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ACADEMICALLY-SPONSORED COASTAL RESEARCH VESSELS IN THE NEW ENGLAND REGION: AN ASSESSMENT OF CURRENT MANAGEMENT AND IMPLICATIONS FOR THE FUTURE

BY

BRENDAN B. McAVOY

A MAJOR PAPER SUBMITTED IN PARTIAL

FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

MASTER OF MARINE AFFAIRS

UNIVERSITY OF RHODE ISLAND

1988

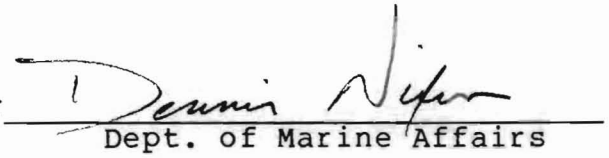
MASTER OF MARINE AFFAIRS

MAJOR PAPER

OF

BRENDAN B. McAVOY

APPROVED:

Major Professor 
Dept. of Marine Affairs

UNIVERSITY OF RHODE ISLAND

1988

ABSTRACT

In New England an informal communications network exists between coastal research vessel operating institutions. Vessel scheduling and operational support has been identified as adequate for the current amount of research being conducted within the region. However, societal shift towards coastal regions is prompting an increase in attention to research within the coastal zone. Current and pending federal initiatives are responding to this increased research need. This, in turn, is beginning to impose greater demands on coastal vessel sea-time. Therefore, a strengthening of the region's inter-institutional communications network may be warranted for the future in order to better coordinate coastal research vessel funding and use.

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INTRODUCTION

Oceanographic research in the coastal zone incorporates methods similar to those used in blue-water oceanography, but emphasizes the study of basic coastal and estuarine processes. This emphasis is becoming increasingly important in light of the mounting pressures on the coastal environment from technological innovation, industrialization, and the population shift towards coastal regions. Because these societal pressures directly affect the productivity and existence of valuable natural resources, society's activities and their influence on coastal regions must be understood if rational resource management of these areas is to be implemented.

Federally-funded research of coastal and estuarine areas is undertaken by the academic community, the private sector, and by authorized government agencies. This study will focus primarily on research conducted by the academic community, which harbors two resources valuable to marine research--highly-skilled scientific personnel and research vessels. Together, these two assets have been responsible for many advancements in the field of oceanography and, in turn, have benefited society by increasing its knowledge of the marine environment. Given the increasing need for sound coastal zone research as a basis for resource management, academically-sponsored coastal zone research vessels have been underutilized and suffer from lack of coordination between their sponsoring institutions.

As stated by Dr. Donald Boesch, Executive Director of the Louisiana Universities Marine Consortium, in a hearing before the Subcommittee on Oceanography of the House Merchant Marine and Fisheries Committee on June 24, 1986: "The widely dispersed coastal academic fleet constitutes a capable, strategically located, and underutilized resource for Federal research programs in the coastal zone. Operation of this fleet lacks coordination and convenient support mechanisms such as the inter-agency agreements to support research of UNOLS ships through the National Science Foundation. Coordination can be improved by regional organizations and consortia for this purpose."[1] Dr. Boesch's testimony, along with further evidence of the issues currently facing coastal zone research vessels--found in trade and technical journals, and through personal communication with university faculty, researchers, and marine superintendents--prompted this study of coastal research vessel utilization.

The study addresses the subject of academically-sponsored research vessel use in the New England coastal zone. It identifies the different requirements of coastal and blue-water research vessels, and specifically addresses the differences between custom-built coastal vessels and vessels that were converted for research purposes. It provides an overview of the federal agencies which fund coastal research, and some examples of current research projects in the New England region. Additionally, it

examines the possible need for an organizational structure for coastal research vessels similar to the University National Laboratory System (UNOLS), and the implications of such an organization on the use and funding of coastal vessels. The current state of coordination between operating institutions, funding agencies, and research personnel in the academic community and the private sector, is compared to the potential effectiveness of implementing new means for strengthening the inter-institutional network in order to enhance the future funding, scheduling and operation of vessels within the study region.

THE STUDY

Survey of Coastal Research Vessels

Since the emphasis of this study is the utilization of coastal research vessels, it was first important to identify these vessels and their geographical locations. The primary source for this information was the National Oceanographic Fleet Operating Schedule, published by the U.S. Naval Oceanographic Office. This annual publication primarily contains a comprehensive listing of research vessels under government ownership and operated by academic institutions, federal agencies, and the U.S. Coast Guard and Navy. The publication is largely comprised of informational profiles on each of these government-owned vessels, including their point of contact, operating cost, crew and scientific complements, range, endurance, electronics, deck gear,

propulsion machinery and a host of other pertinent information on the specific capabilities of each vessel. However, also included in the Schedule is an additional list of non-government vessels, which are owned and operated by academic institutions. The majority of coastal vessels fall within this group. Unfortunately, this separate list does not include the complete informational profile given for the federally-owned vessels.

The Fleet Operating Schedule was, however, useful in identifying certain criteria for the vessels to be included in this study. Because the study was to be concerned with the regional aspects of coastal vessel utilization, geographic location and vessel size were determined to be the most important criteria to be considered. Therefore, vessels located on the U.S. east coast and having an overall length of no more than 45 to 100 feet, were selected from the Schedule's supplemental list. The UNOLS vessels fitting this description were purposely omitted because of their inclusion in the national umbrella organization that oversees their scheduling and funding.

As the Schedule did not include specific information on the vessels identified for the study, this information had to be acquired through a survey mailed to the selected vessel operating institutions. (SURVEY, Appendix 1) A total of 22 surveys were sent to institutions located along the length of the U.S. eastern seaboard. Of those sent, 16 replies were received, and an additional four obtained by

telephone contact with the operating institutions. The survey identified 24 vessels conforming to the study's original selection criteria, and two that were found to be over the size limit.[2]

Geographic Region of the Study

Because of the magnitude of the survey response, it was necessary to further define the geographic region with which the study would be concerned. In defining the study's region, geographic and coastal configuration as well as institution location and vessel concentration were considered the most important criteria. Additional consideration was given to federal agency regional and divisional boundaries, and the programs carried out under the authority of these agencies. These programs include, in particular, the National Estuary Program of the Environmental Protection Agency and the U.S. Army Corps of Engineers' Disposal Area Monitoring System.

Based on these factors, the study's boundaries were determined as: the internal waters, territorial sea and Exclusive Economic Zone from the U.S./Canadian border to the Connecticut/New York State boundary, including all of Long Island Sound. (MAP I, Appendix 2) This geographic region, referred to in the study as "the New England region" or "the region," proved to provide an adequate informational base for the study, because of the number of academic

institutions and vessels located within its boundaries, as well as the current coastal research activity in the area.

Vessel User Groups

It was next necessary to determine the vessel user groups within the study region. A representative sampling of user groups was identified from within the region's academic community and its public and private sectors. These groups were contacted by telephone to ascertain their vessel use requirements. User groups contacted include academic researchers, marine technology systems manufacturers, environmental consultants and data acquisition firms.[3]

In contacting the user groups, it was discovered that privately-owned and operated vessels were also being used to conduct research in the New England coastal zone. These vessels, while not the focus of this study, did provide an extended view of actual vessel operational and contractual procedures.[4] It should also be noted that the academic vessel-operating institutions contacted in the study does not represent an exhaustive list. Many state environmental agencies, and private non-profit organizations operate vessels for coastal and estuarine research.

However, considering that this study is most directly concerned with inter-academic institutional coordination and scheduling, the vessels selected can be considered a representative sample for the region. Ultimately, nine

included in the study: the UCONN (University of
the ONRUST (New York State University at Stony
ERE CHASE (University of New Hampshire); the
BURY (Cornell University); the CAPTAIN BERT,
nd the LAURI LEE (University of Rhode Island);
(Massachusetts Maritime Academy); and the ARGO
Maritime Academy).

COASTAL ZONE RESEARCH VESSELS

h vessels are an important component of the
tific research infra-structure. They not only
sportation to and from study locations, but also
king platforms, laboratories and shelters for
and crew. Many types of research vessels exist,
nes which preform specialized tasks, and others
ployed in more general capacities. Both types
rom small run-abouts that require only limited
r handling, to larger ocean-going ships that
fessionally trained crews to oversee their
around the clock.

essels included within the scope of this study,
ssed as small to medium in size, having an overall
5 to 80 feet. These vessels are generally capable
ming their principle tasks of serving as stable
working platforms and shelters in fair to moderate seas, and
they operate primarily in enclosed, semi-enclosed, or near
coastal ocean areas. Desirable characteristics of coastal

research vessels include: a shallow draught to access shoal areas or tributaries; reasonable speed in order to move on and off station within the limits of the vessel's endurance; adequate work and laboratory space; navigational position fixing capabilities (i.e., LORAN, RADAR); a "clean" electrical power supply for scientific instrumentation; good all-round visibility; and deck gear capable of deploying and retrieving scientific instruments at sea. While these characteristics do not differ greatly from those of large oceanographic research ships, the smaller coastal research vessels do not require the magnitude of additional equipment necessary for deep-sea research, such as real-time communications systems, on-board computer facilities, satellite navigation, and increased endurance.

In the New England region, the geographic disbursement of vessels allows for research to be accomplished in almost any tributary, bay, sound, or coastal area within the region. (MAP I, Appendix 2) However, there is some limitation to the operating range of individual vessels due to their U.S. Coast Guard inspection certification, their insurance coverage, or their institution's operating policies. Of the vessels surveyed, about half are U.S. Coast Guard inspected, and those that are not, keep safety or Coast Guard compliance at a high priority.

The vessels are variously used to meet the demands of their operating institution's in-house researchers, requests for sea-time from other colleges and universities, and

charter activities outside of the academic community. While each operating institution schedules its vessels according to demand, the majority give priority to in-house academic research, while also attempting to maintain full, yet flexible schedules.

The physical condition of the vessels vary greatly. They are constructed of either steel, fiberglass, or wood, and they range in age from as little as four years to as much as 35 years. Equipped with a variety of deck gear and electronics, these vessel offer a wide range of services and capabilities. Through the use of A-frames, davits, booms, or articulated cranes, their hoist capacities range from 500 to 13,000+ pounds. Additionally, the majority are equipped with either electric or hydraulic, single and/or double drum deck winches, with wire cable from 5/32 to 7/8 inch in diameter. All have generators for AC power, with several vessels being equipped with more than one. The majority employ permanent crew, are well maintained, and operate year round. (TABLE I, Appendix 3)

UNIVERSITY NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

The federal government has long recognized the important role the academic community plays in scientific exploration and discovery, and has endeavored to further academic scientific research through the establishment of systems for funding and support. Since the beginning of World War II, the federal government has directly supported

marine scientific research in academic institutions; and in 1950, strengthened its support through the establishment of the National Science Foundation (NSF). This federal agency was authorized in order "...to promote the progress of science; to advance the national health, prosperity and welfare; and to secure the national defense."[5] By this authority, the NSF was enabled to award grants and contracts to individuals and organizations, including institutions of higher education, for the purposes of scientific research. In 1967, the NSF began to sponsor oceanographic research through its Division of Environmental Sciences, and after internal reorganization in 1976, through its Division of Ocean Sciences.[6] The NSF, which maintains firm ties to the academic community through its National Science Board [7], and the Office of Naval Research (ONR), are now the primary sponsors of marine scientific research in the United States.

Under section 11, paragraph (e) of the 1950 National Science Foundation Act, the NSF is authorized to "...acquire by purchase, lease, loan, real and personal property of all kinds necessary for, or resulting from, the exercise of authority granted by this Act."[8] Acting under this authority, the NSF--in cooperation with several academic institutions offering advanced degrees in oceanography--formed a fleet of research vessels owned and funded by the NSF and operated by the academic institutions. These NSF-sponsored research vessels, along with several Navy-owned

and academically-operated vessels, constitute a fleet of general and special purpose research vessels capable of conducting oceanographic research upon all the oceans of the world.

The academic institutions which operate these vessels, are located on the U.S east, west, and gulf coasts, and in the Great Lakes region. Because of their diverse geographic locations, the institutions formed, in 1971, the University National Laboratory System, commonly known as UNOLS.[9] According to the current UNOLS charter, this organization has two objectives: "To create a mechanism for coordinated utilization of and planning for oceanographic facilities through an association of academic institutions in a national system whereby institutions can work together and with funding agencies to assist in the effective use, assessment and planning for oceanographic facilities for graduate level research and educational programs," and, "to optimize federal and other support for academic oceanography, thereby continuing and enhancing the excellence of this nation's oceanographic program."[10]

Academic institutions operating UNOLS vessels or National Oceanographic Facilities [11], for which a significant amount of the funding is from federal sources, are eligible to become UNOLS members. Furthermore, an associate membership in UNOLS is available to institutions which "...conduct academic programs in the marine sciences and use on a recurrent basis, but do not necessarily

operate, seagoing oceanographic facilities for academic purposes."[12] Through the combination of these two classes of UNOLS membership, a large number of universities and institutions have joined together to coordinate their interests in federal funding, laboratory facilities, and the needs of their academic communities. UNOLS members communicate and coordinate research vessel scheduling on a national level. Additionally, an annual meeting (located at a different member or associate member institution each year), allows for a formal review of vessel operation, safety and administrative procedures, and serves as a forum for informal idea exchange. This system of inter-institutional and facility coordination assists in maintaining a comprehensive overview of the vessel requirements for effective deep-sea oceanographic research within the academic community. However, the formal coordinating role that UNOLS plays nationally for blue-water vessels, has no counterpart for coastal research vessels, even at the regional level.

OCEANOGRAPHY IN THE COASTAL ZONE

While oceanography is generally thought of by the public as the study of "the deep, blue sea," in actuality, the field of oceanography comprises the study of coastal and estuarine waters, as well as that of the world's oceans. The science of oceanography developed, in part, as a result of the desire to understand how the ocean's natural

processes impact one another, and thereby define the different ecosystems. The advancement of oceanographic studies has been furthered by society's desire to improve its standard of living, through the knowledge and use of the ocean's natural resources. This world-wide desire has spurred domestic and international efforts to understand the marine environment in order to develop rational resource conservation and management programs.

Coastal and estuarine areas are the most biologically productive regions in the world, and some of the most productive of these regions are found in the United States. Because of their proximity to land, these regions are directly affected and influenced by society's activities. With the recent growth in societal shift towards coastal regions, it is increasingly important to understand coastal and estuarine areas in scientific terms. Furthermore, because of the make-up of their ecosystems, research of these areas requires an inter-disciplinary approach incorporating knowledge of physical, chemical, biological, and geophysical processes. This combined approach to coastal zone scientific study is essential in order to form sound management decisions involving the natural resources of these areas. Most importantly, it is necessary to understand people's impact on these areas if resource productivity is to be sustained. Ongoing basic research in the coastal zones of the world's oceans, with an emphasis on society's interaction with the natural processes of these

areas, is increasingly needed as the twenty-first century approaches.

The coastal zone includes not only the areas where continental landmasses meet the ocean, but also those areas where fresh water interacts with the saline water of the sea. In these regions, periodic cycles of tidal and seasonal change combine with the intermittent fluctuation which occurs during meteorological processes to produce profound saline and temperature gradients. These processes result in circulation patterns which, in turn, affect the fate of any dissolved or particulate matter. Any anthropogenic input of this matter affects the natural ecosystem, and can cause adversities in primary and secondary productivity. Nutrient loading from point and non-point sources, and toxic contaminants from industrial activity, can severely affect the natural filtering process that is a function of estuaries and near coastal regions. Valuable resources, both living and non-living, are easily destroyed by human activity in these regions. Ironically, it is these very resources which have attracted people to the coastal zone for centuries.

Another physical aspect of the coastal region that is of importance to society, is the interplay between coastal morphology and the hydraulic forces which act upon it. The coastal region is a high energy environment. Thus, an understanding of its energy boundaries is essential when construction is planned in close proximity to the

coastline. This is especially true in areas around tidal inlets, beaches, and barrier islands, in which the process of erosion and sediment transport is of primary importance. As this natural process of sediment transport is affected by hydraulic forces, an understanding of these forces is critical to land-use functions. Hydraulic forces also affect sediments released into the environment as a result of dredging activity. Dredged spoil dispersal and transport can effect the productivity of biota in and around disposal sites, a problem which is further compounded if spoil is contaminated with toxic substances. In either case, an understanding of sediment transport hydraulic forces is necessary in making decisions involving the designation of dredge spoil disposal sites.

These examples illustrate the need to understand the basic scientific processes of the coastal zone, in order to balance society's activities in marine transportation and the harvesting of natural resources with the needs of the marine ecosystem. Furthermore, all of these processes--nutrient loading, flux of dissolved and particulate matter, and input of toxic contaminants--have an impact on a global scale. Coastal studies are being linked to world-wide surveillance of deep ocean processes concerning the flux of materials, biological productivity, and even meteorological change. The key to rational management of natural resources is a basic inter-disciplinary knowledge of the ocean's

ecosystems. Therefore, coastal areas currently necessitate increasing amounts of research activity.

FEDERAL AGENCY SPONSORSHIP OF COASTAL ZONE RESEARCH

National Estuary Program

The Environmental Protection Agency's (EPA's) National Estuary Program formally achieved national status with the passing of the 1987 Water Quality Act. Section 320, paragraph (a) of the Act, specifically states: "The Governor of any State may nominate to the Administrator an estuary of national significance and request a management conference to develop a comprehensive management plan for the estuary."[13] Furthermore, subparagraph (B) of the Act states: "The Administrator shall give priority consideration under this section to Long Island Sound, New York and Connecticut; Narragansett Bay, Rhode Island; Buzzards Bay, Massachusetts; Puget Sound, Washington; Delaware Bay, Delaware and New Jersey; New York-New Jersey Harbor, New York and New Jersey..."[14]

This legislation is significant to the scope of this study as three of the estuaries given priority consideration are contained within the study's geographic boundaries. (MAP II, Appendix 4) Additionally, paragraph (g) of the Act makes federal funding available to private firms and institutions for research activities in these priority areas.[15] The federally-funded EPA National Estuary Program has, thus, increased the availability of funding for

coastal zone research within the study's geographic region and, correspondingly, there may be an increased need for the services of coastal research vessels within the region in the future.

DAMOS

Another federally sponsored program central to the study's concerns is the comprehensive and advanced dredged spoil Disposal Area Monitoring System, or DAMOS, which the Army Corps of Engineers (ACE) initiated in 1977. Under the DAMOS program, nine active disposal sites are located along the New England coast from Rockland, Maine to Stamford, Connecticut.[16] (MAP III, Appendix 5)

The New England Division (NED) of the ACE, subcontracts the monitoring of these sites out to private research groups, such as Science Applications, Inc. of Newport, Rhode Island. The contracted researchers, in turn, subcontract for vessel time.[17] As a result, coastal research vessels operated by the University of Connecticut and the University of New Hampshire have been used by the program for water quality monitoring, which involves the use of biological sampling gear (i.e., bottom trawls, plankton nets, divers, and Remotely Operated Vehicles). Additionally, scientists from Yale University, the University of Rhode Island, and the University of Connecticut, have actively participated with the NED in the program.[18]

Other Federal Programs

The National Estuary Program and DAMOS are just two initiatives of federal agencies that sponsor research in the coastal zone. Additional sources of federal support are available from the National Science Foundation, the Office of Naval Research, the National Oceanic and Atmospheric Administration's (NOAA's) Sea Grant Program, the Department of Energy, the Department of the Interior's Bureau of Land Management, the U.S. Coast Guard, NOAA's National Marine Fisheries Service, and the U.S. Geological Survey.[19]

This federal support is available through grant proposals submitted for peer review, and through contracts with the respective federal agencies. However, the primary federal supporter of academic marine research in the coastal zone is Sea Grant, which uses a peer review process for approving proposals and which requires grant monies to be matched by outside funds.[20] The NSF and ONR, while larger and having more grant money at their disposal than Sea Grant, are more active in funding basic research in blue-water oceanography, global processes, and in polar regions.[21]

Additional government support for coastal zone research originates at the state level in conjunction with special state environmental programs and directives. An example of which is the recently formed Association for Research on the Gulf of Maine (ARGO), which involves the University of Maine, Maine Department of Marine Resources, Bigalowe

Laboratory for Ocean Sciences, Maine Geological Survey, and the Maine Maritime Academy.[22] The institutions involved in this consortium "...have joined in an association to form a critical mass of scientific and marine expertise, committed to studying and preserving the Gulf of Maine in a whole ecosystem approach."[23]

In addition to sponsoring scientific research through grants and contracts awarded through the peer or agency review process, federal agencies also contract research and associated services through Requests For Proposals (RFPs) solicited in the Federal Register or the Commerce Business Daily.[24] It is not uncommon for oceanographic and marine-related RFPs to be responded to by private construction firms, environmental consultants, and laboratories. These private firms, along with marine technology systems manufacturers, can sometimes require the use of academically-owned coastal research vessels. If a private firm must charter out to an academic institution for the use of a research vessel, it is most often because of the firm's lack of in-house facilities. Surveying, sediment sampling with corers, biological sampling with advanced fishing gear, requiring on-deck hydraulics, winches and cables, or facilities to test underwater systems, or to conduct personnel training, are some of the requests made by firms in the private sector when subcontracting or charting a coastal research vessel.[25]

CUSTOM AND CONVERSION RESEARCH VESSELS

The nine vessels in this study fall within two groups--custom research vessels and conversion research vessels. "Custom vessels" are vessels that were specifically designed and built for the primary task of supporting marine scientific research; and "conversion vessels" are vessels that, after providing service in a different capacity, were either modified or adapted to their new roles as research vessels. These two groups can be used to describe the types of coastal research vessels found within the New England region. However, it should not be generally inferred that the conversion vessels are not able to fulfill their new tasks as well as the custom vessels. In fact, some converted or modified vessels currently used for marine research are perceived to be preforming well according to their operators.[26] Furthermore, conversion coastal vessels are often the only economically viable alternative to the highly expensive process of designing and building a custom research vessel.[27]

Custom Research Vessels

Custom coastal research vessels are dispersed along the New England coastline and are operated by a variety of organizations and institutions. The vessels identified in this study will be discussed according to their geographic location, beginning with the northern-most vessel and moving south to the vessel located at the southern-most point

within the study's defined geographic region. (MAP I, Appendix 2) A brief description of each of the vessels, along with their primary functions, will be included.

The 80 foot R/V ARGO MAINE operated by the Maine Maritime Academy is the largest vessel included in this study. Built in 1968, and formally a member of the UNOLS fleet, the ARGO MAINE is probably the most sophisticated and well-equipped research vessel located north of the Woods Hole Oceanographic Institution in Cape Cod, Massachusetts. The ARGO MAINE was recently awarded to the State of Maine by the National Science Foundation to serve as the support vessel for the Association for Research on the Gulf of Maine.[28]

With a gross tonnage of 165 tons, the ARGO MAINE has an operating range of 4500 nautical miles (NM), and maintains a cruising speed of nine knots. This vessel is equipped with several deck winches of varying capacities, including two A-frames, and one crane. With its variety of on-board electronic and mechanical equipment, its extensive cruising range, and its size, the R/V ARGO MAINE is well suited for aiding the consortium in its research efforts.

The funding for the vessel's operation is primarily secured from consortium memberships and from fees to other chartering organizations. In addition, this base funding is currently being supplemented by the Maine Legislature for a finite period of two years, in order to assist in building up the vessel's operational program. However, additional

state funding may be available in the future to help subsidize the vessel as it is no longer eligible for direct operating funds from federal sources as it was under UNOLS.[29]

The next custom vessel located along the New England coast is the 45 foot R/V JERE A. CHASE, owned and operated by the University of New Hampshire (UNH), and docked in Portsmouth, New Hampshire. The JERE CHASE was built for work in the northern latitudes, and is therefore constructed of double planked oak. Launched in 1964, the JERE CHASE operates primarily in the Gulf of Maine, and is certified by the U.S. Coast Guard as a small passenger vessel for the area "...coastwise: between Eastport, Maine and Cape Cod, Massachusetts not more than 20 miles from a harbor of safe refuge, under reasonable operating conditions."[30]

Although only certified for this area, the vessel has an operating range of 1000 miles by virtue of its 600 gallon fuel capacity and only three gallon per hour consumption rate. The vessel works to directly support UNH research projects and those of other academic institutions and contract charterers. Maintained by a permanent crew of two, the JERE CHASE has a one ton capacity A-frame, an 800 lbs. capacity boom, a deck winch, and 144 square feet of working deck space. The wheelhouse is outfitted with radar, loran, VHF radios, sounding recorder and a video sounder. The JERE CHASE is funded directly by UNH and by user fees gained

through UNH's Institution of Marine Science and Ocean Engineering.[31]

Also located in the Portsmouth area, but operated only on a seasonal basis, is the 48 foot R/V JOHN M. KINGSBURY. Owned by Cornell University in Ithaca, N.Y., this vessel was launched in 1984 by Gladding-Hearn Shipbuilding Corporation of Somerset, Massachusetts. The JOHN M. KINGSBURY was designed to fulfill the combined roles of research, passenger, and cargo vessel, and to additionally serve as a floating classroom and training vessel for undergraduate students studying at Shoals Marine Laboratory on Appledore Island (located 6 NM from the mouth of the Piscataqua River in the Gulf of Maine). The Shoals Marine Lab is jointly operated by Cornell University and UNH, and as an island community uses the JOHN M. KINGSBURY for logistical purposes as well as to offer students the opportunity for a "hands-on" marine scientific experience.

Equipped with a "Kort" nozzle and 10 inch diameter bow thruster, the vessel is highly maneuverable. On deck is an articulated crane with a capacity of one ton at a 10 foot reach, hydraulic winch with 1000 feet of cable rated at one ton line pull, towing bitt, large after deck, and an after steering console. In the wheelhouse there is radar, loran, VHF and Single Side Band (SSB) radios, and a recording and video sounder. Although it rarely leaves the Maine/New Hampshire coastal area, the KINGSBURY is U.S. Coast Guard

certified from Eastport, Maine to Brownsville, Texas for not more than 100 NM offshore.

The next custom coastal research vessel is located in the southern-most portion of the region at Stony Brook, New York on Long Island. Owned and operated by the State University of New York, at Stony Brook, the 55 foot R/V ONRUST works to directly support marine scientific research for the University's Marine Sciences Research Center and for other academic researchers. The ONRUST was launched in 1974 by Rhode Island Marine Services, Inc., located in Snug Harbor, Rhode Island. Operated with a crew of two, this vessel has an endurance period of three days and has berthing for six. Its design follows that of an off-shore lobster boat. With its range of 750 NM at a cruising speed of 10 knots, the ONRUST provides the Marine Sciences Research Center with offshore capability and service within the Long Island Sound area. A working deck space of 240 square feet is complemented by a one ton capacity hydraulic A-frame, one 1000 lbs. capacity cargo boom, a double drum hydraulic deck winch, and a store of oceanographic sampling and collecting gear. Electronics in the wheelhouse include: radar, two loran sets, depth recorders, and side scan sonar. The vessel is not classified as a small passenger vessel, and therefore does not require Coast Guard inspection.

Conversion Research Vessels

The conversion of a fishing, cargo, supply, or crew boat to an oceanographic research vessel can be an economically viable asset to a marine scientific research program. Often it is the only solution if a vessel is required within a restricted budget, as is frequently the case among non-profit academic institutions. However, vessel conversions which involve extensive modifications or rebuilding can sometimes present problems in the long run. Employing a vessel in functions other than those it was designed for, can result in excessive wear and tear on its structural members, and can promote unsafe working environments if strict attention is not paid to design details of the modifications. For example, initial stability, safe working loads of deck gear, and general deck layout must be considered. These factors and others, such as propulsion machinery and power take-offs used to operate auxiliary deck gear, when not designed for their new uses, can evolve into long-term cost overruns in operation and maintenance.

The northern-most conversion vessel within the study region is the 68 foot R/V EDGERTON located at the Massachusetts Maritime Academy (MMA) in Buzzards Bay, Massachusetts. This vessel is operated by MMA for use in its fisheries program and in support of the Massachusetts Institute of Technology's marine science programs. Originally launched in 1981, the vessel was converted to a

research vessel in 1984. It has one A-frame of one ton capacity, and a working deck area of 400 square feet. The wheelhouse contains three loran sets, one VHF and SSB radios, and two radars. The EDGERTON is not Coast Guard inspected, and operates primarily in Cape Cod Bay and Buzzards Bay.

The next three conversion vessels located along the New England coast are the R/V SCHOCK, the R/V LAURI LEE, and the R/V CAPTAIN BERT, all owned and operated by departments of the University of Rhode Island. The 65 foot R/V SCHOCK is a converted U.S. Army Transport boat, or T-boat, built in large numbers for the U.S. Army in 1953. This vessel is operated by URI's Ocean Engineering Department and is docked at a leased facility in Wickford, Rhode Island. The SCHOCK is primarily used to support University classroom research, although it is occasionally used by outside charters. The SCHOCK was converted to a research vessel in 1980, with the addition of a 5000 lbs. capacity A-frame. The vessel has a fuel capacity of 1200 gallons, with an operating range of 700 miles at a cruising speed of 9.5 knots. It is operated by a crew of two. The vessel has a coast-wise navigational region from Portland, Maine to New York. It is not Coast Guard inspected. The SCHOCK has two radars, two lorans, a depth sounder, and one SSB and two VHF radios. Its working deck space of 324 square feet forward and 144 square feet aft, gives the SCHOCK one of the most generous working spaces of all the vessels surveyed in the region.

The second vessel owned by URI, is operated by its School of Oceanography. The 59 foot R/V LAURI LEE was acquired from U.S. Customs as a confiscated drug runner; it was converted to a coastal research vessel in 1985. This vessel has a cruising speed of 19 knots, making it one of the faster of the regional vessels. But its twin GM 1271 Turbo diesels consume 50 gallons of fuel per hour. The LAURI LEE has a working deck area of 224 square feet, with a two ton capacity articulated crane and a 500 lbs. capacity davit. Operated with a crew of two, the vessel has a range of 600 NM, with a seasonal navigation restriction of 80 NM offshore from June to August, and a near coastal and Narragansett Bay restriction from September to May. The vessel's electronics include: two radar, two loran, two VHF radios, and one SSB radio. Because it is not certified as a small passenger vessel, it is not Coast Guard inspected; but equipment on board does comply with Coast Guard regulations. Like URI's R/V SCHOCK, the R/V LAURI LEE is primarily used to directly support URI's academic program's, with some outside chartering activity.

The third vessel owned by URI is the 53 foot R/V CAPTAIN BERT, which is operated by the Department of Fisheries, Animal and Veterinary Sciences. With its six deck winches and A-frame, the CAPTAIN BERT is primarily rigged for trawling and heavy lift work over the stern. The vessel has a cruising speed of 12 knots and a fuel consumption of approximately 15 gallons per hour. The

wheelhouse electronics include four loran sets, two radars, and multiple sounding equipment and radios. The CAPTAIN BERT is not inspected and is operated year round by a crew of one. Like the LAURI LEE, the CAPTAIN BERT, is a confiscated drugboat that has been modified for its new role as a research vessel. And, like URI's other coastal vessels, it is used to support University academic programs as well as research charterers from the private sector.

Located further down the coast, is the R/V UCONN at the Avery Point Marine Science Institute in Groton, Connecticut. The Marine Science Institute is a division of the University of Connecticut at Storrs, which offers graduate degrees in the marine sciences. The UCONN is a converted T-boat, like the R/V SCHOCK. Originally modified by the Scripps Institute of Oceanography in California to be used as a seismic survey vessel, the UCONN was acquired by the University of Connecticut in 1965. The vessel has logged coastal mileage from New Jersey to Maine, and is well suited for research in its home waters of Long Island Sound and offshore.[32]

The UCONN has a fuel capacity of 2400 gallons, giving it an operating range of 1700 miles at 8.5 knots. It employs one boom with a hoist capacity of 900 lbs., a single drum deck winch with 500 feet of 5/16 inch diameter wire cable, and working deck space of 266 square feet forward and 98 square feet aft. The 65 foot vessel has a gross tonnage of 77 tons, and is operated by a crew of two. Though it is

not Coast Guard inspected, safety is cited as a high operating priority.[33] The on-board electronics include loran, radar, depth sounder and recorder, and VHF and SSB radios. The UCONN is hauled out for maintenance every two years, and although 35 years old, continues to serve academic and private researchers on a year round basis. (TABLE I, Appendix 3)

ADMINISTRATION OF COASTAL RESEARCH VESSELS

Through the detailed information gathered in the survey, it is possible to evaluate a vessel's ability and derive a reasonable estimation of its effectiveness in preforming support services for coastal and estuarine research. Some of the vessels, including some of the conversions, have been more involved with research activity than others, and have become more visible to contract and charter users outside the operating institution.[34]

The amount of vessel activity was found to be often directly proportional to the amount of money available for its operation through federal, state, and local funding of marine scientific research in the coastal zone. Because funding is often the limiting factor, the researcher must pay careful attention to a project's cost and must draft its budget accordingly. This can necessitate searching out the least expensive vessel with which to accomplish the required research tasks. However, an ill-equipped or maintained vessel, even if inexpensive, is not always cost-effective.

Therefore, it is not only necessary for the researcher to be aware of the most economical vessel available, but also the one most suited to a project's needs. Furthermore, this information is often required well in advance of a project's actual implementation in order for the researcher to prepare grant proposals and reserve sea-time. This need for specific information on coastal research vessels, requires some form of communication between the researcher--whether academic, public or private--and the administration directly responsible for the research vessel's scheduling and operation.

Although, there are several universities offering advanced degrees in oceanography in the New England region, with the exception of those institutions using the large oceanographic vessels of the UNOLS fleet, there is little indication of an organizational structure to facilitate inter-institutional vessel scheduling and information exchange. There are several reasons for this situation, including the perceived effectiveness of the current informal communications network and institutional pride connected with exclusive management of a vessel's operation. However, the recent focus on coastal and estuarine research, due in part to society's growing use of these areas, suggests larger demands on coastal vessel use and, therefore, the need for increased cooperation in vessel scheduling, funding, and maintenance in the future.

Current Informal Communications Network

The academic institutions that operate coastal research vessels in New England are located in relatively close proximity to one another. (MAP I, Appendix 2) The comparatively small geographic region these institutions comprise, explains in part the informal network for communication which exists between their operating institutions. Most of these institutions employ marine superintendents or marine program administrators to oversee vessel scheduling, operation and maintenance. The normal procedure for a researcher desiring vessel sea-time, is for the researcher to personally contact the institution's vessel operations office either by telephone or by mail. If the program office cannot provide the researcher with the sea-time requested, either because of scheduling conflicts or because of equipment maintenance and repair, the superintendent or administrator usually has personal knowledge of other vessels in the area to which to refer the researcher. This informal, word-of-mouth network is the general form of communication between coastal vessel operating institutions and researchers within the region.[35]

While this informal method of sharing information is generally perceived as currently adequate for the amount of research being conducted within the region, there is also the sense that this may not hold true for the future. Bruce

Tripp, Director of the EPA's National Estuary Program at Buzzards Bay, summed up this current attitude, stating: "While the informal network is more than sufficient now, I can see the need for increased regional cooperation in the future."[36]

In addition, the study has revealed that the region's lack of centralized vessel information may have hidden negative repercussions for the research community. The informal network--in which specific information on a number of vessels' schedules, capabilities and costs is not readily accessible for comparison by researchers--can mask scheduling inefficiencies, high costs and inadequately outfitted and maintained vessels. This lack of comparative data limits the researcher's knowledge of available vessels to those known through the existing personal contact system. Which can, in turn, affect the economic viability of a research project and/or the quality of the science it achieves, if the vessel selected is either not suited to the tasks at hand or is comparatively expensive to operate. This is an important factor not only for the academic researcher seeking funds for research through government or foundation grants, but for the researcher in the private sector as well, where an even greater emphasis is put on the cost effectiveness of the operational aspects of marine research.

Vessel Scheduling

Each vessel-operating institution coordinates its vessel's operating schedule a little differently, which, to some extent, has limited inter-institutional communication and scheduling. Only two institutions involved in this study formally prepare a schedule for vessel use for a year in advance--the University of New Hampshire, which schedules the JERE CHASE; and the State University at Stony Brook, which schedules the ONRUST. To prepare the JERE CHASE's schedule, UNH's Marine Programs Office mails notices to past vessel users and then holds an annual scheduling meeting in January or February to consolidate the requests. Priority is given to in-house research, with the remaining available time chartered to other academic researchers. Any user contacting UNH's Marine Programs Office subsequent to the scheduling meeting is allotted sea-time accordingly, with academic research again given preference.[37]

The Marine Sciences Research Center at Stony Brook, schedules the ONRUST in much the same way, but does not hold a meeting. A memorandum is sent to faculty for vessel-time requests, and a tentative schedule is drawn up in December for the oncoming year. Like UNH, Stony Brook gives in-house researchers scheduling priority and works in any outside or subsequent requests accordingly.[38]

The procedure used to schedule URI's CAPTAIN BERT is more informal than used for either the JERE CHASE or the ONRUST, but it is also sometimes scheduled in advance. In fact, projects have been scheduled as much as two years ahead. The need for long-range scheduling may be a refection of the vessel's extensive use. It actively serves URI's Fisheries program for in-house research, as well as for student instruction in fishing gear and technology, and vessel handling. In addition, the vessel is also scheduled for outside charter for use in both long and short term research projects.[39]

By providing the "big picture" for the forthcoming calendar year, this method of advanced planning can increase vessel efficiency as it allows for maintenance scheduling and advanced preparation for extensive voyages. However, a vessel's annual operating schedule must remain flexible as it is, of course, dependent on the amount of research being undertaken and, in turn, the amount of available funding. Operating schedules are also subject to change from cancellations and other modifications, and therefore any advance planning must maintain a certain degree of flexibility.

URI's LAURI LEE and SCHOCK, the University of Connecticut's UCONN, and MMA's EDGERTON are scheduled on a more short-term basis. These vessels are booked according to "first come, first served", and require only three to four weeks advance scheduling notice. In-house research is

again given priority in scheduling, and the amount of vessel use is directly dependent on the amount of research being funded.[40]

The ARGO MAINE's program has only recently been established, and formal cruise scheduling criteria have not yet been developed. To date, the vessel has been used primarily by the ARGO Maine members, along with some use by researchers from URI and the University of Massachusetts. However, current plans include promoting the vessel through extensive mailings of brochures describing the vessel, its availability, and purpose.[41]

The utilization of a vessel of this size requires more extensive advance planning than is required with smaller vessels because of its increased maintenance and crew needs. The ARGO MAINE will regularly receive routine maintenance, as it is docked and maintained at the Maine Maritime Academy, where maintenance and repair projects can be accomplished by using in-house equipment and personnel, which will hopefully reduce and prevent repair time, and correspondingly translate into an economical operating cost.

The JOHN M. KINGSBURY is scheduled differently from the other vessels in this study as it is used only on a seasonal basis and solely in support of the Shoals Marine Laboratory. While the vessel is used daily during its summer operational season from May to September, its owner, Cornell University, has not yet actively pursued off-season outside chartering activity.

Through these examples, it is clear that each of the vessel operating institutions included in the study, uses a different method for scheduling their vessel's sea-time. Although each vessel operator holds different priorities, the academic institutions overwhelmingly place in-house research first. Differences in scheduling and priorities, combined with the variability of research funding, are perhaps the primary inhibitors to a coordinated inter-institutional scheduling program for coastal research vessels.

Vessel Operating Cost

The cost of vessel sea-time for the UNOLS fleet is directly covered by block funding from the ONR and the NSF. Therefore, scientists drafting grant proposals for blue-water studies involving the use of a UNOLS vessel, need not calculate the vessel's operating costs into their project's budget. The same is not true, however, for researchers proposing studies requiring coastal vessel sea-time. These researchers must include the anticipated cost of vessel time in their budgets.[42] And, while the least expensive vessel is not always the appropriate choice--since factors such as location, capability and size must also be considered--the cost of sea-time can affect a proposal's viability. But without a centralized source for vessel information, a researcher has no readily referenced guide for comparing coastal vessel operating costs.

Of the ships surveyed in this study, the most striking inconsistency in operating cost is revealed by a comparison of the University of Connecticut's UCONN and URI's SCHOCK. Both converted T-boats, the vessels vary only slightly from one another--the SCHOCK has an A-frame on deck for deploying heavy gear, which the UCONN does not have. The UCONN, however, has a 1700 NM operating range because of its large fuel capacity, while the SCHOCK has only a 700 NM range. The UCONN is also regularly maintained and frequently used, unlike the SCHOCK, which has recently been described as "...in poor shape."[43] The UCONN, though, has an operating cost of $85 an hour (after the first 8 hours its rate is $115 an hour) or $680 a day based on an eight hour work day, while the SCHOCK has a $1200 daily operating cost. (GRAPH, Appendix 6)

The SCHOCK's poor maintenance and high operating cost has been attributed to administrative inefficiencies within URI's small boat program.[44] Dr. Randy Watts, Chairman of the URI in-house committee charged with drafting a five year plan for the University's small boat program, has recommended forming a "mini-UNOLS" within URI. He sees this "one umbrella organization" as a centralized authority responsible for the safety, maintenance and scheduling of URI's smaller vessels. He also indicated that it was hoped that this coordinated effort would broaden the vessel's available funding base as "...without direct federal money

available to this class of vessel, ship time is dependent on individual grants for sponsoring."[45]

This relationship between research funding and vessels use is true for other coastal vessels as well. As stated by George Pongonis, of the Virginia Institute of Marine Science, "Vessel demand is a direct result of the funding available for marine research, and the cost of operation increases during times of low activity, and decreases during times of high vessel activity."[46]

Until the formal establishment of EPA's National Estuary Program in 1987, coastal zone research in the New England region had been largely supported by Sea Grant or by state granting programs. The formal inception of the National Estuary Program has brought increased strength to the research funding available, and is an indication of the growing national concern for these waters. In undertaking its research efforts, this federal program carefully considers the cost of coastal vessel sea-time. This is evidenced by EPA Region 1's Narragansett Bay project. In order to conduct trawling and benthic sampling necessary to the project, Region 1 charters time on a local fishing vessel, which offers a lower fee than the research vessels operated by URI.[47]

It is clear that when attention must be paid to the cost of coastal research vessel sea-time, researchers will seek the least expensive vessel available for the job.[48] Therefore, it could benefit both researchers and operating

institutions to participate in a centralized vessel data bank. Such a resource could assist researchers in locating cost-effective vessels and help operators increase the market awareness of their vessels. A coordinated informational system could, however, prove damaging to those vessels revealed as comparatively high in cost.

Institutional Pride

Marine science academic institutions have many common interests, reflected in their shared interest in issues concerning the marine environment. However, there is also an element of individual pride within these institutions, especially concerning high-profile research projects. This pride can also extend to an institution's research vessel. A great deal of effort is required to fund, maintain, and staff a research vessel within the size criteria of this study. A well-operated vessel is very tangible evidence of the effort expended on its behalf, and this investment of both time and money can promote strong institutional pride in a vessel.

William Wise, Associate Director of the Marine Sciences Research Center at Stony Brook, states, "There is a strong internal movement within a research organization to operate their own vessel because a ship is part and parcel to the institution."[49] This link between an institution's identity and its research vessel, can be evidenced in the promotional flyers distributed by operating institutions

describing their vessel's capabilities and past accomplishments. Glossy photographs, drawings, vessel histories and achievements, are outlined in these publications. They serve to increase public awareness of the vessels, to enhance marine program and university development programs, and to serve as marketing tools to increase vessel operating funds through outside charterers.

While some institutions have no interest in soliciting outside charters, others actively market their vessel to government agencies, other academic institutions, and to the private sector. While private sector research can be diversified and sometimes lucrative, the exploitive nature of some private research is not in keeping with the missions of non-profit academic institutions. Some institutions are, therefore, reluctant to become overly involved in private sector chartering as their vessel is directly reflective of the institution.[50]

When seen at sea, whether actually conducting research, or simply providing transportation, a vessel represents its operating institution. With its name and home port visible on its stern, the coastal research vessel can generate strong feelings of institutional pride. This pride can, however, be an obstacle in promoting inter-institutional cooperation, which can be perceived as threatening to an institutions's identity.

IMPLICATIONS FOR THE FUTURE

Future Research Support

A 1977-1978 study by the Political Science Department of the University of Connecticut, found that there has been close and durable funding relationships between the academic marine science community and only a few federal agencies: the National Science Foundation, the Office of Naval Research, and Sea Grant. The Environmental Protection Agency was found to follow these top three, and the Department of Energy, the Army Corps of Engineers, and the Department of the Interior's Bureau of Land Management followed next with about equal levels of contact. In last position were the National Marine Fisheries Service and the U.S. Coast Guard. Generally speaking, only the National Science Foundation, the Office of Naval Research, and Sea Grant, were found to have a strong funding relationship with the academic community.[51] (TABLE II, Appendix 7)

While the ONR and the NSF have been long-standing supporters of academic marine research, these agencies have focused their attention on blue-water, polar, and global studies. Until recently, only Sea Grant provided strong support at the regional level for coastal zone research. But, with the passing of the Water Quality Act in 1987, the EPA formally increased its funding of regionally-based research of the coastal zone. This recent legislation is

evidence that federal emphasis on coastal zone research is increasing.

States are also playing an increasing role in addressing research and management issues in the coastal zone. U.S. coastal states have jurisdiction over the nation's territorial sea, which runs from the low water mark at the shoreline to three miles offshore. State control and management efforts in these coastal waters have been increasing since the passage of the Coastal Zone Management Act of 1972, and, more importantly, since the Sea Grant Improvement Act of 1976. This 1976 Act authorized the establishment of Sea Grant Colleges and Regional Consortia.[52] Through this national program, traditional state responsibilities have been expanded by creating mechanisms for improving coastal resource management studies at colleges and universities.[53]

Sea Grant helps to educate and train scientists and professionals to make informed decisions involving marine-related issues in the coastal regions.[54] In light of today's societal shift towards coastal areas, the increasing emphasis on training coastal zone managers and researchers is warranted. Continued coastal area development and rapid population growth has placed growing pressures on coastal ecosystems, and it is estimated that by 1990, 75% of the United States population will be living within 50 miles of the coast.[55]

Increasing societal pressures on natural resources has forced policy makers to rely on environmental scientific information more than ever before. Mark Sagoff in his article, "Ecology and Law: Science's Dilemma in the Courtroom," states, "...courts and legislatures have called upon those in the environmental sciences to testify about the intricacies of the environment, to warn us about dangers, to evaluate risks and, in effect, to help provide the information it takes to make important legal and policy decisions."[56] The increasing role of environmental research in policy formation and the increasing pressures on coastal resources, are calling for an increase in future funding for marine scientific research in the coastal zone.

An awareness of this need is noticeable at the federal level in current pending legislation. The Strategic Ocean and Coastal Resources Act of 1987 (H.R. 1727), is currently being reviewed by the House Committee on Merchant Marine and Fisheries. Section 206 of the proposed Act, calls for the establishment of a national Strategic Research Program to address "...research of a scope and duration that is beyond the capacity of programs and projects assisted under section 205 (of the Sea Grant College Program)."[57] If this bill is signed into law, additional federal support will be available for future coastal and estuarine research.

Future Coastal Vessel Use

Based on the current level of vessel use and research within the New England coastal zone, this study has found an over-capacity of coastal research vessels under 100 feet in length within the region. The majority of the vessels involved in the study are operated by academic institutions, which presently are also the primary vessel users. However, with the trend towards increasing federal and state support for coastal area marine scientific research, these academic institutions may find a greater demand in vessel chartering from outside agencies as well as from in-house researchers funded by the increasing availability of research support. Consequently, a greater degree of demand and funding accountability may move the New England academic coastal research fleet to undertake more cooperative efforts in vessel scheduling and management in the future.

A current example illustrating this, is the joint program between the State University of New York at Stony Brook and the University of Connecticut. Stony Brook and the University of Connecticut are recent co-recipients of federal funding from EPA's National Estuary Program for scientific studies in Long Island Sound.[58] These studies will require extensive use of both of the institutions' research vessels, the R/V ONRUST and the R/V UCONN, during the 1988 summer navigating season. Unlike in previous years, this increase in research money has resulted in the UCONN being almost completely scheduled by in-house

researchers, with little time available for outside users.[59] The ONRUST is also booked for the entire season for use in two projects connected with the Long Island Sound studies.[60] If this recent example involving the UCONN and the ONRUST is an indication of future trends, then increased inter-institutional coordination may not only be beneficial to the academic community, it may be essential.

Strengthening the Inter-Institutional Network

Although institutions currently prefer to operate their own coastal research vessels in order to maintain flexible schedules and control over its operations, as vessels are in greater demand, sea-time will need to be reserved farther in advance than is currently necessary. To accomplish this, more formal scheduling procedures will need to be adopted and the inter-institutional communications network will need to be strengthened. Because of the nature of coastal zone research work, flexibility in vessel schedules is essential, and is completely viable if good communication between operating institutions is maintained.

Because of the size, range, and endurance of the vessels involved in this study, a formal organizational structure for regional coordination along the lines of the national UNOLS program is not currently warranted. Aspects of the UNOLS program could, however, be beneficial on the regional level. Although an informal communications network currently exists between small coastal vessel operators in

the New England region, this network could be strengthened. Suggested methods for accomplishing this include: an annual, informal meeting of marine superintendents, vessel users, funding agency representatives and products manufacturers for information exchange; a quarterly or bi-annual regional newsletter to address current funding, research and technical topics; and a computerized regional vessel listing detailing individual vessel characteristics and capabilities. This vessel data bank could serve as a ready reference guide for marine superintendents and researchers seeking the services of a vessel. Once established, the computerized information could be updated with relative ease, and print-outs could be made available to vessel users and operators. Because of its existing regional affiliations, and its ties to both the academic community and to federal funding, the Sea Grant Advisory Program appears a logical choice to maintain a vessel listing of this type. Furthermore, the vessel survey undertaken by this study could serve as a basis for the computerized data bank.

CONCLUSION

Within the New England region, academically-sponsored coastal research vessels currently operate within an informal network supported by personal communication among vessel operators, researchers and outside agencies. While this network is presently perceived as sufficient by the

vessel operators for the amount of vessel use and research being conducted within the region, a greater demand for vessel use and accountability in the future may necessitate strengthening the region's inter-institutional network. Possible tools for accomplishing increased information exchange include, an annual meeting, regional newsletter, and the establishment of a computerized vessel data bank.

The use of research vessels is often central to the gathering of marine scientific information and, in turn, to the management of the marine environment. Recent concern over the management of the natural resources and ecosystems of the coastal zone has prompted an increase in research in this area. Information derived from current research will enable rational management decisions concerning coastal and estuarine environments to be made. In addition, continued societal shift towards coastal regions implies a greater demand for coastal zone research and, correspondingly, for coastal vessel use, in the future. Recent and pending legislation for the support of coastal research confirms the national importance of coastal area studies. Finally, with scientific information playing an increased role in policy formation, the tools of marine scientific research must be the best available. And, the tools themselves must be used within a coordinated, efficient infrastructure in order to facilitate quality scientific investigation.

NOTES

1. Statement of Dr. Donald Boesch, Exec. Director, Louisiana Universities Marine Consortium, Federal Oceanographic Fleet, Hearing before the Subcommittee on Oceanography of the Merchant Marine and Fisheries Committee, House of Representatives, 99th Cong., 2nd Sess., June 24, 1986, Serial No. 99-45, p. 61.

2. Surveys requests (SURVEY, Appendix 1) were originally sent to the following institutions; those that returned completed forms are indicated in parenthesis: Southern Maine Vocational Technical Institute (Y); Massachusetts Institute of Technology (N); Southern Massachusetts University (N); University of Connecticut (Y); Cape Fear Technical Institute (Y); Florida Institute of Technology (Y); S.U.N.Y. at Stony Brook (Y); Hobart and William Smith Colleges (Y); S.U.N.Y. at Buffalo (Y); Virginia Institute of Marine Science (N); NOAA-University of North Carolina at Wilmington (N); University of New Hampshire (Y); Cornell University (Y); Spice Island Traders, Boston, Mass. (N); Sippican, Marion, Mass. (Y); Bay Explorer, Boston, Mass. (Y); University of Rhode Island (Y); Ocean Reporter, Rockport, Mass. (Y); Massachusetts Maritime Academy (Y); Maine Maritime Academy (N); Chesapeake Biology Lab of University of Maryland (Y); The Marine Science Consortium, Inc., Wallops Island, Virginia (N).

3. Vessel users contacted include: EG & G (Waltham, Mass.); Klien Associates (Salem, N.H.); Kimball Chase (Portsmouth, N.H.); Science Applications, Inc. (Newport, R.I.); Ocean Surveys (Old Saybrook, Conn.); Battelle Laboratories (Duxbury, Mass.); Army Corps of Engineers, New England Division; Environmental Protection Agency, Region 1.

4. Two privately-owned research vessels located in the study region and academic researchers are: F/V OCEAN REPORTER (owner/operator, Capt. Billie Lee, Rockport, Mass.); R/V ANNANDALE (owner, Spice Island Traders, Boston, Mass.).

5. National Science Foundation Act of 1950, P.L.100-4, 100th Cong., preamble.

6. Div. of Ocean Science, National Science Foundation, Washington, D.C., telephone contact, April 25, 1988.

7. Sec. 4. (a) of the National Science Foundation Act of 1950, states: "The President is requested, in the making of nominations of persons for appointment as members, to give due consideration to any recommendations...submitted to him by the National Academy of Sciences, the Association of Land Grant Colleges and Universities, the National Association of State Universities, the Association of American Colleges, or by other scientific or educational organizations."

8. Ibid., Sec. 11 (e).

9. The current (1988) UNOLS members are: Univ. of Alaska, Univ. of Hawaii, Univ. of Miami, Univ. of Delaware, John Hopkins Univ., Moss Landing Marine Laboratories, Duke Univ., Lamont-Doherty Geological Observatory, Oregon State Univ., Univ. of Rhode Island, Scripps Inst. of Oceanography, Skidaway Inst. of Oceanography, Univ. of Texas, Texas A&M, Univ. of Washington, Woods Hole Oceanographic Inst., Univ. of Michigan. Information from the National Oceanographic Fleet Operating Schedules for 1987 (Bay St. Louis, NSTL: National Oceanographic Office, March 1987), pp. iii-iv.

10. UNOLS Charter and Annexes I-III, Amended and readopted, October 23, 1987, Washington, D.C., unpublished, p. 1.

11. Ibid., see Annex II, p. 12.

12. Ibid., Sec. 2 (e)(2), p. 1.

13. Water Quality Act of 1987, P.L. 100-4, 100th Cong., Sec. 320 (a).

14. Ibid., Sec. 320 (a)(B).

15. Ibid., Sec. 320 (b)(G)(1), states: "The Administrator is authorized to make grants to State, interstate and regional water pollution control agencies and entities, State coastal zone management agencies, interstate agencies, other public or non-profit agencies, institutions, organizations and individuals."

16. "Evaluating and Managing Dredged Material," Information Bulletin (Waltham, Mass.: U.S. Army Corps of Engineers, New England Division), undated, unpaginated.

17. Dr. Tom Fredett, Regulatory Branch, U.S. Army Corps of Engineers, New England Division, Waltham, Mass., telephone contact, April 1, 1988.

18. "Evaluating and Managing Dredged Material."

19. W. Wayne Shannon and David D. Palmer, "Academic Marine Scientists and the Federal Funding System," Ocean Development and International Law, vol. 17, no. 1/2/3, 1986, pp.16-17.

20. Sea Grant Improvement Act of 1976, P.L. 94-461, 94th Cong., Sec. 205 Grants and Contracts.

21. Dr. M. Grant Gross, "Ocean Sciences at NSF: Broadening Horizons," p. 14, and, R. Adm. J.R. Wilson, Jr., "U.S. Navy: Oceanography's Critical Role," p. 12, Sea Technology, vol. 29, no. 1, January 1988.

22. Statement of Kenneth M. Curtis, Chairman, Policy Board, ARGO Maine, Environmental Trends in the Gulf of Maine, Hearing before the Subcommittee of Environmental Protection of the Committee on Environment and Public Works, U.S. Senate, 100th Cong., 1st Sess., Sept. 8, 1987, S. Hrg. 100-273, p. 11.

23. Ibid., p. 59.

24. Joe D'Altaris, Dept. of Fisheries and Animal Veterinary Science, Univ. of R.I., Wickford, R.I., telephone contact, May 12, 1988, and, Capt. Billie Lee, Ocean Reporter, Rockport, Mass., telephone contact, March 11, 1988.

25. Private firms which have chartered coastal research vessels in the study region are: EG & G, Klien Associates, Battelle Laboratories, Science Applications, Inc., Ocean Surveys; see footnote 3.

26. Two conversion research vessels performing well according to their operators are: the R/V AQUARIUS (converted crew boat), operated by Chesapeake Biology Laboratory; and the R/V OSPREY (converted Navy coastal patrol boat), operated by Florida Institute of Technology.

27. See, Jack Morton, "Science on a Shoestring: Research Vessel Conversion," Oceans '87 Proceedings (Washington, D.C.: Marine Technology Society, 1987), pp. 506-511.

28. See p. 19, ARGO Maine.

29. Phil Harmon, Maine Maritime Academy, Castine, Maine, telephone contact, March 11, 1988.

30. U.S. Coast Guard, Certificate of Inspection, R/V JERE CHASE, April 21, 1986-89, unpublished, p. 1.

31. Capt. Paul Pelletier, R/V JERE CHASE, Univ. of N.H., Portsmouth, N.H., telephone contact, March 8, 1988.

32. Promotional brochure for the R/V UCONN, Marine Science Institute, Univ. of Conn., Avery Point, Groton, Conn., undated, unpaginated.

33. Survey return for R/V UCONN, Univ. of Connecticut.

34. Of the vessels surveyed, the ones found to be the most active in outside chartering are the R/V UCONN, R/V JERE CHASE, R/V CAPT. BERT, and the R/V ONRUST.

35. Jack Bash, Marine Superintendent, Graduate School of Oceanography, Univ. of Rhode Island, Narragansett, R.I., personal interview, February 19, 1988.

36. Bruce Tripp, EPA Region 1, Woods Hole, Mass., telephone contact, February 17, 1988.

37. Pelletier.

38. William Wise, Assoc. Director, Marine Sciences Research Center, S.U.N.Y at Stony Brook, Stony Brook, N.Y., telephone contact, February 24, 1988.

39. D'Altaris.

40. Capt. Mark Gustafson, Captain, R/V LAURI LEE, Univ. of Rhode Island, Wickford, R.I., April 20, 1988; Phil Le Blanc, Dept. of Ocean Engineering, Univ. of Rhode Island, Kingston, R.I., April 20, 1988; David Kan, Massachusetts Maritime Academy, Buzzards Bay, Mass., April 20, 1988; and Red Banker, Engineer, R/V UCONN, Avery Pt., Groton, Conn., April 13, 1988; all telephone contacts.

41. Harmon.

42. Dr. Randy Watts, Graduate School of Oceanography, Univ. of Rhode Island, Narragansett, R.I., personal interview, April 4, 1988.

43. Ibid.

44. Ibid.

45. Ibid.

46. George Pongonis, Virginia Inst. of Marine Science, Gloucester Point, Va., telephone contact, April 4, 1988.

47. Caroline Karp and Alan Beck, EPA Region 1, Providence, R.I., telephone contact, February 17, 1988.

48. Tim Lynch, Rhode Island Dept. of Environmental Management, Narragansett, R.I., telephone contact, May 12, 1988.

49. Wise.

50. Pongonis.

51. Shannon and Palmer, p. 18.

52. Sea Grant Improvement Act of 1976, Sec. 207.

53. Lauriston R. King and Steven G. Olson, "Marine Policy and the States," Proceeding of Coastal Zone '87, Seattle, Washington, W.W. Div./ASCE, May 26-29, 1987, reprinted by Texas A.& M., Sea Grant College Program, 1987, p. 796.

54. Ibid., p. 797.

55. Lee M. Thomas, "A New Emphasis on Near Coastal Waters," Sea Technology, vol. 29, no. 1, January 1988, p. 33.

56. Mark Sagoff, "Ecology and Law: Science's Dilemma in the Courtroom, Marine Perspectives, University of Maryland, Sea Grant College Program, 1987, preface.

57. "Strategic Ocean and Coastal Resources Act of 1987," (HR 1727), Sec. 206 (a)(B), from National Sea Grant College Program Reauthorization, Hearing before the Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, House of Representatives, 100th Cong., 1st Sess., June 30, 1987, Serial No. 100-27.

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59. Banker.

60. Wise.

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Banker, Red. Engineer, R/V UCONN, University of Connecticut, Avery Pt. (Groton), Conn., April 13, 1988.

Bartell, Steve. Ocean Surveys, Inc., Old Saybrook, Conn., April 18, 1988.

Beck, Alan. Narragansett Bay Project, EPA Region 1, Providence, R.I., February 17, 1988.

Bellmer, Russ. Biologist, Army Corps of Engineers, New England Division, Waltham, Mass., April 1, 1988.

Boyer, H.C. National Marine Fisheries Service, Woods Hole Oceanographic Institute, Woods Hole, Mass., March 14, 1988.

D'Altaris, Joe. Dept. of Fisheries and Animal Veterinary Sciences, University of Rhode Island, Wickford, R.I., May 12, 1988.

Dinsmore, Capt. Robert. Woods Hole Oceanographic Institute, Woods Hole, Mass., April 13, 1988.

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Fredett, Dr. Tom. Regulatory Branch, Army Corps of Engineers, New England Division, Waltham, Mass., April 1, 1988.

Gustafson, Capt. Mark. Captain, R/V LAURI LEE, Univ. of Rhode Island, Wickford, R.I., April 20, 1988.

Harmon, Phil. Maine Maritime Academy, Castine, Maine, March 11, 1988.

Kan, David. Massachusetts Maritime Academy, Buzzards Bay, Mass., April 20, 1988.

Karp, Caroline. Narragansett Bay Project, EPA Region 1, Providence, R.I., February 17, 1988.

Kozak, Gary. Klien Associates, Salem, N.H., March 9, 1988.

Le Blanc, Phil. Dept. of Ocean Engineering, Univ. of Rhode Island, Kingston, R.I., April 20, 1988.

Lee, Capt. Billie. Captain, F/V OCEAN REPORTER, Rockport, Mass., March 11, 1988.

Lynch, Tim. Rhode Island Dept. of Environmental Management, Narragansett, R.I., May 12, 1988.

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Merckel, Charles. Biologist, S.U.N.Y. Buffalo, Buffalo, N.Y., March 9, 1988.

Moller, Donald. Marine Operations Coordinator, Woods Hole Oceanographic Institute, Woods Hole, Mass., April 11, 1988.

Morton, Jack. Supervisor of Marine Operations, Florida Institute of Technology, April 13, 1988.

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Pelletier, Capt., Paul. Captain, R/V JERE CHASE, Univ. of New Hampshire, March 8, 1988.

Pongonis, George. Virginia Institute of Marine Science, Gloucester Pt., Virginia, April 4, 1988.

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Smolowitz, Ron. National Marine Fisheries Service, Gloucester, Mass., March 14, 1988.

Tripp, Bruce. Director, Buzzards Bay Project, EPA Region 1, Woods Hole, Mass., February 17, 1988.

Wise, William. Associate Director, Marine Sciences Research Center, S.U.N.Y. Stony Brook, Stony Brook, N.Y., February 24, 1988.

APPENDICES

COASTAL RESEARCH VESSEL SURVEY

POINT OF CONTACT

POC:
OFFICE:
ORGANIZATION:
ADDRESS:
PHONE:

ADMINISTRATIVE DETAILS

DESIGNATOR (R/V,F/V, S/V) & NAME:
CLASS/TYPE:
CALL SIGN:
HOME PORT:
OPERATIONS CONTROL:
OPERATING COST/DAY:
SCIENTIFIC COMPLEMENT:
NUMBER AND COMPLEMENT OF CREW:
NO. OF BERTHS:
ENDURANCE:
BUILDER:
WHERE BUILT:
LAUNCH DATE:
CONVERSION DATE:
LAST OVER-HAUL:
MAINTENANCE CYCLE:

VESSEL CHARACTERISTICS

LOA:
BEAM:
MAXIMUM HEIGHT:
GROSS TONNAGE:
DISPLACEMENT:
DRAUGHT:
CRUISE SPEED:
RANGE:
MAXIMUM SPEED:
MINIMUM SPEED:

ENGINEERING/DECK EQUIPMENT

MAIN PROPULSION:
AUXILIARY PROPULSION:
NO. OF SHAFTS:
BOW THRUSTER:
DEEP ANCHOR:
WORKING DECK SPACE:
WET LAB:
DRY LAB:

METEOROLOGICAL OBSERVATIONS:
UTILITY BOATS/TENDERS:
A,U, OR L FRAMES (NO. AND MAX HOIST CAPACITY):
WINCHES (MAJOR TYPE/USE/LINE PULL):
WIRE TYPE, DIAMETER, LENGTH:
OCEANOGRAPHIC EQUIPMENT:

ELECTRONICS

AUXILIARY GENERATOR:
FACSIMILE:
LORAN:
SATNAV:
RADAR:
DEPTH SOUNDER/RECORDER:
RADIO/COMMUNICATION:

FUEL DETAILS

CAPACITY:
TYPE:
CONSUMPTION RATES:
    NORMAL/CRUISING SPEED:
    OPERATIONS:

SAFETY AND LIFESAVING

COAST GUARD INSPECTED:
EPIRB:
FIRE FIGHTING:
OTHER:

UTILITY OPERATIONS

TOWING:
CARGO CARRIAGE:
TRAINING:

NAVIGATION RESTRICTIONS

SEASON:
GEOGRAPHIC REGION:

PRIMARY UTILIZATION OF VESSEL (ACADEMIC, CHARTER):

IS YOUR VESSEL ACHIEVING MAXIMUM UTILIZATION?:
(MAINTENANCE SCHEDULES AND INSTITUTIONAL MISSION REGARDED)

WOULD A REGIONAL LISTING BENEFIT YOUR SCHEDULING?:

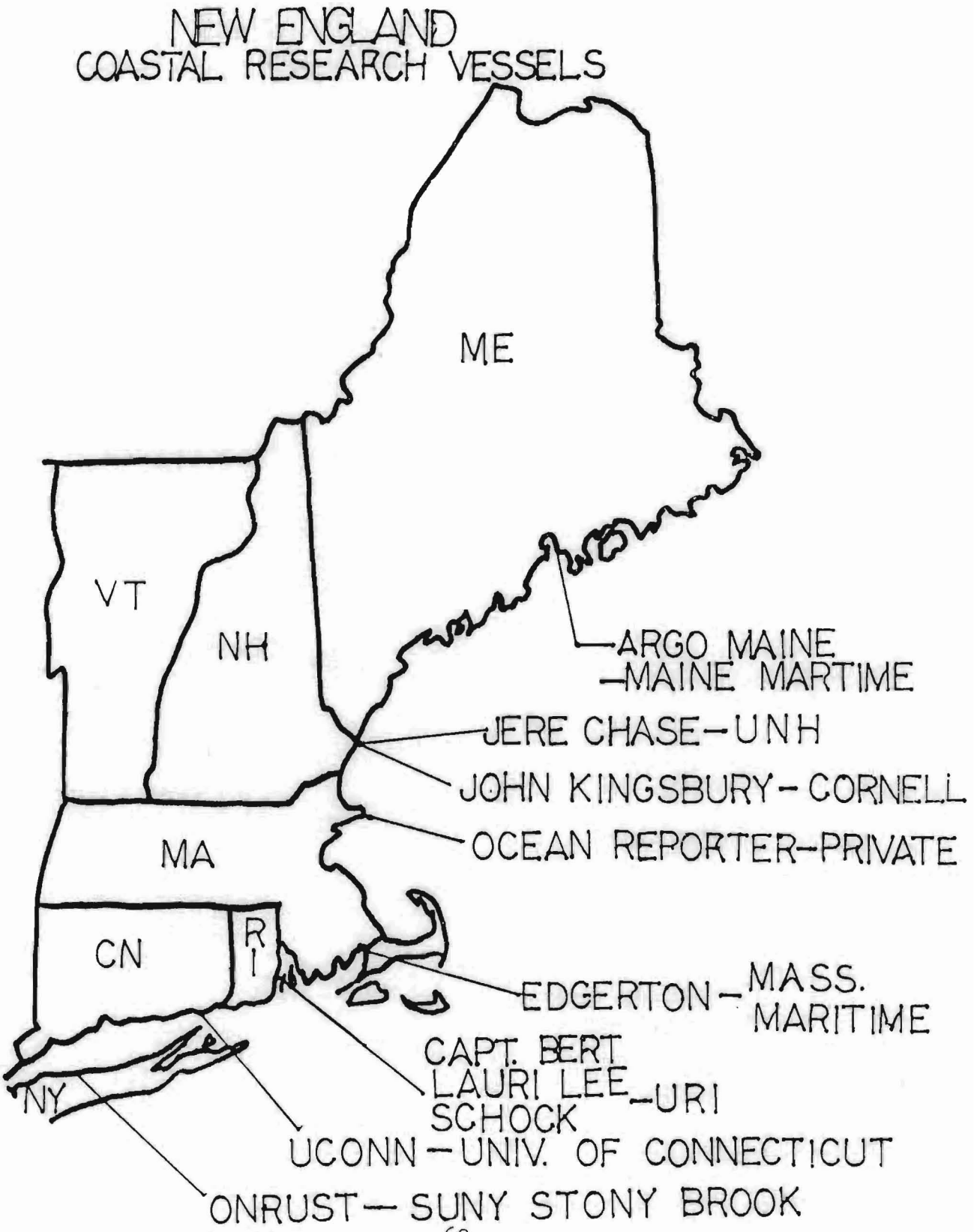
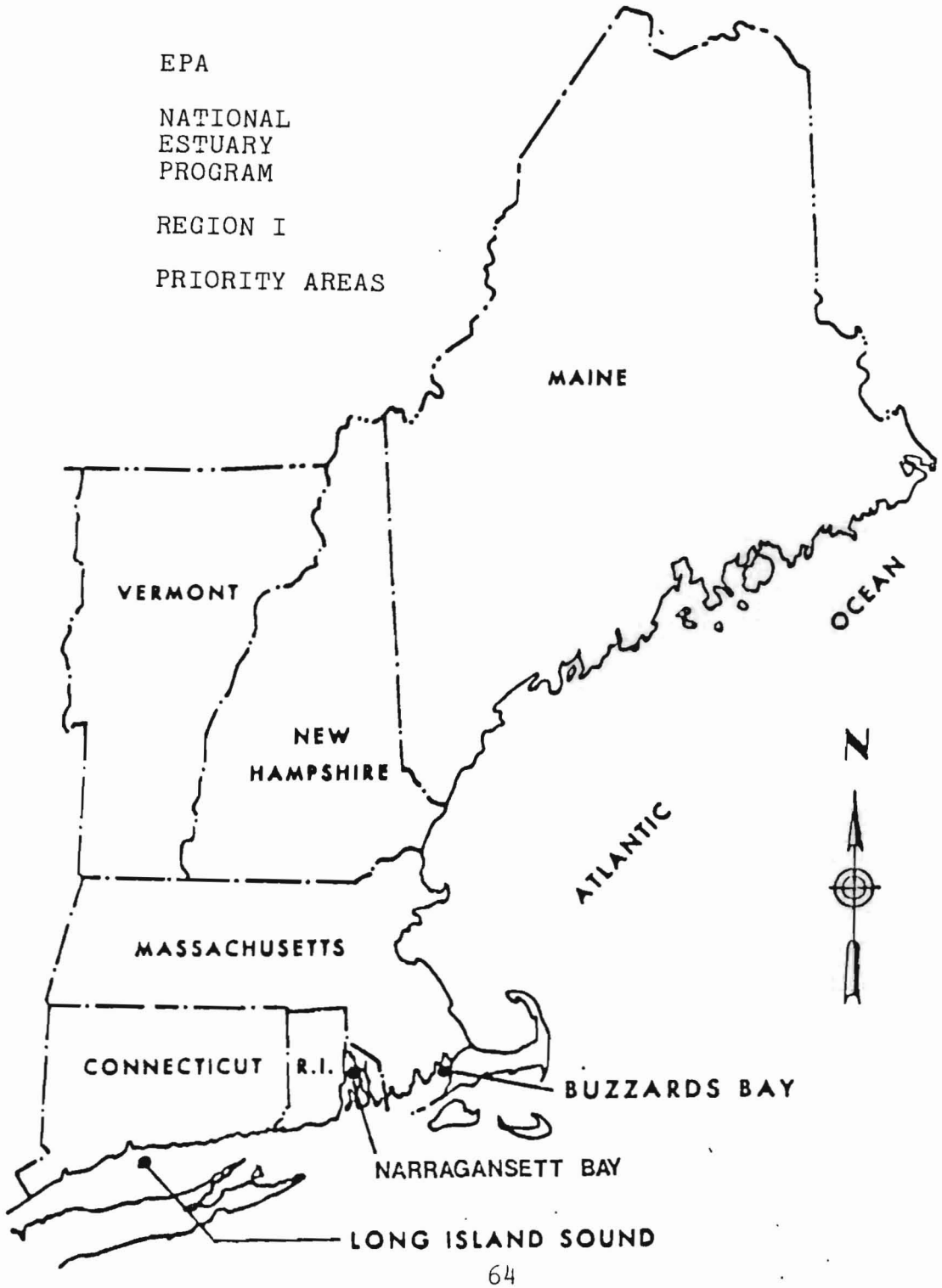

NEW ENGLAND
COASTAL RESEARCH VESSELS
ME
VT
NH
MA
CN
RI
NY
ARGO MAINE
MAINE MARTIME
JERE CHASE-UNH
JOHN KINGSBURY-CORNELL
OCEAN REPORTER-PRIVATE
EDGERTON-MASS. MARITIME
CAPT. BERT
LAURI LEE-URI
SCHOCK
UCONN-UNIV. OF CONNECTICUT
ONRUST-SUNY STONY BROOK

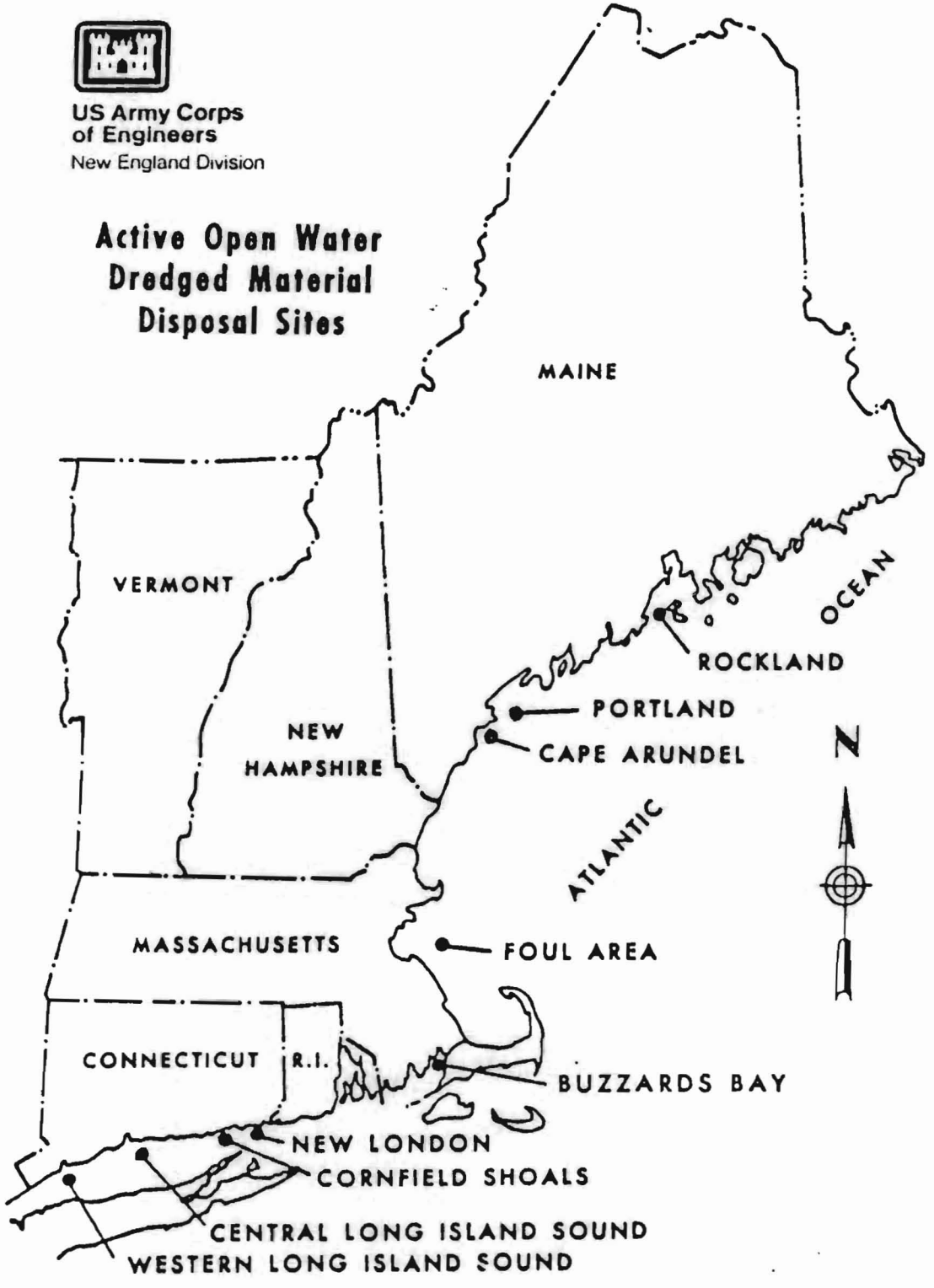
TABLE 1, Appendix 3

Vessel and Home Port	Operating Institution	Operating Cost (Per Day)	Length (Ft.)	Gross Tonnage	Cruise Speed (kts.)	Range (NM)	Conversion/ Launch Date	Propulsion	No. of Crew	Endurance (Days)	Operating Region	Deck Area (Sq. Ft.)	A-Frame/ Crane/ Boom	Winches	Generator	Fuel Capacity (Gal.)	Fuel Consumption (GPH)	Loran	Radar	Sounding Equipment	Radios	Coast Guard Inspected
ARGO MAINE Castine, Me.	Maine Maritime Academy	$2200	80	165	9.0	4500	1968	Diesel	7	20	Gulf of Maine	N/A	2 A-Frame 1 Crane	2	yes	10,500	8.3	yes (specific	yes	yes elec.	yes info.N/A)	no (ABS)
JERE A. CHASE Portsmouth N.H.	University of New Hampshire	$450	45	22	7.5	1000	1964	DD4-53	2	14	Eastport Me. to Cape Cod Mass.	144	1 A-Frame 1 Boom	1	6.5 Kw	600	3.0	2	1	1 rec. 1 vid.	2 VHF	yes
J.M. KINGSBURY Portsmouth N.H.	Cornell University	$575 +fuel	48	35	8.5	680	1984	GM471	2	3	Gulf of Maine	260	Articu-lated Crane	1	7.5 Kw	400	5.0	1	1	1 rec. 1 vid.	2 VHF 1 SSB	yes
EDGERTON Buzzards Bay, Mass.	Massachusetts Maritime Academy	$1500	68	85	8.5	3000	1984 conv.	Cum-mings Diesel	3	N/A	Buzzards Bay/ Cape Cod Bay	400	1 Crane	1	30 Kw	3,000	1.0	3	2	3	VHF & SSB	no
LAURI LEE Wickford, R.I.	Univ. of R.I. (Grad. School of Oceanography)	$400 (Bay) $800 (Ocean)	59	50	19.0	600	1985 conv.	Twin GLM 1271	2	4	Rhode Island and S.E.Mass.	224	1 Articu-lated Crane 1 Davit	none	7.2 Kw	1,600	50.0	2	2	2	2 VHF 1 SSB	no
CAPT. BERT Wickford, R.I.	Univ. of R.I. (Fisheries Dept.)	Not Available	53	N/A	12.0	N/A	1987 conv.	GM Twin 12V71	1	3	N/A	630	1 A-Frame	6	10 Kw	1,000	15.0	4	2	video/ rec.	VHF & SSB	no
SCHOCK Wickford, R.I.	Univ. of R.I. (Dept. of Ocean Engineering)	$1200 +fuel	65	75	9.5	700	1980 conv.	CAT. 300Hp.	2	6	Portland Me. to New York	324 fwd. 144 aft	1 A-Frame	1	20 Kw & 7.5 Kw	1,200	10.0	2	2	1	2 VHF 1 SSB	no
UCONN Avery Pt. (Groton), Conn.	Univ. of Connecticut	$85/hr. (over 8 hrs. $115 per hr.)	65	77	8.5	1700	1953 launch conv. N/A	CAT. 375Hp.	2	8	New England/ Northern N.J.	266 fwd. 98 aft	1 Boom	1	20 Kw(2) & 6.25 Kw	2,400	12.0	1	2	2	2 VHF 1 SSB	no
ONRUST Port Jeff. N.Y. (Ll)	S.U.N.Y. Stony Brook	$1000	55	50	10.0	750	1974	GM 1271	2	3.5	New York Bight/ Adjacent Inshore Waters	240	1 A-Frame 1 Boom	1	yes	1,800	18.0	2	1	2 rec. 1 side scan	2 VHF 1 SSB	no

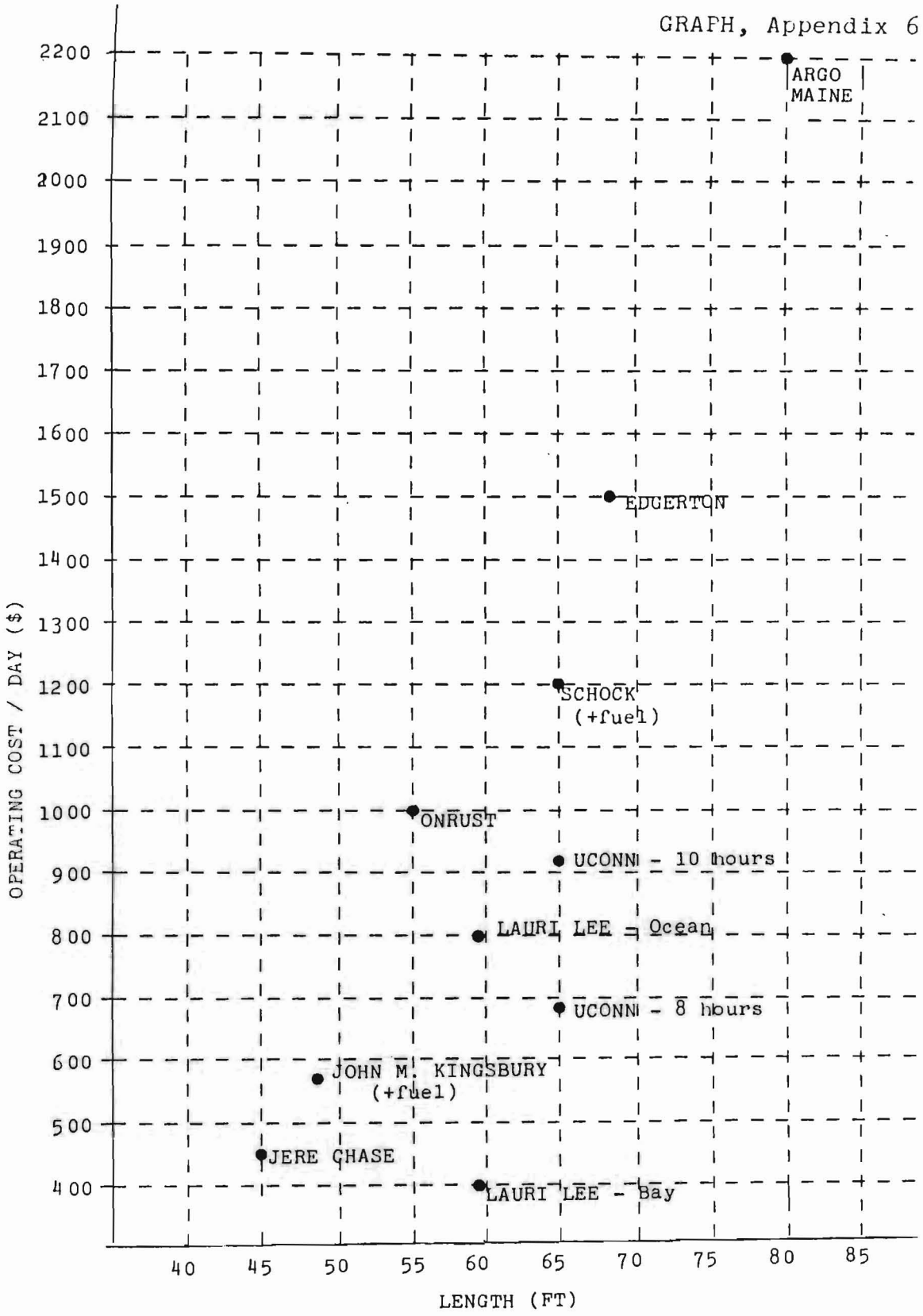
MAP II, Appendix 4



DAMOS


US Army Corps
of Engineers
New England Division
Active Open Water
Dredged Material
Disposal Sites
MAINE
VERMONT
NEW
HAMPSHIRE
OCEAN
ROCKLAND
PORTLAND
CAPE ARUNDEL
ATLANTIC
N
MASSACHUSETTS
FOUL AREA
CONNECTICUT
R.I.
BUZZARDS BAY
NEW LONDON
CORNFIELD SHOALS
CENTRAL LONG ISLAND SOUND
WESTERN LONG ISLAND SOUND

GRAPH, Appendix 6



NOTE: Daily Operating Cost for R/V CAPTAIN BERT not available.

U.S. Academic Marine Scientists: Contact with Federal Agencies, 1972–1977
(percentage by row)

Agency	No Contact	Some Contact	Reviewed or Advised Only	Submitted Proposal(s)	
				Received Funding	Did Not Receive Funding
NSF—Oceanography	44.8	55.2	8.1	32.6	14.6
NOAA—Sea Grant	48.4	51.6	4.4	27.9	19.3
Office of Naval Research (ONR)	50.6	49.4	3.3	31.5	14.6
NSF—IDOE	58.7	41.3	9.2	21.1	11.0
NSF—Other	68.2	31.8	8.7	13.6	9.5
Environmental Protection (EPA)	69.2	30.8	4.0	13.9	12.9
Energy R&D Admin. (ERDA)	69.8	30.2	3.7	11.9	14.6
Bureau of Land Management (BLM)	73.2	26.8	4.2	11.7	10.9
Army Corps of Engineers	78.3	21.7	2.0	11.5	8.2
NSF—Facilities and Support	79.8	20.2	4.3	9.5	6.4
NOAA—Marine Fisheries (NMFS)	82.5	17.5	4.2	7.5	5.8
U.S. Coast Guard	84.0	16.0	4.0	5.5	6.5

Source: W. Wayne Shannon and David D. Palmer, "Academic Marine Scientists and the Federal Funding System," Ocean Development and International Law, Vol. 17, Numbers 1/2/3, 1986, page 18.