Organizatio Pew Memorial Tru: Sea Grant.	n Name and Address st; Department of Comme	rce, NOAA Off:	ice of Techn	epuit & Period
			14.	
15. Supplementary Notes	······			
prehensive polic process of devel related to the m of ocean affairs through national unsatisfactory o The positio not equivalent t essentially the interests before	tes which consider the opment. The ability to arine scientific capabi . Effective developmer commitments. In most r lacking. ns adopted in the U.N. o marine policy definit translation of LA fears the countries develop	Law of the Se tions. Jurisd themselves the	a Conference by LA c ictional pronounceme e exploitation by for	countries are ents have been preign
17. Key Words and Docum	nt Analysis. 170. Descriptors	······································	, <u>, , , , , , , , , , , , , , , , , , </u>	
<ol> <li>Marine Polic</li> <li>Marine Scien</li> <li>Latin Americ</li> </ol>	У Се а			
** technological of the Sea, the treaty is the 19 territorial seas Lima (1970) and In addition, onl 17b. Identifiers/Open-End	capability. In spite only joint declaration 52 Declaration of Sant of at least 200 miles Santo Domingo (1972) a y Haiti, Mexico, Domin ed Terms	of the contri that has had iago when Peru . The Declara re simply stat ican Republic	butions by LA jurist the power of an inte , Chile, and Ecuador tions of Montevideo ements of adherence and Venezuela have b	ts to the Law ernational claimed (1970), to principles both ***
*** signed and n (Garcia-Amador,	atified the four Conve 1976).	ntions derived	l from the 1958 Gener	va Conference
17c. COSATI Field/Group	5			
18. Availability Statement			19. Security Class (This Report) UNCLASSIFIED 20. Security Class (This	21. No. of Pages 58 22. Price
			Page UNCLASSIFIED	
l		······································		USCOMMA DC 14952-

<ol> <li>Marine Policy</li> <li>Asrine Science</li> </ol>	Paisto. J. Latin Monerica Paisto. J. Latin Monerica Jer Grant I. Paisto, Francisco Munagement I. Paisto, Francisco		doption II. Per Manustial Trust Integral	to move the set of the	ffairs. 804-6-158-44106 through	ze 🔰 📕 IV. WHOI Marine Policy 6 Guesan Management	Program	ation fore This card is UNCLASSIFIE Juristo this card is UNCLASSIFIE the auto and and and and and and and and and and		1. Marima Policy	2. Marine Science	Palacio. 3. Latin Marica cetal Terret der Carnt Muneyement 1. Falacio, Franciaco		udoption II. Pew Memorial Trust integral	r to adopt III, MOAA, Office of scientific 5 as Grant .	1224/158-44106 - through	17. MHOI Marine Policy E Crean Funagemen	ce by	usion More This card is UNCLASSIFIE	l the Untiago .east	l achd Llacigolae.
Woods Hola Ceeanographic Institution MBU2-77-63	Tokhuka A NUMIR POLICE TH JATH NERGEN by Trancisoo J. P 5 papes. October 1977. Prepared with funds from the Pev Name and by the Inpertent of Commarce, NOMA Office of See Grant und Flowe-1950-41106, and the Institution's Marine Solicy and Ocean Flower-1950-41106, and Che Institution's Marine Solicy and Ocean	· · · · · · · · · · · · · · · · · · ·	The purpose of this paper is to stress the need for the ad in the of comprehenting policies which contacts the second as an intervention of the second second as an	and implement such policies is directly related to the marine a	capability of the country and to national awareness of ocean af Effective development of these two aspects can only open about	mational commitments. In most LA countries such consituents are unsatisfactory or lacking.	The positions adopted in the U.M. Law of the 844 Conferenc	EX countries are not equivalent to marine policy dafinitions. Durisdictural proconcements have been assantiably the transla of Li fars from resources exploitation by foreign intervents but the countries develop themselves the necessary scientific and the countries develop themselves the necessary scientific and power of an international transly is the 1922 Inclurions bat has had hower of an international transly is the 1922 Inclurion for the Noner of an international transly is the 1990, than 1970) Santo Douingo (1972) are simply interements of Abrence to prin the Inclure the Inclure the neck of the science of prin the Inclure the Inclure transle	In addition, only Mail, Mailo, Deminical Mobulic and Venetia have both signed and ratified the four Conventions. derived from the 1958 Geneva Conference (Garcia-Nador, 1976).	Mooda Bola Oceanographic Institution Neo-171-65		Towards A warne policy in LATIM AMENICA by Francisco J. 3 58 pages. October 1971. Prepared with Yunda Evon the Peer Mand and by the Department of Commerces. WOAN Office of Saa Commu Mode - 198-44106, and the Institution's Marine Policy and Commu Power-198-44106, and the Institution's Marine Policy and Commu	• <b>11</b> 3 <b>6</b> 4 4 a	The purpose of this paper is to stress the need for the ac in LA of comprehensive policies which ponsider the opean as an	and important part of the process of develogment. The ability and implement much policies is directly related to the marine (	Capability of the country and to national swaranaws of octaan at Effective development of these two assects can only come about	national committents. In most LA countries such committents a unmatisfactory or lacking.	The positions adopted in the U.M. Law of the Sea Conferen	In contrains are not equivalent to mean point of dilations. In the second performance have been essentially the transit of it fears from resource apploitation by foreign interests be the contraine develop themetors the more second to endentific and technological appailing. In spike of the contraintican by its	to the law of the Baa. the only joint declaration that has had power of an international treaty is the 1952 Backartion of Sa when Prev, Child, and Reudor claimed territorial seam of at L	200 miler. The Declaritions of Konterideo (1970), Lina (1970) Sarto Domingo (1972) are simply statements of adherence to pril addition: colv Matti, Kerico, Deminican Rembils and Vaneru
1. Marine Policy 2. Marine Seiere	3. Latin Neerloa I. Palacio, Francisco	;	II. Pev Memorial Trust	III. NUAA, OFFICE OF	104-6-158-44106	IV. WIOI Marine Policy		this card is untrastrizo		1. Marine Policy	2. Marint Science	<ol> <li>Latin America</li> <li>Falacio, Francisco</li> </ol>	-	II. Pew Mesorial Trust	III. NOAA, Office of See Grant	+04-5-158-44106	IV. WHOI MARTINE Policy 5 Ocean Management	Program	This card in UNCLASSIFIED		
Woods Hole Oceanographic Institution Medi-77-63	TUANDES A MARINE POLICY IN LATIM ADERICA by Francisco J. Falecio. 5 Bages . October 1377. Frapried with fund Erica the Far Hermorial Trust and by the Dapartement of Connector, NOM Office of Sea Grant under Grant F0-6-138-44106, and the Institution's Warine Policy and Geean Management Foreras.		The purpose of this paper is to stress the need for the adoption in 1A of comprehensive policies which consider the ocean as an integral	and important part of the process of development. The ablitty to adopt and implement such policien is directly related to the marine scientifie	capability of the country and to national awareness of ocean affairs. Effortive development of these two essents can only recent shout theorem	national consideration. In most LA countries such commitments are	The mostetone advantad in the U.N. Ise of the das Conference bu	LA countries are not equivalent to marine policy definitions. Jurisdictional pronouncements have been assentially the translation of LM fears from respondents have been assentially the translation the countries develop themasives the necessary scientific and technological capability. In spire of the contributions by LM jurists to the law of the Sam, the only joint declaration that has had the power of an intermation tracky is the 1952 beclaration of Santago uhen Faru, Onlies, and Feudor claimed corritorial seas of a stage the oblight of the Sam, and reudor claimed or claimed on of Santago uhen Faru, Onlies, and Feudor claimed corritorial seas of a stage Santo Donlage (1972) are simply statements of adherence to principles.	In addition, only Maiti, Makico, Dowinican Republic and Vennerwia have both signed and ratified the four Conventions. derived from the 1958 Geneva Conference (Garcia-Anador, 1976).	Noode Hole Oceanographic Institution		TOWARDS A NUMINE POLICY IN LATIN ANDRICA by Francisco J. Palacio. 56 pages. October 1977. Tragered with funds from the Par Hamovial Trust and by the Department of Commerce. MANA Office of Sax Grant under Grant 104-6-158-48106, and the Institution's Marine Policy and Ocean Management	Program.	The purpose of this paper is to strass the need for the adoption in LA of comprehensive policies which consider the orean ms an integral	and important part of the process of development. The ability to adopt and implement such policies is directly related to the marine momentific	capability of the country and to national awaranamy of ocean affairs.	riterities unrecomments of insertion affords out only our mouth construction Intional constituents. In host IA countries such constituents are Unsertastoor of laction of lactions	The positions adopted in the U.N. Lav of the Sea Conference by	It countries are not equivalent to marine point definitions. Juridictional pronouncements have been assailably the translation of 1A fears from resolves exploitation by forming internets before the countries develop themesives the meremany relatified and frommological constitue. In moste of the contributions by IA justs	to the Law of the Sea, the only joint dislaration that hus hid the power of an international tracky is the 1937 Bouldaration of Santlago when Peru- (Alle, and Studior claimed territorial seas of at least	200 miles. The Declarations of Montevideo (1970), Lina (1970) and Santo Domingo (1972) are singly statements of adherence to principles.