

Coastal water protection

LCDR Myron Hura, USN

*Headquarters Naval Material Command
Washington, D.C. 20360*

Evan C. Evans, III

*Naval Undersea Center
Kailua, Hawaii 96734*

Forrest G. Wood

*Naval Undersea Center
San Diego, Calif. 92132*

The U.S. Navy is prominent in many harbors and coastal areas of the world. This visibility is both intentional and desirable, but carries with it a number of important responsibilities, one of which is environmental protection. The importance of minimizing the environmental impact of ships, aircraft, and shore-based operations is well recognized by all echelons of command. This awareness is reflected in the multi-disciplinary environmental protection program being carried out under the guidance of the Chief of Naval Operations. Under this program substantial capital and personnel resources are being allocated to implement procedural changes and technological controls that will reduce pollution attributed to Navy resources.

The Navy program is often characterized as purely compliance oriented; however, this characterization is inaccurate. It fails to consider on-going research and development efforts that are designed to provide the Navy with better scientific tools and data to understand the true environmental consequences of its operations. Of particular note is the marine environmental quality assessment program sponsored by the Chief of Naval Development.

Program objectives

Because of their wide-ranging scope, Navy operations come under the control of a variety of environmental laws, and under the influence of an even greater variety of public attitudes and concerns. Fully committed to meeting Federal rules arising from the National Environmental Policy Act of 1969 (NEPA), the Navy plainly recognizes the need for gaining a better understanding of the true impact of its operations on the environment. Thus in 1971, the Naval Undersea Center (NUC) was given the primary responsibility for seeking practical means of assessing and documenting general marine environmental quality. To meet this responsibility, the Center has been conducting a long-range program to develop reliable methods for surveying, analyzing, and predicting the general quality of marine environments, with special emphasis on harbors.

Most harbors represent multiply perturbed environments in which the various stresses can either reinforce or cancel each other. Furthermore, intact marine communities have a far greater capacity to tolerate chronic low-level insults or recover from intermittent high-level insults than the isolated marine organisms used to determine present environmental standards. Thus, emphasis in the marine environmental quality assessment program has been placed on community response as a sensitive and integrative measure of general environmental quality. The concentration of efforts on harbor communities is based on the following considerations:

- A significant proportion of naval activities involves the restricted confines of a harbor.
- Harbors are usually situated in estuaries, which are among the most productive marine ecosystems in the oceans.
- The majority of estuarine systems are already under severe, but poorly understood environmental stress.
- Appropriate assessment and management techniques developed for estuaries can certainly be adapted for effective application elsewhere in the oceans.

Existing and new data are provided by surveys of important Navy harbors and are being organized into an easily accessible body of verified environmental information that can facilitate the Environmental Impact Statement preparation and review process. Analysis of harbor response will provide a means of determining the true impact of specific naval operations, as opposed to other perturbants. This information will be used both to find practical means of reducing future impacts and to establish sound criteria for harbor monitoring and protection. Through the development of practical and dependable bioindicator systems, experience gained in one location may be reliably extrapolated to others. Information will be shared with universities and other agencies, so that a rational strategy for harbor protection can be more quickly achieved.

Program structure

The marine environmental quality program consists of three mutually interactive elements: field survey development, data bank development, and microcosm experience (Figure 1). Microcosms are contained, and usually simplified communities of marine organisms that closely approximate the real systems under survey.

While the data bank is the heart of the program, it has not been, and cannot be, developed independently of the other two elements. Field surveys, often conducted in collaboration with local universities, represent a basic input, but existing environmental information is also fed into the system after verification. Survey procedures are modified both by data analysis within the bank and by the results of supportive experimentation done in the microcosms established to simulate field conditions. Conversely, trends observed in the field influence both the microcosm work and the kinds of analytical and display techniques applied to the data.

Both physicochemical and biological parameters are important in the microcosm experiments and in the field surveys. Intermittent physicochemical sampling, however, does not always provide a sufficiently accurate picture for interpreting biological response. Thus, automatic instrumentation is being developed for determining and recording on a continuous basis biologically important parameters in marine waters.

Simple field procedures have been developed for rapid, yet comprehensive inventorying of marine organisms in a wide variety of geographic locations. Most surveys performed to date have been conducted in the northeastern Pacific. Major surveys include Apra Harbor, Guam; Pearl Harbor, Hawaii; San Diego Bay; and Hood Canal, Wash. A particular value of this work is the fact that all locations have been covered by the same survey teams, who used uniform techniques. The field data have been placed in the bank where they can be analyzed separately or in combination with other verified data sets, obtained either by the program or by university-based survey teams.