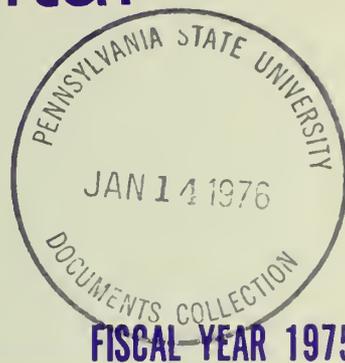


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Federal Plan for Marine Environmental Prediction



FEDERAL COORDINATOR FOR
MARINE ENVIRONMENTAL
PREDICTION



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Clayton E. Jensen

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FEDERAL COORDINATOR FOR
MARINE ENVIRONMENTAL
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FEDERAL PLAN FOR MARINE ENVIRONMENTAL PREDICTION

FISCAL YEAR 1975

WASHINGTON, D.C.
July 1974



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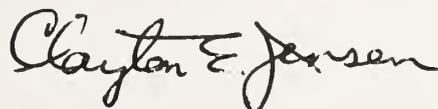
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PREFACE

This Federal Plan is a summary of Federal agencies' planned Marine Environmental Prediction (MAREP) services and research to improve these services in fiscal year 1975. Coordinating MAREP activities and preparing the Federal Plan are the responsibilities of the Interagency Committee for Marine Environmental Prediction (ICMAREP).

The basic programs are summarized for fiscal year 1974, and increases in fiscal year 1975 are described for participating Federal agencies. Data for fiscal year 1975 are as included in the President's fiscal year 1975 budget submission to the Congress. A more detailed description of the ongoing MAREP programs is contained in the *Federal Plan for fiscal year 1974*, previously issued.

A major thrust to improve the MAREP service will be made through the Geostationary Operational Environmental Satellite (GOES) System, which will provide data for sea surface temperature and sea state analyses and will be equipped to relay data from remote surface observation platforms. Expansion of ground facilities to receive, analyze, and distribute this and other satellite data will improve coverage for the MAREP services and research. An intensive program of monitoring offshore oil drilling is designed to preserve the quality of the marine environment. In addition to studying the open ocean, much research in the coastal zone will be devoted to determine baseline conditions and to study mechanisms of change in the physical, chemical, radiochemical, and biological states.



Clayton E. Jensen
Federal Coordinator for Marine
Environmental Prediction

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Summary of Ongoing Programs

INTRODUCTION

Although man has made increased use of the oceans for transportation, food, recreation, and security, many of their natural dangers and mysteries remain. Indeed, little more than the surface of this vast frontier has been studied. Recently apparent is that one of the pressing problems is the effect that man himself has on his environment. The answers to questions about the hydrosphere in general require analysis or interpretations of much data over large areas.

The marine environment is being subjected to man's influences on an ever-increasing scale. Because of the lack of knowledge of the consequences of man's actions on the marine environment, one of the Nation's economically significant needs is to establish adequate marine environmental prediction services. Marine Environmental Prediction (MAREP) is defined here as the monitoring, assessing, and forecasting of the physical, chemical, and biological states of the ocean and its interaction with the overlying atmosphere and adjacent terrestrial boundaries. The marine environment is broadly interpreted to include the open sea, the coastal regions, and the Great Lakes.

The principal goals of the Federal effort in MAREP are fourfold:

1. To provide an integrated program for marine prediction and information services, including timely warnings of hazardous environmental conditions—both natural and manmade—for the protection of life and property and for efficient marine operations on the high seas, in coastal waters, and on the Great Lakes.

2. To develop an integrated environmental monitoring system that will effectively provide physical, chemical, and biological data from oceanic and contiguous coastal regions to support service-oriented programs and to facilitate assessment and control of marine environmental quality.

3. To support assessment and predictions of (a) the distributions and abundances of living marine

- resources of principal importance to the United States, and (b) the influences on these resources of natural environmental variations, fishing, and other activities of man.

4. To support national security requirements by coordinating, utilizing, and augmenting 1. through 3. above, as feasible.

Federal planning for MAREP is coordinated by the Interagency Committee for Marine Environmental Prediction (ICMAREP). Agencies conducting or funding operations or research relating to MAREP are members of this committee. The membership includes the Departments of Commerce, Defense, the Interior, State, and Transportation, the Army Corps of Engineers, the Atomic Energy Commission, the Environmental Protection Agency, the National Aeronautics and Space Administration, the National Sci-



Figure 1.—Experimental Buoy 02 moored over the Cobb Seamount 300 nautical miles west of the coast of Washington.

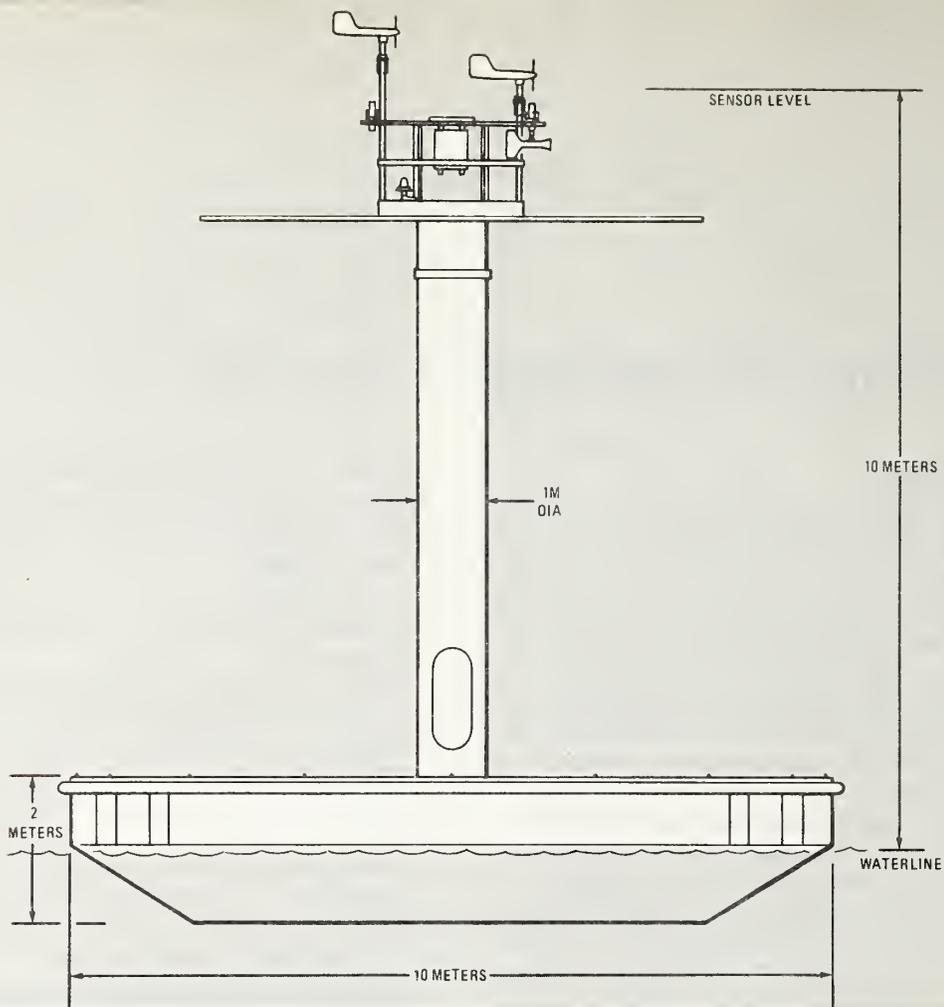


Figure 2.—Prototype Environmental Buoy under development by General Dynamics for the NOAA Data Buoy Office.

ence Foundation, and the Smithsonian Institution. This annual Federal Plan for MAREP briefly summarizes the services and research, indicates major program changes, and describes new program thrusts planned for the fiscal year 1975.

Specialized MAREP plans, directed to specific environmental services and systems, are prepared to coordinate related capabilities and program needs of several agencies. Such specialized plans identify national needs for integrating ongoing programs with longer range program improvements. The *National Program for Continuing Environmental Monitoring for the Marine Leg of the Trans-Alaska Pipeline System*, published in 1973, is the first specialized MAREP plan. The ICMAREP Subcommittee on Marine Environmental Baselines and Monitoring is preparing *A Federal Plan for Coordination of Marine Environmental Quality Monitoring*. This plan will summarize the composite monitoring program anticipated to assess the nature, extent, and rate of

environmental quality change in designated coastal, estuarine, and ocean areas. The ICMAREP Subgroup on Buoys is completing the *Federal Plan for Environmental Data Buoys*. The purpose of this plan is to place the applications of environmental data buoy technology in perspective as an essential component of marine environmental monitoring. Buoy techniques are to be employed in support of research, assessment, prediction, and warning services to serve oceanic areas and coastal communities. Such services are developed in the interest of safety of life and property, efficiency of operation, economic development, energy transportation and exploration, and recreational activities with due regard for environmental preservation and enhancement.

The ICMAREP Subcommittee on the Integrated Global Ocean Station System (IGOSS) links the national monitoring, assessment, and prediction aspects of MAREP with related international marine programs. IGOSS is a joint program of the Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organization (WMO) and, in many ways, an international counterpart of

MAREP extending the weather and sea information provided by the WMO Marine Meteorological Services System (MMSS).

MARINE ENVIRONMENTAL PREDICTION (MAREP) SERVICES

The marine environmental prediction services of the United States are provided to meet the requirements of the general public, national defense, and specialized elements of the economy for marine environmental information. The Basic MAREP Service is intended to fulfill broad-support requirements common to various user groups and to provide the foundation for the Specialized Services. Specialized MAREP Services provide products to serve more specific user groups. Such Specialized MAREP Services include those for Maritime Navigation, Water Pollution Assessment, Living Marine Resources, and National Security.

Basic MAREP Service

The Basic MAREP Service provides fundamental observations and multiple application forecasts used by the general public, government agencies, specialized user groups, and other segments of the economy. The Basic Service also provides many of the observations, analyses, forecasts, and communications needed to support the Specialized MAREP Services. Furthermore, certain marine meteorological observations, analyses and forecast centers, and their communication links, provided primarily for the Basic Meteorological Service,¹ furnish invaluable support to the MAREP Services.

The principal elements of the Basic MAREP Service are:

1. Data acquisition
 - a. Oceanographic and related marine meteorological observations taken by Navy, Coast Guard, and NOAA vessels, research and cooperative ships, data buoys, aircraft, coastal marine stations, and fixed platforms, including monitoring of streamflow in estuaries and the Great Lakes.
 - b. Aircraft flights to collect sea surface temperature and bathythermograph (BT) data and over the Arctic Basin and Great Lakes to observe sea ice and related environmental data.

¹ A full description of the Meteorological Services and Supporting Research is published annually by the Federal Coordinator for Meteorological Services and Supporting Research. Although the Basic and Specialized Meteorological Services are generally incidental to the MAREP Plan, the Marine Meteorological Service and tropical cyclone warnings are important MAREP services.

- c. Global observations of the marine environment obtained by environmental satellites or relayed from other platforms and coastal observation stations.
 - d. Establishment of techniques and secondary reference standards for the assessment of oceanographic instrument performance and development.
2. Communications
 - a. Means for data acquisition for continuous data flow from the place of acquisition to the processing center.
 - b. Means for information dissemination to bring analyses, forecasts, and warnings to the user in a timely fashion.
 3. Data processing
 - a. Coastal, offshore, and high seas weather and sea warnings and forecasts.
 - b. Ice analyses and forecasts for the Great Lakes and Alaskan waters.
 - c. Sea and swell analyses and programs for the Northern Hemisphere.
 - d. Mean monthly sea surface temperature charts and Gulf Stream charts.
 - e. Tide and tidal current predictions.
 4. Information dissemination
 - a. Marine forecasts and warnings by very high frequency/frequency modulation (VHF/FM) and high frequency (HF) voice, CW, and facsimile radio broadcasts.
 - b. Tsunami warnings from the Tsunami Warning System for the Pacific Ocean basin.
 - c. Limnological, marine climatological, and ocean environmental data services, as listed above, to State and local governments, industry, and the user public.
 5. General agency support
 - a. Training of personnel.
 - b. Maintenance of equipment and facilities.
 - c. Internal support.
 - d. Administrative requirements above the operating level.

Specialized MAREP Service for Maritime Navigation

In addition to the Basic MAREP Service the Specialized MAREP Service for Maritime Navigation is of particular significance to maritime navigation because of its applicability to safety and efficiency of operations. Elements of the MAREP Service useful to maritime navigation include forecasts of sea and swell, storm surge forecasts, forecasts of tropical and extratropical storms, and information provided by marine atlases, sailing directions, tide and tidal cur-

rent tables, and various special marine publications. The shipping industry, fishing fleets, and recreational boatmen use such products to protect life, increase safety, and minimize damage to vessels and cargo by altering ship tracks for optimum transit between ports.

Specialized MAREP Service for Water Pollution Assessment

Marine pollution is of great concern in the Great Lakes, coastal zone, and the deep oceans in varying degrees. Recent statutes, particularly the "Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)" and the "Marine Protection, Research, and Sanctuaries Act of 1972 (PL 92-532)," assign new responsibilities to Federal agencies for monitoring the marine environment.

Investigation of effects of pollution on the marine environment include:

- Surveillance system for monitoring and assessing the trend in quality of the navigable waters, the waters of the contiguous zone, and selected ocean areas.
- Research, studies, and experiments for the pre-

vention, control, and elimination of oil discharges and hazardous substances.

- Research and studies with respect to the quality of the waters of the Great Lakes and stream discharges.
- A continuing program for regulating ocean waste disposal.
- Assessment of the levels and significance of trace elements and chlorinated hydrocarbons in marine fisheries products to protect the consumer and the fishing industry.

In April 1974 the Secretary of Commerce transmitted to Congress the first annual report required by PL-532, *Title II Comprehensive Research on Ocean Dumping*. This "Report to Congress on Ocean Dumping and Other Man-Induced Changes to Ocean Ecosystems" describes Federal programs and activities nationally and internationally which contribute to the solution of problems caused by ocean dumping and other activities of man. Although the report covers the activities of many Federal agencies, the principal participants were NOAA, EPA, the Coast Guard, and the Army Corps of Engineers.



Figure 3.—Garbage barge carrying man's wastes to be dumped at sea.

Specialized MAREP Service for Living Marine Resources

Fishery resources are renewable unless fished beyond the point of recovery or so adversely affected by environmental change that they can no longer survive. These resources are currently considered common property subject to international harvesting on the high seas, as well as competitive harvesting by U.S. fishermen on the high seas and in waters under U.S. jurisdiction. Agreements among nations, both multilateral and bilateral, attempt to solve high seas fisheries allocation problems. A major effort is now underway to improve management of domestic fishery resources.

Knowledge of the status of fishery stocks is essential to negotiating international agreements and developing plans for domestic management. Resource research and assessment provide the necessary information on the abundance and distribution of fish and shellfish stocks, including information on life cycles, annual harvest, susceptibility to natural or manmade environmental change, and other critical factors. The investigations include surveys and studies to provide in-depth understanding of the resources, their environment, and their interrelations. Studies include analysis of data from surveys and from fishing operations.

Specialized MAREP Service for National Security

Department of Defense activities involving a need for specialized marine environmental information include search, rescue, and salvage; antisubmarine warfare (ASW); amphibious operations; mine warfare; polar operations; and ocean and coastal engineering. In addition, routine fleet operations require marine information and prediction services not otherwise obtainable from the Basic MAREP Service.

Much of the national security effort in MAREP is to support various ASW systems. This support is essential because sound propagation underwater is central to most aspects of ASW, and the behavior of sound in sea water is strongly influenced by marine environmental factors. For ASW purposes environmental conditions controlling underwater sound propagation must be monitored extensively and projected into the future on a broad basis.

INTERNATIONAL ACTIVITIES

With brief historical notes, this section discusses United States involvement in international cooperation in MAREP-related areas since the FY 1974 Federal Plan for MAREP was prepared.

GIPME

The Global Investigation of Pollution in the Marine Environment (GIPME), a program of the Intergovernmental Oceanographic Commission (IOC), is intended to be a major project of the International Decade of Ocean Exploration (IDOE). The scientific advisory bodies to IOC have recommended that programs instituted with GIPME consider the feasibility of a study of river inputs to ocean systems, encourage and coordinate national and regional programs for baseline studies of marine pollution, and give high priority to the creation of cooperating laboratories for determining the concentrations and effects of chemical pollutants in sea water, marine organisms, and sediments.

An International Coordination Group (ICG) for GIPME, charged with preparing a comprehensive plan to implement GIPME, held its first meeting in London in April 1973. ICG reviewed present efforts for conducting baseline surveys on a regional scale and urged that these efforts be given every support. ICG also reviewed an earlier proposal that the results of such baseline surveys be compiled into a preliminary report on the "Health of the Ocean" and recommended that the IOC Secretariat soon appoint a consultant to do the compiling and prepare a draft report. In addition, ICG recommended that a small group of experts be established on an ad hoc basis to suggest means for obtaining information on the quantities of pollutants introduced into the ocean from land-based sources by whatever route.

At the Second Session of the Executive Council of IOC, held in May 1973, the delegations of several nations including the United States expressed serious concern about the lack of progress of ICG. They noted that a comprehensive plan for GIPME had not been developed as required by ICG's terms of reference; that the relevant recommendations of the UN Conference on the Human Environment had not been adequately considered; and that ICG had transferred most of its work, or work that it should have delegated, to the Secretariat of IOC.

The Executive Council was informed by the Secretariat that a consultant had been retained for the recommended study on the "Health of the Ocean" and that the preparation of a comprehensive plan for GIPME had been discussed with the Secretariats of the UN agencies having scientific programs relating to oceanography and with the Office for the International Decade of Ocean Exploration within the National Science Foundation of the United States. The Executive Council adopted a resolution on GIPME which endorsed the concept of local, regional, and global-scale studies, including baseline

investigations, and urged member states to support national, regional, and international efforts.

The Eighth Session of the Assembly of IOC, which met in November 1973, examined the progress on GIPME that had been made by ICG, bearing in mind the reservations expressed by the IOC Executive Council. The Assembly, recognizing the potential dangers that accelerating rates of pollution pose to the marine environment, urged the Secretary of IOC to make every effort to accelerate the preparation of the comprehensive plan for GIPME. In regard to this matter, the Assembly was informed by the Secretariat of IOC that a consultant had been engaged to produce the first draft of the comprehensive plan for GIPME and that steps were underway to set up the small ad hoc group of experts recommended by ICG to suggest means for obtaining

information on the quantities of pollutants introduced into the ocean from land-based sources. This group, entitled Pollution of the Oceans Originating on Land (POOL), will first meet in spring 1974.

IGOSS

In September 1967, IOC, in cooperation with WMO and other United Nations organizations, undertook the formation of the Integrated Global Ocean Station System (IGOSS). The IGOSS program is intended to provide a variety of operational products resulting from the observation, assessment, and prediction of the marine environment based upon the unrestricted transmission and reception of ocean data and services employing an international system rather than a system established through bilateral exchange agreements. This international exchange system en-



Figure 4.—Temperature profiling using expendable bathythermographs.

Courtesy of the Sippican Corporation

ables the developing and developed countries alike to share and use information acquired by all participating countries.

Initially, IGOSS program development was concerned with the worldwide collection, exchange, and processing of ocean temperature data received in report form, via either telecommunications facilities or log forms submitted by mail. A Pilot Project for the Collection, Exchange, and Evaluation of Bathythermograph Data (BATHY Pilot Project) commenced in January 1972. Results of the BATHY Pilot Project have been most encouraging, and in 1975 the activity will be converted to a completely operational project on a permanent basis.

In August 1973, the Second Session of the Joint IOC/WMO Planning Group for IGOSS (IPLAN-II) met in Geneva. A major topic for the meeting was a draft international operational plan for the IGOSS Pilot Project on Marine Pollution Monitoring. Oil and petroleum constituents were identified as initial targets for the international pollution monitoring program, which will ultimately require establishment of analysis standards and techniques for other pollutants as well. The first phase of the Pilot Project includes the reporting of visual observations of oil slicks and other surface pollutants, the sampling and semiquantitative analysis of particulate petroleum residues or "tar balls," and the shore laboratory analysis of water samples from the ocean for dissolved petroleum hydrocarbons.

International experts met in May 13-17, 1974 in Gaithersburg, Md., for a Marine Pollution Monitoring (Petroleum) Symposium and Workshop. The Conference was sponsored by IOC/WMO and three Department of Commerce agencies: the National Bureau of Standards, the National Oceanic and Atmospheric Administration and the Maritime Administration. Objectives of the International Symposium and Workshop were:

- Through the Symposium, to communicate and exchange ideas and results on an international basis, which reflect the status of current methodology for the measurement, through sampling and analysis, of petroleum and petroleum products in the marine environment, and
- Through the Workshop, to apply the results of the Symposium discussions to the development of working guidelines for the IGOSS Pilot Project on Marine Pollution Monitoring.

A Task Team on an Ocean Current Observation Program was established by IPLAN-II (August 1973) to study scientific requirements for incorporation of sea current observations into IGOSS and to further study capabilities for current measurements. The Task Team was charged, among other things,

with making suitable proposals for a future Pilot Project on Ocean Current Determination and Reporting.

The first IGOSS assistance to a major field program is being planned for experiments of the Global Atmospheric Research Program (GARP) sponsored by the International Council of Scientific Unions and the World Meteorological Organization. Specific projects for which support has been solicited are the GARP Atlantic Tropical Experiment (GATE) in 1974, the Monsoon Experiment (MONEX) in the Indian Ocean in 1976-77, and the First GARP Global Experiment (FGGE) in 1978.

An outline for an IGOSS Data Processing System (IDPS) under consideration provides for world, regional, and national oceanographic data processing centers. The world data centers would provide products to national data centers which the latter may not be able to generate, including charts showing thermal and density structure of the upper layers of the ocean and, later on, information on currents, etc. Regional data centers would be established on the basis of a geographic partitioning of requirements for products or for serving a special category of users. National data processing centers would have the ultimate responsibility for providing oceanographic services to the immediate user community. The U.S. has played a major role in developing the IGOSS Manual on Data Archiving and Exchange, a manual aimed at making all data acquired through IGOSS accessible to future users. The U.S. has also been involved in the work of the International Oceanographic Data Exchange (IODE) ad hoc Group on Marine Pollution Data. This group provides a focal point with IODE for considering international exchange of marine pollution data and related documentation.

Marine Meteorology

The Marine Meteorological Services System (MMSS) under the auspices of the World Meteorological Organization (WMO) provides weather and sea surface information related to the safety of life and property and to the efficiency and effectiveness of marine operations. Maritime nations have agreed on areas of the world ocean for which they accept responsibility for providing hurricane and storm warning and other real-time and statistical information. Also, these nations share in supporting the WMO Voluntary Observing Ship scheme. About 7,000 ships participate by delivering their weather and sea state observations to specified radio stations. All data received at these stations are forwarded to national centers and distributed worldwide over the World Weather Watch Global Telecommunications System (WWW/GTS).

Ocean Data Transmission

The IOC Assembly in November 1973 noted the increasing need to facilitate the transmission of data from ocean platforms and also the concern about the possible relocation, by the 1974 Maritime World Administrative Radio Conference, of radio frequencies for transmitting ocean data. Because of the coming rearrangement of Maritime Mobile Service frequencies expected toward the year 1980, a relocation now would result in serious operational difficulties. The Assembly recognized the concern of Member States, including the U.S., over their expenses in altering the now-allocated ocean data high frequency (HF) bands and the serious operational difficulties that would result from such alterations. The Assembly, influenced by the U.S., urged Member States to have their delegations to the 1974 Maritime World Administrative Radio Conference avoid changing the allocation of HF bands for ocean data transmission in view of possible changes in frequency allocations by 1980.

Tsunami

The Tsunami Warning System (TWS) in the Pacific operated by the National Weather Service and supported in part by the U.S. Geological Survey, interacts with other countries through the IOC International Coordination Group for TWS in the Pacific (ITSU). The primary function of ITSU is to encourage other countries to participate in the Pacific-wide warning system by providing tide and seismic data and receiving of the tsunami warnings issued by the NOAA Honolulu Observatory. Standardizing procedures and providing advice on the operation of the International Tsunami Information Centre (ITIC) are other functions of ITSU. During the coming year, Member States of ITSU are to concentrate on: expanding the tide and seismic data network; improving communications, possibly through the use of satellites; making ITIC an effective instrument for coordinating the international aspects of TWS, primarily through assistance to developing countries; and promoting the exchange of scientific information and scientists among participating states.

International Fisheries

During 1973, significant international cooperation was continued in monitoring the changes in the populations of important fish stocks as part of the Marine Monitoring, Assessment, and Prediction (MARMAP) program of the U.S. In the northwest Atlantic, the International Commission for the Northwest Atlantic Fisheries (ICNAF) surveys of ichthyoplankton (fish eggs and larvae) and oceanographic

conditions, extending from the coastal waters off Nova Scotia to the out-flow of Chesapeake Bay, were completed by a five-nation (U.S., U.S.S.R., Poland, Federal Republic of Germany, Canada) operation using standard MARMAP methods. ICNAF has extended national fishing quota regulations first implemented in September 1972. These regulations were formulated using economic and technical considerations as well as scientific criteria, demonstrating the feasibility of cooperation between nations in mutual policing of activities of common concern.

Change in the status of fish stocks and oceanographic conditions in the Pacific were monitored in a joint U.S.-U.S.S.R. survey off the Washington, Oregon, and California coasts. Pelagic stocks were jointly surveyed by the U.S. and Mexico in the California Current and Gulf of California areas.

In 1974, U.S. scientists presented information on the status of fish stocks based on survey and monitoring observations to support allocation and management decisions for six international commissions and eight bilateral agreements.

In 1973, the U.S. joined the International Council for the Exploration of the Sea (ICES). ICES is the scientific advisory body to the North-East Atlantic Fisheries Commission (NEAFC), and a large part of its work has been with the state of the stocks of important commercial fishes in the Council's area. Canada joined the Council 6 years ago, so that ICES membership now covers the whole North Atlantic. It is expected that this regional consolidation will lead to much expansion of the Council's activities over the next few years.

Under the direction of an ICES working group, 13 research vessels from seven countries participated in the "Overflow 73" expedition. The purpose of this expedition, carried out from Aug. 15 to Sept. 15, 1973, was to study the overflow of subzero °C Arctic water across the Greenland-Scotland ridge. The investigation of this phenomenon and its variations in time and space is essential to understanding the whole circulation in the Atlantic and Arctic Oceans.

Pollution has been very much in the foreground in the discussions at ICES meetings in recent years, and several important research projects are based on it. A comprehensive report on the Baseline Study of the Level of Toxic Substances in Fish and Shellfish in the North Sea, and on a study of the inputs of pollutants to that area, will soon be available. The Council decided to expand the baseline studies to cover the whole of the Oslo Commission Area, that is, the northeast Atlantic, north of Gibraltar.

A similar study of the pollution of the Baltic is well underway in cooperation with the Scientific

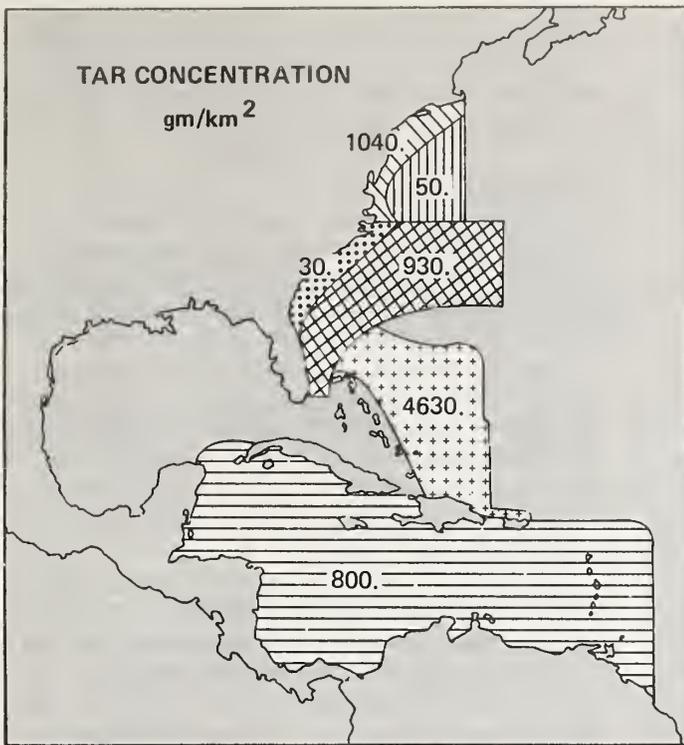


Figure 5.—Tar concentrations determined by the Marine Monitoring, Assessment, and Prediction program.

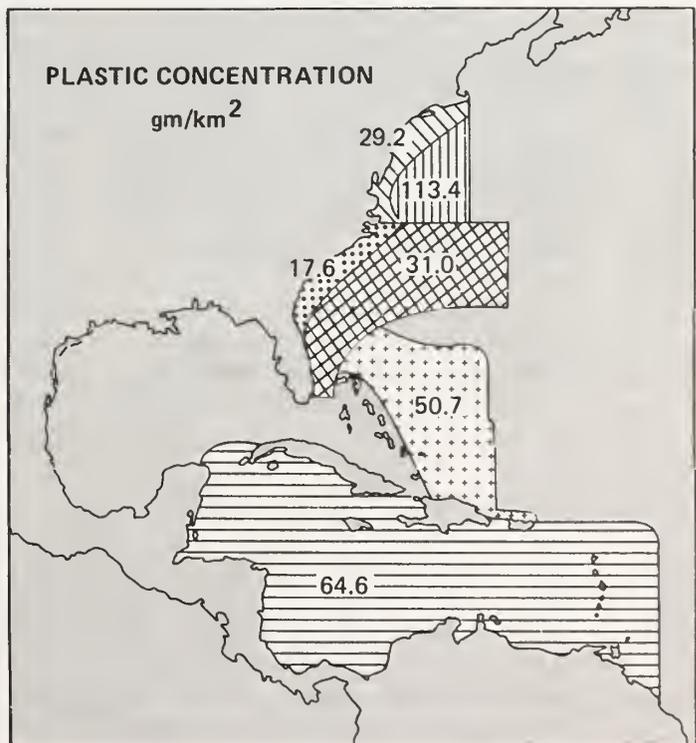


Figure 6.—Plastic concentrations determined by the Marine Monitoring, Assessment, and Prediction program.

Committee on Oceanic Research (SCOR). In addition, more basic studies of circulation and other important processes in the Baltic, including exchange of water and substances with the North Sea, are planned.

In 1973, the Council established an Advisory Committee on Marine Pollution, composed of recognized scientists, acting in their personal capacity and responsible only to the Council.

U.S.-U.S.S.R. Cooperation

On June 19, 1973, the United States and the Soviet Union signed an Agreement on Cooperation in Studies of the World Ocean. The provisions of the agreement focus primarily upon research rather than monitoring and marine environmental prediction. However, included among the subject areas delineated in the agreement are large-scale ocean-atmosphere interactions, including mathematical modeling of such interactions, and intercalibration and standardization of oceanographic instrumentation and methods. Cooperation in these two areas may be expected to increase the rate of progress in marine environmental prediction.

Pollution Control from Ships—IMCO

During 1973 significant progress was made toward the control of marine pollution arising from vessel operations. Under the auspices of the Intergovernmental Maritime Consultative Organization (IMCO), the International Convention for the Prevention of Pollution from Ships was negotiated and adopted. The objective of the Convention is to eliminate intentional discharges and minimize accidental discharges of oil and other substances harmful to the marine environment. The Convention establishes regulations concerning construction and operation of ships carrying oil and other harmful substances. In addition, it controls the packaging and handling of potentially harmful cargoes.

A protocol to the Convention Relating to Intervention on the High Seas in Cases of Oil Pollution was also approved. Before the protocol, the coastal

states had the right to take action on the high seas to prevent or mitigate danger to their coastlines only from oil pollution of the sea. The protocol expands the right to intervene to protect the coastal waters from other pollutants.

EARTHWATCH

A major component of the United Nations Environment Program (UNEP) is EARTHWATCH, a global environmental assessment program including monitoring, information exchange, research, and evaluation. A primary purpose of EARTHWATCH is to assess the impact of pollutants upon the environment and the environment upon man. EARTHWATCH is designed to provide the capability for continuing assessment of selected natural resources and for early warning of potential environmental hazards so that timely corrective measures can be taken.

EARTHWATCH is conceived as a global system composed of the national facilities, services, and research provided by individual members, coordinated by UNEP and in some cases supported by UNEP and other international organizations. Information required by member nations, specialized agencies, and other users includes both environmental observations and processed data. Information must be received in some cases in a timely and coordinated fashion and for other purposes must be readily accessible in convenient forms.

A major initiative within EARTHWATCH, approved by the Governing Council in March 1974, was the initiation of a Global Environmental Monitoring System (GEMS). An intergovernmental meeting on monitoring held in Nairobi, Kenya, in February 1974 proposed a framework for GEMS that included the following program goals: improved capabilities for the surveillance of human health, natural disasters, and food contamination; intensified assessments of man's impact on climate, the oceans, biological systems, and ecosystem stability and modification; and more thorough evaluations of the impact of land-use practices.

Summary of Fiscal Data

The following tables summarize fiscal information for programs of the Federal Government associated with MAREP as proposed in the President's fiscal year 1975 budget. The funds listed are those used to provide services and to support research directed toward both long- and short-term improvements in services.

The Marine Meteorological Service, discussed as a Specialized Meteorological Service in the annual *Federal Plan for Meteorological Services and Supporting Research*, is also included as part of this Plan for MAREP.

Each agency's funding for MAREP operations and research is presented in table 1. The total Federal expenditure for MAREP planned for FY 1975 is \$272,076,000, an increase of \$41,220,000 over FY 1974. Of this increase, \$9,920,000 is for operational services and \$31,300,000 for research. Table 2 presents the same funds as they apply to Basic and Specialized Services.

Although most increases in expenditure for MAREP represent expansion in services and research, some represent rising costs of goods and services.

Table 1.—Federal Funding for Marine Environmental Prediction, by agency
[Thousands of Dollars]

Agency	Operations			Research			Total		
	FY 74	FY 75	Difference	FY 74	FY 75	Difference	FY 74	FY 75	Difference
Commerce	54,655	60,461	+5,806	59,165	64,395	+ 5,230	113,820	124,856	+11,036
Defense	23,849	27,724	+3,875	16,521	16,649	+ 128	40,370	44,373	+ 4,003
Interior	7,549	9,391	+1,842	14,186	26,940	+12,754	21,735	36,331	+14,596
Transportation	10,795	9,192	-1,603	2,695	2,924	+ 229	13,490	12,116	- 1,374
AEC				7,444	17,545	+10,101	7,444	17,545	+10,101
EPA	6,724	6,724	0	4,833	4,833	0	11,557	11,557	0
NASA				2,861	3,309	+ 448	2,861	3,309	+ 448
NSF				16,460	18,870	+ 2,410	16,460	18,870	+ 2,410
Smithsonian	1,362	1,362	0	1,757	1,757	0	3,119	3,119	0
Total	104,934	114,854	+9,920	125,922	157,222	+31,300	230,856	272,076	+41,220

Table 2.—Federal Funding for Marine Environmental Prediction, by service
[Thousands of Dollars]

Service	Operations			Research			Total		
	FY 74	FY 75	Difference	FY 74	FY 75	Difference	FY 74	FY 75	Difference
Basic	56,465	61,411	+4,946	83,579	111,839	+28,265	140,039	173,260	+33,211
Maritime navigation	6,344	6,681	+ 337	890	1,181	+ 291	7,234	7,862	+ 628
Water pollution assessment ..	15,666	17,746	+2,080	11,092	13,057	+ 1,965	26,758	30,803	+ 4,045
Living marine resources ...	10,627	10,710	+ 83	15,055	15,815	+ 760	25,682	26,525	+ 843
National security	15,832	18,306	+2,474	15,311	15,330	+ 19	31,143	33,636	+ 2,493
Total	104,934	114,854	+9,920	125,922	157,222	+31,300	230,856	272,076	+41,220

Table 3.—Agency operational expenditures for Marine Environmental Prediction, by function
[Thousands of Dollars]

Agency	Data acquisition		Communications		Data processing		Information dissemination		General agency support		Total	
	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75
Commerce	24,717	29,607	899	899	10,805	10,805	8,397	8,813	9,837	10,337	54,655	60,461
Defense	7,836	10,099	2,047	2,202	5,113	6,123	2,095	2,100	6,758	7,200	23,849	27,724
Interior	6,794	8,452	(¹)		(¹)		(¹)		755	939	7,549	9,391
Transportation	8,535	7,250	209	208	768	814	644	252	639	668	10,795	9,192
EPA		(²)	(²)		(²)		6,724	6,724	(²)		6,724	6,724
Smithsonian	869	869			(¹)		293	293	200	200	1,362	1,362
Total	48,751	56,277	3,155	3,309	16,686	17,742	18,153	18,182	18,189	19,344	104,934	114,854

¹ Received some funds from amount shown for Data Acquisition.

² Received some funds from amount shown for Information Dissemination.

Table 4.—Agency manpower engaged in Marine Environmental Prediction operations, by function
[Man-years]

Agency	Data acquisition		Communications		Data processing		Information dissemination		General agency support		Total	
	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75
Commerce	572	574	19	19	348	348	233	240	294	301	1,466	1,482
Defense	340	333	216	204	438	459	239	222	556	538	1,789	1,756
Interior	398	481	(¹)		(¹)		(¹)		42	51	440	532
Transportation	944	814	16	16	68	68	13	13	44	45	1,085	956
EPA							30	30	6	6	36	36
Smithsonian	63	63			(²)		12	12	7	7	82	82
Total	2,317	2,265	251	239	854	875	527	517	949	948	4,898	4,844

¹ Some man-years counted for Data Acquisition were spent in this function.

² Man-years spent in this function included under Data Acquisition.

Table 5.—Agency funding for research to improve Marine Environmental Prediction functions
[Thousands of Dollars]

Agency	Understanding basic processes		Data acquisition		Communi-cations		Data processing		Information dissemination		Agency support of research		Total	
	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75	FY 74	FY 75
Commerce	35,426	39,000	21,128	22,784			2,222	2,222	389	389			59,165	64,395
Defense	6,474	6,196	6,961	6,652	614	579	1,070	1,314	1,244	1,748	158	160	16,521	16,649
Interior	12,767	24,246									1,419	2,694	14,186	26,940
Transportation	1,078	1,170	1,347	1,462							270	292	2,695	2,924
AEC	7,444	17,545											7,444	17,545
EPA	4,833	4,833											4,833	4,833
NASA			2,861	3,309									2,861	3,309
NSF	16,460	18,870											16,460	18,870
Smithsonian	1,757	1,757											1,757	1,757
Total	86,239	113,617	32,297	34,207	614	579	3,292	3,536	1,633	2,137	1,847	3,146	125,922	157,222

The increases in the Department of Commerce funding are for improving the Basic Service and expanding research for water pollution assessment and understanding basic processes. The Department of Defense increased its planned operational expenditures for services through greater use of satellite data. The Department of the Interior greatly increased its planned MAREP expenditures to focus on environmental quality by monitoring offshore petroleum drilling platforms to prevent violations of environmental conservation laws. The Department of the Interior MAREP research program is directed toward evaluating the potential for mineral recovery in offshore areas. Although the Department of Transportation has had to reduce some of its services, it has been able to manage small increases to the adjusted base for research to support the Basic Service and the Specialized Service for Maritime Navigation. In anticipation of offshore floating nuclear

reactor siting, the Atomic Energy Commission is planning to increase its funding for research to understand the effects of these power plants on the marine environment. The National Aeronautics and Space Administration plans increased funding to improve the Basic Service through improvements in satellite data and applications. The National Science Foundation plans increased funding of research for the understanding of basic processes. The Environmental Protection Agency and the Smithsonian Institution remain level funded for MAREP in FY 1975.

Table 3 divides the operational funding of each agency into four operational functions and one support function. Table 4 shows the man-years involved in the operational functions of table 3. Table 5 outlines the functional expenditures for research to improve MAREP services. Understanding basic processes covers research not directed specifically to improvement of one service.

Increases in the Basic MAREP Service

The Department of Commerce and the Department of Defense have program increases for FY 1975 which will provide for an expansion of the Basic MAREP Service (table 6). Within the Department of Commerce, NOAA will provide for better community preparedness for natural disasters, Automation of Field Operations and Services (AFOS), and expanded use of the Geostationary Operational Environmental Satellite (GOES) data. The Department of Defense will expand its capabilities to use satellite data.

Table 6.—Funding of the Basic Marine Environmental Prediction Service, by agency
[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Commerce	41,157	46,048	+4,891
Defense	5,263	6,166	+ 903
Interior	1,250	1,250	0
Transportation	7,433	6,585	- 848
Smithsonian	1,362	1,362	0
Total	56,465	61,411	+4,946

Expansion of the community preparedness program of NOAA, in coordination with the Defense Civil Preparedness Agency, the Red Cross, and the Federal Disaster Assistance Administration, will reach into disaster-prone coastal areas of the nation. NOAA program increases also will improve flash flood warnings and forecast services to the public in coastal areas. NOAA will expand its VHF/FM service, which provides continuous broadcasts of weather forecasts, warnings, and advisories to the public and disaster relief agencies, to include several more coastal communities. Weather forecasts for the coastal States of Washington, California, Connecticut, Massa-

chusetts, Rhode Island, and Maine will be more rapidly available due to the expanded coverage of the NOAA Weather Wire Service within these States. Coverage of coastal States by weather radar, which is the main observational instrument for monitoring weather occurrences capable of causing severe storms, will be increased.

In order to increase the effectiveness and productivity of manpower and improve and extend warning and forecast services, the Automation of Field Operations and Services (AFOS) program will be implemented. This program involves the use of highly automated weather forecast offices. Forecast and warning preparation and dissemination will become automated, permitting further automation of observations.

The Geostationary Operational Environmental Satellite (GOES) procurements will be continued. GOES is expected to significantly improve the accuracy and completeness of sea surface temperature data and will assist in technique development for sea state determination. GOES will be equipped to collect data from remote observational platforms and ships at sea. The data will then be transmitted to a data acquisition station at Wallops Island, Va., for further dissemination. Several Weather Service Forecast Offices (WSFO) will be equipped to display and use observations from the GOES system. Ground equipment needed to operate and control the polar orbiting spacecraft will be procured at a one-time cost.

The Defense Department is expanding its capabilities to receive and process satellite data. Expansions in satellite ground equipment and data processing personnel and facilities will expand the Basic Service as well as the Specialized Services of Maritime Navigation and National Security.

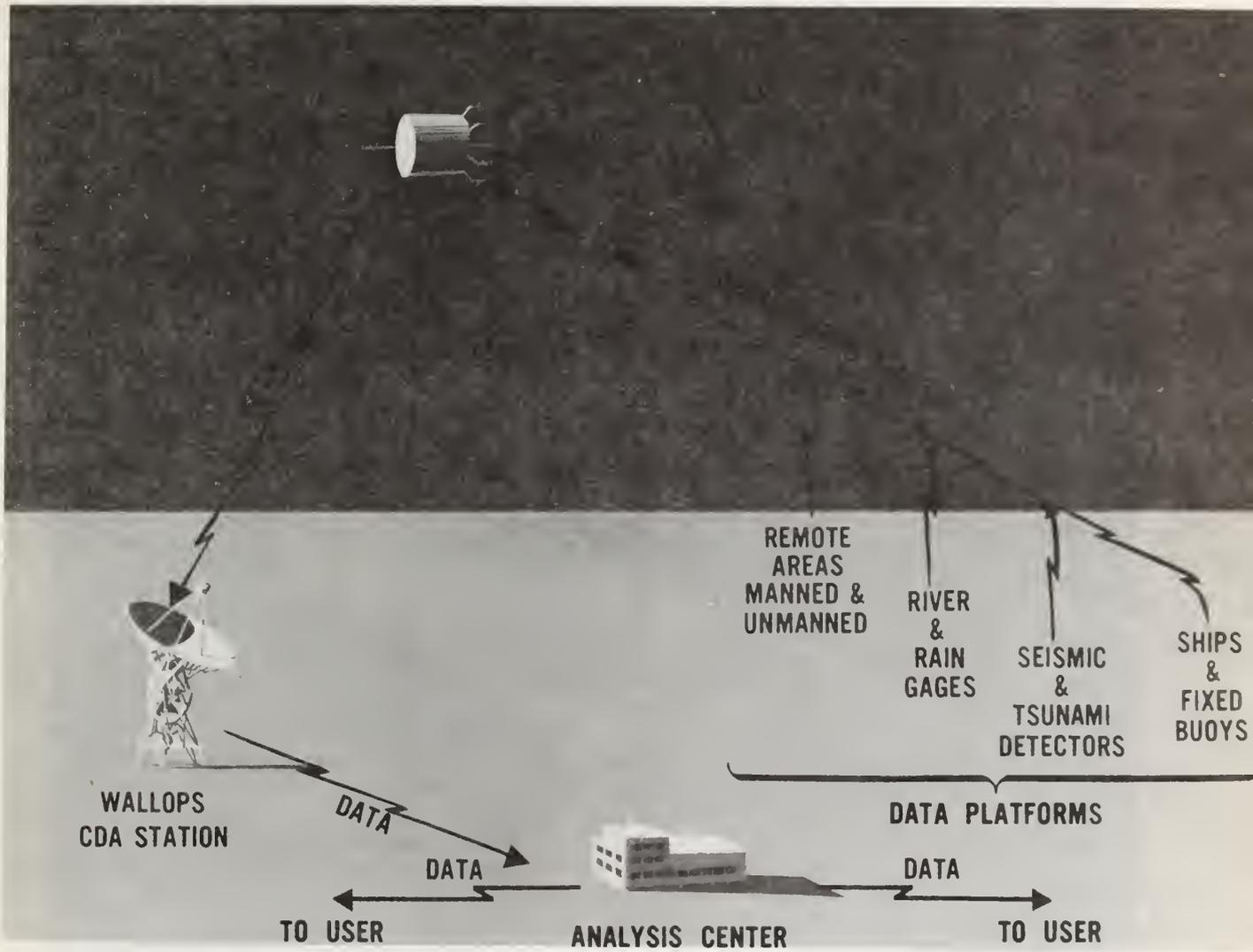


Figure 7.—The GOES system will provide pictures and infrared imagery of North America and the adjacent oceans and will relay oceanographic data from remote sites.

Increases in the Specialized MAREP Services

The Basic MAREP Service provides support for the Specialized MAREP Services for maritime navigation, water pollution assessment, living marine resources, and national security. Planned improvements in these operational services for FY 1975 are described in this chapter and budgeted for as indicated in table 7. The expansion of research planned for fiscal year 1975 to improve these specialized services is described in the next chapter.

SPECIALIZED SERVICE FOR MARITIME NAVIGATION

Under the lead of the Army Corps of Engineers an interagency committee is continuing to plan for extending the navigational season of the Great Lakes and the St. Lawrence Seaway. Improved predictions for snow, ice, and ice fog are results of this program. The Side-Looking Airborne Radar (SLAR) is flown by NASA² and the Army. Methods of analysis of this data developed by NASA, the Coast Guard, and NOAA are expanding these predictions of snow, ice, and ice fog to Arctic regions as well as the Great Lakes.

Studies of deep-water ports by the Corps of Engineers to determine which ports will permit the use of deep-draft bulk carriers will be used in planning dredging and expansion of ports and port facilities. Consideration of requirements to expand environmental prediction services are included in these studies. Navy development of improved positioning systems will benefit prediction services. Continued development of an automated ice-data archive by the Naval Oceanographic Office permits rapid access to ice information for the Arctic and Antarctic as obtained from ship, shore station, and aircraft.

² NASA's participation is funded as a research effort and therefore appears as part of table 11.

Table 7.—Funding of the specialized Marine Environmental Prediction Service for Maritime Navigation, by agency

[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Commerce	2,009	2,424	+415
Defense	2,684	3,162	+478
Transportation	1,651	1,095	-556
Total	6,344	6,681	+337

As part of the U.S. program to improve environmental services for the merchant fleet, a new monitoring system for shipboard observations will be demonstrated in FY 1975. This effort, being funded by NOAA and the Maritime Administration, is aimed at providing an automated oceanic observing system for use on merchant ships. The system will include satellite telecommunications as a means of data transmission. An integral part of these environmental service packages on merchant ships will be the capability for receiving warnings, forecasts, and other marine information on call or on scheduled broadcasts.

Since the movement of oil and natural gas from Cook Inlet, Alaska, has increased rapidly, more accurate information on tidal currents is required to avoid navigational accidents and to minimize environmental damage from oil spills. The most hazardous factor to vessel operations through Cook Inlet is the high-speed currents in the northern inlet resulting from the extreme rise and fall of the tides. Through the National Ocean Survey of NOAA is expanding its efforts to develop an adequate tidal current measuring network.

A portion of the Department of Defense funds for improving satellite data acquisition and processing will aid navigation through better ice detection and sea state estimations.

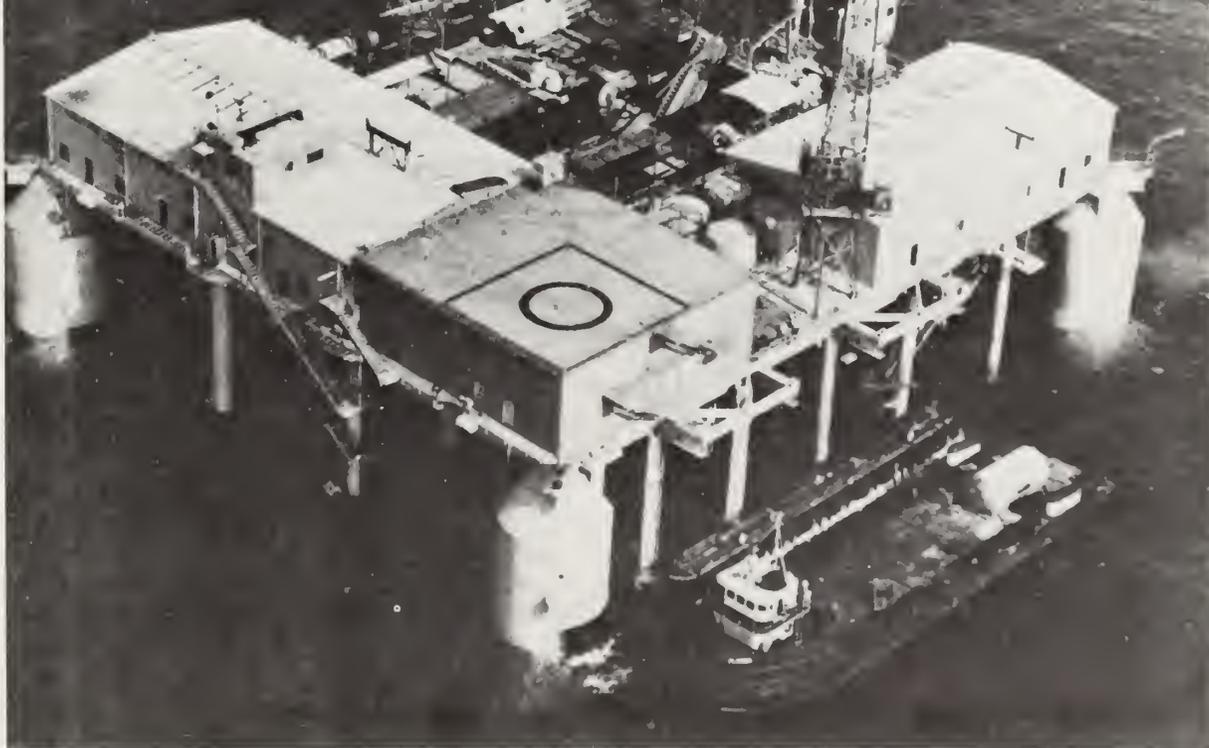


Figure 8.—An offshore oil-drilling platform.

SPECIALIZED SERVICE FOR WATER POLLUTION ASSESSMENT

Because water pollution assessment involves comprehensive measurement of the ocean, the discussion here will deal with those parameters that are not primarily concerned with other MAREP services. Much of the material under Living Marine Resources is also concerned with water pollution assessment.

The major increase in the MAREP Specialized Service for Water Pollution Assessment is provided by the Department of the Interior (table 8). The Conservation Division of the Geological Survey is

Table 8.—Funding of the specialized Marine Environmental Prediction Service for Water Pollution Assessment, by agency

(Thousands of Dollars)

Agency	FY 74	FY 75	Difference
Commerce	1,776	2,026	+ 250
Defense	70	90	+ 20
Interior	6,299	8,141	+1,842
Transportation	797	765	- 32
EPA	6,724	6,724	0
Total	15,666	17,746	+2,080

responsible for insuring that offshore oil drilling rigs do not pollute the surrounding coastal waters. In order to insure compliance with established oil pollution-free practices, the Conservation Division monitors offshore drilling rigs. This monitoring will be increased in FY 1975 to a daily visit to each oil drilling platform. The operation will be observed and the log of the previous 24 hr will be inspected for violations of legal procedures. In addition, the drilling platforms and the surrounding waters will be inspected frequently by helicopter.

Within the Department of Commerce, NOAA's marine environmental impact analyses of dredging, construction, and permit and license granting for use of fisheries resources will be expanded. These analyses include a justification of the resource value, quantitative estimates of the impact on the marine environment, and recommendations to assist in making informed decisions on the best use of man's marine environment. These impact analyses will also cover evaluation of the proposed activities upon the resource, field investigations where warranted, identification of the research information base, and coordination with Federal and State environmental agencies.

SPECIALIZED SERVICE FOR LIVING MARINE RESOURCES

Increases in the Specialized Service for Living Marine Resources (table 9) are concentrated on preserving estuarine and coastal fisheries habitats. NOAA's environmental impact analyses and recommendations in past years have prevented or mitigated damage to an estimated 100,000 acres of these habitats annually. The increase in the Service is expected to benefit 70,000 more acres annually to prevent an additional 14 million dollar loss of the fishery habitat. Environmental impact analyses upon fisheries

resources will affect the granting of permits and licenses for construction and dredging and the evalu-

Table 9.—Funding of the specialized Marine Environmental Prediction Service for Living Marine Resources, by agency

[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Commerce	9,713	9,963	+250
Transportation	914	747	-167
Total	10,627	10,710	+ 83

ation of applications referred by the Environmental Protection Agency involving pollution discharge elimination systems. The impact analyses include a justification of the resource value, the quantitative effect of the impact, and recommendations that will allow an informed decision on the methods and techniques for protecting the environment while permitting progress. In addition these analyses will entail field investigations where warranted, identification of the research information base, and coordination with other Federal and State environmental agencies.

SPECIALIZED SERVICE FOR NATIONAL SECURITY

The Department of Defense is increasing its budget for the Specialized MAREP Service for National Security by \$2.474 million over the FY 1974 total of \$15.832 million. This service will be expanded by increased effort to utilize satellite data for global monitoring. Ground equipment and manpower for acquiring satellite data, as well as facilities and personnel for analyzing and preparing forecasts, will be expanded. Improved analyses and forecasts of sea ice, sea surface temperature, wind fields, currents, and sea state will be available, particularly for remote areas of the ocean.

Increases in MAREP Research

INTRODUCTION

FY 1975 increases in Federally supported research and development that will contribute to improvements in MAREP services are presented in this chapter. More details of the ongoing research programs are described in the *Federal Plan for Marine Environmental Prediction for FY 1974*, published in July 1973.

Federal funds spent in FY 1974 and planned for expenditure in FY 1975 on MAREP research programs are summarized in table 1 of the chapter "Summary of Fiscal Data." Federal funds allocated for research in support of MAREP functions in FY 1974-75 are shown in tables 10-14.

Significant increases in research by Federal agencies to improve MAREP services are described in the following paragraphs under basic MAREP research and research to improve specialized services.

BASIC MAREP RESEARCH

The Department of the Interior has increased its funding of Basic MAREP Research (table 10) to obtain sufficient knowledge for leasing and control of offshore mineral (primarily petroleum and natural gas) resources. The Geologic Division of the Geological Survey and the Bureau of Land Management will increase research in FY 1975, including baseline investigations of potential petroleum provinces of the outer Continental Shelf and degradation of the coastal zone by energy-related activities. Much of this work will be in the eastern Gulf of Mexico. The Conservation Division of the Geological Survey performs geological and geophysical research pertinent to mineral leasing and environmental hazards on the outer Continental Shelf.

The Office of Water Resources, Department of the Interior, contracts for research oriented toward the needs of MAREP in the coastal zone. Studies are underway on modeling of estuaries, thermal dispersion in estuaries, and saltwater encroachment of underground freshwater supplies.

Table 10.—Basic Marine Environmental Prediction Research, by agency

[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Commerce	40,759	43,220	+ 2,461
Defense	372	395	+ 23
Interior	13,861	26,615	+12,754
Transportation	2,339	2,469	+ 130
AEC	6,082	16,059	+ 9,977
NASA	1,944	2,454	+ 510
NSF	16,460	18,870	+ 2,410
Smithsonian	1,757	1,757	0
Total	83,574	111,839	+28,265

The Atomic Energy Commission has made a sizable increase in research to understand the basic processes of radioactive nuclide transport and effects in the coastal zone in anticipation of requests for siting of nuclear reactors on the coast or in the coastal zone. This research is needed to allow rapid and orderly utilization of the coastal zone in fulfillment of energy needs in such a way as to protect this environment. Several comprehensive programs have been identified for study:

- Coastal shelf transport and diffusion
- Processes controlling productivity in the coastal zone
- Distribution of eggs and larvae in the coastal zone
- Effects of heat, chlorine, copper, and other pollutants arising from energy operations on organisms exposed to thermal plumes
- Physical, chemical, and biological modeling on a regional scale

Much emphasis of this basic research is on the biological factors in an effort to understand and protect man from radionuclide transfer via the food chain.

Under the NOAA Sea Grant program marine environmental research and marine technological development will be expanded in FY 1975. The planning and development of an ecological study of Puget Sound will be emphasized to provide baseline knowl-

edge for waste management and deep water port development including oil transportation in the area. Similar work will be undertaken in other regions to develop models for monitoring the environment and to provide reliable predictions of the environmental consequences of alternative management decisions. Work will be toward the increased utilization of marine products, projects for mariculture development, and the processing of fishery wastes into new products.

The Environmental Research Laboratory (ERL) of NOAA plans increases in research on the ability of radar, sonar, and laser techniques to measure ocean parameters, such as ocean temperature, sea state, chlorophyll, currents, and ocean contaminants, and to study applications to the development of fisheries resources.

Research to decrease the destructive forces of hurricanes is being conducted under the STORMFURY project. This project has consisted of hurricane modeling and experimental silver iodide seeding of hurricanes to alter their dynamics so as to expand the diameter of the eye wall and lead to lower wind velocity. The NOAA Research Flight Facility suspended the seeding operation pending improvements in aircraft instrumentation and safety to enable experimental operations in the Pacific where there is a much greater incidence of suitable storms. Planned increases will be used to purchase an additional four-engine aircraft and scientific instrumentation for aircraft which will be used when the STORMFURY project moves to the Pacific in 1976 or 1977.

The major increase in the National Science Foundation support of the International Decade of Ocean Exploration (IDOE) will be used principally for environmental forecasting research. The objectives of this research are to develop information applicable to an ocean monitoring system for predicting conditions in the oceans and atmosphere. The program supports several major studies in FY 1975:

- The North Pacific Experiment (NORPAX)
- Climate, Long-range Investigation, Mapping and Prediction (CLIMAP)
- Mid-Ocean Dynamics Experiment (MODE)
- International Southern Ocean Studies (ISOS)
- Continental Shelf Dynamics Study

The increased support for this environmental forecasting effort in FY 1975 will be used in planning for a 1976 joint U.S.-U.S.S.R. field experiment similar to MODE and to initiate the Continental Shelf Dynamics Study.

Increases in the NSF Scientific Research Project Support will expand research in the physical processes of the ocean and air-sea interaction, including transport processes that control thermal and other pollu-

tants in coastal and estuarine waters. Other increases are planned in theoretical and observational studies of tides, circulation, mixing, and diffusion processes in the near-shore areas. The studies of the functioning of marine ecosystems will also be augmented.

The NSF Office of Research Applied to National Needs plans FY 1975 increases for studies of the coastal zone designed to predict the environmental effects of energy production and use, like the effects of construction of deep water ports and additional refining capacity on coastal ecosystems. Other increases will be for studies to predict how and where specific pollutants are transported from energy sources.

In the field of prediction the Department of Defense is furthering its effort to predict and model dynamic oceanographic and marine meteorological conditions. Parameters of interest to the military include such divergent items as sea ice conditions, waves and surf, winds, currents, ocean thermal structure, and tropical storms. Numerical environmental prediction models are being updated to maximize utilization of satellite input data. Special emphasis is being placed on predicting the mixed layer depth and gradient. Increases are also planned for Defense participation in MODE and NORPAX.

The National Aeronautics and Space Administration (NASA) supports research and development responsive to the needs of other Federal agencies for new or improved MAREP data acquisition capabilities. These efforts cover the design, development, and evaluation of multispectral visible and infrared and passive and active microwave remote sensing techniques for use on high-altitude aircraft and earth orbiting spacecraft. Emphasis is now on remote sensing techniques that can provide data on the coastal zone marine environment on a synoptic, repetitive basis over extended regions. This increased effort is reflected in the projected estimated increase in FY 1975 funds for basic MAREP research. A portion of the increase will support experiments dealing with the analyses of active microwave data to be provided by the pulsed radar altimeter carried on the GOES spacecraft, launched in May 1974. These experiments will seek to evaluate the feasibility of inferring information about sea state and ocean dynamics from this type of data.

Funds are planned for increased bilateral studies between the U.S. and U.S.S.R. U.S. and Soviet cooperative projects are now being developed under the Agreement on Cooperation in Studies of the World Ocean.

MARITIME NAVIGATION

The Division of Naval Reactors of the Atomic

Energy Commission has increased funding for the development of a nuclear power plant for a deep submersible vehicle.

Table 11.—Research funding for the improvement of the specialized Marine Environmental Prediction Service for Maritime Navigation, by agency

[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Transportation	210	301	+ 91
AEC	600	800	+200
NASA	80	80	0
Total	890	1,181	+291

Projections of the level of development of the Alaskan North Slope oil resources indicate the eventual necessity for direct shipment of oil by water transport from the Alaskan north coast. Coast Guard research to develop this capability so as to enhance safe navigation and protect the marine environment includes:

- Development of structural requirements for Arctic oil tankers and barges
- Determination of the extent of seasonal and all-year navigability of the water routes to the north coast of Alaska
- Development of a routing system for navigation of ships through ice-covered waters

WATER POLLUTION ASSESSMENT

With the passage of the Marine Protection, Research, and Sanctuaries Act of 1972, special emphasis was placed on determining the impact of ocean dumping in the New York Bight. The level of research of the NOAA-sponsored New York Bight MESA project will be increased to meet problems associated with ocean dumping and potential offshore nuclear power plants and deepwater ports in the area.

Table 12.—Research funding for the improvement of the specialized Marine Environmental Prediction Service for Water Pollution Assessment, by agency

[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Commerce	4,246	6,310	+2,064
Defense	1,600	1,610	+10
Interior
Transportation	146	154	+8
EPA	4,833	4,833	0
NASA	267	150	-117
Total	11,092	13,057	+1,965

In order to reduce pollution and minimize potentially serious environmental problems, the activities will include:

- Expanded seasonal studies of ocean currents and circulation
- Studies of bottom sediments movements
- Assessments of contaminants
- Chemical studies for evaluating man-induced changes
- Increased effort in predictive and descriptive model development.



Figure 9.—Ocean water sampling during the New York Bight MESA project.

Also, NOAA plans to increase funds for bilateral agreements with France and the U.S.S.R. involving manned undersea exploration related to oceanographic as well as geophysical research.

LIVING MARINE RESOURCES

In order to increase the capability for general fisheries analysis and assessment, to support the development of Central Pacific fisheries, and to predict the abundance, distribution, and movement patterns of commercial concentrations of shipjack tuna, NOAA will reactivate the *TOWNSEND CROMWELL* in FY 1975.

Table 13.—Research funding for the improvement of the specialized Marine Environmental Prediction Service for Living Marine Resources, by agency

[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Commerce	14,160	14,865	+705
Interior	325	325	0
NASA	570	625	+55
Total	15,055	15,815	+760

An analysis of effective management systems for coastal recreational and commercial fisheries will be developed, implemented, monitored, and evaluated by the National Marine Fisheries Service of NOAA so that the optimum benefits may be realized from these resources. Domestic fisheries management requires coordination between the coastal States with jurisdiction over the 3-mile territorial sea and the Federal Government with responsibility for the 3-12-mile contiguous zone. Development thrusts have been committed to the New England and South Atlantic-Gulf of Mexico areas in order to meet the most severe U.S. fishery management problems. This work includes feasibility studies on the mechanization of Maine sardine processing; development of fisheries for previously discarded species to replace resource failures in New England fisheries; and location of oyster beds in unpolluted waters in Chesapeake Bay and Mississippi Sound.

The National Marine Fisheries Service is studying the cycling of trace elements and organic contaminants in the estuarine and marine environment, the physiological effects of these constituents on marine organisms, and the occurrence and public health significance of contaminants in fish and fishery products. This work in FY 1975 will include: increased effort to develop recommendations for industry to safeguard against high levels of contaminants in fish; to assess the amounts of contaminants contributed by fish to U.S. diets; and to provide regulatory agencies with comprehensive data and recommendations for

establishing regulations concerning permissible levels of contaminants in fish.

The National Marine Fisheries Service is increasing the staff of the new Fishery Research Laboratory at Port Aransas, Tex., from two to seven personnel in FY 1974 and plans five more in FY 1975. Initial activities at this Laboratory will be life history studies of finfish in the families *Sciaenidae* and *Bothidae* in the northwestern Gulf of Mexico and a survey of the sportfish catch in that region.

NASA continues to work very closely with the National Marine Fisheries Service to optimize remote sensing techniques and related data processing and formatting procedures for locating schooling fish such as menhaden in the Gulf of Mexico.

NATIONAL SECURITY

In the field of prediction, development is underway for modeling dynamic oceanographic and marine meteorological conditions. Parameters of interest to the military include such divergent items as sea ice conditions, waves and surf, winds, currents, ocean thermal structure, and tropical storms. Numerical environmental prediction models are being updated to utilize more data from satellites. Special emphasis is being placed on predicting the depth and gradient of the mixed layer.

Table 14.—Research funding for the improvement of the specialized Marine Environmental Prediction Service for National Security, by agency

[Thousands of Dollars]

Agency	FY 74	FY 75	Difference
Defense	14,549	14,644	+95
AEC	762	686	-76
Total	15,311	15,330	+19

Development of meteorological sensors for patrol aircraft based on the configuration of the "A" size sonobuoy is planned. The primary devices are tactical weather buoys to provide surface observations for periods of up to 10 days and a dropsonde which may be fitted with a subsurface profiler.

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