

International Decade Of Ocean Exploration



**A REPORT BY THE NATIONAL COUNCIL
ON MARINE RESOURCES AND ENGINEERING
DEVELOPMENT, EXECUTIVE OFFICE OF
THE PRESIDENT**

MAY 1968

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Foreword

The oceans, as Longfellow observed, not only separate but also unite mankind. They are an important source of food and minerals for a rapidly developing world society. They control the weather on land as well as at sea. And for many centuries they have been pathways of transportation and trade, linking societies around the globe.

The science of the oceans is universal, and nations long have collaborated in probing their secrets. These cooperative efforts of our scientists have led to many benefits to science, to economic development, and to international understanding. Now the growing strength of our scientific and technological capabilities can offer new rewards for all mankind through an expanded international program to explore the seas and their resources.

To meet this promise, President Johnson proposed on March 8, 1968, an International Decade of Ocean Exploration during the 1970's—a Decade of intensified and sustained international collaboration to plan, develop, and implement programs for exploring the world's oceans. The Decade of cooperative endeavor should set a pattern for other endeavors with tangible rewards—a pattern that can extend both seaward and landward of the water's edge.

This report elaborates the general character of an International Decade of Ocean Exploration. Its purpose is to foster further development of the Decade concept by scientists, engineers, and representatives from industry and governments. We have not attempted to prejudge the detailed scope of the Decade, the national and international collaborative projects which would develop, nor the international mechanisms for planning and coordination. These aspects must be worked out collectively in the months and years ahead.

As Chairman of the National Council on Marine Resources and Engineering Development, I invite the participation of all nations—large and small—in an adventure limited only by our wisdom, our vision, and our energy.



Hubert H. Humphrey

VICE PRESIDENT

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AN INTERNATIONAL DECADE OF OCEAN EXPLORATION

The Proposal

On March 8, 1968, the President proposed the launching of “an historic and unprecedented adventure—an International Decade of Ocean Exploration for the 1970’s.”

The President subsequently stated that such activities could:

- “expand cooperative efforts by scientists from many nations to probe the mysteries of the sea;
- increase our knowledge of food resources, to assist in meeting worldwide threats of malnutrition and disease;
- bring closer the day when the people of the world can exploit new sources of minerals and fossil fuels.”

The President has invited and encouraged the efforts of other nations in exploiting the promise of the sea, and he has asked the Secretary of State to explore with other nations the joining together in long-term ocean exploration.

The Concept

General

Contemporary research and survey activity leading to commercial-scale development of ocean resources has convincingly demonstrated that the ocean is an important source of food and minerals for a rapidly developing world society. An unprecedented scientific and technological capability now exists to explore the sea—to increase the harvest of these resources and to contribute to the protection of life and property on land and at sea through improved weather and ocean forecasting services. This new capability also promises to contribute to the advancement of science itself.

In recognition of the rapidly growing significance of ocean resources and the increasing importance of an understanding of ocean processes, the President has proposed that the nations of the world join together in a concerted, long-term cooperative program of ocean exploration on a worldwide basis. As the initial focus for such a vast undertaking, he has proposed a 10-year period of expanded collaborative efforts, designated as the International Decade of Ocean Exploration.

The Decade is envisioned as a period of intensified collaborative planning, development of national capabilities, and execution of national and international programs of oceanic research and resource exploration. Knowledge of the ocean and its resources is exceedingly limited. Because of the very size, complexity, and variability of the marine environment, scientific investigations of vast scope will be necessary if knowledge of this environ-

ment is to increase within a reasonably short interval. At the same time excellence, experience, and capabilities in marine science and technology are shared by many nations. Hence, a broad program of ocean exploration can be carried out only through a cooperative effort by many nations. The success of such an endeavor will depend in large measure on the extent to which various nations contribute their particular expertise and capabilities, assume a share of responsibility for the program, develop their manpower and facilities, and disseminate to others the results of scientific discoveries.

The Decade can be a period of opportunity to broaden methods of cooperation between nations that will persist far beyond the Decade in developing the future economic potential of the ocean. Cooperative programs of the past provide experience and a base on which to develop expanded and more deliberate efforts of the future.

Geographical Exploration of Ocean Resources

The Decade can contribute to the economic and scientific development of all participants. Also, the Decade can encourage and assist in the development of resources, and particularly new sources of food, critically needed in the developing areas of the world. Thus, emphasis should be placed on the identification and assessment of food and mineral resources as well as investigation of ocean processes.

Realization of the full food potential of the sea will require an assessment of unused fish stocks readily available to current fishing techniques. In addition, there are known resources in the deep ocean and in the mid-depths that to date cannot be harvested economically. Expanded efforts to locate fish more precisely, increase the efficiency of capture, and predict abundance and availability of the stocks on a seasonal basis should lead to substantial improvements in fish catch. Increased efficiency also will expand the need for scientific management techniques to avoid overfishing and disturbing the ecological balance. Improved understanding of fishery resources and their reactions to natural and manmade disturbances is necessary to increase and maintain the yield and to resolve international fishery conflicts.

While very little is known of the composition and distribution of non-living seabed resources, these resources are being sought on the Continental Shelf to meet a growing demand for energy and minerals. In the deeper ocean there are extensive sedimentary basins and other geological structures that may signify important resources. However, the content and the geological history of these features remain unknown. Also lacking is the detailed information about regional geological structure that is so necessary for assessment of resource potential. If we are to develop knowledge of the history of the ocean basins and gain insights into mineral resource distribution, the full array of geophysical and geological exploration expertise must be employed. Exploration objectives might include sedimentary basins, ridge systems, major faults, and oceanic extensions of continental structures. A substantial portion of the mineral exploration, however, should be reserved for investigation of the unusual and of those aspects of the deep ocean which make it different from the continents.

Any segment of the programs of the Decade devoted to the mineral resources of the Continental Shelf would be undertaken only with the per-

mission of the contiguous coastal state. Similarly, programs in food development would take into account existing international fishery agreements, and legal considerations, including claims of national sovereignty.

Scientific Exploration

Effective exploration of the oceans can best be achieved through balanced research and survey, that is, between programs to solve specific scientific problems and programs for systematic collection of data on a broad regional or world ocean basis. Research and survey efforts are mutually supporting. For instance, survey data led to the recently developed concept of ocean floor spreading. Further surveys are now being directed to test this concept. When the specific nature of ocean floor rifting is documented on a global basis, it may then be possible to predict the physical and geological properties at any particular location with a greater degree of certainty.

The Decade does not by any means suggest exploration of every square mile of the world's ocean, nor investigation of every conceivable ocean phenomenon. However, it does imply that collectively the nations of the world can identify the most promising geographical areas and lines of scientific inquiry.

Development of National Programs

Almost every activity of a nation to investigate or operate in the marine environment contributes in some direct or indirect way to a general capability for exploring the oceans and to better understanding of the marine environment. During the Decade all nations would be encouraged to identify how ocean exploration can contribute to scientific and economic development, and accordingly

- develop their capabilities for exploring the oceans;
- expand national ocean exploration programs; and
- share with other nations experience and scientific data acquired from these national programs.

At the present time most nations are primarily interested in ocean exploration programs close to home shores—exploration of the Continental Shelf and of coastal fishery stocks—and these programs receive the bulk of national financial support. Even though nations are moving farther out to sea every year, in the foreseeable future much of the world's ocean exploration activity will probably continue to be coastal activity, of interest primarily to individual nations. However, sharing of experiences and data from these activities can benefit others.

Advances in marine science and technology depend critically upon the effective flow of information—from data collectors to data consumers. Existing mechanisms, both national and international, need considerable strengthening to handle the ever-increasing flow of marine data. If the Decade is to be successful, early attention to data exchange on a broad basis appears essential. As more sophisticated data processing equipment comes into use, particular attention should be given to the compatibility of national data systems. Also, standardization of data collection techniques and common procedures for calibrating oceanographic instruments are essential if data are to be useful on a broad basis.

Precision navigational aids are becoming more important as oceanographic measurements are made increasingly in waters distant from shore. National programs for improving navigational accuracies have traditionally assisted the ships of many nations. Further refinement of existing systems and introduction of new systems by the maritime nations could contribute significantly to the success of the Decade.

Skilled manpower is essential for any nation to enhance its capabilities for exploring the oceans. The size, scope, and quality of current national programs and programs initiated in the next several years for training oceanographers, marine engineers and technicians, and specialists in related fields will be a significant factor in determining the rate at which ocean exploration is intensified during the 1970's.

International Collaborative Projects

Types of Projects

As a point of departure for international discussions, consideration might be given to the following kinds of projects:

- surveys of selected ocean areas, principally from oceanographic ships, complemented by increasing use of other platforms such as spacecraft, buoys, submersibles, and ships of opportunity;
- intensive study of designated ocean areas of limited expanse;
- research directed to specific ocean phenomena;
- development of improved world-wide data collection, processing, storage, and distribution facilities and services to facilitate international exchange of data; and
- assistance in strengthening the capabilities of the developing nations to participate in exploration programs, including manpower training.

Illustrative Objectives

Illustrative of the types of objectives for such collaborative endeavors that might be considered internationally are these examples:

1. Exploration of Living Resources

Assessment of living resources useful to man in uncharted regions of the world ocean.

Assessment of current utilization of known fishery stocks.

Acquisition of knowledge relating living resources to their environment in order that greater efficiency in their capture and conservation can be achieved.

2. Exploration of the Ocean Floor

Determination of the geological structure and mineral and energy resource potential of the world's continental margins.

Preparation of topographic, geological, and geophysical maps of selected areas of the deep ocean floor.

Coring and drilling on the continental margins and deep ocean floor in selected areas.

3. *Exploration of Ocean Processes*

Study of scales of motion in the sea and the dynamics of ocean current systems.

Investigations of surface boundary processes, such as the growth and propagation of ocean waves.

Investigations of evolutionary processes of ocean basins.

4. *Assistance to the Developing Nations*

Mapping of selected areas of the Continental Shelf of developing nations.

Surveys of the coastal fishery resources of the developing nations.

Building on Past Cooperative Endeavors

International cooperation involving scientists throughout the world has been widespread in oceanography for many years. During the late 1950's, the International Geophysical Year was a major stimulus in expanding earlier efforts, and particularly in encouraging international exchange of data from scientific investigations. Since that time a number of collaborative ocean exploration projects have been developed and successfully carried out: For example, the International Indian Ocean Expedition, the International Cooperative Investigation of the Tropical Atlantic, and the Cooperative Study of the Kuroshio. Their success has encouraged current consideration by the Intergovernmental Oceanographic Commission of new cooperative programs in the Caribbean and Mediterranean Seas, and in the North Atlantic and Southern Oceans.

Surveys and assessments of fishery stocks in Asia, Africa, and Latin America, supported by the Food and Agriculture Organization, are having a significant impact on economic development in those areas. A number of important international fisheries are being successfully conserved through the programs of international fishery commissions. Furthermore, limited studies carried out by the commissions are contributing to our understanding of world fishery resources. Additionally, the UN Economic Commission for Asia and the Far East is fostering cooperation in investigations of the mineral resources of the Continental Shelf of four Asian countries.

Of particular importance to the success of these international endeavors has been the contribution of nongovernmental scientific organizations and institutions in developing the scientific basis for the programs and taking part in their implementation. For example, the International Council of Scientific Unions, acting through several of its Unions and through the Scientific Committee on Oceanic Research, has made continuing contributions to cooperative oceanographic programs. Also, the Advisory Committee on Marine Resources Research of the Food and Agriculture Organization assists in developing fishery research programs. Direct and personal arrangements between the scientists of different nations have similarly added to the international storehouse of knowledge.

It is against this background of scientific interest and experience in collaborative projects that a long-term continuing program of exploration, worldwide in character, would be built. Current programs sponsored by international organizations, together with existing and planned bilateral and

multilateral cooperative exploration endeavors, would provide an excellent starting point for the Decade.

To insure the maximum reward, international planning for the Decade should be pursued as quickly as practicable. Planning would include the development internationally of a broadened scientific and organizational framework for the Decade, the identification of specific projects to be carried out internationally, and further development of data exchange arrangements.

In preparing the concept of a Decade, the United States has not attempted to prejudge the scope, the international collaborative projects which would develop, nor the international arrangements for planning and coordination. Detailed aspects should be worked out on the basis of consultations with all interested nations and international organizations. The United States therefore has initiated discussions with nations throughout the world on the concept of the Decade. The concept will continue to be discussed in the months ahead at appropriate international meetings to insure that all views can be carefully considered by the international community.

Many national programs of ocean exploration are of direct interest to the international community. The inclusion of these programs within an international framework simply by contributions of data would comprise a significant component of the International Decade of Ocean Exploration. The greatest benefits, however, are derived from the pooling of resources and the sharing of responsibilities through international programs, and participation by all interested nations in planning and implementing specific collaborative projects is desirable.

The continental margins will undoubtedly provide the greatest economic return during the Decade. However, the deep oceans cover by far the largest and least known areas. It is in the deep oceans that international cooperation will provide a common scientific return leading to future economic reward. Because of the high cost of operations at sea, it is of great importance that plans be coordinated internationally to insure that areas with the highest potential interest to the most users be given priority attention. Rather than take all the oceans of the world under consideration for exploration within a 10-year period, a rational delineation of those areas of highest interest must be made.

Program Development in the United States

As early as 1959 the National Academy of Sciences' Committee on Oceanography called for oceanwide surveys: "Not only for research, but in order to exploit and use the oceans, we need detailed knowledge which can be obtained only through systematic surveys in three dimensions. . . . It is essential that these surveys be conducted on an oceanwide, ocean-deep basis as quickly as possible. Our knowledge is now limited largely to waters 100 miles from shore and even here is inadequate for present and future needs." The recommendation was reinforced by the Committee's 1966 report which urged that "the program be carried out in a systematic and expeditious manner." Since that time the necessity for intensified ocean exploration programs has been widely recognized by a number of governmental and nongovernmental organizations.

The National Council on Marine Resources and Engineering Development has been assigned the responsibility by the President for coordinating on a Government-wide basis the ocean exploration activities of all Federal agencies and for developing a coordinated national exploration plan. The Council has assigned to its Committee on Ocean Exploration and Environmental Prediction the responsibility for developing the framework for a 10-year Federal ocean exploration plan, which would provide a basis for more detailed planning of exploration activities. During the next fiscal year the Decade planning role will be undertaken by a new joint governmental/non-governmental planning organization, reporting to the National Council on Marine Resources and Engineering Development. The scientific and industrial communities will be invited to participate continuously and actively in this planning activity, particularly through the National Academy of Sciences and the National Academy of Engineering.

The scale and pace of development of internationally oriented ocean exploration programs will depend in large measure on the international interest and participation in the Decade, and the benefits that are derived from the collaborative programs as they develop. Clearly, significant strides in realizing more fully the potential of the oceans will require greater allocation of resources by all participants, together with closer coordination using the present resources of many nations. If the Decade is accepted and broadly supported on an international basis, it is likely that the expenditures will increase more rapidly during the later years of the Decade than during the early 1970's as the mobilization of the resources of many nations accelerates. At the present time the United States supports many programs devoted to ocean exploration with about 30 percent of the Federal marine science budget designated for programs related to ocean exploration. About half of these programs are of broad international interest.

The Promise of the Ocean

We have only begun to realize the promise of the ocean. As the world's population grows rapidly, the sea can provide new sources of nutritious food. Untapped mineral and energy resources of the sea can help meet growing demands of the world's expanding economy. New understanding of the processes of the ocean—the great regulator of weather and climate—can benefit agriculture, shipping, travel, health, and recreation.

The time is ripe to extend our efforts seaward. The technology is under accelerated development. The task is formidable, but the challenge of the ocean frontier will inspire all who probe its secrets.

The ocean can tie the nations of the world together more than it separates them geographically. The sciences of the ocean are universal. Now all nations can unite in mobilizing their energies to promote the peaceful and cooperative use of the ocean so that its bounty may serve the needs of all mankind.



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