IDENTIFYING OCEANOGRAPHIC DATA GAPS IN THE EEZ

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ABSTRACT

The issuance of the Presidential Proclamation on the Exclusive Economic Zone (EEZ) in March of 1983 has resulted in an appraisal of the state of knowledge of oceanographic data in the coastal waters within 200 miles of the United States and its territorial possessions. This appraisal revealed a significant gap in our knowledge of the region in certain ocean parameters and in certain frontier areas, i.e. Alaska and Pacific Trust territories. An analysis of the data holdings in the National Oceanographic Data Center, several reviews held by the National Oceanic and Atmospheric Administration, the Department of the Interior, and the National Advisory Committee on Oceans and Atmosphere have further verified these data gaps and the impacts of these gaps on the mandate to explore and assess the resources of the EEZ.

BACKGROUND

In March 1983, when President Reagan proclaimed the United States Exclusive Economic Zone (EEZ) he extended the nation's boundaries 200 nautical miles seaward from the coastline and established sovereign rights for the exploration, exploitation, conservation, and management of natural resources that lie within this vast region. The proclamation acquired for the United States approximately 3.4 million square nautical miles of ocean space, nearly 1.5 times the land area of the United States and its territorial possessions. (Figure 1) Immediately following the proclamation steps were taken to assess the availability of oceanographic data and information for the region and determine areas where there were insufficient data to answer the critical questions regarding the marine environment.

FIGURE 1

United States Exclusive Economic Zone

The Department of the Interior's United States Geological Survey (USGS) held a symposium in November 1983 to determine the goals of the national program. (1) The Symposium issued approximately 36 recommendations in the areas of science, engineering technology, legal and leasing issues. It concentrated on the subject areas dealing with oil, gas and hard mineral recovery. (2) While the recommendations from this symposium tended to be general in terms of oceanographic measurements and specific geographical areas, they did point the way toward broad areas where data were needed. These included detailed sea floor mapping utilizing multi-beam and side scan technology and regional geological and environmental studies. The Symposium recommended that data be assessed and synthesized on a regional basis for generic assessments and long-range strategic planning of marine areas.

NACOA RECOMMENDATIONS

In May 1984, the National Advisory Committee on Oceans and Atmosphere (NACOA) released a report of their

<u>OCEAN USE</u>	<u>SEA FLOOR MAPPING</u>	<u>GEOPHYSICAL MEASUREMENTS</u>	<u>SEDIMENT CHARACTER</u>	<u>WATER COLUMN</u>	<u>BIOLOGICAL MAPPING</u>	<u>OCEAN SURFACE</u>
Oil/Gas	X	X	X	X	X	X
Fisheries	X		X	X	X	X
Mineral Resources	X	X	X	X	X	X
Waste Disposal	X		X	X	X	X
Renewable Energy	X		X	X	X	X
Pharmaceuticals				X	X	X
National Defense	X	X	X	X	X	X
Transportation	X					X
Recreation	X		X		X	X
Scientific	X	X	X	X	X	X

TABLE 1

NACOA RECOMMENDED ELEMENTS OF A NATIONAL EEZ EXPLORATION PLAN

1-year study on the policy issues surrounding the implementation of the Exclusive Economic Zone Proclamation. (3) In this report NACOA recommended that a "vigorous" national program of ocean exploration and research concerning the EEZ and its resources be undertaken to provide a solid background of knowledge upon which to base the direction of the national EEZ program. NACOA concluded that "... Our knowledge of the oceans, compared with our knowledge of our land mass, remains inadequate despite our increasing technical ability to observe and study the oceans and its resources." An expansion of territorial claims should be accompanied by an effort to better define the resources of the acquisition and determine the environmental limits on the recovery of these resources.

NACOA subsequently designated a special panel which expanded upon their initial report. This panel made recommendations regarding specific elements of a national scientific exploration plan. They suggested that it include scientific data and information that is useful for the economic development of the EEZ. (4) The recommendations include: 1. Ocean Bottom Mapping; 2. Marine geophysical measurements -- gravity and magnetic and

seismic reflection profiles of the bottom and sub-bottom 3. Sediment characteristics; 4. Water column characterizations, including chemistry and physical data as well as biological content; 5. Biological census and community mapping; and 6. Ocean surface data including near surface meteorological data. In regard to collection of environmental data NACOA concluded that a comprehensive data quality assurance and data management plan will be required to assure that all data and information is useful for achieving the broad policy goals of the Proclamation. Table 1 is the NACOA assessment of the elements of a national exploration plan and the applications to various users of the EEZ. This table will be useful as the timetable for collection of various data is determined.

The NACOA report outlined three major governmental functions within a national EEZ scientific exploration plan:

1. Provide an initial baseline of environmental data necessary for the development of basic "road-maps," useful for assessing the potential effects of pollution, addressing ocean use conflicts, helping in identifying candidate marine sanctuaries and renewable re-

sources regions and producing the basic information necessary for increased scientific study of the region;

2. Provide physical, geological, chemical and biological data for regional EEZ resource assessments;

3. Provide effective data and information management and exchange among government, industry, and academic institutions.

While the recommendations by this organization are helpful in regard to general needs or "gaps" in the national EEZ data base, it requires additional effort to refine their recommendation to guide a national oceanographic data collection program. Surveying and developing this vast underwater frontier requires a cooperative effort and effective utilization of resources of both the public and private sectors. Two Federal organizations, the USGS and the National Oceanic and Atmospheric Administration (NOAA) are currently providing a broad spectrum of expertise for investigation of the EEZ. (5) NOAA's work focuses on ocean processes and the environment; USGS studies center on geologic evolution and framework. Together, their work is increasing the information necessary for sound decisions on development and use of the EEZ's resources.

1985 EXCLUSIVE ECONOMIC ZONE SYMPOSIUM

In October 1985, a second national symposium was held in Washington D.C. The purpose of the meeting was to provide an opportunity for representatives from academic institutions, governmental agencies, and private industry to hear summaries of ongoing and planned activities in the EEZ and to participate in discussions and debate which will outline the future directions and guide policy developments. (6) The Symposium was organized into a series of panels dealing with a specific aspect of the national EEZ program. Panel members were asked to present, in a summary format, the on-going program and include recommendations regarding areas for future oceanographic research needed for exploration of the zone. Generally, the recommendations centered around the need for additional information in regard to the assessment of the resource potential on and within the sea bed. Specifically:

1. There is a need for reliable estimates of the resource potential of the EEZ, especially such non-living aspects as oil and gas and other hard minerals. Current estimates are based upon limited

scientific knowledge and few direct observations.

2. In many respects, knowledge of the oceanic, and geological processes pertaining to the continental shelf and slope is rudimentary. Sufficient information is not available to make long term decisions. Information should be collected regarding the ocean bottom and the substructure as it relates to the formation of features having high resource potential. It should include a comprehensive program of marine geological investigations, sampling and drilling, and reconnaissance marine geophysical surveys.

3. The concerns over the impact of a vigorous program of exploration and development of the EEZ has raised the issue of environmental impacts. In many instances, sufficient data and information either does not exist nor is it in a usable form. An accelerated program of environmental baseline studies should be supported in advance of resource recovery in the EEZ.

ASSESSMENT OF AVAILABLE DATA

A diverse resource of EEZ data exists in academic and government research and monitoring laboratories throughout the nation. Data centers of NOAA's National Environmental Satellite Data and Information Service (NESDIS) hold one of the nation's largest collections of data on the EEZ. Data on ocean bottom and geophysical characteristics, on water physical and chemical characteristics, and on surface meteorological parameters are held respectively by the National Geophysical, Oceanographic, and Climatic Data Centers.

Getting access to environmental data poses the classic problem of the "Age of Information" -- although data produced through environmental satellites, oceanographic ships, fixed stations, buoys are accumulating at an accelerating rate, finding the data can be difficult, costly, and time-consuming. Ignoring useful data can be costly in terms of added expenses to collect data, requiring building in safety factors that may not be necessary, guessing the probability of an event incorrectly, or perhaps risking the well-being of thousands of individuals.

Fortunately, a system exists to overcome this obstacle. NESDIS has developed a system to identify the existence, location, characteristics, and status of environmental data sets. This system

FIGURE 2

Oceanographic Station Data Holdings at the National Oceanographic Data Center for the United States Exclusive Economic Zone off the East and West Coast. Data measurements include temperature, salinity vs. depth and cover the years 1900-1984.

called NEDRES -- A National Environmental Data Referral Service -- combines the knowledge of many organizations and environmental specialists with the speed, flexibility, and ease of use of today's computer and telecommunications technology.(7) Data types available through NEDRES include meteorological, oceanographic, geophysical, geological, hydrological and limnological. Geographical coverage is worldwide.

The National Oceanographic Data Center (NODC) has for many years maintained an inventory of data recently collected. Data collectors provide first level inventory information (data type, location, dates, analytical procedures, etc.) on a ROSCOP (Report of Observations/Samples Collected in Oceanographic Programs) form. This information is helpful to those seeking near real-time (6-12 months) information on data availability, and guides NODC in

its data acquisitions. In Addition, Each NESDIS center maintains detailed inventories of their own holdings and can provide inventory information based on a variety of selection criteria. A search utilizing the NEDRES identified many files of environmental data of interest to the EEZ. For example, the NODC has within their holdings the world's largest collection of physical oceanographic data. While these data do not cover the entire spectrum of EEZ data needs, an examination of these data gives a first order estimation of the level of effort of oceanographic exploration throughout the EEZ allowing for certain general conclusions to be made.

To facilitate this examination, the NODC has published a document which provides information on measurements at approximately 500,000 locations within the EEZ. (8) Fifteen data types of potential use in economic development

FIGURE 3

Ocean Station Data Holdings at the
National Oceanographic Data Center for
the Midway Islands, Johnson Islands and
the Hawaiian Islands

FIGURE 4

Ocean Station Data for the Exclusive
Economic Zone off Alaska

were selected for presentation from the more than forty oceanographic data files routinely maintained by NODC. The files cover a range of oceanographic information including ocean temperature, salinity, dissolved oxygen, chemistry, and biological data.

The U.S. EEZ was divided into six major areas for data coverage descriptions. These are the U.S. East Coast, Gulf Coast, West Coast, Puerto Rico, Alaska and the Pacific Islands. The Pacific islands have been further sub-divided into three sub-areas because of their widely-scattered locations. These are Midway, Johnson Island, and Hawaii; Howland and Baker Islands, Palmyra Atoll, Jarvis Island, and American Samoa; and the Northern Mariana Islands, Guam, and Wake Island.

For the purposes of this analysis, it is useful to show by illustrative comparison the range and variability of data types by geographical region and type of data. Figure 2 shows data holdings for classical oceanographic station data (Nansen bottle casts) for the heavily sampled East Coast and the same data file plotted for the West Coast. While the actual number of data stations, 22,070 vs. 18,630, are relatively close, an examination of the plots shows the density of station coverage with the heaviest concentrations near the coast, i.e. on the continental shelves. A further examination of these data holdings shows that the majority of observations are taken during the months of April through October, with very little coverage in the winter months.

Another example is shown in Figure 3. This figure includes data coverage for the Hawaiian and Johnson Islands. Data are clearly concentrated nearby the major islands in the chain and are sparse near the outer islands. A similar situation exists for the Alaskan region shown in Figure 4.

CONCLUSIONS

Additional oceanographic data are needed as the EEZ continues to be explored and developed. Primary data requirements are needed in the general areas of conflict resolution, model verification, environmental monitoring, ocean forecasting and predictions. Time and spatial scales of data vary with the intended application. Geographical positioning and accuracy of specific measurement parameters are dependent upon the potential users and needs. As the National EEZ program is further developed it will become increasingly

important to carefully examine each of these areas, and to ensure that a complete search and evaluation is made of existing (historic) data, as we attempt to fill the oceanographic data "gaps" in the EEZ.

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