UNIVERSITY OF MIAMI SEA GRANT

ANNUAL REPORT NUMBER 5

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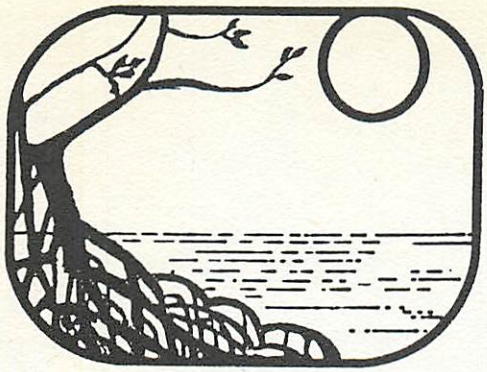
ANNUAL REPORT 1976—1977



UNIVERSITY OF MIAMI

SEA GRANT

CONTENTS

DIRECTOR'S OVERVIEW

Dr. Eugene H. Man

"Sea Grant" in the south Florida area and, indeed, throughout the State has become synonymous with increasing frequency with "Biscayne Bay." This special identity recognizes the success of one of the major thrusts of the Miami program: to provide a coherent, consolidated research and educational effort focusing on the vast and complex challenges created by the interaction of the State's most populous area with a fragile estuarine system, a major element of which is Biscayne Bay. It is safe to say that without the continuing stimulus of the Miami Sea Grant program, the efforts of government at all levels, decisionmakers, and the commercial interests based on the marine area would be far more fragmented than they are now. Sea Grant is the major driving force in the community-wide effort (now reflected at the State level in terms of major legislation underway) to develop, utilize, and preserve the Bay--

through its research programs, its service-oriented projects, and through a major educational and communications interaction with the community involving symposia, special training programs, and the widespread use of the media.

The bottom line of all these efforts involving the appropriate utilization of Biscayne Bay is that it is without question the single most important geological feature upon which the economy, the livability, and the continuation of the south Florida region as it exists today depend. The opportunity for developing questions and answering problems in this one system alone is more than sufficient to occupy the talents of a major university with basic science and engineering resources, as well as one of the nation's major marine and atmospheric science centers. The combination of a complex problem needing solutions and a constituency vitally interested and demanding answers is the framework upon which the Miami Sea Grant program reviewed in this Annual Report is constructed.

PATHOLOGISTS FIND CAUSES OF FISH KILLS

Dr. Bennett Sallman, Dr. Lanny Udey
Co-Principal Investigators

Since the coroner's office to investigate causes of fish deaths was opened by Sea Grant at the University of Miami more than three years ago, hundreds of autopsies have been held and several fish pathogens have been indicated.

The fish morgue was begun by Sea Grant in response to requests of a south Florida populace concerned by major fish kills which often left waterways and shorelines littered with decaying corpses.

Last year pathologists checked out more than 250 citizens' reports made on a well-publicized 24-hour "Hot Line." Of these, 12 actual kills--all in fresh water--were investigated by the University of Miami team. In most cases, low dissolved oxygen content of the water or a bacterium, Aeromonas hydrophilia, was identified as the cause of death. A link was shown between depleted but sublethal oxygen content and the onset of A. hydrophilia infection.

High levels of A. hydrophilia are found in many eutrophic fresh water canals and represent a major disease threat to fish in south Florida. The bacterium isolated by the Sea Grant laboratory has unusual characteristics and may represent a new and geographically limited biotype.

No major fish-kills occurred in salt waterways during the report period.

The "Hot Line" enables technicians directed by Dr. Bennett Sallman and Dr. Lanny R. Udey to respond quickly to citizen calls. They often arrive on the scene in time to recover moribund fish. At worst, they gather bodies of dead fish before scavengers dispose of them or their tissues deteriorate too much for successful postmortems.

The findings of the past year are in contrast to the previous year when Dr. Udey identified the organism which caused what the media called the "Whirling Death" as a previously unknown bacterium which attacks fish nervous systems. This caused the victims to swim erratically, often in tight circles, nose to tail, in a macabre dance. Appropriately, Dr. Udey named the anaerobe Eubacterium tarantellus after the whirling Italian folk dance, La Tarantella.

Anaerobic organisms cannot exist in oxygen, so cannot be found in a normal atmosphere and are therefore difficult to track down.

The discovery brought national recognition to Dr. Udey--as well as calls from mariculturists, the tropical fish industry and others for help in identifying causes of death in their fish stocks.

The University of Miami microbiologists have proposed to extend their studies of the extent of fish morbidity and mortality caused by anaerobic infections. Laboratory studies show that E. tarantellus can infect many important species, including sea trout, bluefish, permit, sheepshead, menhaden, snook and striped mullet.

Scientists continue to explore the extent of fish disease in north Biscayne Bay, which is under most stress by urbanization. Mr. Walter Kandrashoff, a commercial fisherman assisting the team, has noticed and documented on film a marked increase in disease conditions such as tail erosion and fin and body deformities. Four principal sampling stations in north Biscayne Bay were visited weekly for 60 weeks and netted specimens examined, more than 5,000 in all. The results show incidence of the finrot syndrome to be the heaviest reported anywhere in the country. Scale disorientation in striped mojarra, black drum, bonefish, ladyfish and Atlantic croaker was found at high levels. Sampling in more pristine south Biscayne Bay has been concluded. Only the scale disorientation was found to be prevalent.

All data have been computerized and analyzed. The laboratory has also developed new or improved methods, reagents and media for easier and more rapid identification of pathogens. A convenient method for screening a large number of cultures for their ability to metabolize multiple carbohydrates was also devised.

'UNBENDERS' HELPING STRICKEN SPORT DIVERS

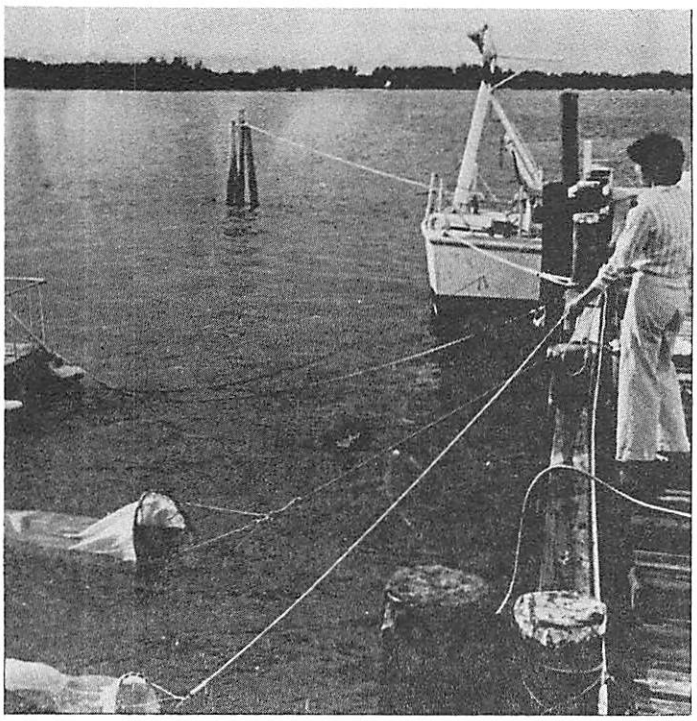
George C. Bell, M.D.
Principal Investigator

This project drew quick-response support from the Director's discretionary funds. It enabled the Principal Investigator to complete outfitting of a well-equipped emergency room needed as a complement to the Miami Recompression Chamber, opened in 1976 in the National Marine Fisheries Service (NOAA) building on Virginia Key. The emergency room was needed to obviate the long cross-city run to the expertise and equipment of the Aquatic Medicine team headed by Dr. Bell at the Jackson Memorial Medical Center.

In the first 11 months of operation, 25 critically ill patients were treated in the only recompression chamber between the U.S. Navy's operations at Key West and University of Miami chamber aboard its research vessels--and 24 survived.

In addition, during the report period, a special course in recompression procedures was held on Virginia Key, the First Annual Symposium on Underwater Medicine was held on Key Biscayne, and Dr. Bell was a co-author of presentations at two medical meetings and of papers published in two medical journals.

Dr. Bell also received the Air Force Commendation Medal for his meritorious service with the NOAA recompression chamber for the two years ending in August, 1977.



MEASURING TURBIDITY WITH LASER METER

Dr. J.G. Hirschberg
Principal Investigator

Supported by Sea Grant discretionary funds and by the National Aeronautics and Space Administration, a reliable, convenient way to measure turbidity has been under study. The experience of the past two years has revealed that the lack of knowledge about turbidity is due mostly to lack of precise and coherent data.

Several promising methods of measuring turbidity were tested, but the need for a new compact instrument, capable of measuring turbidity in the daytime, and a monitor, capable of being left in place for days or weeks, would be desirable. Accordingly, a back-scatter, solid state laser turbidity meter is being developed. It measures scattering in situ at different angles and the high intensity of the laser pulses yield high precision while the near infrared wavelength allows daylight operation. The small power requirement of such an instrument makes it suitable for continuous monitoring. Such an instrumentation would provide land developers with early warning of any pollution which enters a drinking water source.

During the past year the instrument has been designed and the components procured. The specification and expected performance of the instrument indicate its great interest for the study of turbidity in Biscayne Bay. Work will continue in building electronic circuits so the device can be tested in the laboratory and, eventually, in the field.

STUDENTS RESEARCH BAY LEGAL PROBLEMS

Professor Dennis O'Connor
Principal Investigator

The four-year project, Community Legal Problem Services: State and Local (RL/2), completed during the 1976-77 college year, focused on the legal problems of Biscayne Bay. Twelve problem studies by students were presented in the Coastal Law Seminar.

A summary of these studies and overall synopsis conclude the project. The computerized synopsis and analytical classification of coastal law cases was brought up-to-date and now comprises more than 2,000 pages in its completed form. As selected reports it will be useful to coastal zone managers.

Papers completed during the concluding year of the project, following Professor Dennis O'Connor's paper entitled "Legal Aspects of Biscayne Bay Management," were:

McRAE: Storm Disaster Planning and Control.

STEPIEN: Aquatic Preserve Guidelines and Development.

LEEPER: Pollution Control.

O'CONNELL: Coastal Management Experience in Other Areas--Nassau-Suffolk and SF-BCDC.

LAWRENCE: Port and Harbor Management.

FERNANDEZ: "Environmental Sensitivity" Zone and Land Management.

BLAKEMORE: Islands Management and Overall Bay Planning.

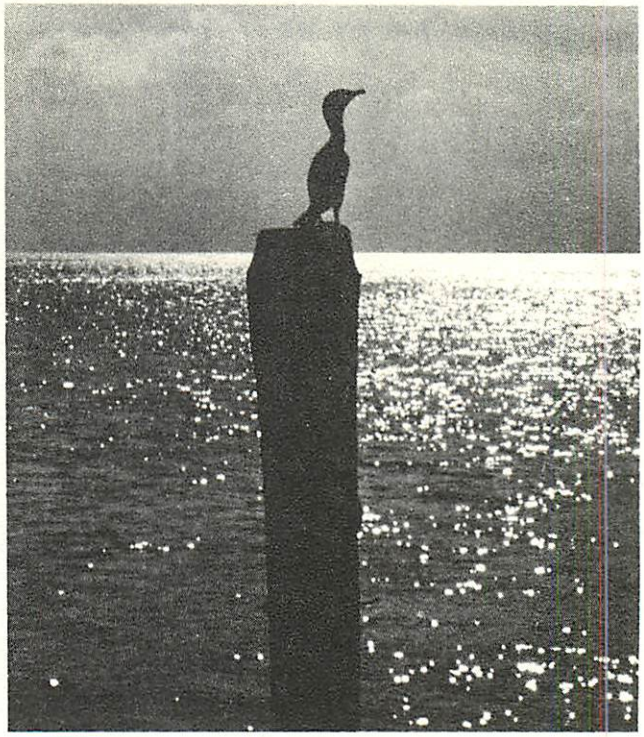
ALLEN: Regulation of Commercial Fishing.

THOMAS: Marine Location and Construction.

MacLAUGHLIN: Water Supply Management and Salt Water Intrusion.

BOOKS: Government Organization and Management.

SLIGER: Government Organization and Management.



FOUR MONOGRAPHS ON THE LAW OF THE SEA

Dr. Thomas A. Clingan, Jr.
Principal Investigator

In a special project supported by the Director's discretionary funds, Dr. Clingan wrote LAW OF THE SEA: Four Monographs for the General Reader. This 67-page book was published by University of Miami Sea Grant as Special Report No. 10 in February, 1977. It has been widely distributed to law schools, government officials, and fisheries interests.

Dr. Clingan is especially qualified to discuss issues which have arisen in the Law of the Sea deliberations sponsored by the United Nations. He has served as Deputy Assistant Secretary of State for Oceans and Fisheries Affairs and was Deputy Representative of the United States to the third Law of the Sea Conference. Since August, 1975, he has served as expert consultant to the Department of State Office of Oceans and Fisheries Affairs.

His monographs are entitled "The World Oceans," "The Law of the Oceans," "Institutional Arrangements for the Law of the Sea," and "The Work of the Third United Nations Law of the Sea Conference." He appended "A Final Word" to the monographs.

TIDE AND WIND FLOWS PREDICTED BY MODEL

Dr. John D. Wang
Principal Investigator

During 1976-77, data were collected for prescribing model boundary conditions. These consisted of simultaneous time series of water surface elevation at Miami Harbor entrance, Bear Cut, Cape Florida, Soldier Key, Ragged Key III, Adams Key and Broad Key. The data were analyzed for tidal and wind components and subsequently used to predict current flow fields and flushing characteristics (particle paths). Mr. Edward A. Swakon wrote a master's thesis on the data analysis and model predictions. This thesis was published as Sea Grant Technical Bulletin #38.

Verification of the model by comparing predicted tidal elevations and currents with measured values is ongoing. Several current meter stations have been occupied for parts of a tidal period, a recording current meter was installed offshore of Snapper Creek and Turkey Point for periods of a month and existing tidal data from Turkey Point and Cutler were obtained from NOAA. Verification of the hydrodynamics model was completed in December 1977.

Implementation of the dispersion model for Biscayne Bay was begun and dye studies for determination of mixing characteristics are being planned. Data analysis is continuing and the efforts are directed towards separating astronomical tides from wind effects upon water surface fluctuations and current measurements.

The main achievements to date have been:

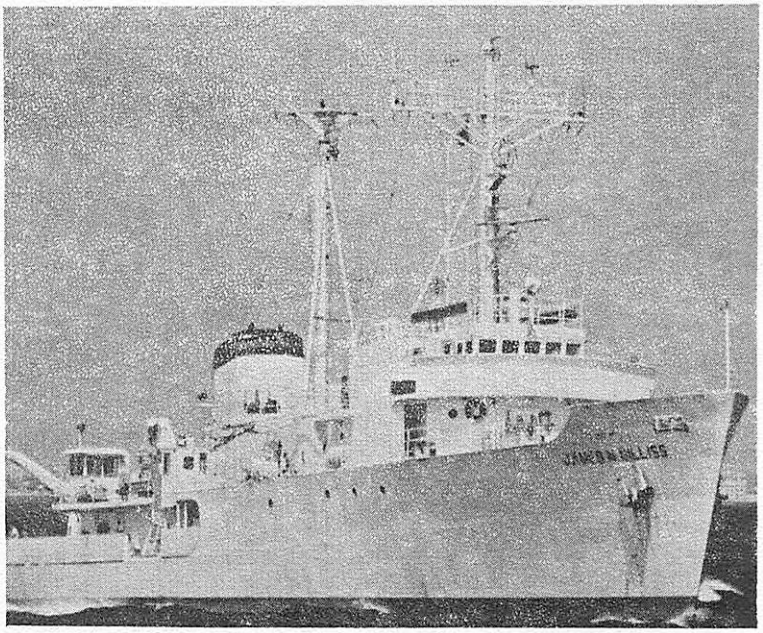
(1) Collection and analysis of tidal data for prescribing model boundary conditions.

(2) Collection of wind data and coherent analysis of this data with the tide data to determine changes in boundary conditions due to wind.

(3) Hydrodynamic model implementation and predictions of current patterns and long-term net drifts.

(4) Collection of current velocity data in the interior of Biscayne Bay.

(5) Evaluation of baroclinic flow in Biscayne Bay showed this forcing mode to be fairly unimportant.



BETTER WAYS SOUGHT TO RECOVER VIRUS

Dr. M. Michael Sigel
Principal Investigator

The easiest and cheapest way to dispose of sewage is to dump it in the ocean--and for many years the communities on the Eastern Seaboard have done so. As populations soared and elbowed to the edge of the sea, the dumping of partially treated and raw sewage has reached into thousands of millions of gallons a day and has stirred concern about danger to human health and survival of marine animals, including commercially valuable fish and shellfish. Careful monitoring of sewage disposal practices is essential.

However, it is not possible at present to make precise recommendations on pollution control because of the many unknowns and variables. The extent and intensity of viral pollution, for example, is largely unknown in any given body of water because of the difficulty of recovering and quantifying human viruses at different times. The problem is complicated by the presence in sea-water of substances which mask or neutralize human viruses.

During the past year, attention has been concentrated on two major activities: improvement of procedures for recovery of virus from sea-water and development of techniques for the cultivation of shrimp cells. In addition, certain aspects of previously initiated immunological studies in fish and on immunosuppressive substances from marine organisms were continued.

BETTER ASSESSMENT OF RECREATION DATA

Dr. C. Bruce Austin
Principal Investigator

The 1975-76 Sea Grant project was an empirical study that combined boat registration data, site interviews, mail questionnaires, and aerial boat census to estimate amounts, types, locations, and times of recreational boating to plan future marina sites. The most important methodological lesson was that "time of day" was a critical factor with regards to being able to estimate total traffic or traffic by type of activity and offshore boating destination.

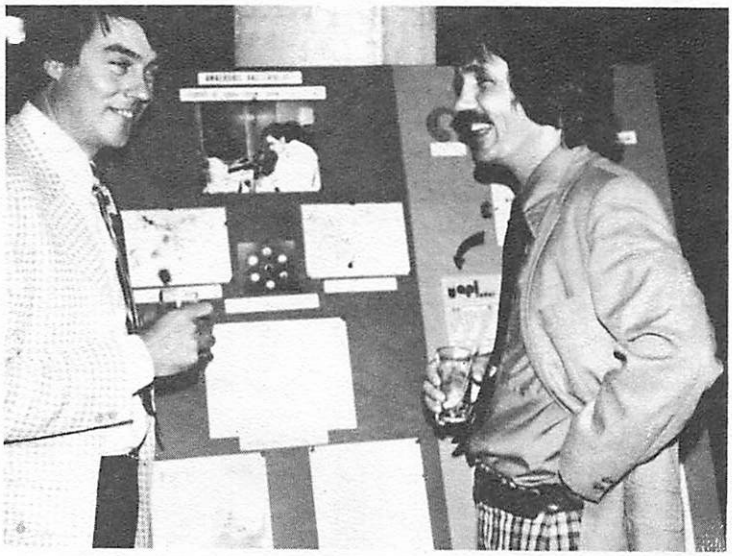
The 1975-76 study developed and utilized what were called "time curves" for estimating boating activity. These time curves were a distinct advantage over previously known methods and exposed the type of bias that has developed in previous studies because time of day considerations were not incorporated.

This project refined time curve estimation methods and illustrated how they could be used. The result of this project has been two conference papers and a draft manuscript that is to be published as a Sea Grant Technical Report. The time curve principles (and manuscript) have been utilized by biologists in the Florida Department of Natural Resources to estimate recreational fishing activity off the east coast of Florida in 1976-77. Time curve principles have also been incorporated into site sampling techniques of the Island Resources Foundation (St. Thomas, Virgin Islands) in an ongoing contract with the National Marine Fisheries Service to estimate recreational fishing in Puerto Rico and the Virgin Islands.

This project supported a graduate student who completed a Master's Degree in economics at the University of Miami and has continued for the doctorate degree at San Diego with continuing interest in marine recreation. It also supported a student who is now studying towards his doctorate at Berkeley.

PEOPLE/NATURE CLASH S. FLORIDA'S PROBLEM

Mr. Al Volker
Principal Investigator



Advisory Services at the University of Miami moved toward a more conventional Sea Grant approach during the report period. A Memorandum of Agreement was signed with the Florida Sea Grant College Program to establish a Dade County Marine Extension Agent whose activities would be directed jointly by the two Sea Grant Programs. This action gives the Miami Program access to the MAP network operated in coastal counties by the Florida Program and, in return, allows state system scientists an opportunity to work in Miami research in the estuarine system of south Florida. Two scientists at the Florida International University, in fact, are included in the Miami proposal for 1978-79 and applications of others are being considered. The agent is expected to begin his duties in calendar 1978.

This addition does not divert Miami from the strong position it has preempted in the classic confrontation between rapid urbanization versus natural resource, people versus nature. (See below, Development of a Community Presence). Lacking, as a private university, the services of an extension system, Miami developed its own response strategies.

Two approaches have been used: (1) personal contact with decisionmakers and (2) contact through publications and the media with the citizens who elect the decisionmakers. It is worth stresssing that all program managers and principal investigators now consider themselves to be involved in Advisory Services, so close is the interaction between Sea Grant and its constituency.

The Advisory Services function may be summarized as follows:

* In the report period two Field Guides, four Special Reports, four Technical Bulletins, a publications catalog, and an Annual Report were issued (see page for titles). Three other Special Reports are in press. In addition to the mandatory free distributions of the above publications, more than a thousand copies were sold to scientists, government officials, and students all over the world.

* The Sea Grant Log, issued each month primarily for internal use, consists of four 8 1/2 x 14 inch sheets. It reports news of interest to the Sea Grant family, announcements of notice of meetings, vacancies in other programs, and lists publications from other institutions before the publications are submitted to the library of the Rosenstiel School of Marine and Atmospheric Science for cataloging. Information Services also serves as a clearing house for all information received from other programs and government, including reprints, other newsletters, and various announcements.

* Advisory Services continued to contribute to the cost of printing the Florida MAP Newsletter and prepared an article for each issue.

* Media contracts were carefully maintained. Releases to the print and electronic media were issued when advisable and the media were special guests at symposia and workshops and extensive coverage was enjoyed. Scientific expertise and commentary were furnished to the media on request and Miami investigators appeared on several talk shows. The Associate Director for Advisory Services was a contributing editor to Sea Grant 70's.

* Advisory Services worked closely with the Community Advisory Board (see page) and two groups that developed as a result of the two Biscayne Bay Symposia of April, 1976: The Biscayne Bay Implementation Task Force and the Biscayne Bay Advisory Sub-Group of the Dade County Wetlands Demonstration Project. A Task Force subcommittee developed plans for a third Biscayne Bay Symposium on Restoration and it was planned for the fall of 1977.

* Advisory Services prepared the Annual Report for 1975-76 and was responsible for design and coordination of the proposal volumes for 1977-78.

* To initiate a program of Public Education, Advisory Services held the first in a series of

Science Teachers Workshops with the aim of improving the quality of instruction in the marine sciences. This workshop was held March 4-6 at the University of Miami Environmental Field Station at Pigeon Key. Thirty-two Dade County teachers earned credit for attendance in classes and field trips directed by three members of the Rosenstiel School of Marine and Atmospheric Science facility. (Program for workshop on page). Other Public Education programs are being developed.

The year-long deliberations of the Task Force Committee on North Bay Rehabilitation led to Biscayne Bay Symposium III: Restoration of North Biscayne Bay, scheduled for October 21, 1977 at the Rosenstiel School of Marine and Atmospheric Science. More than 500 state and local officials and planners, conservationists, developers, scientists, students, and the media were invited. It was hoped that the Symposium would produce a mandate for implementation by state and local governments.

Sea Grant management, scientists, and legal experts have consistently responded to community calls for help in solving many coastal and estuarine problems. The closely-integrated Miami Sea Grant campaign in cooperation with Federal, State, and local organizations to protect and improve the Bay and to make best use of its assets is in the highest tradition of Sea Grant community service.

HOW'S A COMMUNITY PRESENCE MERITED?

In Dade County and the State of Florida, the University of Miami Sea Grant Program stands for Biscayne Bay--its study, its protection, its enhancement, its management. The University-Community liaison is close and increasingly productive.

How did Sea Grant earn such a community presence?

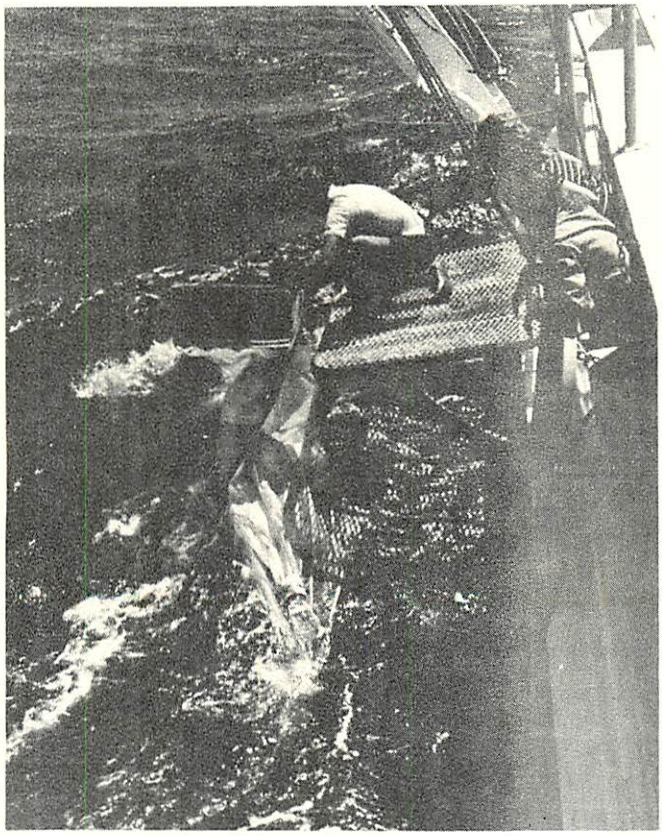
Several years ago Sea Grant examined a tangle of competing claims to the Biscayne Bay resources, a complicated mixture of jurisdictions that frustrated action, and an unfocused body of scientific expertise that only added to the confusion. Sea Grant decided to concentrate its efforts on "The Optimal Utilization of Estuarine Resources in South Florida," which includes 50-mile-long Biscayne Bay.

First, Sea Grant volunteered to the Greater Miami Chamber of Commerce to sift through an intimidating pile of scientific papers and maps and produce, for public use, a report on the Bay. "Biscayne Bay: Environmental and Social Systems" by Susan Uhl Wilson appeared in March 1975. It was followed in several months by "A Bibliography of Biscayne Bay, Florida--Monitoring and Research Programs," by Peter Rosendahl.

The community was vexed some years ago by intermittent fish kills in Biscayne Bay. No county, state, or federal agency had the expertise or methodology to pinpoint causes. Sea Grant volunteered and conducted a fish pathology program for several years; a 24-hour "Hot Line" enabled citizens to report fish-kills so scientists could respond quickly and identify pathogens.

Sea Grant then sponsored two symposia in April, 1976. Symposium I consisted of oral presentation, plus papers that were included in a 35-page Sea Grant publication ("Biscayne Bay: Past/Present/Future") embracing all that is scientifically known about the Bay--and what remains to be learned. The Energy Research and Development Administration was a co-sponsor.

Symposium II followed within a week. Four workshops composed of national, state, and local officials; developers, conservationists, scientists, and media persons discussed a set of topics touching policies



and priorities. The consensus was discerned and published with a definitive address by the Hon. Nat Reed, Assistant Secretary of Interior ("Biscayne Bay Symposium II: Environmental Quality, Utilization, Management").

An outgrowth of Symposium II was formation of the Biscayne Bay Implementation Task Force. It concentrated on four studies--one of them the rehabilitation of north Biscayne Bay. The Task Force also served as the Biscayne Bay Advisory Committee for the Dade County Wetlands Demonstration Project.

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PUBLICATIONS

Issued July 1, 1976 to Sept. 30, 1977

Field Guide Series

FG No. 5	A Guide to the Larger Marine Gastropods of Florida, the Gulf of Mexico, and the Caribbean Region. 54 pp. July 1976.
FG No. 6	A Guide to the Commoner Shallow-Water Gorgonians (the Whips, Sea Feathers, and Sea Fans) of Florida, the Gulf of Mexico, and the Caribbean Region. 25 pp. March, 1977.

Special Reports

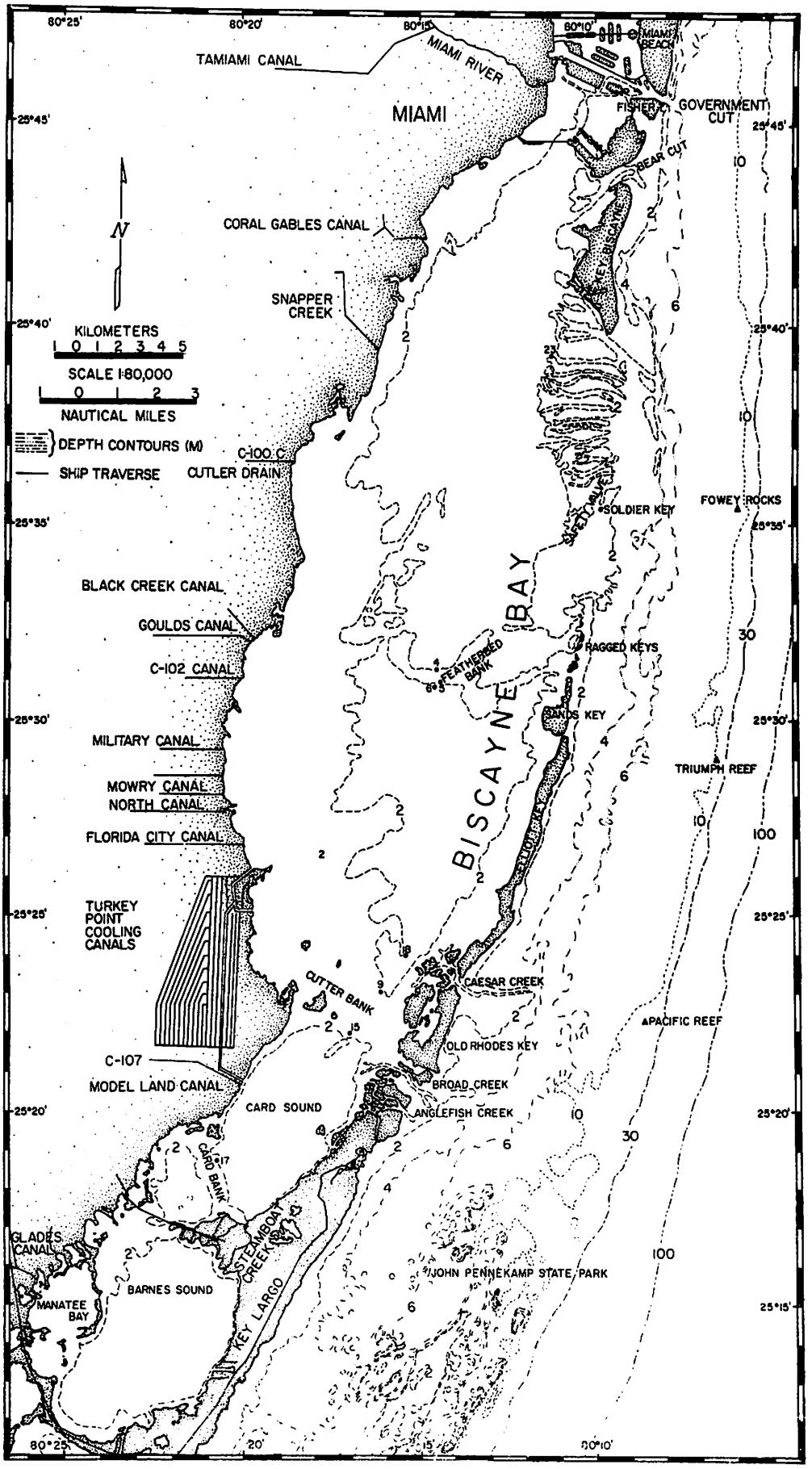
SR No. 9	Recreational Boating in Dade County. 150 pp. March, 1977.
SR No. 10	LAW OF THE SEA: Four Monographs for the General Reader. 70 pp. February, 1977.
SR No. 11	Wetlands-Related Legislation in the United States. 77 pp. May, 1977.
SR No. 12	SUMMARY: The Fishery Act of 1976. 15 pp. September, 1977.

Technical Bulletins

TB No. 35	Intensive Culture of the Stone Crab, Menippe mercenaria. 18 pp. October, 1976.
TB No. 36	Culture of Pink Shrimp, Penaeus duorarum, at Turkey Point Experimental Mariculture Laboratory. 45 pp. October, 1976.
TB No. 37	Modeling of Wind and Tide Induced Flow in South Biscayne Bay and Card Sound. 144 pp. June, 1977.
TB No. 38	Density Induced Motion in Shallow Lagoons. 29 pp. August, 1977.

Publications Catalog No. 5

University of Miami Sea Grant Annual Report No. 4 1975-1976.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TAMIAMI CANAL
MIAMI RIVER
MIAMI
MIAMI BEACH
FISHER I.
GOVERNMENT CUT
REAR CUT
KEY BISCAYNE
CORAL GABLES CANAL
SNAPPER CREEK
N
KILOMETERS
0 1 2 3 4 5
SCALE 1:80,000
0 1 2 3
NAUTICAL MILES
DEPTH CONTOURS (M)
SHIP TRAVERSE
C-100 C
CUTLER DRAIN
SOUTH CHANNEL
SOLDIER KEY
FOWEY ROCKS
BLACK CREEK CANAL
GOULDS CANAL
C-102 CANAL
MILITARY CANAL
MOWRY CANAL
NORTH CANAL
FLORIDA CITY CANAL
FEATHERBED BANK
RAGGED KEYS
SANDS KEY
TRIUMPH REEF
BISCAYNE BAY
TURKEY POINT COOLING CANALS
CUTTER BANK
CAESAR CREEK
PACIFIC REEF
OLD RHODES KEY
C-107
MODEL LAND CANAL
BROAD CREEK
CARD SOUND
ANGLEFISH CREEK
CARD BANK
GLADES CANAL
STEAMBOAT CREEK
JOHN PENNEKAMP STATE PARK
BARNES SOUND
MANATEE BAY
KEY LARGO

APPENDIX I: RESOURCES AND FUNDS

Grouping Sea Grant Research	Sea Grant Classification	Project Number	Title	NOAA 76-77 Sea Grant Award	76-77 Matching Funds	Total 76-77 Program
I.	MARINE RESOURCES DEVELOPMENT					
	A. Living Resources, Other than Aquaculture					
	06	R/MP-1	Pathology of Marine Animals	117,000	19,000	136,000
	08	R/MP-2	Bacteria as Pathogens in the Marine Environment	15,000	19,100	34,100
	08	R/MP-3	Virology and Protective Factors	19,700	18,000	37,700
			SUBTOTAL	151,000	56,100	207,800
II.	SOCIO-ECONOMIC AND LEGAL STUDIES					
	B. Ocean Law					
	15	R/L-5	Community Legal Problem Services (State and Local)	33,400	7,200	40,600
	C. Marine Recreation					
	18	R/MR-1	Methods for Assessing Marine Recreation	41,800	24,500	66,300
			SUBTOTAL	75,200	31,700	106,900
IV.	MARINE ENVIRONMENT RESEARCH					
	D. Environmental Models					
	46	R/ES-1	Calibration and Field Verification of Numerical Models for Circulation and Dispersion in Biscayne Bay	41,200	---	41,200
			SUBTOTAL	41,200	---	41,200
V.	MARINE EDUCATION AND TRAINING					
	D. Other Education					
	70	E/L-2	Juris Doctor Specialization in Ocean and Coastal Law	---	44,400	44,400
			SUBTOTAL	---	44,400	44,400
VII.	PROGRAM MANAGEMENT AND DEVELOPMENT					
	79	M/PA-1	Program Management - Administrative Functions	18,700	51,100	69,800
	81	M/PD-1	Program Development	20,000	---	20,000
			SUBTOTAL	38,700	51,100	89,800
			GRAND TOTAL	306,800	183,300	490,100

APPENDIX II: PROGRAM SUMMARY

Grouping Sea Grant Research	Sea Grant Classification	Project Number	Title	Year 1976-77			Project Number 1977-78	Year 1977-78	
				N	C	T		C	R
I.	MARINE RESOURCES DEVELOPMENT								
	A. Living Resources, Other Than Aquaculture								
	06	R/MP-1	Pathology of Marine Animals		C		R/MP-1	C	
	08	R/MP-2	Bacteria as Pathogens in the Marine Environment		C		R/MP-2	C	
	08	R/MP-3	Virology and Protective Factors		C	T			
II.	SOCIO-ECONOMIC AND LEGAL STUDIES								
	B. Ocean Law								
	15	R/L-5	Community Legal Problem Services (State and Local)		C	T			
	C. Marine Recreation								
	18	R/MR-1	Methods for Assessing Marine Recreation	N		T			
IV.	MARINE ENVIRONMENT RESEARCH								
	D. Environment Models								
	46	R/ES-1	Calibration and Field Verification of Numerical Models for Circulation and Dispersion in Biscayne Bay		C		R/ES-1	C	
V.	MARINE EDUCATION AND TRAINING								
	D. Other Education								
	70	E/L-2	Juris Doctor Specialization in Ocean and Coastal Law		C	T			
VII.	PROGRAM MANAGEMENT AND DEVELOPMENT								
	79	M/PA-1	Program Management - Administrative Functions		C		M/PA-1	C	
	81	M/PD-1	Program Development		C		M/PD-1	C	

N= New C=Continuing T=Terminated or Completed R=Restructured

APPENDIX III:
COMMUNITY ADVISORY BOARD

(As of December 31, 1976)

MR. PETER BALJET
Ludovici & Orange,
Consulting Engineers

MR. THOMAS BILHORN
Director of Development Coordination
General Development Coporation

MR. CHARLES CRUMPTON
Assistant City Manager
City of Miami

MR. CHARLES DUGAN
Proprietor
Farm Fresh Shrimp Farm (Goulds, FL)

MS. JUANITA GREENE
Editorial Board
The Miami Herald

MR. JOHN W. GREENLEAF
President
Marine Council of Greater Miami

MS. HELEN K. HALEY
Land Planner
Florida Dept. of Natural Resources

MS. MAUREEN HARWITZ
Izaak Walton League

HON. ROBERT W. McKNIGHT
State Representative

DR. RICHARD MORGAN
Director, Dade County Health Dept.

MR. COLIN MORRISSEY
Director, Dade County Department of
Environmental Resources Management

MR. DANIEL PAUL
Attorney

MR. THOMAS R. POST
Attorney
(Graduate of Ocean Law Program)

HON. JAMES REDFORD
Dade County Commissioner

HON. HARVEY RUVIN
Dade County Commissioner

MR. HARMON SHIELDS
Director
Florida Dept. of Natural Resources

MR. GARRETT SLOAN
Director,
Miami Dade Water & Sewer Authority

MR. REGINALD WALTERS
Director,
Dade County Planning Department

MS. SUSAN UHL WILSON
Commissioner
Fla. Dept. of Environmental Regulation

Ex Officio
DR. EUGENE H. MAN
Director, Sea Grant Program

APPENDIX IV

SEA GRANT ORGANIZATION

(As of December 31, 1976)

Program Managers Council:

Dr. C. Bruce Austin Department of Economics and Division of Biology and Living Resources	Marine Recreation
Prof. Dennis O'Connor, Dr. Thomas Clingan, Jr. School of Law	Ocean and Coastal Law
Dr. Bennett Sallman Chairman, Department of Microbiology	Living Resources Quality
Dr. John Wang Department of Ocean Engineering	Environmental Systems
Dr. Francis Williams Division of Biology and Living Resources, Rosenstiel School of Marine and Atmospheric Science	At Large

Dean's Advisory Council

Dr. Jerome Catz
Acting Dean, School of Engineering and Environmental Design

Dr. John Harrison
Dean, Honors and Privileged Studies and Senior Academic Dean

Dr. William Hay
Dean, Rosenstiel School of Marine and Atmospheric Science

Dr. Soia Mentschikoff
Dean, School of Law

Dr. Clarence Stuckwisch
Dean, Graduate School; Interim Dean, College of Arts and Sciences

Dr. Warren Wisby
Associate Dean, Rosenstiel School of Marine and Atmospheric Science