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ANNUAL REPORT OF THE COASTAL RESEARCH CENTER
OF THE WOODS HOLE OCEANOGRAPHIC INSTITUTION

By

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WOODS HOLE OCEANOGRAPHIC INSTITUTION
Woods Hole, Massachusetts 02543

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TECHNICAL REPORT

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Approved for Distribution:

John W. Farrington, Director
Coastal Research Center

Abstract

Coastal research at the Woods Hole Oceanographic Institution was the subject of a special series of seminars and discussions in 1978-1979 which led to the identification of three important issues:

- (1) The need for more formal multidisciplinary interactions in order to effectively tackle some key research problems;
- (2) The need for facilities for experimentation; and
- (3) The need for unrestricted funds to initiate new multidisciplinary research ventures or to act as the "glue" binding together ongoing research projects.

The Coastal Research Center was established in late 1979 with the charge of meeting these needs and initiating and carrying out projects in coastal research. Work within the Center is carried out by scientists and students from the scientific departments, visiting scientists, and post-doctoral investigators. A Planning Committee advises the Center Director in areas of research projects, budgets, and experimental facilities.

Three specific projects were chosen for initial emphasis:

- (1) Georges Bank
- (2) Assimilative Capacity
- (3) Instrumentation

Planned new facilities for coastal research include an experimental laboratory which is now under construction, a 100-meter flume, a greenhouse, and an addition to the existing Environmental Systems Laboratory.

INTRODUCTION

Introduction

Coastal research at the Woods Hole Oceanographic Institution was the subject of a special series of seminars and discussions in 1978-1979. Many individual scientists and small groups of scientists had been conducting research in estuarine, riverine, nearshore, and continental shelf areas since the founding of the Woods Hole Oceanographic Institution. These scientists had wide-ranging interests in fundamental knowledge of the marine environment and, more often than not, conducted their research simultaneously or concurrently in coastal and deep ocean areas. Thus, there was an explicit recognition that many research problems could not be arbitrarily designated as exclusively "coastal" or "open ocean". Nevertheless, the seminars and discussions did lead to the identification of three important issues relating to coastal research:

- (1) The need for more formal multidisciplinary interactions in order to effectively tackle some key research problems;
- (2) The need for facilities for experimentation; and
- (3) The need for unrestricted funds to initiate new multidisciplinary research ventures or to act as the "glue" binding together ongoing research projects.

The Coastal Research Center of the Woods Hole Oceanographic Institution was established in late 1979 with the charge of meeting these needs and initiating and carrying out projects in coastal scientific research that, because of their size, scope, and interdisciplinary nature, would not normally be undertaken within the individual departments of the Institution. As constituted, the Center has no permanent scientific staff except the Center Director. Research within the Center is carried out by scientists and students from the scientific departments who devote various periods of time, from weeks to several years, to projects within the Center. The Center serves as a home for visiting scientists and post-doctoral investigators who are invited to the Institution to participate in specific research projects within the Coastal Research Center. From time to time, personnel other than scientific staff are assigned to the Center to meet specific needs.

Dr. John H. Ryther, Senior Scientist in the Biology Department, was the first Director of the Coastal Research Center, serving until October 1981 when he accepted a position on the staff of the University of Florida at

Gainesville. A Planning Committee consisting of representatives from the scientific staff of each department, the Marine Policy Program, and the Sea Grant Program at WHOI was established with the charge of providing advice for the Center Director in areas of research projects, budgets, and experimental facilities. Dr. John W. Farrington, Associate Scientist in the Chemistry Department, represented that department and served as first Chairman of the Planning Committee until October 1981, when he succeeded Dr. Ryther as Center Director. Dr. William D. Grant of the Ocean Engineering Department is department representative to the Committee and has succeeded Dr. Farrington as Chairman. Other Committee members are Dr. David G. Aubrey, Geology & Geophysics; Dr. Robert C. Beardsley, Physical Oceanography; Dr. Judith M. Capuzzo, Biology; Dr. Kirk Cochran, Chemistry; Dr. Susan Peterson, Marine Policy Program; and Dr. David A. Ross, Sea Grant Coordinator.

The Andrew W. Mellon Foundation provided the support for initiation of the Center's activities. Two grants were awarded: the first grant, in the amount of \$500,000, was to be expended primarily in support of scientific and technical staff activities during the period 1980-1984 at an average rate of \$100,000 per year; the second grant, in the amount of \$250,000, was to be spent on one or more specific projects initiated within the Center at any time during the five-year period. The important work of the Planning Committee is supported in its first three years by a grant of \$40,000 per year from the Charles E. Culpeper Foundation.

The Center Director and Planning Committee have been active and have worked with Dr. John H. Steele, Director of the Institution; Dr. Derek W. Spencer, Associate Director for Research; and Dr. George D. Grice, Associate Director for Scientific Operations in meeting the needs for coastal research as described previously.

Principal Projects

The Planning Committee sought input from the scientific and technical staff on specific projects to be initiated by the Coastal Research Center. After deliberations during the first half of 1980, three projects were chosen for emphasis. These are described in detail in this report.

1. GEORGES BANK

Georges Bank Project

The Center has brought together academic scientists, representatives of local, state and federal organizations, and private contractors who have been engaged in research on Georges Bank over the past decade. Georges Bank is one of the most productive fishing regions of the world. Recently it has become the focus for oil and gas exploration. These two activities, coupled with the Bank's dynamical importance as the interface between the Gulf of Maine and Mid-Atlantic Bight, have resulted in Georges Bank becoming one of the most intensely studied shelf systems in the world. There is a need to condense and evaluate this extensive data base to develop an understanding of the Bank. The objective of the initial phase of the Coastal Research Center's Georges Bank project is to accomplish this via the writing of a book and atlas, which is described in detail below. Several meetings of contributors and chapter editors have taken place this year, sponsored by the Coastal Research Center. In addition to making progress on the writing of the book, these meetings provide a contemporary forum for the researchers active in the Georges Bank area to exchange their latest data, interpretations, and plans for future research.

Funding is now being sought from several government and private sources to bring this phase of the project to completion in 1983 with the publication of the book and atlas. A cooperative research agreement has been signed with the Northeast Fisheries Center of the National Marine Fisheries Service which includes joint participation in the writing of this book and atlas.

Dr. Richard Backus, Senior Scientist in the Biology Department, is General Editor of the book. He is advised by an editorial board consisting of Dr. Robert C. Beardsley, Senior Scientist in the Physical Oceanography Department at WHOI; Dr. Bradford Butman, U. S. Geological Survey; Dr. Marvin Grossline, National Marine Fisheries Service; and Dr. Richard Price, a geographer in the WHOI Marine Policy Program.

The spirit of cooperation among the scientists of the Woods Hole scientific community (the Marine Biological Laboratory's Ecosystems Center, the U. S. Geological Survey, the National Marine Fisheries Service, and the Woods Hole Oceanographic Institution), in addition to the efforts of colleagues at many other universities, government laboratories, and private contracting agencies, has provided a good start on this important project.

Georges Bank and its Surroundings: Book and Atlas

Description

Motivation: Georges Bank is a highly productive and heavily exploited, but nevertheless only partially understood, natural system. Moreover, the recent assessment and plans for the development of its petroleum resource have caused an intense debate over the management measures appropriate for avoiding damage to the fishery. Thus, the area is receiving wide attention. This book will synthesize what is known about Georges Bank, its physical and biological nature, and the history of its use (see attached outline). It will be among the most complete accounts ever attempted for a marine ecosystem. Extensive research has been conducted recently on Georges Bank, and cross-disciplinary syntheses of this new (and old) research may yield an understanding of the productivity of the bank. This book will be produced by the Coastal Research Center of the Woods Hole Oceanographic Institution in cooperation with numerous other agencies and institutions as the first step in a long-term study of Georges Bank.

Readership: Anyone concerned with ocean use, management, and public policy, including oceanographers and other natural scientists, social scientists, other professionals including legislators, and students.

Content and Style: Since the book is first and foremost a scientific work, its style will be unavoidably technical. However, there will be a minimum of highly specialized jargon and many kinds of details will be omitted. The chapters will incorporate the most recent findings about Georges Bank, but generally speaking will not contain data or arguments on narrow subjects not already published or in the process of being published in the usual technical journals elsewhere. It is hoped, however, that the book will contain new insights from cross-disciplinary connections made and developed during the book's preparation. To extend its usefulness the book will have non-technical summaries at the section or chapter level.

Form: The work will be in one hard-cover volume of about 650 pages. A large page size (20+ x 30+ cm) will be necessary to accommodate properly the 100 or so maps that will occur with the text. Some special maps will be appended to the end of the volume, one or more large folded ones in a pocket inside the rear cover. Multi-color processes will be used where appropriate to increase the information content and legibility of the maps.

Organization: The book will be divided into a dozen sections (about 50 chapters total). The principal entries in the accompanying outline are the section heads, and the secondary entries represent chapters for the most part. The chapters will be about 20 manuscript pages (5 book pages) each; altogether there will be about 325 book pages of text. In addition, it is estimated that there will be about 650 illustrations, 70% of which will be line drawings, the remainder half-tones, occupying a total of about 220 book pages. Last, there will be about 100 pages of colored maps. Figures and maps will be interspersed within the text.

Editing, Writing, and Reviewing: Every subject will be treated in the most authoritative way possible; thus, it is expected that most, if not all, chapters will have a multiple authorship. Each chapter will have a chapter editor, a group of writers, and a group of reviewers. A lead writer will be designated for each chapter and may or may not be the same person as the chapter editor. Reviewers and writers are being chosen in such a way as to assure a rounded as well as an authoritative view of the subject being treated. The chapter editor, writers, reviewers, and editor of the section to which the chapter belongs constitute the writing team for that chapter. The section editor, with the help of the chapter editors on the one hand and the editorial board and general editor on the other are arranging the composition of the writing teams. The writer making the largest contribution to a chapter will be designated senior author of that chapter and cited first among authors in the usual way. Reviewers will be acknowledged, but not listed as authors. Section editors will work with the general editor, having ordinary editorial responsibilities for their section but also writing non-technical summaries and probably participating as writer for some of the chapters within their section.

Maps: Base maps of four or five scales and coverages will be chosen for general use. These will be sent to authors for plotting before writing starts. Authors' rough plots will be returned to the editors for circulating to other authors and for finishing.

Bibliography: The literature citations for each chapter will be appended to that chapter. In addition, there will be a general annotated bibliography of particularly important papers.

Publisher: An agreement has been made with the MIT Press that they publish the book.

Schedule: A fairly detailed plan for the book was nearing completion at the end of 1981. Writing will begin for most parts early in 1982, with final copy to be in hand by the end of that year. The finished book will appear towards the end of 1983.

Georges Bank and its Surroundings: Book and Atlas

Short Outline

1. Introduction

1.1. About this book

- 1.1.1. What Georges Bank is
- 1.1.2. What's in this book
- 1.1.3. Why this book was done
- 1.1.4. How this book was done

1.2. A general or social history of Georges Bank

- 1.2.1. Early exploration, including cartographic history
- 1.2.2. Fishing history
- 1.2.3. Exploration for petroleum
- 1.2.4. The "oil/fish" conflict
- 1.2.5. The boundary dispute between the United States and Canada
- 1.2.6. Scientific research on Georges Bank

The high productivity of the Georges Bank fishery is the principal reason for our scientific interest. That, and the conflict in resource management due to the probable existence of petroleum, are the principal reasons for this book. (Section 1 approximately 30-40 ms. pages.)

2. Geology: Structure and Physiography

- 2.1. Physiography (10-15 ms. pages)
- 2.2. Surficial geology, shallow structure, and sedimentary processes (20 ms. pages)
- 2.3. Subsurface geology (20 ms. pages)
- 2.4. Petroleum potential of Georges Bank (20 ms. pages)

3. Weather and Climate

- 3.1. The atmospheric regime (20 ms. pages)
- 3.2. Statistical analysis of regional atmospheric forcing fields (20 ms. pages)
- 3.3. Climate (20 ms. pages)
- 3.4. Wave climate

4. Physical Oceanography

- 4.1. Introduction (10 ms. pages)
- 4.2. Tides and tidal currents (10 ms. pages)
- 4.3. Water structure (30 ms. pages)
- 4.4. Seasonal mean circulation (20 ms. pages)
- 4.5. Low-frequency current and pressure variability (30 ms. pages)
- 4.6. Near-bottom currents and bottom stress
- 4.7. Vertical and horizontal transfer processes (10-15 ms. pages)
- 4.8. Implications of circulation and residence times for transport and productivity (10-15 ms. pages)

5. Chemistry

- 5.1. Dissolved gases (15 ms. pages)
- 5.2. Trace metals (20 ms. pages)
- 5.3. Natural radionuclides (20 ms. pages)
- 5.4. Artificial radionuclides (20 ms. pages)
- 5.5. Natural organics and organic pollutants (25 ms. pages)

6. Botany

- 6.1. The phytoplankton
- 6.2. The seaweeds (5 ms. pages)
- 6.3. The distribution of chlorophyll

7. Zoology

- 7.1. Zoogeography
- 7.2. The zooplankton including ichthyoplankton (20-30 ms. pages)
- 7.3. The bottom animals (20-25 ms. pages)
- 7.4. The fishes and cephalopods (30 ms. pages)

- 7.5. Bird life (15-20 ms. pages)
- 7.6. The whales and porpoises (10-15 ms. pages)
- 7.7. The turtles (3-4 ms. pages)
- 8. Microbiology
 - 8.1. Introduction
 - 8.2. Taxonomy and physiology
 - 8.3. Biomass
 - 8.4. Activity
 - 8.5. Environmental relationships
- 9. Fisheries Ecology and Management
 - 9.1. The fisheries resources
 - 9.2. History of the Georges Bank fishery and its management (20-30 ms. pages)
 - 9.3. Fisheries research
 - 9.4. Factors controlling population changes
- 10. Organic Production
 - 10.1. Primary production (including an explanation of why Georges Bank is so productive (25 ms. pages)
 - 10.2. Annual cycles of zooplankton production (20 ms. pages)
 - 10.3. Benthic production (meio-, macro-, and megafauna) (20 ms. pages)
 - 10.4. Fisheries production (15-20 ms. pages)
 - 10.5. Total ecosystem production, comparison to other shelf ecosystems (20 ms. pages)
- 11. Element Cycling
 - 11.1. Sources
 - 11.2. Sinks
 - 11.3. Annual mass balance

12. Using Georges Bank

- 12.1. What it's like to fish on Georges Bank
- 12.2. Exploring for petroleum on Georges Bank
- 12.3. The legal regime on Georges Bank
- 12.4. Social and economic aspects of the modern Canadian and American fisheries
- 12.5. A history of the development of Georges Bank gas and oil
- 12.6. The impact and probable impact of petroleum transport and production on the living resources of Georges Bank (20 ms. pages)
- 12.7. Canadian-American agreement and disagreement on Georges Bank
- 12.8.

13. Summaries

- 13.1. Conceptual and mathematical models of the Georges Bank ecosystem
- 13.2. Georges Bank and other ecosystems compared
- 13.3. Public policy and Georges Bank
- 13.4. What we need to know about Georges Bank and don't
- 13.5.

14. Supplementary Maps

15. Annotated Bibliography

16. Glossary for Non-Technical Summaries

2. ASSIMILATIVE CAPACITY OF THE COASTAL ZONE FOR WASTES

Assimilative Capacity Project

The present and future role of the coastal ocean for receiving and assimilating wastes from man's activities has been undergoing re-evaluation due to the ecological and economic problems encountered with waste disposal on land, in the air, or via recycling. Discussions within the Planning Committee of the Coastal Research Center and with colleagues active in this area of research quickly focused on the critical role of particulate matter in the movement of many wastes, especially toxic chemicals, through and within coastal ecosystems. The Center's activities are concerned with fluid processes responsible for mixing, diffusing and resuspending particulate matter, physical oceanographic processes transporting particulate matter, fluid mechanical and geological aspects of sinking and sedimentation of particulate matter, and geochemical problems related to the fate of chemical constituents in seawater and sediments. Biological problems under investigation include both toxic and possible beneficial effects (i.e., as nutrients) on all aspects of marine life.

During the past two years there have been several small projects initiated and some already completed within the overall context of this general project.

(A) Peru Upwelling Area

Dr. Nick Staresinic was appointed a Visiting Investigator in the Coastal Research Center from January 1981-January 1982. Dr. Staresinic had conducted his Ph.D. thesis research at the Woods Hole Oceanographic Institution in the WHOI-MIT Joint Program and completed his doctoral dissertation, "The Vertical Flux of Particulate Organic Matter in the Peru Coastal Upwelling as Measured with a Free-Drifting Sediment Trap", in August 1978. Dr. Staresinic continued his research on particulate matter in the oceans at the IAEA Laboratory in Monaco and at Gif-sur-Yvette in France from 1978 to 1980.

Research on the role of particulate matter in highly productive coastal ecosystems such as that of Peru provides a fundamental understanding of the potential influences of particulate matter on other coastal ecosystems. Dr. Staresinic visited the Coastal Research Center to interact with several scientific staff members and students who were actively conducting research on the Peru upwelling area and other coastal regions. Dr. Staresinic completed several important papers during his visit and contributed to the writing of papers by others through discussions and comments. He also initiated research on the role of easily resuspended particulates in the transport of the pollutant organic compounds (PCBs) in the Buzzards Bay ecosystem within the context of the project described below.

(B) Buzzards Bay Project

Buzzards Bay is an important segment of the Massachusetts coast. It is a transit route for Cape Cod Canal traffic and the New Bedford fishing fleet. The coast of Buzzards Bay (Figure 1) continues to be developed for various purposes such as light and heavy industry, recreation, fishing -- the range of multiple use pressures found in the heavily populated northeastern U.S. coastal zone. Yet there have been few systematic studies of this coastal area. In comparison, other areas of the U.S. east coast such as Chesapeake Bay and Narragansett Bay have been extensively studied.

The Coastal Research Center of WHOI, in cooperation with colleagues of the U.S. Geological Survey, Boston University Marine Program, Marine Biological Laboratory's Ecosystems Center, and Massachusetts state agencies, has initiated a Buzzards Bay study. This is an opportune time to pursue this study because:

- (1) scientific input is needed to solve some immediate, critical environmental quality problems in one portion of Buzzards Bay;
- (2) several individual scientific research projects have reached a point where focused multidisciplinary actions of a more formal nature are needed to make significant advances; and
- (3) there is a critical mass of scientists in the Woods Hole community who are enthusiastic about pursuing a Buzzards Bay study.

Individual components of the Buzzards Bay project include:

New Bedford Harbor Environmental Quality Problems

The cities of New Bedford and Fairhaven reside on either side of the Acushnet River estuary, more commonly referred to as New Bedford Harbor, at the western end of Buzzards Bay. Summerhayes, et. al. (1977) and Stoffers, et. al. (1977) provided an assessment of sediment type in the New Bedford Harbor areas and parts of western Buzzards Bay. These researchers also found that the sediments of the harbor area were severely polluted with trace metals that resulted from discharges by industrial plants over the past 81 years. They determined that the harbor was a leaky sink for trace metals and that these metals were moving from the harbor to the western part of Buzzards Bay. Particulate matter transport was implicated. We know that once material reaches the sediments of the western part of the bay, tidal and storm resuspension make the particulates, or some portion of them, available for transport to other areas of the bay (Rhoads, 1973).

FIGURE 1

PCB Pollution Problem

The New Bedford Harbor area (Figure 1) is severely contaminated with PCBs. We have studied this problem with support from Sea Grant (July 1979-June 1981), the U.S. EPA Mussel Watch Program (1978-present), and the WHOI Coastal Research Center, Andrew W. Mellon funds (1980-present).

Briefly, two electrical component manufacturing facilities discharged PCBs to the harbor area over the past two or three decades. Our measurement of PCBs in cores of surface sediments coupled with those of survey measurements of grab samples by state agencies has provided a rough estimate of about 110 tons of PCBs in the upper 50 cm of inner harbor (Area I, Figure 1) sediments. Thus, PCB loading in the inner harbor alone is about equal to the PCB loading of sediments in the upper Hudson River (General Electric) case that has been officially recognized as a severe PCB pollution problem by the state of New York and by the U.S. government.

A comparison of data for PCBs in mussels (*Mytilus edulis*) for the U.S. coast shows that *Mytilus* sampled in New Bedford Harbor have the highest PCB values recorded by the U.S. Mussel Watch program (Farrington, et. al., 1982). Other bivalves (oysters and hard shell clams from the area) are also severely contaminated (Hatch, et. al., 1981). A selected set of data for PCBs in mussels and oysters are presented in Table 1 and include our most recent data for Buzzards Bay. These data yield the following major points of interpretation:

- (1) Concentrations in the New Bedford Harbor area are much higher than the concentrations in the more remote areas of the northeast U.S. coast and even in samples near the Boston sewage outfall and the New York Bight stations.
- (2) Concentrations have not decreased over the 1978-1981 period.
- (3) Our present interpretations of the elevated PCB levels for East End Beach yield the hypothesis that along shore transport results in movement of PCBs from the harbor area to the area of East End Beach.

The data of Table 2 illustrate that contamination by PCBs is present in a wide variety of organisms sampled in the outer harbor (Area II, Figure 1). The PCB contamination levels are high enough to result in closure of certain fisheries in the areas indicated in Figure 1 in order to minimize the public health risk.

The severity of the PCB pollution problem, the attendant potential public health problems, and the economic hardship associated with the closure of local fisheries resulted in the formation of an Ad Hoc Committee of state and local officials, scientists, and engineers to deal with these problems and related issues. State Representative Roger R. Goyette of New Bedford chairs the committee. Dr. Farrington of WHOI is the Chairman of the Technical Data

TABLE 1

PCB Concentrations in Mussels and Oysters from
Buzzards Bay and Nearby Massachusetts Sites*

10^{-6} g/g dry weight

Location	Date	Aroclor 1242	Aroclor 1254
<u>New Bedford Harbor</u>			
<u>Hurricane Barrier</u>	781002	16	15
	800327	39	10
	810504	11	12
<u>East End Beach</u>	800327	1.1	0.9
	810504	0.4	0.9
<u>Slocum River</u> (oysters)	810504	--	0.5
<u>Lloyd Center</u> (oysters)	810504	--	1.0
<u>Cuttyhunk Harbor</u>	791205	0.2	0.6
<u>West End Pond</u>	791205	0.02	0.07
	800626	--	0.03
	800826	--	0.03
	810519	--	0.1
<u>Cape Cod Canal</u>	760925	--	0.2
	770819	--	0.2
	800114	--	0.2
	800214	--	0.3
	800310	--	0.2
	800424	--	0.2
	800522	--	0.2

TABLE 1 (continued)

Location	Date	Aroclor 1242	Aroclor 1254
<u>Vineyard Sound</u>	781011	--	0.095
(near Gay Head)	781026	--	0.096
	790828	--	0.098
	790926	--	0.14
<u>Nantucket Harbor</u>	800717	--	0.080
(West Jetty)	800924	--	0.022
<u>Esther Island</u>	800717	--	0.072
	810519	0.02	0.05
<u>Transplant Experiments: (From Nantucket 810519)</u>			
<u>Outer New Bedford</u>	810605 (Day 17)	0.98	1.3
<u>Harbor</u>	810616 (Day 28)	1.4	1.6
	810715 (Day 57)	1.8	2.8
<u>Cleveland Ledge</u>	810715 (Day 57)	0.12	0.36

*All samples Mytilus edulis except two Crassostrea virginica samples as indicated.

TABLE 2

Concentrations of PCBs in Selected Organisms from
New Bedford Harbor and Adjacent Areas of
Buzzards Bay, Massachusetts
(Farrington, et. al. analyses)

New Bedford Outer Harbor, Butler's Flat Light
Parallel with Channel or S.E. Coast, Sampled July 9, 1979

Species	Aroclor 1254	Wet Wt.	Dry Wt.
<u>Lephopsetta maculata</u> tissue	A ^a	7.0	39
(sand flounder), edible flesh	B	6.0	33
3 each (20-28 cm) large			
3 each (12-15 cm) small	A ^a	3.6	18
	B	3.3	17
<u>Pseudopleuronectes americanus</u>	A ^a	4.0	18
tissue (winter flounder; black	B	4.1	18
back) 3 each (15-49 cm)			
<u>Stenotorus versicolor</u> tissue	A ^a	2.5	11
(scup) 3 each (16-24 cm) large	B	2.2	9.9
<u>Mustelus canis</u> tissue (dogfish)	A ^a	0.26	1.3
2 each (35, 33 cm)	B	0.24	1.2
<u>Porontus triacanthus</u> tissue	A ^a	1.8	8.9
(butterfish) 45 each (approx.	B	1.6	7.8
8-10 cm) small			
<u>Tautogolabrus adspersus</u> tissue	A ^a	2.3	10.4
(cunner) 11 each	B	2.2	10.1
<u>Neopanogoe texons</u> whole (crab)		1.4	7
16 each			
<u>Loligo pealei</u> whole (squid)	A ^a	1.3	Not
3 each	B	1.1	Measured

TABLE 2 (continued)

Westport River, Sampled April 21-29, 1979			
Species	Aroclor 1254	Wet Wt.	Dry Wt.
<u>Pseudopleuronectes americanus</u>	A	.102	Not
(black back; winter flounder)	B	.089	Measured

^aDuplicate analyses of homogenized sample composed of the number of individuals indicated.

Group of the Task Force. In 1980, the Ad Hoc Committee recommended a survey of concentrations of PCBs in blood of residents from New Bedford in order to obtain further information about the potential public health risk for the area. Blood samples taken from volunteers by the Massachusetts Department of Public Health were analyzed at the U.S. Center for Disease Control (CDC) in Atlanta. Based on previous analyses nationwide, the CDC reports that an expected 99% of the population will have PCB concentrations in blood at or below 30 ppb (parts per billion - 10^{-9} parts/part). The first survey of the New Bedford area shows greater than the expected concentrations, with 10 of 22 people having PCB concentrations in blood ranging from 30 to 104 ppb. This has stimulated a wider ranging survey and the design of a systematic public health study which has been submitted by the Massachusetts Department of Public Health for funding considerations to a combination of state and federal agencies.

It is readily apparent from the preceding brief data presentation that New Bedford Harbor has a severe PCB pollution problem which may impact or may have already impacted public health. There are economic impacts on local fishermen. Moreover, the harbor is probably leaking PCBs to Buzzards Bay via the mechanism of particulate matter transport previously discussed for trace metals. Economic development of the harbor area requires dredging to maintain existing port facilities and to expand the harbor. This raises a series of important questions related to methods of dredging, dredge spoil disposal and containment, and temporary increased resuspension and transport of polluted sediments. These have been discussed in a recent independent assessment of potential problems for the Massachusetts Department of Environmental Quality Engineering (Malcolm-Pirnie, 1981).

Sewage Effluent

The City of New Bedford has proposed extending its sewer outfall beyond Area III (Figure 1) into Buzzards Bay. This raises the important issue of the general lack of knowledge of circulation in the bay and the distribution of chemical contaminants in sewage effluent to other areas of the bay. The coast of Buzzards Bay continues to be developed for various purposes such as recreational areas, light industry, heavy industry, etc., -- the range of multiple use pressures found in the heavily populated northeastern U.S. coastal zone.

Marsh-Bay Connection: Dynamics of Exchanges of Water, Particles, Nutrients

Research in the Great Sippewissett Salt Marsh Project has been ongoing for several years, with some support from Sea Grant. The combined efforts of scientists from WHOI, Boston University Marine Program, and Marine Biological Laboratory have contributed extensive and important new knowledge about salt marsh ecology. This research has reached a point where there is a need to more quantitatively assess the flux of water, particles, and associated nutrients and chemicals between Buzzards Bay and the fringing marshes. A rough estimate of the importance of marshes as sources of nitrogen to Buzzards Bay is given in Table 3.

TABLE 3

Rough estimates of the importance of marsh exports
in relation to stock of dissolved inorganic and particulate
nitrogen in the receiving waters of Buzzards Bay.

	Dissolved Inorganic Nitrogen (kg)	Particulate N (kg)
Annual marsh export	33,100	27,600
Nutrient stock in Buzzards Bay	80,000	400,000
Annual consumption by primary producers	4,100,000	
Annual consumption by zooplankton		2,000,000

Data on marsh export from Valiela and Teal (1979).

Consumption by algae and zooplankton from Roman (1981).

Calculations assume that the nitrogen load of the 13 m water column studied by Roman (1981) are representative of the whole of Buzzards Bay.

A study of the hydrology, physical oceanography, and nutrient and particulate matter dynamics of Buzzards Bay, conducted concurrently with the ongoing salt marsh research would provide an assessment of the importance of salt marshes in water, nutrient, and particulate matter cycles of the bay.

Proposed Research in Buzzards Bay: Specific Initiatives of the Coastal Research Center

(1) Literature Review

The Coastal Research Center will undertake a literature review of scientific and technical papers dealing with Buzzards Bay. Reviews of selected topics already exist in several research papers and in the collected papers of the Great Sippewissett Marsh project. This review will be accomplished via a combination of Coastal Research Center participants and students in the WHOI-MIT Joint Program, and published as a Technical Report of the Woods Hole Oceanographic Institution. The review will form the basis for a reference source for future research in the Buzzards Bay area. We anticipate completion of this phase of the project by January 1, 1983.

(2) Sediment Resuspension and General Circulation

The deliberations of the Ad Hoc Committee on the PCB pollution problem identified the physical oceanography of Buzzards Bay and the role of waves, near bottom turbulence, and bottom boundary layer dynamics as key information needed for the eventual solution of the PCB pollution problem. This is a specific example of a similar set of general problems which require a better understanding of the role of near bottom flow processes in resuspension and transport of polluted sediments in coastal and open ocean areas. A group of WHOI researchers has been doing basic research in the area of near bottom flows and sediment transport processes in the coastal ocean for several years. Models developed through this research will be applied to the Buzzards Bay Study, e.g., Grant and Madsen (1979), along with a unique suite of instrumentation to monitor the near bottom flow. Important basic scientific questions must be answered to solve the practical problem of wisely managing the specific polluted sediment problems of the New Bedford Harbor-Buzzards Bay system and the myriad general sets of polluted sediment interactions with the physical dynamics of coastal areas.

Our first goals are:

- (a) To determine the character of the near bottom flow and its ability to resuspend and transport sediment at various locations in the bay;
- (b) To compare the storm response of the near bottom flow and sediment resuspension with ambient conditions;
- (c) To link the near bottom flow to forcing processes in the bay; and
- (d) To estimate the importance of animal-sediment interaction in modifying and stabilizing the bottom sediment under both ambient and storm flows.

Because of the importance of New Bedford Harbor as a source of PCBs, we will concentrate one set of measurements near the harbor. Two other locations will be in the general vicinity of the mouth of the bay and at the head of the bay near the Cape Cod Canal.

Marsh-Bay Connection

We will continue planning in 1982 for a general hydrology, physical oceanography, nutrient and particulate matter dynamics study of Buzzards Bay in 1983-1985. We think this study will involve a network of stations for measurement of temperature, salinity, nutrient, particulate matter, and chlorophyll profiles in conjunction with current meter measurements. There is also a good probability that remote sensing by aircraft can be incorporated in these studies.

Summary of Buzzards Bay Project

There is a need for accelerated and coordinated research into the many facets of the Buzzards Bay ecosystem. The PCB pollution problem in the New Bedford Harbor area on the western shores of the bay and the long-term, very successful Great Sippewissett Marsh research project on the eastern shores of the bay have stimulated an immediate need for a better understanding of the physical dynamics of the bay ecosystem.

There are several ongoing or planned research programs focused in whole or in part on the bay. The Coastal Research Center has initiated an effort to coordinate these efforts and stimulate new critical research programs in Buzzards Bay. The strategy is to combine a mix of individual research projects and strongly focused multidisciplinary projects in order to maximize the input of the wealth of scientific expertise of the Woods Hole scientific community. We plan to cooperate with state agencies in these studies and to involve state college and university scientists as we have done in the PCB pollution research during 1979-1981.

We anticipate submitting a proposal to Sea Grant for a multidisciplinary study of key research problems in Buzzards Bay to begin in July 1983. Planning for this project, as well as ongoing research described above, will continue during 1982-1983.

REFERENCES

- Farrington, J. W., R. W. Risebrough, P. L. Parker, A. C. Davis, B. de Lappe, J. K. Winters, D. Boatwright, N. M. Frew. Hydrocarbons, polychlorinated biphenyls, and DDE in mussels and oysters from the U.S. Coast 1976-1978 -- The Mussel Watch. WHOI Technical Report, in preparation.
- Grant, W. D. and O. S. Madsen (1979). Combined wave and current interaction with a rough bottom. J. Geophysical Res., 84: No. C-4, 1797-1808.
- Hatch, W., P. D. Brady, D. W. Allen, A. Davis, and J. W. Farrington (1981). PCBs in clams (Mercenaria mercenaria) and oysters (Crassostrea virginica) from the New Bedford Harbor, Massachusetts. Pest. Monit. J. (in press).
- Rhoads, D. (1973). The influence of deposit feeding benthos on water turbidity and nutrient recycling. Am. Jour. of Science, 273: 1-22.
- Stoffers, P., C. Summerhayes, V. Forstner, S. R. Patchineelam (1977). Copper and other heavy metal contamination in sediments from New Bedford Harbor, Massachusetts: A preliminary note. Envir. Sci. Tech., 11: 819-821.
- Summerhayes, C., J. P. Ellis, P. Stoffer, S. Briggs, and M. G. Fitzgerald (1977). Fine-grained sediment and industrial waste distribution and dispersal in New Bedford Harbor and western Buzzards Bay, Massachusetts. WHOI Technical Report 76-115.

(C) Comparison of Assimilative Capacity of Marsh Ecosystems, Crop Land Ecosystems, and Estuarine Ecosystems for Sewage Disposal

The Coastal Research Center has initiated a joint study with Cornell University's Ecosystems Research Center which will compare the responses of coastal wetlands, estuaries, and crop lands to sewage input. The project will use the extensive data of the Great Sippewissett Marsh project to provide a basis for a specific example of the long term response of a marsh to years of controlled experimental applications of sewage sludge. The research of several Cornell University scientists has focused on the response of crop lands to sewage sludge disposal. Cornell's Ecosystems Research Center scientists are also working in cooperation with scientists of the Marine Ecosystems Research Laboratory at the Graduate School of Oceanography at the University of Rhode Island, where experimental microcosms are being used in eutrophication studies.

The project at WHOI's Coastal Research Center during 1982 will consist of a Post-Doctoral Investigator, Dr. Anne Giblin, working under the supervision of Dr. John M. Teal, Senior Scientist in the Biology Department. Support for expenses associated with travel to Cornell, writing, library work, and data manipulation and interpretation will be provided from Coastal Research Center funds. The initial scientific focus will be comparisons of nutrient and trace metal dynamics (biogeochemistry) in these sewage sludge or sewage stressed ecosystems. The overall goal is to provide a fundamental assessment of how to compare various ecosystem types when considering the multi-media (air, land, water) approach to waste disposal. Several participants in the WHOI Marine Policy Program are involved in the policy evaluation aspects of these types of comparisons and will be involved in these projects.

3. INSTRUMENTATION

Instrumentation Project

Advances in oceanographic research are often dependent on development and use of modern instrumentation, and coastal and estuarine research are not exceptions. There is a critical need for development of instrumentation to meet the special needs of research in these geographic areas. The Coastal Research Center has sponsored a group of scientists and engineers from all WHOI departments who meet in a discussion group to exchange ideas about instrumentation needs and capabilities.

This coastal instrumentation group is now in the process of providing input to criteria for the construction of a small 3-meter flume to be housed in the Coastal Research Center Experimental Laboratory. The multidisciplinary input of the group has been important towards assuring maximum effectiveness of the flume for experimental studies for many disciplines and, more critically, for interactive studies. The group will oversee the construction of the flume and initial testing.

The group has completed a review of staff requirements for general field instrumentation over the next several years. This review has allowed us to identify new instrumentation to be purchased through block grants, for example to the National Science Foundation, or through special grants. The availability of this new instrumentation will greatly enhance our coastal field research capabilities at WHOI.

The instrumentation group has also identified the need for extensive discussions on how to measure wind stress at the sea surface under a variety of conditions. Measurements of this type have become important to the present and future modeling of wind stress as a forcing function in coastal and continental shelf circulation, surface wave dynamics, and turbulence.

The members of the group are: Richard T. Nowak, Ocean Engineering; David G. Aubrey, Geology & Geophysics; Robert C. Beardsley, Physical Oceanography; William D. Grant, Ocean Engineering; Yogesh Agrawal, Ocean Engineering; Richard Koehler, Ocean Engineering, Donald Anderson, Biology; John Burke, Chemistry; and Keith Von Der Heydt, Geology & Geophysics.

RAPID RESPONSE PROGRAM

Rapid Response Program

The capability of providing funds for rapid response to unexpected events is generally absent in federal research budgets. Private funding such as that available from the Andrew W. Mellon Foundation for Coastal Research Center activities makes it feasible to consider rapid response to natural and man-induced phenomena which are unpredictable by their very nature; e.g., coastal storms.

The CRC is now evaluating plans for rapid response to the following unpredictable events: (1) a coastal storm, (2) severe flooding of rivers, (3) the intrusion of a gulf stream eddy on the southern New England Shelf, and (4) an outbreak of Red Tide. In each case, the merits of the scientific research, the need for commitment of funds for the initial response, and the feasibility of obtaining funds for follow-up, longer-term research will be used to select the one or two projects which can be supported.

After selection, plans will be formulated as to the details of the sampling and analysis program and selection of the individual event to be studied. Then funds will be set aside to be activated within hours of the occurrence of the event. In this manner, we hope to gain valuable insights as to the role of these types of short-term intense events in coastal ecosystems.

Two examples of how this process works occurred during 1981.

Dr. John Milliman of the WHOI Geology & Geophysics Department was conducting joint research with scientists from the Peoples Republic of China and learned of the opportunity to sample sediment discharge and obtain hydrographic parameters during the worst flood of the Yangtse River since 1905. This was a unique opportunity to study the effects of a 100-year storm flood upon a major river and its estuary. A \$10,000 grant from the Coastal Research Center was awarded within a day of receipt of Dr. Milliman's request, and allowed Dr. Milliman and a visiting Chinese scientist to obtain valuable data on river-estuarine systems as part of a larger cruise and research effort already in progress.

The second example is the research of Dr. Richard Lambertson, a veterinarian and post-doctoral scholar at WHOI during 1981. The Coastal Research Center awarded funds to Dr. Lambertson to assist in his studies of stranded marine mammals, aimed at elucidating the causal factors for strandings via autopsies, histopathological studies, and hematology.

FACILITIES FOR COASTAL RESEARCH

Facilities for Coastal Research

Experimental laboratory studies form an essential link between in situ observations of the environment and our concepts of proper management and use. In one type of experiment, key processes simultaneously active with many others in nature can be isolated in the laboratory and studied in detail using delicate instruments and observational techniques not suited for the harsh field environment. Other types of model studies or experiments can be an essential prelude to decisions on the use of the coastal area, providing the evidence for judgments about the consequences of full-scale development. Because of complicated interrelations, many experimental coastal studies need to be conducted on a large scale or with specialized facilities not realizable with conventional laboratory space.

From the Center's inception, the Center Director and the Planning Committee have devoted much time and effort to the planning of new facilities for coastal research. Plans were developed for the expansion and improvement of existing facilities and the addition of new, specialized buildings. The facilities necessary for scientists at WHOI to carry out their expanding research in the coastal environment are designed to meet certain special needs but retain considerable flexibility in use.

First in priority was the new Coastal Research Center Experimental Laboratory (CRCEL) (Figure 2). The facility is primarily designed to provide much-needed space for experimental research and for instrument development and testing by physical scientists and engineers. The main purpose of this 10,000 square foot building is to provide flexible space for the construction of flumes, tanks, and other structures of adequate sizes to test experimentally concepts and theories of physical, chemical, geological, and biological processes in coastal areas, and especially the interactions among these processes. The large open area will have multiple access lines for seawater and satisfy many of the needs of the various disciplines by providing space for a wide range of experiments. In addition, the space will be used for construction and servicing of large measurement devices such as current meter arrays, nephelometers, and tripods which are used in the field component of coastal research. A large overhead crane will allow for movement of heavy pieces of gear within the area without disturbing ongoing experiments. This maximizes usable floor space.

FIGURE 2

The building also contains three specialized laboratories on the first floor: one for the study of geophysical fluid dynamics, one for biogeochemical studies, and a general use laboratory with facilities for specialized physical measurement systems. The second floor of the building will hold offices, a computer room, and a conference room (Figure 3).

The Coastal Research Center was fortunate to receive generous support for construction of this facility from the Kresge Foundation, the Mobil Foundation, Percy Chubb 2nd, and numerous individual contributors. The main structure of the building is now complete and the final work on the interior of the specialized laboratories is in progress. We anticipate full use of the facility by late spring 1982.

Future expansion of the CRC facilities includes a 100-meter covered flume which will allow studies of the interactions of physical processes (e.g., waves, turbulence), sediments, geochemical, and biological processes; a greenhouse to be constructed over an existing series of ponds which will be used for experimental salt marsh and similar ecosystem research; and an addition to the existing Environmental Systems Laboratory that will approximately double its laboratory and office space (Figure 4).

FIGURE 3

FIGURE 4

COASTAL RESEARCH CENTER

Activities Summary: Inception to Present

Latest Update: March 1, 1982

CRC PROJECT SUPPORT BUDGETED FOR 1982

General Account \$ 126,211

To be used for salaries, travel, honoraria for visitors, support of student research projects, and stipends and research support for post-doctoral scholars.

Assimilative Capacity Project \$ 45,686

To be used for salaries, travel, and graphic services associated with this project.

Instrumentation Project \$ 43,000

To be used for salaries, travel, and equipment and shop services associated with construction of flume. Also ship time on R/V ASTERIAS for testing of coastal instrumentation.

Georges Bank Project \$ 100,000

To be used for salaries, graphic services, and manuscript preparation and map compilation services.

Rapid Response Program \$ 70,000

To be used as needed, as described previously in this annual report.

GUEST INVESTIGATORS

<u>Name</u>	<u>Affiliation</u>	<u>Dates</u>
Dr. Peter C. Smith	Bedford Institute of Oceanography Dartmouth, Nova Scotia, Canada	9/ 1/80-12/31/80
Dr. William C. Boicourt	Chesapeake Bay Institute The Johns Hopkins University Shady Side, MD	2/ 1/81- 6/30/81
Georges Bank Study Group:		11/14/80-11/14/82
Dr. John Walsh	Brookhaven National Laboratory Upton, NY	
Dr. Terry Whittedge	Brookhaven National Laboratory Upton, NY	
Dr. Marvin Grossline	National Marine Fisheries Service Woods Hole, MA	
Dr. Michael Sissenwine	National Marine Fisheries Service Woods Hole, MA	
Dr. Robert Howarth	Ecosystems Center Marine Biological Laboratory Woods Hole, MA	
Dr. Brad Butman	U. S. Geological Survey Woods Hole, MA	
Dr. Paul Boehm	ERCO Energy Resources Company, Inc. Cambridge, MA	
Dr. Jacek Sulanowski	Earth Sciences Department Bridgewater State College Bridgewater, MA	6/18/81- 9/30/81

VISITING INVESTIGATORS

<u>Name</u>	<u>Affiliation</u>	<u>Dates</u>
Dr. Nick Staresinic	IAEA Laboratory Monaco	1/15/81-1/14/82 (3/4 support)

POST-DOCTORAL INVESTIGATORS

<u>Name</u>	<u>WHOI Department</u>	<u>Dates</u>
Dr. Anne Giblin	CRC (Assimilative Capacity Project)	1/25/82- 1/24/83

POST-DOCTORAL SCHOLARS

<u>Name</u>	<u>WHOI Department</u>	<u>Dates</u>
<u>1981:</u>		
Dr. Richard H. Lambertson	Biology	1/ 1/81-12/31/81
Dr. John W. Loder	Physical Oceanography	2/ 1/81-12/31/81

1982:

TBA (2)

VISITING SCHOLARS

<u>Name</u>	<u>Affiliation</u>	<u>Dates</u>
Dr. Donald C. Malins	NOAA National Marine Fisheries Service Seattle, WA	4/16/81- 4/24/81
Dr. Robert Guza	Center for Coastal Studies Scripps Institution of Oceanography La Jolla, CA	8/26/81- 8/28/81
Dr. Erwin Suess	School of Oceanography Oregon State University Corvallis, OR	3/15/82- 3/19/82

STUDENT SUPPORT

<u>Name</u>	<u>WHOI Department</u>	<u>Dates</u>	<u>Amount</u>
Susan Libes	Chemistry	7/ 1/80- 6/30/81	\$ 7,735
"The Geochemistry of Stable Nitrogen Isotopes in Marine Sediments"			
Cheryl-Ann Hannan	Biology	1/15/81-12/31/82	\$ 7,500
"Experimental Evaluation of the Role of Passive Larval Settlement in Benthic Marine Invertebrates: Do Hydrodynamic Processes Determine Settlement Sites or do Larvae Actively Choose Where to Settle?"			
Daniel Repeta	Chemistry	2/25/81- 3/28/81	\$ 6,085
"Carotenoid Transformations in the Water Column"			
Alan Klotz	Biology	8/ 1/81- 7/31/82	\$ 4,010
"Purification and Characterization of the Polysubstrate Monooxygenase System from the Coastal Marine Fish <u>Stenotomus Versicolor</u> "			
Richard Mercier	Ocean Engineering	9/15/81- 9/14/82	\$ 5,525
"Development of Experimental Methods for Studying Interactions Between Environmental Processes and the Turbulent Microenvironment"			

STAFF SUPPORT

<u>Name</u>	<u>WHOI Department</u>	<u>Dates</u>
Dr. Kenneth Brink, Asst. Scientist	Physical Oceanography	10/15/80-10/14/82 (6 months support per year for 2 years)
Ms. Elizabeth Suwijn Cartographer	CRC (Georges Bank Project)	12/28/81-

SPEAKERS

<u>Name</u>	<u>Affiliation</u>
Dr. Richard Burroughs	Bureau of Land Management Washington, DC
Dr. Clifford Russell	Resources for the Future
Dr. Kathryn Burns	IAEA Laboratory Monaco
Prof. Christopher Martens	Marine Sciences Program University of North Carolina Chapel Hill, NC also: Guest Investigator Chemistry Department, WHOI
Dr. David Cacchione	United States Geological Survey Menlo Park, CA
Dr. John H. Vandermeulen	Bedford Institute of Oceanography Dartmouth, Nova Scotia, Canada
Dr. Mark Melancon	Medical College of Wisconsin

CHINESE VISITORS

<u>Name</u>	<u>Affiliation</u>	<u>WHOI Sponsor</u>
Dr. Chi Yuh Tzao	Jinan University People's Republic of China	Dr. R. Guillard Biology Dept.
Prof. Chen Chiyu	Institute of Estuarine & Coastal Research Shanghai Normal University People's Republic of China	Dr. J. Milliman G & G Dept.
Mr. Dunxin Hu	Physical Oceanography Dept. Academia Sinica Oceanography Lab. Tsingtao University People's Republic of China	Dr. R. Beardsley P. O. Dept.
Prof. Ying Wang	Nanking University People's Republic of China	Dr. J. Milliman G & G Dept.

INTERNAL WHOI PROPOSALS FUNDED BY CRC

Dr. Thomas M. Leschine/Dr. Judith M. Spiller \$ 15,217

"Resource Mapping of Benthic Organisms on Georges Bank
in the Vicinity of Lease Sale #42"

9/ 1/80-12/31/81

Dr. Frederick J. Grassle \$ 1,353

"Benthic Sampling at USGS Sites on Georges Bank"

1/16/81- 2/15/81

Dr. William A. Watkins/Dr. Richard Lambertson \$ 4,016

"Studies on Stranded Marine Mammals"

5/ 1/81- 4/30/82

CRC SUPPORT OF SCIENTIFIC MEETINGS

<u>Title</u>	<u>Location</u>	<u>Dates</u>	<u>Amount</u>
Gulf of Maine	Durham, NH	3/ 2/81- 3/ 5/81	\$ 2,000
Fisheries Ecology	Woods Hole, MA	6/ 8/81- 6/11/81	\$ 6,000
IFIAS	Woods Hole, MA	9/ 9/81- 9/16/81	\$ 5,000
Ocean Pollution 1981	Halifax, N.S.	10/18/81-10/23/81	\$ 6,000

The support of travel of scientists to these meetings and partial support of activities at the meetings provided a basis for requesting and receiving additional support from other sources for three of the above-mentioned meetings. For example, the Ocean Pollution 1981 meeting was supported by additional funds from the Office of Marine Pollution Assessment of NOAA (\$20,000) and several funding sources in Canada.

These scientific meetings also provided a basis for discussions of the Georges Bank Project and the Assimilative Capacity Project with a cross-section of colleagues from other institutions in the United States, Canada, and many other countries.

REPORT DOCUMENTATION PAGE	1. REPORT NO. WHOI-82-15	2.	3. Recipient's Accession No.
4. Title and Subtitle ANNUAL REPORT OF THE COASTAL RESEARCH CENTER OF THE WOODS HOLE OCEANOGRAPHIC INSTITUTION		5. Report Date January 1982	
7. Author(s) John W. Farrington		6.	
9. Performing Organization Name and Address Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543		8. Performing Organization Rept. No.	
12. Sponsoring Organization Name and Address The Andrew W. Mellon Foundation, the Charles E. Culpeper Foundation and the Mobil Foundation.		10. Project/Task/Work Unit No.	
		11. Contract(C) or Grant(G) No. (C) (G)	
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15. Supplementary Notes This report should be cited as: Woods Hole Oceanog. Inst. Tech. Rept. WHOI-82-15.		14.	
16. Abstract (Limit: 200 words) Coastal research at the Woods Hole Oceanographic Institution was the subject of a special series of seminars and discussions in 1978-1979 which led to the identification of three important issues: (1) The need for more formal multidisciplinary interactions in order to effectively tackle some key research problems; (2) The need for facilities for experimentation; and (3) The need for unrestricted funds to initiate new multidisciplinary research ventures or to act as the "glue" binding together ongoing research projects. The Coastal Research Center was established in late 1979 with the charge of meeting these needs and initiating and carrying out projects in coastal research. Work within the center is carried out by scientists and students from the scientific departments, visiting scientists, and post-doctoral investigators. A Planning Committee advises the Center Director in areas of research projects, budgets, and experimental facilities. Three specific projects were chosen for initial emphasis: (1) Georges Bank; (2) Assimilative Capacity; and (3) Instrumentation. Planned new facilities for coastal research include an experimental laboratory which is now under construction, a 100-meter flume, a greenhouse, and an addition to the existing Environmental Systems Laboratory.			
17. Document Analysis a. Descriptors 1. Coastal Research 2. Georges Bank 3. Assimilative Capacity b. Identifiers/Open-Ended Terms c. COSATI Field/Group			
18. Availability Statement		19. Security Class (This Report) Unclassified	21. No. of Pages 44
		20. Security Class (This Page)	22. Price

Woods Hole Oceanographic Institution WHOI-82-15	<p>ANNUAL REPORT OF THE COASTAL RESEARCH CENTER OF THE WOODS HOLE OCEANOGRAPHIC INSTITUTION by John W. Farrington. 44 pages. January 1982. Prepared for the Andrew W. Mellon Foundation, the Charles E. Culpeper Foundation, the Kresge Foundation and the Mobil Foundation.</p> <p>Coastal research at the Woods Hole Oceanographic Institution was the subject of a special series of seminars and discussions in 1978-1979 which led to the identification of three important issues: (1) The need for more formal multidisciplinary interactions in order to effectively tackle some key research problems; (2) The need for facilities for experimentation; and (3) The need for unrestricted funds to initiate new multidisciplinary research ventures or to act as the "glue" binding together ongoing research projects.</p> <p>The Coastal Research Center was established in late 1979 with the charge of meeting these needs and initiating and carrying out projects in coastal research. Work within the Center is carried out by scientists and students from the scientific departments, visiting scientists and post-doctoral investigators. A Planning Committee advises the Center Director in areas of research projects, budgets, and experimental facilities.</p> <p>Three specific projects were chosen for initial emphasis: (1) Georges Bank (2) Assimilative Capacity (3) Instrumentation Planned new facilities for coastal research include an experimental laboratory which is now under construction, a 100-meter flume, a greenhouse, and an addition to the existing Environmental Systems Laboratory.</p>	<p>1. Coastal research</p> <p>2. Georges Bank</p> <p>3. Assimilative Capacity</p> <p>I. Farrington, John W.</p> <p>II. Mellon Foundation</p> <p>III. Culpeper Foundation</p> <p>IV. Kresge Foundation</p> <p>V. Mobil Foundation</p> <p>This card is UNCLASSIFIED</p>
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