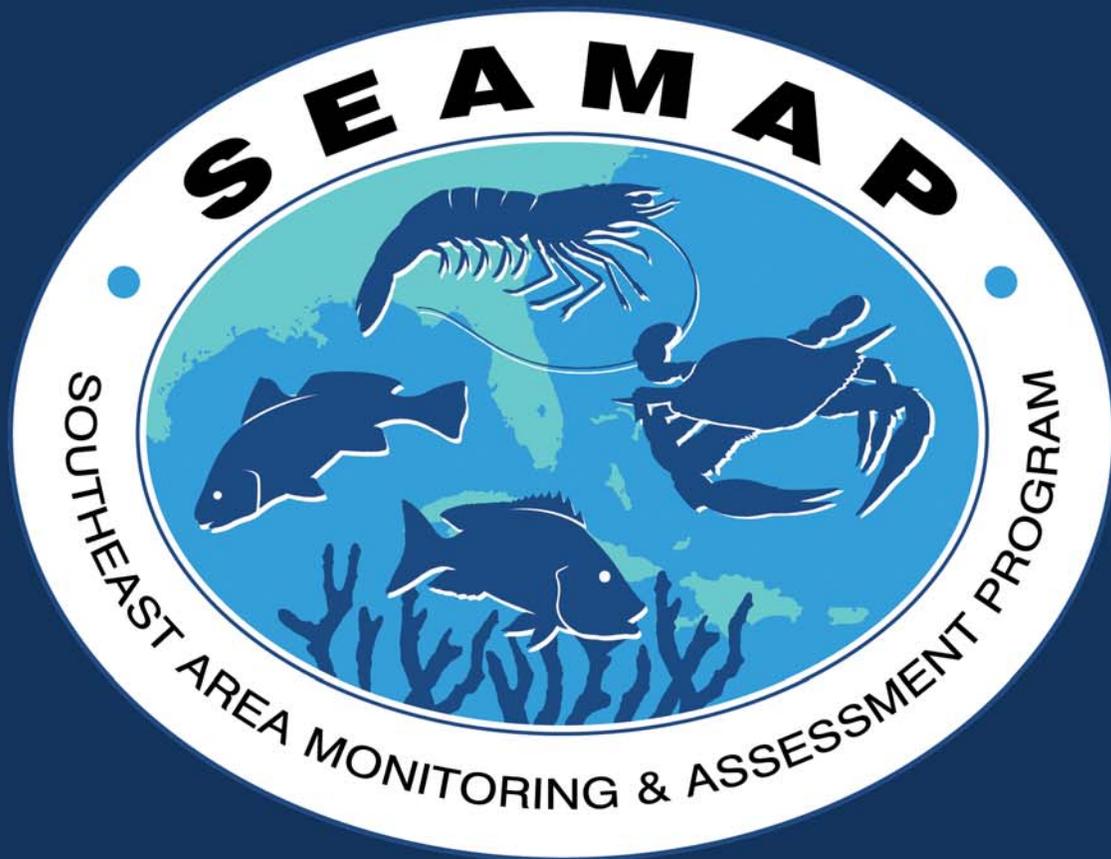


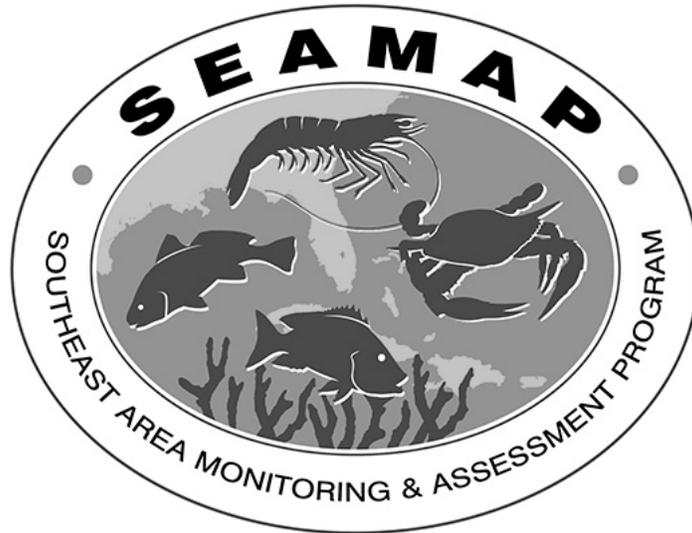
2006 - 2010 MANAGEMENT PLAN



**“COLLECTION, MANAGEMENT, AND DISSEMINATION OF
FISHERIES-INDEPENDENT DATA FROM WATERS
OF THE SOUTHEASTERN UNITED STATES”**

**CARIBBEAN, GULF OF MEXICO,
AND SOUTH ATLANTIC REGIONS**

2006 – 2010 MANAGEMENT PLAN



"COLLECTION, MANAGEMENT, AND DISSEMINATION OF FISHERIES-INDEPENDENT DATA FROM THE WATERS OF THE SOUTHEASTERN UNITED STATES"

Prepared by
Elizabeth L. Griffin and Melissa Paine,
Atlantic States Marine Fisheries Commission
South Atlantic SEAMAP Committee
Gulf of Mexico SEAMAP Committee
Caribbean SEAMAP Committee

Prepared for
Caribbean SEAMAP Committee
South Atlantic State-Federal Fisheries Management Board,
Atlantic States Marine Fisheries Commission
Technical Coordinating Committee, Gulf States Marine Fisheries Commission

Funding for preparation of this plan was provided by the U.S. Department of Commerce, NOAA, National Marine Fisheries Service under Cooperative Agreement Number NA03NMF4350061.



PREFACE

Fisheries are a vital part of the economy in coastal communities of the South Atlantic, Gulf of Mexico, and in the Caribbean. In the region in which the Southeast Area Monitoring and Assessment Program (SEAMAP) is conducted, local and visiting recreational fishermen participated in approximately 45 million fishing trips in 2005 - over 49% of all recreational fishing trips in the nation. At the same time, commercial fishermen landed 1.3 billion pounds of seafood. The fishing and tourism industries contribute significantly to the economies of the nation's coastal communities by generating employment opportunities and associated revenues. As such, these industries directly improve the quality of life and contribute to community diversity by maintaining traditional fisheries. Sustainable recreational and commercial fisheries are dependent on responsible resource management, which, in turn, needs accurate, timely data as a basis for management decisions. SEAMAP plays an integral role in providing fisheries independent data critically needed for effective fisheries management throughout the southeastern United States, including the Atlantic, Gulf of Mexico, and Caribbean regions.

As the focus of fisheries management expands from single species management to ecosystem management, the need for basic information has also increased significantly. For example, in addition to the ongoing baseline data required for effective management of recreational and commercial fisheries, improved information is needed on species interactions, critical fish habitat, and the effects of changing environmental conditions.

Long-term, fishery-independent databases provide the information essential to evaluating the status of the nation's fisheries, including population abundances, mortalities, recruitment, and ecological relationships. These fundamental parameters combined with long-term assessments and monitoring constitute the backbone of effective fisheries management. Only with this basic information can fisheries managers ascertain trends, determine potential causes of changes, and react responsibly to address these changes. Only ongoing, regional fishery-independent efforts, such as those undertaken by SEAMAP, can generate the databases critically needed by fisheries management to address these issues.

Adequate funding continues to be a challenge in fisheries science and management. The budget outlook for the next five years is of particular concern as federal and state government funding for fisheries activities will likely decrease in order to meet fiscal objectives of balanced budgets and reduced spending. The impact on our nation's capability to manage its valuable fishery resources could be significant. However, by building partnerships, the federal and state governments can combine their limited resources to address issues of common interest. In particular, cooperative programs for collecting essential fisheries data would benefit all partners, providing valuable scientific information for management at the state, federal, and regional levels.

SEAMAP is a model partnership for cooperative federal/state data collection. SEAMAP is truly collaborative; fiscal, physical, and personnel resources are shared among participants and decisions are made by consensus. The experience and success of SEAMAP over the last 24 years illustrate its effectiveness. SEAMAP has great potential to increase and improve its usefulness for fisheries management by expanding its fishery-independent data collection programs, provided additional funding is made available. We strongly support this worthwhile program and its expansion to collect more fishery-independent data for purposes of fishery management.

Jim Hanifen
Chairman
SEAMAP-Gulf

Roger Pugliese
Chairman
SEAMAP-South Atlantic

Aida Rosario
Chairman
SEAMAP-Caribbean

ACKNOWLEDGMENTS

The SEAMAP-Gulf, SEAMAP-South Atlantic, and SEAMAP-Caribbean Committees (Appendix A) would like to acknowledge contributions that helped make SEAMAP such a successful program. Many individuals from various federal, state, and academic organizations provided their expertise to SEAMAP projects by serving as members of work groups. The committee would like to thank all of the work group members for their efforts. In addition, the committees would like to thank the following: Jeff Rester, Elizabeth Griffin, and Edgardo Ojeda for their work as coordinators; Dr. Roy Crabtree and Dr. Nancy Thompson, NMFS regional administrator and regional science director respectively, for their support of SEAMAP projects, including strategic planning; and the Atlantic States Marine Fisheries Commission staff for administrative support of this project. The committees also acknowledge Scott Nichols for his efforts and support as SEAMAP's Program Manager at NMFS, and Mark McDuff for his work as SEAMAP's Data Manager. Contributing to the success of the program are many other persons who assisted with the resource surveys and projects by providing equipment and donating their time and expertise.

Fish illustrations by Diane Peebles

SEAMAP COORDINATING AGENCIES



Dr. Scott Nichols- SEAMAP Program Manager
NOAA / NMFS Mississippi Laboratory
P.O. Box 1207
Pascagoula, MS 39568-1207

Phone: (228) 762-4591
Fax: (228) 769-9200
www.nmfs.noaa.gov



SEAMAP South Atlantic Coordinator
Atlantic States Marine Fisheries Commission
1444 Eye Street, NW, 6th Floor
Washington, DC 20005

Phone: (202) 289-6400
Fax: (202) 289-6051
www.asmfc.org



SEAMAP Gulf Coordinator
Gulf States Marine Fisheries Commission
P.O. Box 726
Ocean Springs, MS 39564-0726

Phone: (228) 875-5912
Fax: (228) 875-6604
www.gsmfc.org



SEAMAP Caribbean Coordinator
University of Puerto Rico
Sea Grant College Program
UPRM P.O. Box 9011
Mayagüez, PR 00681

Phone: (787) 832-3585
Fax: (787) 265-2880
<http://seagrants.uprm.edu>

EXECUTIVE SUMMARY

The 2006-2010 Management Plan for the Southeast Area Monitoring and Assessment Program (SEAMAP) provides a statement of the current goals, management policies, procedures, and priorities for all SEAMAP components and partnerships. It also serves as a reference on SEAMAP history and accomplishments. Finally, it details priorities for future activities.

SEAMAP is a cooperative state/federal/university program for the collection, management, and dissemination of fishery-independent data and information in the southeastern United States and Caribbean. Representatives from Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Puerto Rico, the U.S. Virgin Islands, the United States Fish and Wildlife Service, and the National Marine Fisheries Service jointly plan and conduct surveys of economically important fish and shellfish species and the critical habitats that support them.

The SEAMAP mission, goals, and objectives are detailed in Chapter 1. The mission of SEAMAP is to provide an integrated and cooperative program to facilitate collection and dissemination of fishery-independent information for use by fisheries managers, government agencies, recreational and commercial fishing industries, researchers, and others to enhance knowledge of marine fisheries and their associated ecosystems.

SEAMAP is intended to maximize the effective capability of fishery-independent and associated survey activities to satisfy data and information needs of living marine resource management and research organizations in the region. The primary means of performing that task is to optimize coordination and deployment of sampling platforms used in the region to obtain regional, synoptic surveys and provide access to the collected data through documents and accessible computerized databases. Additional roles of SEAMAP are to document long and short-term needs for fishery-independent data to meet current and future critical management and research needs, and to establish compatible and consistent databases for holistic ecosystem and predictive modeling applications. SEAMAP promotes coordination among data collection, processing, management, and analysis activities emphasizing those specifically concerned with living marine resource management and habitat protection; and provides a forum for coordination of other fishery-related activities.

SEAMAP organization and management procedures and policies, fully described in Chapter 2, are structured to facilitate the implementation of the above roles. These policies and procedures include the responsibilities of each member agency, development of planning documentation, program funding, budget policies and budget priorities. The program presently consists of three operational components, SEAMAP-Gulf of Mexico, which began in 1981, SEAMAP-South Atlantic, implemented in 1983, and SEAMAP-Caribbean, formed in 1988. Within the overall program, each SEAMAP component operates independently, planning and conducting surveys specific to each geographical region. Information dissemination conforms to administrative policies and guidelines of the National Marine Fisheries Service's Southeast Regional Office. Joint coordination of the three regions is conducted annually.

Since 1982, SEAMAP has sponsored long-term standardized surveys that have become the backbone of fisheries and habitat management in the Southeast and Caribbean (Chapter 3). SEAMAP currently provides the only region-wide mechanism for monitoring the long-term status and trends of populations and habitats within the region. As a cooperative effort, SEAMAP has the potential capability to monitor the distribution and abundance of fish and other populations from North Carolina through Texas and into the Caribbean.

SEAMAP data have proven essential in management decisions, including the following:



Assessing long-term trends in coastal marine species, thus providing data for linking population trends with changes in environmental conditions such as global warming, nutrient enrichment, and overfishing (All Surveys).



Documenting and defining essential fish habitat in fishery management plans for the Gulf of Mexico, South Atlantic, and Caribbean Fishery Management Councils (All Surveys).



Long-term monitoring of juvenile red snapper abundances and providing necessary information for red snapper stock assessments and habitat requirements (Caribbean and Gulf Reef Fish Surveys, Gulf Trawl Surveys, Gulf Plankton Surveys).



Identifying and verifying the recovery of Gulf and South Atlantic king mackerel stocks, leading to increased fishing quotas (Gulf Plankton Surveys and South Atlantic Trawl Surveys).



Providing to the international community essential data demonstrating the need to discontinue longline fishing for Atlantic bluefin tuna in the Gulf of Mexico (Gulf Plankton Surveys).



Determining population size structures, abundances, and necessary information for stock assessments of Atlantic croaker, queen conch, spiny lobster, Spanish mackerel, whelk and weakfish (Caribbean and Gulf Reef Fish Surveys, Gulf and South Atlantic Trawl Surveys).



Evaluating the abundance and size distribution of penaeid shrimp in federal and state waters to assist in determining opening and closing dates for commercial fisheries (Gulf and South Atlantic Trawl Surveys).



Assessing population structure and harvest estimates within the migratory Atlantic coast striped bass stock (Cooperative Winter Tagging Survey).



Surveillance of hypoxia (dead zone) in the Gulf of Mexico that continues to threaten the marine resources of Louisiana and adjacent states (Summer Trawl Survey).



Bycatch reduction device regulations were supported by SEAMAP estimates of finfish bycatch in the shrimp fisheries of the Gulf and South Atlantic.

The SEAMAP Joint Committee has developed a list of future project activities and prioritized them in four broad categories that rebuild and expand upon existing SEAMAP data collection activities prior to implementation of any new data collection efforts (Chapter 4). Implementation of these project priorities will be dependent on the availability of additional funding. Funding provided in FY2006 for SEAMAP was \$1,363,000.

- I. **Restore current surveys to full utilization (\$2,927,700/yr):** While survey costs have steadily risen since SEAMAP's inception, SEAMAP's funding level has not. SEAMAP funding has only increased \$400,000 since its initial funding level. Virtually all SEAMAP data collection and management activities have been scaled back to compensate for rising costs. The first program priority is to recover lost sampling efforts in trawl, plankton, reef fish, and bottom mapping surveys in all three regions.
- II. **Expand data collection from current sampling platforms (\$2,880,500/yr):** Several additional data collection activities could be performed as low-cost expansions of current surveys. As fisheries management moves to age-based assessments, there is a greater need to collect age, growth, and reproductive data and expand the geographical scope of existing program trawl, plankton, lobster, conch, and bottom mapping surveys. Further, with increasing focus on ecosystem management, there is a critical need for data on nutrient loading and phytoplankton production that can be collected during existing surveys.
- III. **Initiate the development and implementation of new surveys (\$2,129,000/yr):** Additional priorities identified include fisheries independent surveys targeting plankton, harmful algae bloom monitoring, coastal sharks, adult finfish, identification / mapping of existing live bottom and other essential fish habitat, pelagic fish monitoring, and assessment mapping, harmful algae monitoring, and assessments of deepwater reef fish, including snapper and grouper stocks.

SEAMAP was originally designed to provide seasonal sampling data; however, at current funding levels, seasonal sampling is not possible. The most adverse consequence of the lack of funding is SEAMAP's reduced ability to respond to recent critical demands for data and information that only SEAMAP can provide. This is readily apparent in the recent use of SEAMAP data in assessing the impacts of liquefied natural gas (LNG) facilities on marine fishery stocks in the Gulf of Mexico. SEAMAP is the only source of data for these assessments and for some of these projects only one season's data is available. Delays in the LNG permitting

process have occurred as a result of uncertainty in the fishery assessments due to a lack of seasonal data. SEAMAP needs full funding not only to provide better data for management of nationally economically important fisheries, but also for the oil and gas industry, LNG industry, and other interests that use biological and environmental data.

Accurate population modeling and informed resource decisions are impossible without basic annual data. Data collection and distribution activities such as those performed by SEAMAP are the foundation of resource assessments and responsible fisheries management. In turn, sustainable fisheries promote a continued source of recreation and employment for coastal communities. This 2006-2010 Management Plan sets the guidelines and priorities for fisheries-independent data collection efforts that most appropriately use SEAMAP resources and address the needs of fisheries management in the Southeast and Caribbean regions.

TABLE OF CONTENTS

PREFACE.....	ii
ACKNOWLEDGMENTS	iii
SEAMAP COORDINATING AGENCIES.....	iv
EXECUTIVE SUMMARY	v
TABLE OF CONTENTS.....	ix
SEAMAP MISSION.....	1
INTRODUCTION.....	1
REGIONAL PROBLEMS.....	2
PROGRAM MISSION.....	4
GOALS AND OBJECTIVES.....	6
PROGRAM ORGANIZATION AND MANAGEMENT.....	9
PROGRAM ORGANIZATION.....	9
Program Component Structure.....	10
Program Responsibilities.....	12
PLANNING DOCUMENTATION.....	17
PROGRAM FUNDING AND BUDGET MANAGEMENT.....	18
Program Funding.....	18
Budget Policies.....	18
Budget Priorities.....	19
Budget Planning.....	20
PROGRAM REVIEW AND EVALUATION.....	21
Internal Reviews.....	21
External Reviews.....	22
SEAMAP HISTORY AND ACCOMPLISHMENTS.....	22
HISTORY.....	22
Joint Activities.....	23
SEAMAP-Gulf.....	24
SEAMAP-South Atlantic.....	26
SEAMAP-Caribbean.....	28
ACCOMPLISHMENTS.....	30
Resource Surveys.....	30
Special Studies.....	34
Workshops and Symposia.....	37
International Activities.....	38
Specimen Archiving.....	39
Data Management and Information Dissemination.....	39
APPLICATIONS OF SEAMAP DATA.....	40
SEAMAP EXTERNAL PROGRAM REVIEW.....	41
EXPANDING SEAMAP ACTIVITIES.....	43
APPENDIX A -MEMBERSHIP ON SEAMAP COMMITTEES.....	54
APPENDIX B - DOCUMENTS PRODUCED BY SEAMAP.....	55
APPENDIX C - BIBLIOGRAPHY OF PUBLICATIONS BASED UPON SEAMAP.....	

COLLECTED DATA OR SPECIMENS.....	74
APPENDIX D - PROGRAM OPERATIONS.....	91
APPENDIX E -SEAMAP DATA MANAGEMENT.....	96
APPENDIX F - SEAMAP SPECIMEN ARCHIVING.....	100
APPENDIX G - SOUTH ATLANTIC SEAMAP COMMITTEE, 2007 SOUTH ATLANTIC PROGRAM JUSTIFICATION.....	104

SEAMAP MISSION

INTRODUCTION

The Southeast Area Monitoring and Assessment Program (SEAMAP) is a cooperative state/federal program for collecting, managing, and disseminating fishery-independent data in the southeastern United States. Resulting data are used by state, federal, and interstate fisheries managers, academic researchers, and fishing industry (commercial and recreational). Long-term time series data are the foundation of SEAMAP. SEAMAP presently consists of three geographical components: SEAMAP-Gulf of Mexico, established in 1981; SEAMAP-South Atlantic, established in 1983; and SEAMAP-Caribbean, established in 1988.

SEAMAP is a successful example of state/federal partnerships in which the participants work jointly in a cost-effective manner toward common goals and objectives to obtain and utilize scientific information regarding living marine resources. Fishery management and research agencies at the state and federal levels share interest in and responsibilities for common fisheries resources, but often lack the funding to support regional surveys throughout the range of these resources. SEAMAP provides funds to involve regional member organizations in coordinating fishery-independent sampling activities, including coordinating sampling platforms and procedures. Fishery-independent data are collected from research vessels following scientifically designed long-term surveys.

Successful fisheries management relies on combining fishery-independent data with information derived from fishermen. Fishery-dependent data is defined as fishery statistics, either raw or analyzed, that are collected directly from recreational and commercial fishing activities. Fishery-dependent data may be significantly influenced by varying economic conditions, changes in marine fisheries management regulations, changes in vessel and gear designs, discard patterns, willingness of fishermen to provide accurate data, and changes in fishing strategies and practices that cannot necessarily be measured. As managers implement alternative regulatory schemes, such as seasonal quotas or individual transferable quotas, the issue of bias in the fishery-dependent data must be considered.

Fishery-independent data are not statistically influenced or biased by changes in regulations or market considerations, and provide a relative measure of abundance compared to previous years. Fishery-independent data typically provide relevant, unbiased information for conducting population assessments in conjunction with fisheries-dependent data. There is great potential for increased use of SEAMAP data in fisheries management. Specific examples of fisheries for which SEAMAP data are now being used to reach management decisions include red snapper, Atlantic bluefin tuna, king mackerel, shrimp, and Spanish mackerel in the Gulf of Mexico, Spanish mackerel, rock shrimp, and weakfish in the South Atlantic, and red hind in the Caribbean (see "Applications of SEAMAP Data" in Chapter 2).

The scope of SEAMAP encompasses marine and estuarine waters and living marine resources within the United States internal waters, territorial sea, and Exclusive Economic Zone (EEZ) in the Gulf of Mexico, South Atlantic Bight and Caribbean Sea. The scope may be expanded to include geographical areas beyond the EEZ in order to coordinate efforts with foreign governments and international bodies or commissions regarding resources of common interest. In general, the primary emphasis of SEAMAP has been on fishery stocks subject to cooperative state/federal management, as opposed to stocks exclusively under the jurisdiction of a single political entity. However, SEAMAP can address issues involving resources managed primarily by a single entity that may affect fishery resources on a regional or national level.

This five-year management plan describes the current SEAMAP, and serves as a statement of SEAMAP goals, objectives, and management policies and procedures. Directives, policies, and procedures presented in this five-year plan and subsequent annual operations plans supersede those set forth in previous SEAMAP operations plans. Also included in this plan are proposed activities (Chapter 4) that build upon the existing base program and, as such, will be dependent on the availability of additional funding.

Since its establishment, SEAMAP has developed data sets of sufficient quality and temporal scope to be particularly useful in fisheries stock assessments, for example, as indices of abundance for red snapper, king mackerel, and Spanish mackerel in the Gulf of Mexico and Spanish mackerel, king mackerel, Atlantic menhaden, and weakfish in the South Atlantic. SEAMAP data have also been used in the development of fishery management plans and essential fish habitat amendments. Examples include providing data on the distribution of coral in order to protect it from rock shrimp trawling in the South Atlantic, and consolidating bottom mapping data which is now used by the South Atlantic Fishery Management Council to define essential fish habitat. The time-series and quality of fishery-independent data now available to fisheries managers and others interested in marine resources can be attributed to the success of the state/federal partnerships supported by SEAMAP. It is important to note that in addition to collecting marine fisheries data, SEAMAP collects vital environmental data, including physical, biological, geological, and chemical oceanographic information. Furthermore, SEAMAP provides sampling opportunities and educational experiences for researchers and students of various disciplines by allowing them to take part in SEAMAP cruises to collect samples for their own analyses. Thus, SEAMAP serves as a catalyst, bringing together available scientific resources and fishery-independent information within a region for use by fisheries managers, scientists, and others interested in our coastal marine fisheries.

REGIONAL PROBLEMS

Fishery management in the Southeast region is very complex. Regional management must ensure conservation while balancing resource allocations among more than 20 major commercial fisheries, between commercial users and recreational fishing groups, and while considering the views of environmental groups that have become a potent force in the debates. Effective

regulatory decision-making requires good information--preferably a long time-series of biological and environmental information to evaluate fluctuations in resource abundance and distribution. Development of such databases and the analytical skill needed to use them requires an integrated, coordinated, and cooperative approach by the entire fisheries management community. In addition, such databases will provide information necessary for considering the fisheries in the context of their respective ecosystems. SEAMAP was conceived to provide much of the necessary information on abundance trends, distribution, and environmental changes.

Southeast fishery resources support valuable commercial and recreational fishing industries. In 2005, commercial fishermen in the SEAMAP region landed 1.3 billion pounds of seafood, with an estimated ex-vessel value of \$742 million dollars¹.

Recreational fishing is a growing industry in the SEAMAP region, where over 11.6 million U.S. recreational fishermen took over 45 million fishing trips in 2005². Overall, recreational fishing in the SEAMAP region accounted for 49% of the total U.S. marine recreational fishing catch³.

Along with the tremendous yield in fisheries resources from this region comes a host of problems for fisheries managers. Some stem directly from the fishing industry, such as resource depletion and user group conflicts. Complicating fisheries management in the Southeast are issues of bycatch and interactions between fisheries and protected species, including five species of sea turtles that are listed for protection under the Endangered Species Act and several marine mammals protected under the Marine Mammal Protection Act. The recovery of stocks can be impeded through their bycatch in other fisheries. Problems have arisen from other sources as well, including habitat loss and degradation, water pollution, and insufficient biological and ecological information on trophic dynamics and species interactions. Fisheries managers throughout the Southeast region, as well as in all other coastal regions, are challenged to deal with these issues, while avoiding unnecessary restrictions on commercial and recreational fishermen.

Issues that have arisen as a result of fishing industry activities have also affected the entire Southeast region. Recreational and commercial user conflicts have occurred in fisheries for coastal pelagics, reef fish, seatrout, drums, and flounders. In addition, conflicts have arisen among commercial fishermen using different gear types, such as trawls, longlines, and traps. Many fish stocks targeted by fishermen have shown indications of overfishing. In the Caribbean, the conch, spiny lobster, and reef fish stocks are depressed and average reef fish sizes have declined. In the South Atlantic, growth overfishing has occurred for many stocks and SEAMAP data has tracked the status of weakfish and summer flounder resources. Many reef fish, red drum, and mackerel stocks in the Gulf of Mexico are in the process of recovery from previously overfished conditions. Oceanic stocks have also shown the effects of intense fishing pressure in

¹ Based on NMFS 2005 landings data.

² Based on MRFSS data.

³ *Fisheries of the United States, 2005*. 2006. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Washington, DC.

declining catch-per-unit-effort (CPUE) of swordfish and declining bluefin tuna spawning stock. Fishing pressure for yellowfin and bigeye tuna and other oceanic pelagics has continued to grow. The fishery for coastal sharks poses specific concern for managers in all areas because of their low reproductive rate and the limited biological data available for most species.

Bycatch of non-target species has occurred in a number of different fisheries throughout the region. The most publicized problems are the catch of threatened and endangered sea turtle species by shrimp trawlers, which sparked the development and implementation of federal regulations requiring the use of turtle excluder devices. Other bycatch problems include the incidental catch of billfish and turtles in longline fisheries, and the finfish bycatch in the Gulf and South Atlantic trawl fisheries. Of particular concern are the overfished red snapper stocks in the Gulf of Mexico where recovery to conservation standards established by the Gulf of Mexico Fishery Management Council (GMFMC) will not occur unless bycatch from the shrimp fishery is significantly reduced. Shrimp trawls in federal waters of the Gulf of Mexico and the South Atlantic are now required to contain bycatch reduction devices to decrease the incidental catch of finfish.

The primary habitat issue for this region is the loss and degradation of inshore and nearshore areas, including seagrass meadows, marshes, mangroves, shallow water bays, and reefs. The increasing loss of coastal marshes is predicted to result in major fishery declines, particularly impacting valuable commercial and recreational fisheries because many fish are dependent on adequate inshore habitat during the critical nursery period in their life cycle. Inshore and nearshore habitat degradation is caused by alteration of freshwater inflow, influx of nutrient-laden river water leading to eutrophication, hypoxia, toxic contamination of wetlands, and human development activities. Environmentally induced fish diseases and fish kills have been recorded in the Gulf and South Atlantic regions. For example, severe decreases in oyster and hard clam harvests have been attributed to pollution, disease, salinity changes, and habitat losses.

PROGRAM MISSION

SEAMAP itself is not a research program. The mission of SEAMAP is to provide an integrated and cooperative program to facilitate collection and dissemination of fishery-independent information for use by government agencies, the fishing industry (commercial and recreational), researchers, and others to enhance knowledge of marine fisheries and their associated ecosystems. It is the *fishery-independent* collection of data that distinguishes SEAMAP. In the context of SEAMAP, fishery-independent data are defined as those data that are obtained without direct reliance on activities of commercial or recreational fishing activities. Data may be taken from such non-industry activities as trawl surveys for bottom-fish and aircraft surveys for schooling fish.

SEAMAP does not propose to change the basic pattern of regional fisheries monitoring activities but maintains that coordination of survey activities will yield non-duplicative data that can be

incorporated into a region-wide, fishery-independent database. Tracking and coordinating these activities will identify additional areas where fishery-independent assessment activities are required to provide a complete, systematic database for southeastern resources. Specific purposes of SEAMAP are to:

- Maximize the effective capability of fishery-independent and associated survey activities to satisfy data and information needs of living marine resource management and research organizations in the region;
- Optimize coordination and deployment of sampling platforms used in the region, including submersibles, research and charter vessels, aircraft, and satellites in an effort to obtain regional, synoptic surveys;
- Maximize the usefulness of fishery-independent and associated survey data through documented sampling and data collection activities and through documented and accessible computerized databases;
- Document long and short-term needs for fishery-independent data to meet current and future critical management and research needs, and to establish compatible and consistent databases for holistic ecosystem and predictive modeling applications;
- Promote coordination among data collection, processing, management, and analysis activities emphasizing those specifically concerned with living marine resource management and habitat protection;
- Oversee quality control and error tracking of submitted data; and
- Provide a forum for coordination of other fishery-related activities.

The overall approach of SEAMAP emphasizes the collection of fishery-independent data to fill specific short and long-term management needs. Data are entered, stored and disseminated by maintenance of a regional, multipurpose database accessible to all participating management agencies. The SEAMAP database provides information for managers and scientists to monitor and assess the condition of species or species groups subject to state, interstate, federal, and international management programs. Environmental parameters and community structure are monitored in order to provide insight concerning the dynamics of Southeast area living marine resources. Data collection and management procedures are coordinated among participants in order to enhance the usefulness of the data, minimize costs, and increase the accessibility of information to fishery managers, administrators, and researchers. SEAMAP builds on current activities to develop optimum resource sampling and assessment capabilities.

Gathering and disseminating information are long-term goals of SEAMAP. Fisheries management is a dynamic function having a continuing requirement for current data. Moreover, as data are accumulated, their value and utility increase for assessing fish stocks. Long-term data

are needed to describe and explain population trends and responses to fishing activities, environmental factors, and regulatory programs. Also, predictive capabilities for stock abundance, recruitment, and yield require long-term time series of data.

No single fishery management agency has the resources to meet the objectives of existing state, interstate, and federal fishery management plans currently in place, nor those planned for the future. However in the Southeast region SEAMAP, designed to take advantage of an integrated approach to fishery-independent data collection, can fulfill priority data needs identified by managers for developing fishery management plans. For example, relatively few gear types and sampling designs are typically needed to obtain desired data because more than one species group can be sampled by one type of gear or by one sampling cruise. Bottom trawling yields data not only on shrimp, but also on juvenile mackerels, crustaceans, and bottom feeders such as croaker, spot, seatrout, and flounder. Many other species living in the same habitats will also be sampled. Additionally, some plankton and environmental surveys can be conducted in conjunction with bottom trawl or other surveys by deploying plankton nets and hydrographic gear from the trawling vessels, providing valuable data on early life history stages, environmental factors affecting species abundance and distribution, as well as other vital parameters.

GOALS AND OBJECTIVES

Goal 1. *Collect long-term, standardized, fishery-independent data consistent with established fisheries data systems on the condition of regional living marine resources and their environment.*

Objectives:

- Conduct routine surveys and special studies, as needed, of regional resources and their environments: estuarine, shelf, oceanic, and reef.
- Develop and evaluate sampling systems and procedures needed for SEAMAP surveys and special studies.
- Standardize and calibrate sampling systems and procedures used in SEAMAP surveys and special studies.
- Obtain biological specimens, samples of their habitat, and associated environmental data.
- Obtain data, such as remotely-sensed temperatures, from other agencies and organizations in order to plan and conduct SEAMAP activities.
- Develop partnerships with governmental and non-governmental

organizations to improve acquisition of fisheries-independent and associated ecological data for the Southeast region.

Goal 2: *Cooperatively plan and evaluate SEAMAP-sponsored activities.*

Objectives:

- Develop an annual operations plan for each SEAMAP component (Gulf, South Atlantic, Caribbean) consistent with budget and operational constraints.

- Develop an annual budget allocation plan that considers program needs, annual operations plans, and participant capabilities.

- Conduct annual internal reviews of program activities.

- Conduct periodic coordinated external reviews of specific management, administrative, and technical elements of the program.

- Sponsor individual and joint meetings of the SEAMAP components to cooperatively plan and evaluate activities.

- Sponsor special workshops and symposia to help evaluate or plan sampling strategies, design, or methods.

- Cooperatively plan activities with representatives of foreign governments.

- Establish working groups, as needed, in each component under the auspices of the SEAMAP committees with appropriate expertise to assist in planning and evaluating SEAMAP activities.

Goal 3: *Operate the SEAMAP Data Management System for efficient management and timely dissemination of fishery-independent data and information.*

Objectives:

- Design, implement, upgrade, and maintain a SEAMAP data management support system that can be used to assess and monitor selected living marine resources and associated environmental and habitat factors.

- Establish data handling and processing protocols for all SEAMAP data.

- Compile and maintain a computerized directory of SEAMAP monitoring activities, including data summaries and inventories by gear, species,

species-group, and geographic areas.

- Archive SEAMAP biological specimens and samples.
- Coordinate and integrate, when feasible, the SEAMAP data management support system with non-SEAMAP databases.

Goal 4: *Identify and describe existing non-SEAMAP databases and activities that are of value in fishery-independent assessments of regional living marine resources.*

Objective:

- Provide information to SEAMAP participants and other appropriate organizations.

Goal 5: *Coordinate and document SEAMAP activities, and disseminate programmatic information.*

Objectives:

- Coordinate SEAMAP administrative functions, information dissemination, the SEAMAP Data Management System, archiving centers, and data collection by SEAMAP participants.
- Document joint SEAMAP activities, the activities of each SEAMAP component, and planned SEAMAP activities.
- Inform fisheries research and management agencies, the fishing industry, and the general public of SEAMAP activities by the preparation and dissemination of newsletters, annual reports, annual operations plans, and/or other means.
- Publish information and distribute SEAMAP-collected data on living marine resources and their environments.
- Develop partnerships with governmental and non-governmental organizations to improve dissemination and utilization of SEAMAP fisheries-independent and ecological data.

PROGRAM ORGANIZATION AND MANAGEMENT

PROGRAM ORGANIZATION

The geographical components of SEAMAP – Gulf, South Atlantic, and Caribbean – operate independently, but possess functionally similar systems. All components include systems consisting of two basic elements: program operations and program management. These elements are briefly summarized as follows (see Appendix D for more detailed information about program operations and see Appendix E or more detailed information about data management):

Operations

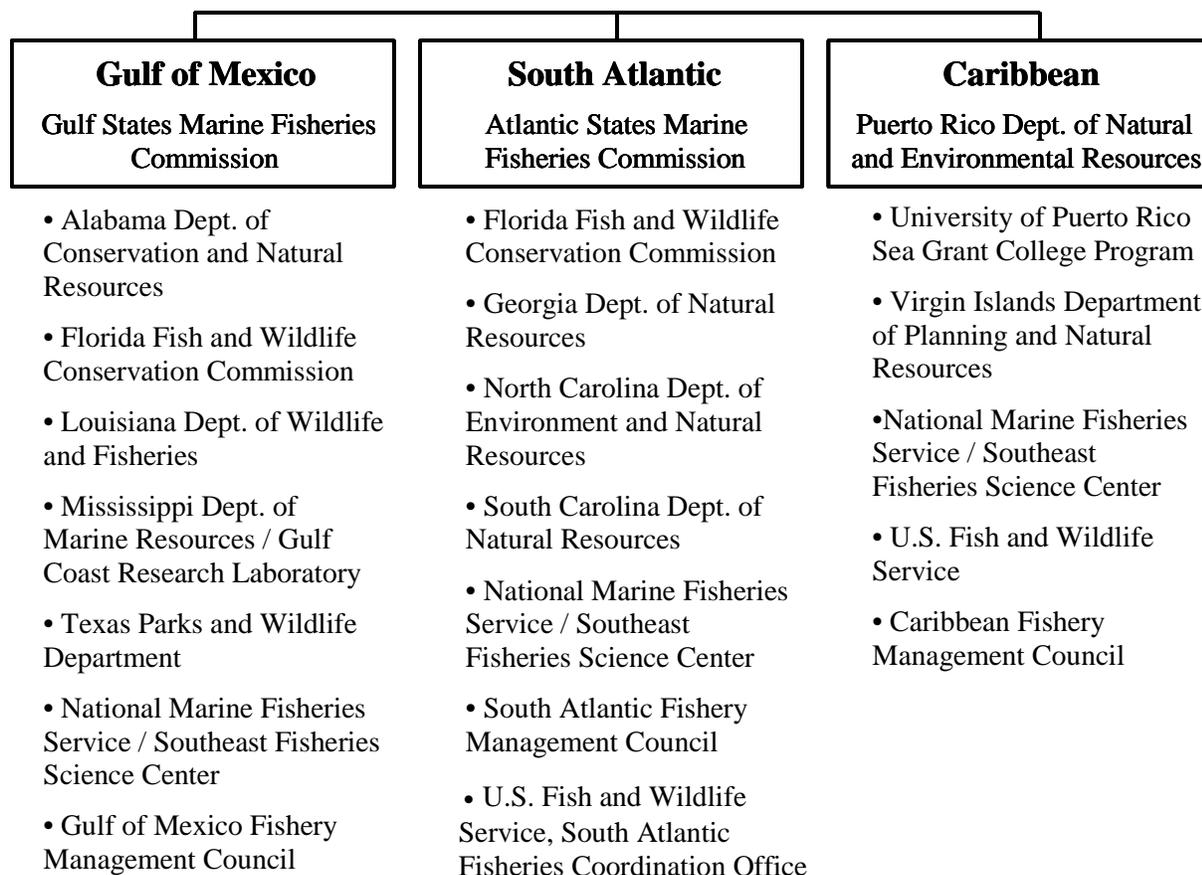
- Resource surveys;
- Sampling gear assessment and standardization;
- Data management;
- Dissemination of SEAMAP derived information;
- Survey methodology workshops.

Management

- Program and operations planning and administration;
- Program evaluation.

The activities for each element are performed by the structural bodies of each component, which are also similar in organization.

SEAMAP Organization



Program Component Structure

SEAMAP-Gulf

SEAMAP-Gulf is administered by the SEAMAP Subcommittee (hereafter referred to as the "committee") of the Gulf States Marine Fisheries Commission's Technical Coordinating Committee (GSMFC-TCC). The committee membership consists of one representative from each of the five participating Gulf states and representatives from the GMFMC and the NMFS Southeast Fisheries Science Center (SEFSC). Committee approved plans, evaluations, and budget requirements are submitted to the TCC for approval. Daily operations of the program are administered by the SEAMAP-Gulf coordinator under the direction of the committee chairman. Administrative supervision of the coordinator is performed by the GSMFC Executive Director, with authority to recruit, employ, and discharge the coordinator, in concurrence with the SEAMAP committee. The coordinator is an employee of GSMFC, funded by SEAMAP, and is employed on a yearly basis, subject to review by the committee, committee chairman, and executive director.

In addition to the standing management agency (GSMFC), management body (TCC), and committee, work groups are established by the committee as needed to address specific issues. Work groups are not standing committees, but are formed to accomplish specific objectives and are disbanded upon completion. The plankton, shrimp/groundfish, environmental data, data coordinating, reef fish, red drum, and adult finfish work groups are all currently functioning in the Gulf component.

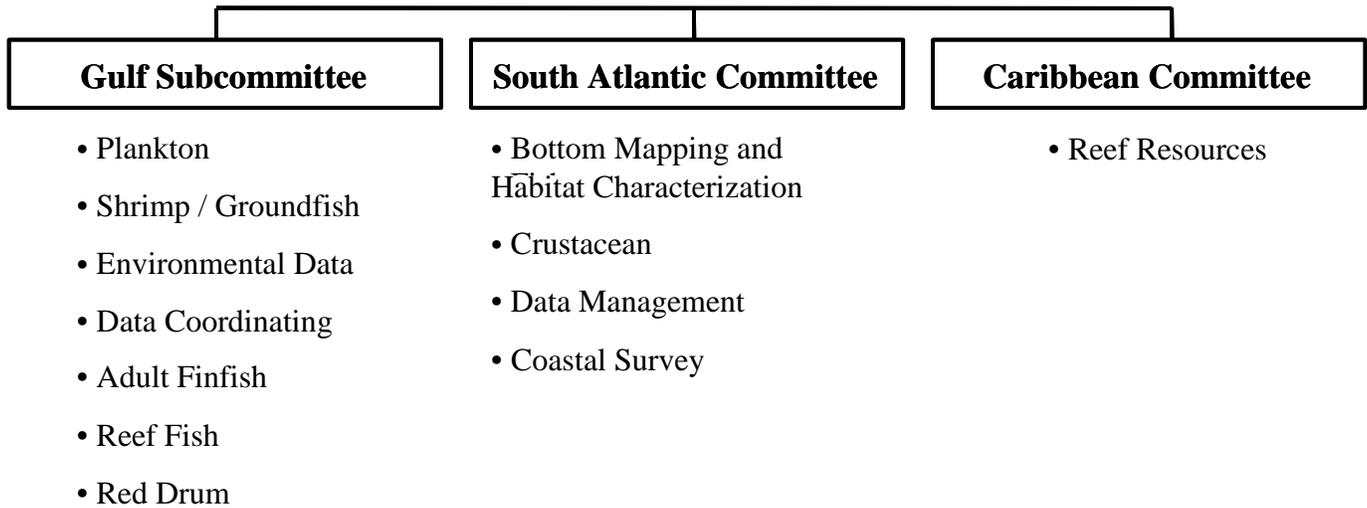
SEAMAP-South Atlantic

SEAMAP-South Atlantic is one of several cooperative state-federal programs under the aegis of the Atlantic States Marine Fisheries Commission's (ASMFC) Science Program. Within the ASMFC, policy and fiscal matters for SEAMAP-South Atlantic are approved by the South Atlantic State-Federal Fisheries Management Board (SAB), an executive group composed of South Atlantic states' marine fishery management agency directors, and representatives of the NMFS regional director and the regional director of the U.S. Fish and Wildlife Service. The SEAMAP-South Atlantic Committee (hereafter referred to as the "committee") is the technical committee responsible for budget preparation and plan preparation and implementation. The committee consists of one representative from each participating South Atlantic state (NC-FL), the South Atlantic Fishery Management Council, ASMFC, and NMFS/SEFSC. Routine operations are administered by the SEAMAP-South Atlantic coordinator, an employee of the ASMFC, funded wholly or in part by SEAMAP. The SEAMAP-South Atlantic coordinator receives assistance from the ASMFC office and technical guidance from the committee. Work groups may be established in addition to the standing management agency (ASMFC), management body (SAB), and committee (SEAMAP-South Atlantic Committee). Current work groups established by the committee include the data management work group, coastal survey work group, bottom mapping and fish habitat characterization work group, and crustacean work group.

SEAMAP-Caribbean

SEAMAP-Caribbean is administered currently by the University of Puerto Rico Sea Grant College Program (UPRSGCP). Because of the obvious differences in political entities, the SEAMAP Caribbean Committee membership differs from that of the other SEAMAP components and consists of one member each from the Commonwealth of Puerto Rico Department of Natural and Environmental Resources, U.S. Virgin Islands Department of Planning and Natural Resources, Puerto Rico Sea Grant College Program, U.S. Fish and Wildlife Service, NMFS-SEFSC, and the Caribbean Fishery Management Council. The SEAMAP-Caribbean coordinator is an employee of the UPRSGCP funded in part by SEAMAP. The coordinator receives administrative support from the UPRSGCP and technical guidance from the committee. Work groups may be established in addition to the committee. Currently, the Reef Resources Work Group coordinates the sampling strategies of reef fish, spiny lobster, queen conch, whelk, habitat assessment and bottom mapping.

Current SEAMAP Work Groups



Program Responsibilities

Management Agency Responsibilities

Administrative services are provided for each component by the GSMFC for the Gulf component, ASMFC for the South Atlantic component, and the UPRSGCP for the Caribbean component through their respective SEAMAP coordinator.

Administrative services rendered by each management agency include:

- Provide budget information to the SEAMAP committee;
- Coordinate SEAMAP meetings;
- Coordinate and schedule workshops;
- Administer funds associated with SEAMAP activities;
- Administer guidance of the coordinators;
- Supervise clerical personnel;
- Affirm committee representatives;
- Annually evaluate management personnel and facilities; and
- Review annual report.

Management Body Responsibilities

Each SEAMAP component is sponsored by its respective management body, namely the TCC for the Gulf component, the SAB for the South Atlantic component, and the UPRSGCP for the Caribbean component. The management bodies for the Gulf and South Atlantic report to the GSMFC and ASMFC, respectively. The UPRSGCP acts as its own management body and management agency. Administrative and planning responsibilities of the management bodies include:

- Provide an ex-officio member to the respective committee;
- Review and approve component operations plans;
- Review annual report;
- Accept or reject actions recommended by an external or internal program review;
- Review and approve committee approved plans, evaluations, and budget requirements;
- Approve special surveys;
- Provide program policy; and
- Coordinate program and management agency directives.

Committee Organization and Responsibilities

Each program component is managed by their respective SEAMAP committee (SEAMAP-Gulf Subcommittee, SEAMAP-South Atlantic Committee, SEAMAP-Caribbean Committee). Committee membership is determined by the respective management agency, with voting rights determined by that management agency. Obligatory committee members and designated alternates to the committees are selected by participant organizations and affirmed in accordance with procedures of the management agency. A committee member may designate a proxy to serve at a given SEAMAP meeting, in accordance with the guidelines set forth by the committee member's organization. Additionally, an authorized representative from the management body to each committee may serve as an ex-officio member of that committee.

The committee chair and vice-chair are elected annually by the Gulf and Caribbean SEAMAP committees, and may serve an unlimited number of one-year terms. For the South Atlantic SEAMAP committee, the chair and vice-chair both serve two-year terms; at the end of their terms, the vice-chair then accedes to the chair position and a new vice-chair is elected. Each committee meets as necessary to accomplish stated goals and objectives. Meetings of the committees are open to all interested persons except during discussions of personnel matters and other actions legally conducted at closed sessions, in accordance with statutes and regulations of the various program participants. Decisions of the committee may be made by either consensus

or by a majority of the voting committee quorum. Recorded votes will be taken upon request of one voting member. Minutes must be prepared for each committee meeting.

At least annually, the three committees meet jointly. The presiding chair is one of the committee chairs and rotates each year as determined by the collective committee chairs. Joint committee decisions will usually be made by consensus; however, important issues will be determined by vote when requested. In such instances, each program will be assigned a single vote, for a total of three. During joint committee meetings, one of the coordinators will be selected by the chair to prepare minutes.

SEAMAP committees are responsible for program management and take the leading role in program planning. The general responsibilities of each SEAMAP Committee include:

- Determine regional fishery-independent data needs that can be met by SEAMAP activities;
- Plan activities to meet identified data needs;
- Coordinate official survey activities in a fashion that will permit collection of the most useful data in the most cost-effective manner;
- Provide technical guidance to the coordinators, data managers, and curators;
- Determine program budgets;
- Establish work groups with specific areas of expertise to assist in the development and evaluation of survey activities;
- Develop and maintain a data management system;
- Support of an archiving system to process and store SEAMAP specimen collections;
- Sponsor workshops and other activities that will generate information needed to improve program operations;
- Develop information dissemination plans;
- Approve special travel and activity requests;
- Develop short term (operations) and long term (management) plans;
- Identify funding needs for SEAMAP operations;
- Define evaluation and review policies and procedures;

- Recommend actions to correct problems that may jeopardize reliability of survey data bases; and
- Submit annual report to the respective oversight body, summarizing SEAMAP activities, accomplishments, needs, and plans.

Coordinator Responsibilities

Coordinators are also responsible for program administration and planning in accordance with committee guidance. General coordinator responsibilities include:

- Work closely with the committee chair in all aspects of program coordination, administration, and operation;
- Implement plans and program directives developed by the committee and approved by the management body;
- Coordinate committee meetings and recommend appropriate agendas;
- Serve as information liaison between the committee and the oversight agency, participants, and organizations interested in SEAMAP activities;
- Submit preliminary administrative budget recommendations and assist the committee with preparation of the budget;
- Prepare or supervise preparation of selected SEAMAP publications;
- Distribute approved SEAMAP information in accordance with committee policies and procedures;
- Assist in representing the program to the community through public educational activities;
- Assist in the identification of regional needs that can be satisfied by SEAMAP activities;
- Maintain a file of all reports and publications which relied on SEAMAP data or SEAMAP specimens, and provide an annual listing to the committee; and
- Prepare the annual report to the oversight body.

Work Group Organization and Responsibilities

Work groups are established by a committee to address specific issues or accomplish specific objectives. Directives to a work group may include:

- Plan approved surveys;
- Evaluate surveys;
- Generate an appropriate sampling design;
- Develop a data format compatible with the SEAMAP Data Management System;
- Estimate costs and related needs associated with SEAMAP activities in accordance with a specific schedule;
- Develop a schedule for processing collected data and samples and recommending persons or agencies that will be responsible for accomplishing this work.

Members of work groups are appointed by the respective committee and are generally not members of that committee. Work group members may be drawn from universities, state and federal marine resource agencies, and the fishing industry in order to obtain the best scientific advice. Work group leaders may be elected by the work group or appointed by the committee at the committee's discretion. When elected, work group leaders are subject to approval by the committee. Work group leaders are responsible for preparing a written report to the respective committee after each work group meeting. Upon the completion of specific tasks assigned to the work group by its appointing committee, the work group may be disbanded by the committee or, depending upon the objectives assigned to the work group, may exist indefinitely.

NMFS/SEFSC Program Management and Responsibilities

Employees of NMFS are appointed as program manager by the SEFSC Director and program officer by the Southeast Regional Administrator. These positions were created to ensure program compliance with SEFSC/NMFS/NOAA/DOC (Department of Commerce) rules, regulations, and policies. The program manager has overall authority and responsibility for the program, including allocation of funds among participants, and ensuring that goals, objectives, and activities are appropriate to the program mission.

The program officer is responsible for insuring proper program documentation by the respective components, especially cooperative agreements and cooperative agreement amendments. These documents must be complete, accurate, and submitted on time in order to insure timely processing and distribution of funds. The program officer also ensures that participants are in compliance with their cooperative agreements, and assists in communication among program components, and, when necessary, the DOC grants administration offices.

Cooperators and Other Interested Parties

Cooperators and other interested parties are not member organizations of SEAMAP, although their input to the program is essential to the cooperative approach of the program. Cooperators include persons or organizations actively involved in SEAMAP operations, such as work group members or researchers collecting data for SEAMAP. For example, Sea Grant organizations are

included in the SEAMAP Gulf and South Atlantic components of the program as cooperators. In the Caribbean component, Sea Grant is a full participating member of the program. As cooperators, Sea Grant's participation in the program is voluntary. Sea Grant organizations are invited to participate in all SEAMAP committee meetings as non-voting participants. Their technical, management, and administrative advice and assistance are often sought, especially in forming work groups, evaluating program performance, organizing workshops and symposia, and disseminating information from and about the program. Sea Grant is generally perceived as representing all universities within a region.

Universities also serve as a major source of technical expertise for work groups. As cooperators, university investigators are often invited to officially participate in functions of SEAMAP, such as committee and work group meetings, with their travel costs paid by SEAMAP.

PLANNING DOCUMENTATION

Three levels of planning documents are used in SEAMAP: the five-year plan, annual operations plans, and cooperative agreements. This five-year plan serves as the basis for program coordination among the Gulf, South Atlantic and Caribbean components. It provides a set of goals and objectives for all components, along with an outline of policies and procedures for program management. This plan is revised every five years to assure current relevance to all aspects of SEAMAP.

Details of activities developed by each component to meet annual objectives for their region are given in the annual operations plan of each component. These plans are prepared by each committee to specify survey objectives and activities for the upcoming year, guide development of cooperative agreements, guide the operations of work groups, and provide an initial basis for budget allocations. These plans are brief (4-5 pages) and are completed in draft form before the joint summer program meeting. Cooperative agreements serve two purposes: they provide the basic legal document which is used by NOAA to transfer funds, and they provide the detailed annual operating and budget plan for each SEAMAP participant, with the exception of NMFS and other federal agencies. Annual detailed NMFS plans are included in each of the cooperative agreements prepared by the other participants. If SEAMAP funds are transferred to another federal agency, such as in the Caribbean component, the transfer is done through a memorandum of understanding which details that agency's activities under SEAMAP.

PROGRAM FUNDING AND BUDGET MANAGEMENT

Program Funding

Funding for SEAMAP activities depends on congressional and state legislative allocations, with the largest share funded through NMFS. Federal funds provided through SEAMAP are used primarily to fund or expand existing state and federal survey programs. For the first three operational years (FY 1982-1984), SEAMAP received no federal programmatic funding. For these years, programmatic activities were supported through existing state and federal resources. Dedicated federal programmatic funding for SEAMAP began in FY 1985 at approximately \$1.0 million and continued at that level through 1991. In FY 1992, funding was increased to \$1.4 million and decreased to \$1.37 million, \$1.32 million, and \$1.34 million in FY 1993, 1994, and 1995 respectively. SEAMAP funding decreased again in FY 1996 to \$1.2 million, and was funded at that level through FY 2000. During FY 2001, the SEAMAP budget was increased to a total of \$1.4 million and remained at that level in 2002 and 2003. The budget increased again in 2004 to \$1.75 million but then was reduced to 1.67 million by rescission. The FY 2005 budget was reduced back to \$1.385 million dollars.

SEAMAP is conducted as a zero-based budget program. Federal funds are allocated annually to each geographic program component in accordance with approved annual operations plans and non-federal participants contribute various amounts of support for SEAMAP activities such as salaries and equipment. Allocations of federal funds to participants are made to maximize participation and operating efficiencies. Internal state and federal budget allocations for specific surveys and survey-related functions may vary significantly among participants and fiscal years. Thus, the individual state or federal share of the SEAMAP appropriation also may vary significantly from year to year, depending on budget needs to meet program objectives.

Budget Policies

Federal SEAMAP funds are allocated, administered, and monitored in accordance with DOC, NOAA, and NMFS Southeast Region policies, directives, and guidelines. The program manager, as designee of the NMFS SEFSC Director, has approval authority for allocation of SEAMAP funds provided by NMFS. The program officer, as designee of the Southeast Regional Administrator, has administrative oversight responsibility for SEAMAP funds allocated to the states, commissions, councils, and others through cooperative agreements and contracts.

Every effort is made to ensure full and efficient utilization of SEAMAP funds. If for any reason allocated funds are determined to be in excess of the planned needs of a participant, the participant will immediately notify the program officer and manager of the projected excess. An attempt will be made to reallocate the excess funds to satisfy other program needs. SEAMAP may accept supplemental and reimbursable funds for specific activities and functions.

Administration of these funds can be arranged through a number of mechanisms, such as contracts or cooperative agreements with NMFS, the interstate commissions, or the states.

The cost of all program support activities will be minimized. The committees will continually review the need for and funding of support functions. Authorized travel on programmatic funds shall be defined by each committee. Out-of-state and foreign SEAMAP travel to other than approved SEAMAP functions (committee and work group meetings) must be approved in advance by the affected committee. However, for SEAMAP-SA, travel is authorized in advance by the ASMFC. SEAMAP meeting, workshop, and symposia locations will be selected to minimize meeting and travel expenses.

Budget Priorities

SEAMAP funds may be used for surveys, including vessel and aircraft operations and charters, gear, supplies, personnel, and travel; coordinator salaries; administrative support: staff, facilities, equipment, and supplies; communications; specimen archiving (including personnel, equipment, facilities, and supplies); publications; travel; meetings (committees, work groups, workshops, and symposia); survey-related analyses; data management (hardware, software, operations, and personnel); program reviews; and other purposes designated by the committees and program manager.

SEAMAP budget priorities are as follows:

- (1) Long-term fishery-independent surveys;
- (2) Data management;
- (3) Coordination (coordinator salaries, meeting costs and coordination, and administration);
- (4) Calibration trials;
- (5) Sorted plankton archives;
- (6) Special surveys;
- (7) Unsorted plankton archives; and
- (8) Workshops, symposia, and special meetings.

Budget priorities 1-3 are considered by the committee to be essential for maintaining the integrity of the program. Priorities 4-8 are determined on a case-by-case basis in the context of each component's activities, SEAMAP's goals and objectives, and available funding.

Budget Planning

Budget planning is conducted in open meetings. The following annual procedure has been developed jointly by all three SEAMAP components:

- (1) Draft annual operations plans for the next year will be developed by each committee in the late spring or early summer. These plans provide the initial basis for subsequent budget allocations.
- (2) Based on best available information, the program manager will provide a preliminary target budget for the program in mid-summer.
- (3) The program manager will meet with the chairpersons and coordinators from each program component collectively to develop preliminary budget targets for each program component.
- (4) A late summer joint SEAMAP meeting will be held soon after the meeting defined in step 3 to present budget needs and plans, to negotiate component budgets (based on the preliminary targets), and to arrive at a recommended budget allocation plan for the total program. This plan will include a budget breakdown by participant.
- (5) If agreement cannot be achieved during any step in the budget planning process, the program manager will develop a recommended budget allocation plan. Each program participant will use this recommended budget plan for subsequent planning until either a new plan is negotiated, or the program manager's plan is overruled by the Southeast Fisheries Science Center Director.
- (6) Individual component operations plans will be revised in accordance with the budget plan and submitted to the respective management body for review and approval.
- (7) Individual cooperative agreements will be developed based on the budget allocation plan and appropriate operations plan for submission to the program officer. These agreements normally will be submitted on or about the start of the new federal fiscal year.
- (8) If the budget allocation plan has to be changed for any reason (such as due to a change in the appropriated amount or in the amount made available to SEAMAP by NMFS), the program manager will immediately notify the committees and work with the committees in developing a modified allocation plan.

With the exception of NMFS, budget allocations to SEAMAP participants normally are made through individual cooperative agreements. This method, however, does not explicitly exclude the use of contracts by NMFS when cost effective and appropriate.

PROGRAM REVIEW AND EVALUATION

Program reviews and evaluations will be conducted to determine program effectiveness in meeting defined objectives and to improve data collection and standardization, data management (including specimen archives), and information dissemination. Program reviews may be classified into two categories, internal and external. Internal reviews serve as more of a summary of activities and are performed by one or more of the structural components of SEAMAP. External reviews can be designed to either evaluate the functional or technical aspects of SEAMAP.

Internal Reviews

An annual review of each programmatic element, including administration, expenditures, survey operations, data management, and information dissemination will be conducted primarily through internal procedures. This review will be included in the annual report of program administration, data management, and information dissemination prepared by the coordinators in accordance with approved policies and procedures. The report will be submitted to the appropriate committee and management body for review. Responsibility for the reviews resides with the committee. Portions of the review may be delegated to the coordinators, work groups, data manager and curators.

Reviews directed at administration will be done primarily by the coordinators, working closely with the appropriate management body officials and committee. Separate reviews shall be done for each program component. Elements to be reviewed include: facilities and staff, reports and publications, budget planning, and work groups.

Reviews directed at operations will be done at least annually by appropriate work groups, SEAMAP data manager, curators, and coordinators, depending upon the needs of the committees. Reviews will cover surveys, data management, and specimen archiving. Reviews will be documented and provided to the appropriate committee for evaluation. These reviews must be approved by the appropriate committee before being incorporated into SEAMAP reports.

Individual project administrative and program reviews will be done by the program officer based on reports submitted to NMFS under terms of the cooperative agreements and contracts. These reviews will be coordinated with the program manager. Problems normally will be handled by the program officer working with the affected party. Serious problems may be brought to the attention of the respective committees.

External Reviews

External reviews may be executed at the request of any management body in accordance with the collective direction of all management bodies. The program manager may request an external review of any aspect of program activities at any time. These requests will be coordinated with the appropriate committee and management body. External reviews will be written and documented. No such review will be released publicly without evaluation and comment by affected committees, management bodies, management agencies, and the program manager. When accepted by the affected committees and management bodies, actions recommended by an external or internal review will be executed within a reasonable time frame.

External technical reviews to evaluate specific operations and other aspects of the program can be called for and sponsored by any committee, with approval from the management bodies and program manager. These reviews are fully coordinated with all program components, and, whenever possible and appropriate, they are conducted jointly. Examples of operations which might be reviewed include plankton sampling, bottom trawling, and data processing and management procedures.

Prior to public release, technical publications produced by SEAMAP undergo peer review. Explicitly excluded from this requirement are data summary documents (e.g., atlases), reports to oversight bodies (e.g., annual reports), and reports from workshops and symposia, which represent collections of individual papers and abstracts.

SEAMAP HISTORY AND ACCOMPLISHMENTS

HISTORY

Since its beginning in 1981 in the Gulf of Mexico, SEAMAP has evolved into three components, each developing long-term data collection programs for monitoring valuable marine resources in the Gulf of Mexico, South Atlantic, and Caribbean regions. In addition, other important SEAMAP activities have been conducted, such as special studies and workshops. Despite the tremendous growth in program activities, there has been no corresponding increase of federal support to the SEAMAP budget. For the first three operational years (FY 1982-1984), SEAMAP received no federal programmatic funding. For these years, programmatic activities were supported through existing state and federal resources. Dedicated federal programmatic funding for SEAMAP began in FY 1985 at approximately \$1.0 million and continued at that level through 1991. Between FY 1992 and FY 2005, funding has fluctuated between 1.2 and 1.67 million dollars. Program activities have been developed and maintained through the cooperation

and strong support of participating states. Continuing the resource surveys for long-term data sets has been a priority; however, the potential of the program has not been fully realized, mostly due to funding constraints. Unfortunately, most states are facing difficult fiscal situations and do not have additional financial resources to supplement SEAMAP. Level funding has already caused lost sampling effort in the current surveys. If the present trend continues, decreased funding with coincident increased costs will erode the base program, jeopardizing the effort and accomplishments already invested in the program since 1981. This plan documents the many successful activities of SEAMAP.

The initial phase of SEAMAP resulted in the publication of the SEAMAP Strategic Plan in January 1981. This document provided a conceptual framework for planning the program by outlining and considering goals, objectives, requirements, priorities, approaches, and guidelines for consistent actions by state agencies and the National Marine Fisheries Service (NMFS), as well as other National Oceanic and Atmospheric Administration (NOAA) components. Along with input from regional fishery management councils, state marine fisheries agencies, interstate fishery commissions, appropriate federal agencies, and other interested parties, the SEAMAP Strategic Plan served as a basis for the development of the subsequent operational plans, including SEAMAP Operations Plan: 1985-1990 for the Gulf of Mexico component, and the SEAMAP South Atlantic Operations Plan: 1986-1990 for the South Atlantic component. The SEAMAP Management Plan: 1990-1995, SEAMAP Management Plan: 1996-2000, SEAMAP Management Plan: 2001-2005 and this document provide the conceptual framework for all three SEAMAP components.

Joint Activities

The first joint meeting between the Gulf and South Atlantic components took place in October 1984, and resulted in the decision to meet jointly every year and to publish a joint annual program report, beginning in FY 1985. In addition, Gulf and South Atlantic SEAMAP personnel participated in the annual NOAA status and trends survey, an activity that continued annually from 1984 to 1993.

In response to an urgent need for the design and development of an integrated data management system to better meet user needs, a joint workshop for data management work groups from the Gulf and South Atlantic components was held in FY 1985. Results of the workshop included approval for development of a new data management system design in FY 1986. By FY 1987, the requirements report for the new data management system, Data Management System Requirements Document for Gulf and South Atlantic, 1987, was published. The advantages of the SEAMAP Data Management System included reducing the time then needed to enter and retrieve data, as well as providing for powerful and flexible local data analysis and display capabilities. Integration of this new system began in FY 1988.

In 1987 a passive gear assessment workshop was sponsored by the joint components of SEAMAP and the University of Puerto Rico Sea Grant College Program to investigate gear alternatives in areas where trawling is not suitable or may not be preferred.

One of the most important administrative events for FY 1988 was the completion of an external program review. The review was conducted by a four-member review panel, including representatives from NMFS, the National Sea Grant College Program Office, the New Jersey Marine Science Consortium, and Auburn University. The review consisted of a comprehensive evaluation of SEAMAP relative to goals and objectives outlined in the operations plans of the Gulf and South Atlantic components. The review panel completed a written report of their findings and recommendations on October 1, 1987. Recommendations of the review panel were discussed at the joint meeting of SEAMAP components in January 1988, and a final slate of recommendations for the program was endorsed. Preparation of the 1990-1995 joint five-year plan for all three SEAMAP components was an important recommendation of the review report. Preparation of SEAMAP joint five-year plans continues to be an integral part of SEAMAP.

SEAMAP-Gulf

The first SEAMAP component, SEAMAP-Gulf, was implemented in the Gulf of Mexico region in December 1981, under guidelines formulated by the Technical Coordinating Committee (TCC) of the Gulf States Marine Fisheries Commission (GSMFC) and described in the SEAMAP Strategic Plan. The GSMFC is responsible for coordinating and administering the SEAMAP-Gulf component. Initial operations were designed to implement the coordination, standardized collection, management, and dissemination of data from fishery-independent surveys conducted in the Gulf of Mexico during the summer of 1982. These surveys included the first annual summer shrimp/groundfish bottom trawl survey, along with the first year of annually collected environmental and plankton data.

With the onset of data collection, compilation of data began for annually produced documents such as SEAMAP marine directories (regional listings of fisheries research facilities and survey plans in the Gulf of Mexico) and SEAMAP atlases (summaries of survey results and data). Distribution of "near real-time data" was initiated, and weekly computer plots and data listings were produced for managers, researchers, industry, and the general public. Additionally, expert work groups drawn from state research agencies, universities, NMFS, and other research centers were established to accomplish specific tasks, including planning and coordinating surveys, data reports, and other SEAMAP functions.

During the second operational year of SEAMAP-Gulf (FY 1983), the SEAMAP Information System and SEAMAP Ichthyoplankton Archiving Center were established. The SEAMAP Information System was established at the Stennis Space Center in Stennis Space Center Station, Mississippi, as the primary management system for all SEAMAP generated data. The SEAMAP Ichthyoplankton Archiving Center was established at the Florida Wildlife Research Institute in

St. Petersburg, Florida, for the archiving of all sorted SEAMAP-collected ichthyoplankton. Specimens archived from SEAMAP cruises were made available for use by interested agencies and researchers. To assist in the coordination of data collection, a calibration workshop on trawling gear was sponsored by SEAMAP in FY 1983, with the results published as workshop proceedings. Additional highlights for FY 1983 included the initiation of an annual spring plankton cruise in the Gulf of Mexico, and the initiation of the South Atlantic component of SEAMAP. Initial SEAMAP-Gulf activities established the basic framework for the current program in the Gulf of Mexico, South Atlantic, and Caribbean regions.

During FY 1984, the Gulf component conducted a plankton survey of coastal and continental shelf waters in August targeting king mackerel larvae and collected data on ichthyoplankton during a winter plankton survey. Also in FY 1984 the Gulf component established an annual fall plankton survey of coastal shelf waters targeting the larvae of king and Spanish mackerel and red drum. In FY 1985, the Gulf component continued winter plankton sampling and also began three special studies, including (1) an evaluation of shipboard weighing procedures, (2) gear investigations for a squid/butterfish fishery and a coastal herring fishery, and (3) location of trawlable concentrations of these species. A trawl survey of outer continental and shelf edge waters was conducted to assess stocks of squid and butterfish in the Gulf of Mexico during FY 1985 (July and August) and FY 1986 (May and June).

Also during FY 1985, advances were made in both data management and specimen archiving. The SEAMAP Ichthyoplankton Archiving Center acquired a computer system and a second archiving center was added. The SEAMAP Invertebrate Plankton Archiving Center (SIPAC) was established at the Gulf Coast Research Laboratory in Ocean Springs, Mississippi, to store and catalog unsorted "backup" samples and selected samples sorted for larval penaeid shrimp, blue crab, stone crab, lobster, squid and other invertebrates.

In FY 1986, to add to its continuing annual summer shrimp/groundfish resource survey, the Gulf component began a fall shrimp/groundfish survey, which mainly targeted groundfish. This activity was built on the NMFS fall groundfish survey, conducted since 1972. In addition, the declining status of red drum in the Gulf of Mexico prompted the red drum work group and other scientists to collaboratively produce a cooperative three year plan for red drum research in the Gulf. Reporting of planning, progress, results, and evaluation of red drum research have continued to be managed by SEAMAP-Gulf.

Fiscal year 1987 activities included the continuation of long-term resource monitoring surveys in the Gulf, with the addition of a short-term special study on the distribution of shortfin squid. The resource monitoring surveys continued through FY 2000, including a new Spring Reef Fish Survey begun in FY 1992 to assess the relative abundance and to compute population estimates of reef fish in the Gulf region. In addition, in FY 1984, FY 1985, FY 1993 and FY 1996 winter plankton surveys were conducted in the open Gulf of Mexico.

Due to continued level funding since FY 1992, the SEAMAP-Gulf component has concentrated efforts on continuing core surveys. These surveys are the Spring and Fall Plankton Surveys,

Summer and Fall Shrimp/Groundfish Surveys, and the Reef Fish Survey.

SEAMAP-South Atlantic

SEAMAP-South Atlantic (SEAMAP-SA) was formally established in October 1983 under the auspices of its management body, the SAB of the ASMFC. An operations plan was developed during FY 1984 and published in October 1984 as the SEAMAP South Atlantic Operations Plan: 1986-1990.

The first year of operations for the South Atlantic component was FY 1985, and included a spring benthic resources survey. Objectives and procedures for a bottom mapping project, and protocol for the calibration of shallow water trawling procedures in the South Atlantic were also developed. In FY 1986, preliminary investigations on gear and calibration were conducted to provide the basis for development of a long-term monitoring trawl survey for the South Atlantic area. A pilot bottom mapping study focusing on south Atlantic hard bottom areas and reefs was also completed in FY 1986.

During FY 1987 and 1988, the second and third years of the three-year preliminary trawl survey study was completed. Also completed in FY 1988 were the North Carolina Calico Scallop Survey, the annual Pamlico/Albemarle Sound Survey, and the annual Winter Striped Bass Tagging Cruise. Although a full hard bottom study was scheduled to begin in FY 1988, lack of funding prevented implementation of the first element in this study until FY 1992.

The Shallow Water Trawl Survey sampling strategy was finalized and implemented in 1989. That project continues through today as a long-term survey and continues to be the largest component and highest priority activity in the South Atlantic program. Continued data collection efforts in FY 1989 through FY 1991 included benthic invertebrate characterization, the Pamlico/Albemarle Sound Survey, and the Winter Striped Bass Tagging Cruise.

Funding for the bottom mapping project resumed in FY 1992. The work group developed a database format designed for easy incorporation into GIS or other mapping software. In FY 1993, the workgroup initiated a search for existing data sources, and captured more than 8,000 records. By FY 1995, several bottom mapping reports were completed on the initial pilot program and hard bottom distribution off South Carolina, Georgia, and North Carolina (Appendix B) totaling more than 23,900 records.

During FY 1994, the ASMFC convened a Workshop on the Collection and Use of Trawl Survey Data for Fisheries Management. SEAMAP-SA members participated with SEAMAP-SA providing some funding for the workshop. A report of the workshop proceedings was published in December 1994.

In FY 1995, the SEAMAP-SA Committee was asked by NMFS to undertake a coordination role for developing finfish bycatch estimates in the South Atlantic shrimp fishery. The SEAMAP-SA

Committee formed the Shrimp Bycatch Working Group, consisting of sixteen members with expertise in shrimp bycatch research and management from appropriate state and federal agencies. The working group's charge was to guide data identification and summarization, evaluate estimation methods, and review final estimates of bycatch removals by the South Atlantic shrimp fisheries. Technical support was provided by NMFS in conducting the specific analyses requested by the working group. A final report was completed in April 1996.

Florida was funded for capture of bottom mapping data in FY 1996, and completed a report on hardbottom mapping off the coast of Florida in FY 1997 (Appendix B). In FY 1998, the first South Atlantic Bight Hardbottom Mapping CD-ROM was produced as a compilation of the North Carolina through Florida data, formatted in GIS and searchable in a visual format by the Florida Marine Research Institute.

During FY 1999, the Bottom Mapping Work Group revised the CD to produce version 1.1, and began discussing improved data access and interactive mapping on the Internet. A cooperative effort with the Coastal Sciences Center (CSC) allowed posting of that data as an information layer on the CSC web site. FY 1999 also concluded ten years of standardized data collection for the shallow water trawl program, marking the maturity of the data set and solidly establishing its utility in fisheries stock assessments.

In FY 2000, the Bottom Mapping Work Group developed a summary hardcopy document to accompany the CD. The CD has been broadly distributed to scientist, natural resource managers, fishermen, consultants, environmental groups, and others. The Shallow Water Trawl Work Group produced a 10-year summary report, and 13 years of data from the winter striped bass tagging cruise data was used to analyze beach replenishment "borrow" areas. The Pamlico/Albemarle Sound survey was continued for the 13th year, and plans were made to update the database format to Oracle.

In FY 2001, the Bottom Mapping Work Group developed a list of issues necessary to create deepwater protocols and future work group priorities. The 2001-2005 SEAMAP Management Plan was also developed.

During FY 2002, the Crustacean Work Group held a symposium in conjunction with the Southeast Estuarine Research Society (SEERS). The symposium focused on "Management, Monitoring, and Habitat Considerations for Crustacean Fisheries in the Southeastern United States". The meeting provided a means for technical information exchange between scientists working for both academic and management purposes. The Bottom Mapping Work Group began to create protocols to convert existing data on deepwater bottom habitats into a standard format as phase 1 of a project to extend the bottom mapping GIS product from the 200 to 2,000 meter (m) depth contour. Phase 2 of the project was also underway to create an annotated, searchable bibliography of deepwater bottom type data sources.

In FY 2003, the SEAMAP Data Management Work Group developed a plan to update the NMFS data structures to contain the full extent of data collected by the trawl survey. They also met

jointly with the Northeast Area Monitoring and Assessment Program (NEAMAP) Data Management Work Group to share information on data structures and various methods to build a fisheries independent data warehouse. The Crustacean Work Group met to discuss state harvest information on blue crabs and shrimp. The Crustacean Work Group sponsored a shrimp symposium at The Crustacean Society Meeting (June 2-5, 2003 in Williamsburg, VA). Presentations and discussion focused on disease, transport, genetic variability, and population status. The Bottom Mapping Work Group finalized a three-phase approach to compile existing deepwater (200-2000 m) bottom characterization data from existing data sets, and appointed a subcommittee to develop the protocols for data transformation. The Bottom Mapping Work Group and Deepwater Subcommittee worked on defining the deepwater habitat characterization, and the types of data for which transformation protocols would need to be developed (Phase I). The subcommittee also approved the completion of a data source compilation document titled "Summary of Seafloor Mapping and Benthic Sampling Conducted in 200-2000 m, from North Carolina through Florida" (Phase II).

During FY 2004, a report entitled "The Status of the Blue Crab (*Callinectes sapidus*) on the Atlantic Coast" was produced. This document is a report of Blue Crab Symposium convened by the Crustacean Society and a Blue Crab Workshop convened by the ASMFC's SEAMAP Crustacean Work Group, both in 2003. The Data Management Committee continued working with NMFS to update the SEAMAP data management system and worked on the development of the SEAMAP.org website. The Bottom Mapping Work Group began work on Phase III of the deep-water habitat mapping project, working with the South Atlantic Fishery Management Council to map bottom habitat in deepwater regions (200-2000 m).

SEAMAP data and associated GIS have been incorporated into the South Atlantic Habitat and Ecosystem Internet Mapping System (<http://map.mapwise.com/safmc/Default.aspx?tabid=62>). In addition, the South Atlantic Council is highlighting the role of the SEAMAP program in supporting the move to ecosystem management in the region through the South Atlantic Habitat and Ecosystem Homepage (<http://map.mapwise.com/safmc/Default.aspx>). Both are tools supporting the development of a Fishery Ecosystem Plan for the South Atlantic Region and the importance of SEAMAP and need for expansion to support the move to ecosystem management.

In FY 2005, the Data Management Committee continued working with NMFS to update the SEAMAP data management system. A new SEAMAP logo was produced and the SEAMAP.org website went online. The Bottom Mapping Work Group continued to work on Phase III of the deep-water habitat mapping project. The 2006-2010 SEAMAP Management Plan was also produced.

SEAMAP-Caribbean

In FY 1988, a SEAMAP Caribbean Committee was established administratively under the guidance and supervision of the Caribbean Fishery Management Council. Initial efforts toward establishing a long term SEAMAP monitoring program in this area were directed toward

ichthyoplanktonic studies, pelagic longline, and environmental monitoring. Initiation of the operational phase began in 1988 with plankton sampling. The effort was a cooperative venture involving the NOAA vessel DELAWARE II, SEAMAP-Caribbean members, and representatives of the British Virgin Islands. During FY 1989 a cruise of the NOAA vessel R/V OREGON to the Caribbean was utilized to monitor the longline catches around the U.S. Virgin Islands.

The SEAMAP-Caribbean committee recognized long-term monitoring of reef resources as its most important priority. During FY1989-1992, procedures for conducting a Reef Resource Survey were developed. Efforts toward establishing and beginning sampling were inhibited by the lack of funding to the operational part of the SEAMAP-Caribbean component. In FY1991, a three-year sampling cycle of a Reef Resources Survey was started, including sampling by hand line and fish traps in waters off Puerto Rico and the U.S. Virgin Islands. In FY1994, the Reef Resources Survey was extended to include the area of St. Croix. Although relying on more conventional sampling gears, some data have also been collected by the U.S. Virgin Islands Division of Fish and Wildlife using underwater cameras. In FY1999, a Reef Resources Survey was carried out south of St. John, USVI that included sampling by hand line and fish traps. In FY2000, the Reef Resources Survey was extended to include the area of St. Croix. In FY2004, SEAMAP-Caribbean began another cycle of reef fish surveys. Puerto Rico began trap and hook-and-line surveys that continued into FY2005. The US Virgin Islands delayed start of these surveys until a new research vessel could be purchased. In late FY2005 additional funds for the vessel were obtained and a request for bids for the new vessel was initiated. Supplemental SEAMAP funding (in FY2004) allowed Puerto Rico to increase trap and hook-and-line survey trips during FY2005. These funds also supported the investigation and completion of the SEAMAP-C US Virgin Islands trap and hook-and-line database.

In FY1990, SEAMAP-Caribbean conducted a survey to determine the relative abundance of the queen conch (*Strombus gigas*) resources around the U.S. Virgin Islands. The methodology to be used in this survey is a modification of previous surveys undertaken in the U.S. Virgin Islands (Woods and Olsen, 1983 and Boulon, 1987). Additional conch surveys were conducted in 1995. These surveys were a joint venture between the U.S. Virgin Islands Division of Fish and Wildlife and the National Park Service (which supported the St. Thomas portion of the study), as well as between the Puerto Rico Department of Natural and Environmental Resources and the University of Puerto Rico, Mayagüez Campus. In FY2001, conch surveys were again conducted in the US Caribbean. These surveys included the all of Puerto Rico and the three main islands of the US Virgin Islands. Diver scooter surveys were completed.

In FY 1996 and 1997, SEAMAP Caribbean examined the spatial and temporal variation of lobster pueruli settlement in coastal waters adjacent to St. Thomas, USVI. Puerto Rico conducted a similar study, which was completed in 1998. In FY2002, pueruli lobster settlement and juvenile lobster attractor surveys were conducted in the US Caribbean. Pueruli collectors were deployed and pueruli lobster settlement was monitored for a 12 month period. In addition, casitas or juvenile lobster attractors were deployed. Juvenile lobster presence in the casitas was monitored.

In FY 1998, SEAMAP Caribbean began a benthic mapping study of the Virgin Islands and Puerto Rico shelf using side-scan sonar.

In FY2003, whelk surveys were conducted in the US Caribbean. These surveys were completed around Puerto Rico and on all three islands of the US Virgin Islands.

ACCOMPLISHMENTS

SEAMAP has been functional since 1981 and has been collecting fishery-independent data since 1982. Accomplishments of the program thus far can best be summarized when considered by activity type. Activity types include: resource surveys, special studies, workshops and conferences, data management, specimen archiving, and information dissemination.

Resource Surveys

Resource surveys encompass both short and long-term surveys of fishery resources and their environments. Although it is the long-term databases that form the foundation of SEAMAP (Table 1), the program has flexibility to accommodate short-term data requests within the overall long-term program. For example, SEAMAP can provide data in response to addressing emergency resource information needs without impacting the program's long-term database.

Table 1. Summary of SEAMAP Resource Survey Activities.

SEAMAP-Gulf

- ***Shrimp/Groundfish Trawl Survey*** (FY 1982-present) to monitor the distribution and abundance of fish and crustaceans. Sampling occurs from Texas to Alabama during two cruises each year (summer and fall). Plankton samples are routinely taken during these surveys.
- ***Plankton Survey*** (FY 1982-present) to determine spawning locations, estimate stock size, and conduct early life history studies. Two cruises (spring and fall) are conducted each year.
- ***Reef Fish Survey*** (FY 1992-present) to assess the relative abundance and compute population estimates of reef fish using trap video techniques.

SEAMAP-South Atlantic

- ***Coastal Survey (Shallow Water Trawl Survey)*** (FY 1989-present) to monitor the distribution and abundance of fish and crustaceans. North Carolina to Florida nearshore waters are sampled during three cruises each year (spring, summer, fall).
- ***Bottom Mapping Survey*** (FY 1985-86, FY 1992-present) to develop procedures for establishing a long-term database to identify bottom types and associated communities in the South Atlantic, and publish available data in a GIS format on a CD.

- **North Carolina Pamlico / Albemarle Sound Survey** (FY 1989 - present) to obtain fishery-independent data on the distribution, relative abundance, and size composition of important finfish, crab, and shrimp species in the Pamlico-Albemarle sounds system.
- **Benthic Characterization** (FY 1983-1987, 1990-1997) to identify and catalog benthic invertebrates collected on four cruises from 1983-1987.

SEAMAP-Caribbean

- **Plankton Survey** (FY 1988 and 1995) to survey reef resources
- **Reef Fish Survey** (FY 1991-1992, 1993-1995, 1998-2001, and 2004-2005) to assess the relative abundance and population estimates of reef fish using trap, video, and hook & line techniques.
- **Queen Conch Survey** (FY 1990, 1995-1996, 2001) to determine distribution, abundance, and population parameters.
- **Survey of Lobster (*Panulirus argus*)** (FY 1996, 1997, and 2002) to determine the distribution and abundance of *Panulirus argus* pueruli in the coastal waters of the eastern end of St. Thomas, USVI. A similar survey was conducted off the west coast of Puerto Rico. In FY2002 an assessment of the effectiveness to determine abundance of juvenile lobsters using artificial shelters was completed in both Puerto Rico and the USVI.
- **Bottom mapping survey** (FY 1998-2000) to identify bottom types and their distribution and abundance of the shelf south of St. John USVI. For Puerto Rico the areas to be sampled are Puerto Rico West Coast platform, and the East coast of Puerto Rico. The East Coast sampling includes areas of Vieques and Culebra Islands.
- **Survey of Whelk (*Cittarium pica*)** (FY 2003) to collect baseline data on the size and population structure, distribution among habitats, and density of the whelk populations around the coasts of Puerto Rico and USVI, start a time series study of the whelk stocks.

Trawling - Shrimp/Groundfish Surveys in the Gulf of Mexico

Brown, white, and pink shrimp in the Gulf of Mexico support one of the most valuable and diverse U.S. fisheries. In addition to the portion of its catch that is landed, the shrimp fishery discards most of the incidental catch of finfish. This discard is composed of over 170 different species, with Atlantic croaker, spot, sand seatrout, Atlantic cutlassfish, sea catfish, and silver seatrout comprising the dominant species. These discarded species also support industrial and food groundfish fisheries. Other species of commercial and recreational importance discarded by the shrimp fleet include king and Spanish mackerel and red snapper. Because of the extensive interactions of these closely associated species, state and federal fishery managers require community-level data to assess the impact of alternate regulatory and technological strategies intended to minimize effects of a given fishery on non-target stocks.

Coordinated, standardized SEAMAP surveys provide system-wide, community level data on recruitment to the fisheries, adult (spawning) stock size, trophic relationships among organisms, and the effect of environmental fluctuations on species distribution and abundance in the shrimp/groundfish community of the Gulf of Mexico. These studies complement fisheries-dependent data by providing information that can be used to estimate a variety of stock parameters, such as recruitment, discard mortality, relative species abundance, age and growth, and size and age at maturity.

The semiannual SEAMAP-Gulf shrimp/groundfish surveys traverse estuarine and Gulf waters out to 60 fathoms. This area was chosen to include the range of many shrimp and groundfish species. The summer survey is designed to coincide with the annual peak in brown shrimp emigration, and spawning of white shrimp. The fall survey obtains valuable assessment data on the brown shrimp spawning stock, white shrimp recruitment, and abundance of many finfish species at the time of peak vulnerability to trawling gear.

Coastal Shallow Trawling Survey in the South Atlantic

Penaeid shrimp also constitute the most valuable commercial fishery in the South Atlantic and support a substantial, but unquantified recreational fishery. Most sciaenids, king and Spanish mackerel, menhaden, mullet, bluefish, blue crabs, herrings, jacks, horseshoe crabs, sea turtles and numerous forage species spend part or most of their early life in shallow shrimp trawling grounds in the South Atlantic area. These species have immense commercial and recreational value and form the basis of many of the principal South Atlantic fisheries. Current state surveys are directed primarily at shrimp and are sufficient for some basic management needs; however, the coordinated, standardized SEAMAP survey provides fishery and ecological data covering the entire region. Community level data are applicable to management and monitoring of all sampled species. Data collected include distribution and abundance of various life history stages, recruitment to nursery grounds and subsequent recruitment to fisheries, spawning stock size, and the effects of various environmental fluctuations on abundance and distribution.

The South Atlantic shallow trawl samples waters from 0-10 fathoms from Cape Canaveral, Florida to Cape Hatteras, North Carolina. Gear and survey procedures are standardized to ensure quality data with a synoptic view of the relative abundance and distribution of the stocks.

Plankton Surveys

Coordinated, area-wide plankton surveys are a key SEAMAP activity. Primary uses of eggs and larvae data by researchers include: (1) determination of spawning areas and seasons, (2) estimation of spawning stock biomass to aid in the estimation of allowable catch levels of regulated species and the determination of management action effectiveness, (3) relative indices of adult stock size, and (4) early life history studies.

Plankton surveys may be conducted in conjunction with other surveys, such as the Gulf shrimp/groundfish survey, in order to improve survey cost effectiveness. Although plankton surveys have been performed by each SEAMAP component, recent work has been restricted to the Gulf of Mexico because of limitations in the ability to process samples.

Mapping and Assessment of Hard Bottom Resources (Biotic and Abiotic)

Because substrate is a major determinant of faunal distribution and composition, a detailed description of superficial geology is being compiled for the South Atlantic area. Knowledge of the presence and extent of hard bottom areas, coupled with fish abundance estimates from certain areas, are essential to determine standing stocks or carrying capacity estimates for reef species. A protocol for mapping hard bottom habitats has been developed by SEAMAP-SA (Ross et al.

1987a and b, Appendix). Features of the data include the location and extent of hard bottom, water depth, relief of bottom type, and detailed information on the source and type of information available in order to facilitate investigators in querying original data sources. Once existing data sources are summarized to document known hard bottom areas, future surveys will focus on areas where no data exist and on determining whether hard bottom areas are stable, increasing, or diminishing due to both natural factors, such as storm waves and shifting sands, and human activities, such as mining and trawling. A great deal of information has already been gathered by the Minerals Management Service, as well as other state and federal agencies, but it has not been made generally available. The area from the shoreline to the 200m depth contour from Cape Hatteras southward to Florida has been examined, and the data are included in the SEAMAP Information System, and are published in two SEAMAP-SA completion reports, and on a CD-ROM in a GIS format (Appendix B).

Initiated in 1998, SEAMAP-Caribbean initiated bottom mapping efforts on the continental shelf around Puerto Rico and the Virgin Islands using side scan sonar to identify bottom types as well as their distribution and abundance.

Trap Video Surveys

A variety of baited pots, traps, and other passive gears are used during SEAMAP survey operations to sample reef fishes, crabs, and deep-water fish populations not accessible with other techniques. In the Gulf of Mexico, a unique trap/video methodology is also being used to assess relative abundance and compute population estimates of reef fishes. Data are collected using a technique where a fish trap containing a video camera is deployed onto selected reef sites to record all organisms in the field of view. Agencies that have or are currently participating in cooperative research using traps and/or video include NMFS, the state agencies of South Carolina and Alabama, and government agencies of Puerto Rico and the U.S. Virgin Islands.

Handline/Manual Snapper Reel Surveys

Manual snapper reels and hand lining are suitable to sample most species of reef fishes in shallow water areas. Agencies which have participated in cooperative research using these gears are government agencies of the U.S. Virgin Islands and Puerto Rico.

Queen Conch and Lobster Surveys

Conch and lobster populations are under increasing fishing pressure in waters surrounding Puerto Rico and the US Virgin Islands. SEAMAP-Caribbean has a five year sampling cycle with 1 year each dedicated to the conch and lobster surveys. These surveys provide distribution and abundance estimates for incorporation into stock assessments and management plans for the protection of these resources.

Environmental Surveys

The abundance, condition, and distribution of living marine resources are affected by critical environmental parameters, such as temperature, salinity, and dissolved oxygen. Compatible data sets covering a broad geographic area and successive seasonal cycles are required to determine how species survival and distribution are affected by key environmental variables. SEAMAP

was designed to obtain basic data necessary for assessing system-level patterns in critical environmental driving forces. These parameters are measured by the best technology available and are coordinated, where feasible, with satellite imagery. The coupling of activities provides valuable ground truth information for calibrating the satellite imagery, to understand the synoptic patterns of sea surface conditions. SEAMAP environmental surveys usually are carried out in conjunction with other surveys, thus maximizing the cost-effectiveness of survey activities.

Special Studies

Although long-term data series are the foundation of the program, SEAMAP is also involved with special resource and environmental studies that are important to the region and may enhance survey information. These may include, but are not limited to tagging studies, sudden environmental perturbation studies, and periodic resource surveys. SEAMAP has also performed studies to facilitate program improvement, including survey strategy studies and program evaluations. Special studies which have been performed include Survey Development, Short-term or Special Resource Surveys (Table 2).

Table 2. Summary of SEAMAP Special Projects.

SEAMAP-Gulf

- ***Status and Trends Benthic Surveillance Project*** (FY1982-1993) to sample for contaminants in coastal fishes and sediments.
- ***Latent resources*** (FY1985-1986) to assess the potential for development of a commercial fishery (squid/herring/butterfish).
- ***Winter plankton*** (FY1984-85, FY 1993, FY 1996) to collect information on the early life stages of winter spawning fishes.
- ***Red drum stock identification study*** (FY1985-86) to collect young red drum for analysis of possible inshore stock differences.
- ***Shipboard versus laboratory weight variance study*** (FY1986) to determine if problems exist when trawl-caught species are weighed onboard research vessels.
- ***Comparative trawl survey*** (FY1993-95) to compare the catch between different vessels simultaneously using the same trawl gear.
- ***Bottom Longlines*** (FY1992-present) to collect data on adult red drum and other finfish in offshore Texas waters during March-May.
- ***Trap Video Study*** (FY1995-present) to develop methods to sample reef fish near artificial reefs using trap video techniques.

SEAMAP-South Atlantic

- ***Status and Trends Benthic Surveillance Project*** (FY1982-1993) to sample for contaminants in coastal fishes and sediments.
- ***Spring benthic resources*** (FY1985) to assess benthic resources in bottom trawls off Florida; scallop and hydroacoustical surveys, neuston sampling, and ornithological

- observations off the coast of Georgia; and trap survey for *Geryon spp.* crabs off the Florida coast.
- ***Geryon crab project*** (FY1986-87) to determine the distribution and abundance of the golden crab, *Geryon fenneri* and other decapod species of the continental shelf.
- ***Calico scallops off North Carolina*** (FY1988-1989) to assess calico scallop stocks.
- ***Shallow water shrimp trawl calibration project*** (FY1985-1986) to demonstrate the mechanical characteristics and catch rates for coastal and estuarine bottom trawls conducted by North Carolina, South Carolina, and Georgia, under similar spatial and temporal conditions.
- ***Shrimp bycatch estimates*** (FY1995) to estimate finfish bycatch in the South Atlantic shrimp trawl fishery.
- ***Striped Bass Tagging*** (FY1988 - present) to assess the population structure and exploitation rates of the migratory Atlantic coast stock.
- ***Age-growth and Histology*** (FY2001 - present) of specimens collected in the shallow water trawl survey to provide vital biological information needed for fisheries management.

SEAMAP-Caribbean

- ***Preliminary pelagic long lining survey*** (FY1989) to survey reef resources.
 - ***Statistical sampling design analysis of the Puerto Rico fishery- independent survey.*** To establish the sampling protocol to be used in the Caribbean.
 - ***Statistical sampling design analysis of the 1991-92 Puerto Rico shallow-water reef fish monitoring survey*** to revise the sampling methodology used in the Caribbean to determine if other parameters needed to be implemented.
 - ***Caribbean-SEAMAP Program Reef Fish Data Evaluation (2002)*** to evaluate and quality control of the long-term SEAMAP-C, USVI and PR reef fish data, evaluation of the fishing effort and catch per unit effort (CPUE) analysis.
 - ***Caribbean-SEAMAP Program Reef Fish USVI Summary Overview (2004)*** to evaluate and quality control of the long-term SEAMAP-C, USVI reef fish data, evaluation of the fishing effort and catch-per-unit-effort (CPUE) analysis.
 - ***St. Croix & St. Thomas/St. John Fisheries Independent Trap and Line Survey, 1992-2002.*** The report provides an analysis of the complete data set for each island, additional surveying techniques were recommended.
-

Bycatch Estimates

Bycatch of finfish associated with the shrimp trawl fishery has been a critical issue for fisheries managers. Regulations adopted by the ASMFC called for reductions of weakfish bycatch by 50 percent. The SAFMC was also seeking to reduce the bycatch component of Spanish mackerel fishing mortality by 50 percent. During FY1995, a working group established by the SEAMAP-SA Committee identified appropriate data sets, prepared estimates of bycatch, and prepared a draft report of their results. The final report, “Estimates of Finfish Bycatch in the South Atlantic Shrimp Fishery” was printed in 1996, supporting the adoption of new bycatch reduction device requirements in the shrimp trawl fishery.

Calibration of Gear and Standardization of Survey Procedures

Assessment data must be collected using standardized procedures in order to provide reliable information on species abundance, distribution, and/or condition. If area-wide data are required, sampling efforts must be conducted so that valid comparisons can be made with similar efforts in other areas or during different times. Trawl calibration between vessels, and ship vs. land based fish weight comparisons have been important parts of the SEAMAP-Gulf bottom trawl surveys. A trawl calibration study for the South Atlantic was conducted in 1985 (Low and Whitaker 1986, Appendix B), and sampling design analysis has been done in the Caribbean. The first SEAMAP sponsored workshop, the Trawl Calibration Workshop, addressed this concern. Additionally, the SEAMAP Operations Manual for Collection of Data (Appendix B) was developed to ensure standardized biological, environmental and plankton surveys.

Contaminant Studies

The NOAA Status and Trends Program examined edible species suspected to be contaminated by heavy metals, hydrocarbons, toxins, or other pollutants. SEAMAP-Gulf and SEAMAP-South Atlantic components were involved in this program early on by providing vessel and personnel. In subsequent years NOAA provided vessels, but coordination that enables Status and Trends Program personnel to most efficiently and effectively collect their required samples occurred through SEAMAP until FY1993.

Environmental Perturbation Studies

Short-term environmental perturbations can have important biological and socio-economic effects. Events such as oil spills, hypoxia, and hurricanes affect both marine resources and the users of those resources. Agencies that must respond to or cope with the consequences of environmental perturbations need factual information, which allows them to anticipate what may happen to marine resources, and on-site descriptive information during and immediately following the emergency. Information collected by SEAMAP surveys is available to agencies responsible for dealing with environmental changes. SEAMAP-Gulf has been involved in reporting and mapping hypoxia in the northcentral Gulf. Also, depending upon funding and survey schedules, it may be possible to coordinate SEAMAP cruises with efforts to assess the impact of a specific environmental perturbation.

Periodic Resource Surveys

SEAMAP provides a programmatic structure to implement short-term resource surveys to meet the needs of fisheries management. These studies may address distribution, abundance, or stock status of marine resources. Activities that fall under this category have included plankton studies in the Caribbean and Gulf, benthic resources calico scallop, and Geryon crab surveys in the South Atlantic, longline and trap video studies in the Gulf, and preliminary long line surveys in the Caribbean.

Support Studies for Stock Definition and Migration Patterns

Fishery management must take into account the stock structure and migratory patterns of exploited species; however, such information is lacking for many of the important fishery species. SEAMAP has and can continue to provide a coordinating mechanism and the basic

logistic support for regional biochemical, morphometric and tagging studies. Both the Gulf and South Atlantic components participated in the SEAMAP red drum stock definition study. Additionally, SEAMAP coordinated the Cooperative Red Drum Research Program in the Gulf of Mexico, which included a mark and recapture study of this species. The striped bass tagging project has monitored the recovery of the Atlantic striped bass population, and with nearly 25% of the fish recaptured, the data has provided both migration information and landings patterns. To some extent this type of study can be conducted in conjunction with monitoring surveys. For example, fish or sea turtles captured during bottom trawling surveys may be marked and released, as is common during all SEAMAP trawl surveys.

Vessel and Aerial Visual Surveys

Many ecologically and economically important species spend a portion of their time at or near the surface where they are readily visible. Since menhaden, other coastal herrings, mullet, mackerels, billfishes, sea turtles, marine mammals, and other pelagic species can frequently be observed from a vessel, visual surveys may be conducted in conjunction with other surveys to minimize costs. Likewise, these species can be surveyed from the air. A Gulf-wide aerial survey for red drum was conducted as an important part of the Cooperative Red Drum Research Program. Although not specifically a SEAMAP survey, SEAMAP did coordinate all the cooperative research included in this program. Other aerial surveys underway in the Southeast area (non-SEAMAP) include those for sea turtles, mackerels, and marine mammals.

Workshops and Symposia

In order to facilitate coordination of surveys and information exchange among participants and other involved organizations, SEAMAP periodically sponsors workshops and symposia, including those noted in Table 3.

Table 3. Summary of SEAMAP Workshops.

SEAMAP-Gulf

- ***Survey Trawling Gear Assessment Workshop*** (April 1983) to address topics such as trawl gear calibration and standardization, comparative catch rates, gear selectivity and gear efficiency.
- ***King Mackerel Conference*** (January 1986) held in conjunction with the SEFSC to coordinate research needs and priorities for the species from North Carolina to Texas.
- ***Red Drum Conferences*** (March 1987, 1988, 1989) to plan and discuss results from the red drum tag and release studies.
- ***Reef Fish Workshop*** (April 1995) to discuss sampling artificial, vertically-distributed habitat (oil and gas platforms) in the Gulf of Mexico.
- ***Uses of Fishery-Independent Data Workshop*** (October 1995) to highlight assessments using SEAMAP data in management decisions.

SEAMAP-South Atlantic

- **King Mackerel Conference** (January 1986) held in conjunction with the SEFSC to coordinate research needs and priorities for the species from North Carolina to Texas.
- **Trawl Survey Data Workshop** (August 1994) to discuss the problems, issues, and opportunities associated with the collection and use of trawl survey data in fisheries management on the Atlantic coast.
- **Blue Crab Symposium** (June 2003) convened by the Crustacean Workgroup at the Crustacean Society meeting to discuss disease, transport, genetic variability, and population status.
- **Blue Crab Workshop** (November 2003) convened by the SEAMAP Crustacean Workgroup to discuss state harvest information on blue crabs and shrimp.

SEAMAP-Caribbean

- **Passive Gear Assessment Workshop** (August 1987) to evaluate the suitability of longlines, traps, and other passive gear methods for monitoring and assessment purposes.
-

International Activities

SEAMAP has frequently interacted with Mexico's National Institute of Fisheries, which is the research agency of SEPESCA, the country's Ministry of Fisheries. A major cooperative event was the SEAMAP-SEPESCA meeting in Mexico City during August 1986, attended by representatives of the SEAMAP-Gulf of Mexico and SEAMAP-South Atlantic components, and scientists and administrators from SEPESCA. Participants presented information on research and data collection activities of common interest, such as king mackerel, red drum, shrimp, and ichthyoplankton.

SEAMAP and SEPESCA have also worked closely under the NMFS' MEXUS-Gulf Program for cooperative Mexican-U.S. research, especially in assessing the abundance and distribution of Gulf of Mexico ichthyoplankton. The SEAMAP-Gulf of Mexico Ichthyoplankton Atlases display results of these surveys, with collected samples identified cooperatively by both the U.S. and Mexican personnel. Mexican scientists have also participated in SEAMAP shrimp surveys and gear technology cruises, in order to establish standardized methodologies for monitoring and assessing Gulf of Mexico resources.

The SEAMAP-Caribbean component has established close working relationships with other nations in the Caribbean in an effort to assess recruitment patterns common to the entire Caribbean Basin. Information has been exchanged to develop the SEAMAP-Caribbean Directory of Fishery-Independent Activities, and it is expected that cooperative surveys may be conducted in association with the British Virgin Islands and the Dominican Republic in the near future.

Specimen Archiving

The SEAMAP Ichthyoplankton Archiving Center houses SEAMAP-collected specimens of fish eggs and larvae that have been identified by the Polish Sorting and Identification Center. All data are now managed in an Access database system, which minimizes mistakes, eliminates coding errors and allows for much faster data entry. Over 281,825 lots of specimens have been catalogued to date representing 19 taxonomic orders, 130 families, 236 genera and 245 species.

The SEAMAP Invertebrate Plankton Archiving Center manages planktonic invertebrates from sorted sample collections, and the backup plankton collections obtained during SEAMAP surveys. The number of samples currently catalogued in the SIPAC collections is 9,010.

Over the past few years, SEAMAP has been donating voucher specimens covering most of the south Atlantic region to the South Eastern Regional Taxonomic Center (SERTC), which is run through the South Carolina Department of Natural Resources. SEAMAP-SA survey staff has attempted to provide approximately five individuals from each state of any invertebrate species they encounter. Exceptions have been made attempting to adhere to constraints imposed by state sampling permits. The goal has been to provide the SERTC with representative specimens, latitudinally stratified; covering the range of the south Atlantic bight. The SEAMAP-SA Trawl Survey has contributed a total of 126 "lots" containing 47 different species and 385 individual specimens from 105 different trawls to the SERTC.

Data Management and Information Dissemination

Biological and environmental data from SEAMAP surveys are included in the SEAMAP Information System. An improved, integrated SEAMAP Data Management System was completed during FY1990 and improvements continue to be made. The new system is decentralized, allowing SEAMAP users to more easily access SEAMAP data. Data may be obtained from the data manager by specific request; over 341 data requests have been satisfied during the period of 1983-2005. Information on data may be obtained from SEAMAP participants, published reports, and through the Internet at www.seamap.org and www.gsmfc.org/seamap.html.

In order to promote participation in SEAMAP and utilization of the SEAMAP database, SEAMAP information is distributed in the form of reports and data summaries to interested parties. Data summaries include real-time data reports during the summer shrimp/groundfish surveys, SEAMAP-Gulf biological and environmental atlases, and SEAMAP-Gulf directories. Cruise reports, quarterly reports and annual reports are also prepared and distributed.

The database system can also distribute data electronically. SEAMAP users are able to access SEAMAP data for data entering and retrieval directly from their local personal computer. Selected SEAMAP datasets are available via the Internet. As the web access to the SEAMAP

database is implemented, a new system for documenting web based data requests will be developed to track data use via the Internet.

Investigators who use SEAMAP data may publish their results with the understanding that SEAMAP is acknowledged for supplying the data. A bibliography of these publications is included in Appendix C. Documents published by SEAMAP are included in Appendix B.

APPLICATIONS OF SEAMAP DATA

Even though SEAMAP does not include any internal provisions for data analysis, it is ultimately the analysis and application of SEAMAP data, particularly to fisheries management, that demonstrates the vitality of the program. SEAMAP has developed a distinguished record for supporting stock assessments, and its role is almost certain to grow as its time series lengthen and new surveys are brought on line. A few of the most important applications to date are:

Determining year-to-year trends in abundance. In the stock assessment process, SEAMAP-based abundance indices are now routinely used both as stand-alone evidence of trends in abundance, and as criteria for "tuning" virtual population analyses. Key applications in the stock assessment process have been: Atlantic menhaden (South Atlantic trawl surveys), bluefin tuna (Gulf plankton surveys), bluefish (South Atlantic trawl surveys), cobia (Gulf trawl surveys), king mackerel (Gulf trawl and plankton surveys), Spanish mackerel (Gulf and South Atlantic trawl surveys), red snapper (Gulf trawl and plankton surveys), red drum (Gulf plankton surveys), red hind (Caribbean reef resources surveys), shrimp (Gulf and South Atlantic trawl surveys), striped bass and weakfish (South Atlantic trawl surveys).

Setting seasonal openings. SEAMAP data are used directly by the States of Texas and Alabama for setting seasonal openings for the shrimp season. Alabama also uses SEAMAP data to fine-tune the extent of open areas. The Texas opening in state waters also sets the date of the opening in federal waters under the GMFMC's "Texas Closure" management action. In the South Atlantic, SEAMAP trawl data are used to adjust and coordinate seasonal shrimp fishery openings in South Carolina and Georgia.

Evaluating existing management actions. SEAMAP trawl surveys have been a major component of retrospective evaluations of effectiveness of the "Texas Closure" management measure. Continued monitoring via the summer trawl survey will provide the first and most definitive information, should any changes in conditions occur that alter the effectiveness of future annual closures. Off Alabama, the Marine Resources Division (MRD) has taken excerpts from SEAMAP-Gulf trap/videos to both promote the artificial reef program at MRD-sponsored workshops and to evaluate the effectiveness of various types of artificial reef materials for their stability (structurally and geographically), biofouling community succession, and fish biomass and diversity.

Evaluating proposed management actions. The spatial distribution data from SEAMAP trawl surveys have been used to advise the GMFMC about potential reductions in shrimp fishery

bycatch using season or area closures. In the South Atlantic, SEAMAP hardbottom data were used by the SAFMC to develop alternative management options to protect coral areas from rock shrimp trawling, define essential fish habitat, and investigate marine protected areas.

Essential Fish Habitat. The South Atlantic Bottom Mapping Work Group has compiled a database of bottom habitats from North Carolina to the Florida Keys, in a searchable GIS format available on CD-ROM. Those data were adopted as the primary definition of essential fish habitat by the SAFMC. In addition, all SEAMAP surveys record data on the distribution of fish both geographically and within environmental variables such as temperature and salinity, which is the first step in defining environmental limits in essential habitats utilized by each species of fish.

Estimating bycatch. SEAMAP data are not suitable as a substitute for catch rate data from the shrimp fishery; however, combining SEAMAP evidence of variation in abundance with observer data taken aboard commercial vessels has allowed estimation of shrimp fleet bycatch over an extended time series in the Gulf of Mexico. SAFMC stock assessment panels are considering similar procedures. Based on the 1996 SEAMAP Shrimp Bycatch report, the SAFMC revised the bycatch section of their Shrimp FMP Amendment 2.

Obtaining basic biological data. SEAMAP trawl surveys provide a unique capability for specimen collection at known times and locations over wide geographic areas. This capability is invaluable for genetic studies for stock identification, which is a critical part of the stock assessment process and extremely useful for providing information on early life age and growth. Studies relying on this SEAMAP capability include investigations of king mackerel, Spanish mackerel, bluefish, cobia, amberjack, red snapper, vermilion snapper, red drum, seabasses, butterflyfish, croaker, weakfish, and several other groundfish species. In 2000, the South Atlantic component completed a report on 10 years of trawl data including species composition, abundance, and biomass.

SEAMAP EXTERNAL PROGRAM REVIEW

A programmatic review of SEAMAP, sponsored by the SEAMAP committees of the Gulf and South Atlantic components, was conducted in FY 1987 by a panel of selected fishery and management experts. The goal of this review was to provide specific recommendations regarding which program organizational and functional aspects should be maintained or modified to ensure that overall goals and objectives of SEAMAP are achieved efficiently. After the review was completed, the recommendations of the panel were reviewed by the regional committees to determine which recommendations would be endorsed and passed on to the SEAMAP oversight bodies. The review panel found SEAMAP to be a very successful program overall and suggested that SEAMAP could serve "as an example for a national initiative to cement state-federal partnerships for fisheries management and resource utilization" and also could serve "as a model for other coastal regions of the nation as well as other state/federal marine programs."

One of the recommendations made by the review panel, strongly supported by the committees, was the development of a joint 5-year plan. In response, a strategic plan was developed for 1990-1995, which included the goals and objectives for all components of SEAMAP, and outlined the program's management and operations process and policies (Appendices D, E, and F). In addition, other recommendations endorsed by the SEAMAP committees were incorporated into the plan. These recommendations included the establishment of budget allocation guidelines, development of annual operations plans for each component, modification of review and evaluation procedures, definition of program cooperator roles and lines of authority for the coordinators, and improved dissemination of information and coordination among program components. This policy was continued with the SEAMAP management plans for 1996-2000, 2001-2005, and 2006-2011.

The year 2007 will mark the 20th Anniversary of the last external review of SEAMAP. All efforts should be made to complete the next external program review by the beginning of 2007. An addendum to this plan may be necessary at that time.

EXPANDING SEAMAP ACTIVITIES

There is great potential for increased use of ongoing SEAMAP data collection for fisheries management, especially as the SEAMAP resource survey databases continue to grow into longer time-series of fishery-independent data. The shrimp/groundfish trawl survey in the Gulf of Mexico currently includes 24 years of data, the shallow water trawl survey in the South Atlantic currently includes 16 years of data, and the reef resources survey in the Caribbean was established in FY 1991 with a three-year sampling cycle.

The SEAMAP committees identified ways to improve SEAMAP in the next five years, focusing on increasing public accessibility to and use of SEAMAP data. For example, SEAMAP data could be further developed into geographical information system (GIS) products and data summaries which would be useful for resource managers, and which would facilitate feedback to the research program regarding management needs. Creating a SEAMAP data web page on the Internet would facilitate the use and accessibility of SEAMAP data, in addition to a central Internet site for SEAMAP to include easy access to information about SEAMAP meetings, and available reports would improve links to universities and other interested persons and result in increased participation due to more extensive and timely dissemination of the information.

In addition, there is great potential for expanding SEAMAP to collect data on stocks that are not well covered by current surveys, for example, by adding other survey methods to existing surveys. As fish stocks fluctuate in response to natural conditions and human actions, i.e., changes in fish abundance, survival, and recruitment, scientific information regarding marine fish populations is needed by managers on a continuous basis.

To date, fisheries management has relied primarily on fishery-dependent data, i.e., reported catches, for determining the status of fishery resources and for determining allowable catches. One benefit of using fishery-independent data is that fishery-independent data are not influenced or biased by changes in regulations or market conditions. In the now common case where catch is limited and fishing is restricted, so is the availability of catch data—especially after the limit is reached and fishing is prohibited.

The problem of obtaining adequate scientific information for management decisions will likely increase in the future as management moves towards alternative approaches, such as property-rights-based management (including individual transferable quotas), habitat-based management, multi-species management, and ecosystem management. The issues of bycatch and recovery of protected species are particularly challenging for both science and management. Fishery-independent data, such as data collected through SEAMAP, can provide the scientific information needed for these alternative approaches. For example, SEAMAP data are already being used to identify the distribution of important bottom habitat in the South Atlantic region and, based on this information, management measures are being adopted that will protect coral and allow rock shrimp trawling to continue. Fishery-dependent data provide critical information

on fishing effort, fishing mortality, catch size and age, and as such, will also continue to be needed. Where appropriate, fishery-independent data could provide information for conducting assessments, for determining species associations, and for determining the distribution of bottom habitats associated with fish.

SEAMAP constitutes an ideal mechanism for developing needed fishery-independent databases for management. It is an example of a very successful state/federal partnership that has succeeded despite limited funding and personnel. SEAMAP is a cost effective program in which participants contribute funding, expertise, sampling platforms and gear, and data. One factor contributing to the program's success is the high degree of cooperation and participation of SEAMAP members in working toward program regional priorities as opposed to individual priorities. One unique aspect of this program is its flexibility to respond to critical information needs without affecting base survey activities. For example, in FY 1996 the SEAMAP-SA Shrimp Bycatch Work Group reported estimates of finfish bycatch in the South Atlantic shrimp fisheries to NMFS and the SAFMC for use by the Council in developing a bycatch amendment to be included in their Shrimp Amendment 2.

The major impediment for developing the databases necessary for meeting the information needs for fisheries management is available funding. Because of the wide range of jurisdictions, laws, regulations, available resources involved in collecting fisheries data and managing fisheries, a cooperative program operating on a regional basis and including appropriate parties at the state, interstate, and federal level, would be most appropriate and most effective. Without the necessary scientific information, management will be hard pressed to develop measures that can maximize habitat protection and conservation of fish stocks while allowing fishing at optimal levels.

The three SEAMAP committees discussed potential future SEAMAP activities for 2006-2010 during the joint program meeting held in August, 2005. Each of the three regional components developed a list of activities that would implement changes according to the following priorities:

- I. Restore current projects to full utilization
- II. Expand current projects to collect additional data on existing platforms, and
- III. Develop new fishery independent data collection programs, and

With regard to future activities, the SEAMAP Joint Committee supports priorities that restore and maximize ongoing program activities prior to implementation of any new fishery-independent data collection efforts. The projects are designed specifically to rebuild and expand upon existing SEAMAP data collection activities and as such, will continue to have a high benefit to cost ratio. Within each priority, the following proposed projects are not presented in order of importance, and all cost estimates are based on current rates (August 2005).

These priorities were adjusted in August 2006 at the annual SEAMAP meeting in response to the potential of congressional funds being handed down at various budget levels for 2007.

I. RESTORE CURRENT PROJECTS TO FULL UTILIZATION (\$2,927,700/yr)

SEAMAP projects have been forced to scale back activities in the past five years due to limited funds. These items and money are required to bring SEAMAP back to its previous functional level, with support for baseline operations to meet high priority needs. For the South Atlantic component, the proposed level of funding was developed and adopted by the South Atlantic Committee to address high priority assessment needs for the region as highlighted by the SEDAR research and monitoring needs report (please see appendix G for South Atlantic program justification and this website for SEDAR recommendations:

<http://www.safmc.net/ecosystem/EcosystemManagement/EcosystemElements/Ecological/tabid/240/Default.aspx>)

National Marine Fisheries Service (increase of \$200K per year)

- Data Management - Currently, NMFS receives \$220,000 yearly for data management duties. NMFS needs an additional \$200K per year to handle data management responsibilities including the development of a web portal to the SEAMAP data, implementation of shipboard data collection systems and development of GIS products from SEAMAP data.

Gulf Component (increase of \$1,127,100)

1. Spring Plankton Survey - An additional \$25,000 is needed yearly to continue sampling at the current level. This increase in funds is needed to combat the rising cost of overhead and ship time.
2. Summer Shrimp/Groundfish Survey - An additional \$191,200 is needed yearly to fully restore the Summer Shrimp/Groundfish Survey. An additional one-time expense of \$170,000 is needed for new trawl gear, CTDs, and water samplers.
3. Reeffish Survey - An additional \$69,400 is needed yearly to continue the Reeffish Survey. This includes restoration of five days of sampling that were previously cut.
4. Fall Plankton Survey - An additional \$293,500 is needed yearly to restore the Fall Plankton Survey.
5. Fall Shrimp/Groundfish Survey - An additional \$195,200 is needed yearly to restore the Fall Shrimp/Groundfish Survey. This includes the addition of two days of sampling cut in previous years. A one-time expense of \$2,800 is needed for new gear.
6. Other Projects - An additional \$180,000 is needed yearly for plankton sorting, the SEAMAP Archiving Center, the SEAMAP Invertebrate Plankton Archiving Center, and the Polish Sorting Center.

South Atlantic Component (\$1,562,600/year)

South Atlantic Coastal Survey:

1. Provide adequate resources to cover increasing costs so that future cut backs in stations are not necessary. The survey is currently functioning as fully implemented. However, the proposed full needed budget for 2007 greatly exceeds what is available in 2006 and an additional \$55,000 is needed to continue work at current sampling levels with increased vessel costs. (\$440,000/yr)
2. Delayed purchase of water quality monitoring sensors, ageing software and equipment, and motion compensation scales. (\$93,100)
3. Shallow water trawl expansion into areas that would be useful in the ecosystem approach such as additional aging and gut content analysis. Age-growth and histological sampling of three sciaenid species was added several years ago, but has rarely been fully funded. The effort has been continued, but with difficulties of personnel loss and juggling of overall project funds. Biological samples add to the understanding of coastal finfish populations and improvement of stock assessments and management plans. With added funds, additional species (weakfish, croaker, whiting) could be added to those now documented. Additional costs would include supplies, vessel time, and staff time. One biologist needed for processing (\$56,000/yr)

Bottom Mapping and Fish Habitat Characterization Work Group:

1. Early life history sampling of species such as gag which ingress into estuarine habitats. (\$80,000/yr)
2. Trap and longline gears for snapper-grouper, red drum, and coastal sharks. (\$75,000)
3. One biologist for processing of life history and gut content analysis. (\$56,000/yr)
4. Nearshore sampling: trap and longline surveys to support snapper-grouper and red drum stock, and coastal sharks assessment; complements Marine Resources Monitoring Assessment and Prediction Program (MARMAP) sampling for inshore areas. Develop a phased in sampling protocol for a nearshore ocean larval/sub-adult/adult finfish survey associated with live/hard bottom habitat from Cape Hatteras, North Carolina to Sebastian Inlet, Florida to complement offshore sampling conducted through the MARMAP survey. Standardized regional fishery-independent sampling of representative live/hard bottom habitat identified in the bottom mapping project would provide extremely useful data that will enhance stock assessments, refine essential fish habitat information on early life stages use of nearshore live/hard bottom habitat. The survey would target larval, juvenile, sub-adult and adult finfish

dependant on live/hard bottom habitat on a year-round basis with high priority target species including black sea bass, gag and red drum. Regional fishery-independent sampling would provide essential stock identification and characterization data (geographic distribution, relative abundance) needed to improve overall abundance indices and assessments of southeastern finfish populations and fully complement ongoing management and research efforts. Conduct phase 1 of juvenile tagging to track movement through inlets to nearshore and mid-shelf bottom habitats (supplement North Carolina effort with companion test in South Carolina) and tagging of emigrants out of estuaries into nearshore and midshelf benthic habitats. (\$25,000 for SC pilot project and initiate regional sample design, \$50,000/yr to expand pilot) (\$300,000) Note: red drum funded in 2007 by Atlantic Coastal Fisheries Cooperative Management Act.

5. Work towards complete bottom mapping in coastal waters (shore-200m) with associated bottom type -sediment and/or live bottom (including coral, leptogorgia, hydroids, SAV, shell bottoms, etc). Along with the mapping, fish/habitat characterization needs to be refined. Coordination on this topic with MARMAP is important. Expand MARMAP scope to meet stock assessment needs in response to SEDAR recommendations (\$120,000 /yr)
6. Processing and cooperative sampling support: process multibeam backscatter data. (\$50,000)

Crustacean:

1. Restoration of funding will allow more frequent meetings (annual or every other year) which would allow better dissemination of information on crustacean issues and management throughout the region, and the increased interactions would foster more regional cooperative research. Projected costs are \$4,000/yr.
2. Continue to monitor impacts of recent outbreaks of diseases such as hematodinium (crabs) and black gill (shrimp) and encourage research efforts to ascertain the causes. (\$5,000/yr)

Data Management

1. Biologist to manage and process current and historical data for quality control (\$57,000/yr)
2. Development of GIS Products: creation of shapefiles and metadata for SEAMAP data. (\$15,000)
3. Environmental data processing; processing of CTD and other environmental data (\$60,000)
4. Data updates: system design and programming for uploading process; uploading data (\$40,000)

5. Create and host an internet map service to display SEAMAP GIS products and metadata records. Customize applications to provide enhanced queries and data downloads. Integrate into South Atlantic Ecosystem IMS. (\$30,000)
6. Host the approved SEAMAP webpage developed by ASMFC with appropriate links. (\$10,000/yr)

Pamlico Sound Survey

1. Retain one biologist for report writing and analysis, and support transfer and presentation in the Ecosystem IMS (\$45,000/yr)

Other Projects

1. ASMFC Administration: meetings and travel cost; coordinator partial salary (\$71,500/yr)
2. Piggyback sampling and processing of plankton, environmental and other data, including larval rearing.

Caribbean Component (increase of \$218,000/year)

1. Conch Surveys – The level of effort for conch surveys has decreased over the last few decades. Without an adequate sample size, results may not be statistically valid. Funding should be increased so that adequate sampling can be completed to be statistically valid. Proposed budget \$120,000/year, one year every five years (USVI). Proposed budget \$120,000/year, one year every five years (PR). (\$48,000/year average)
2. Lobster Surveys - The level of effort for lobster pueruli surveys has decreased over the last few decades. Without an adequate sample size, results may not be statistically valid. Funding should be increased so that adequate sampling can be completed to be statistically valid. Proposed budget \$120,000/year, one year every five years (USVI). Proposed budget \$120,000/year, one year every five years (PR). (\$48,000/year average)
3. Trap and Hook & Line Surveys - The level of effort for fisheries independent trap and hook & line surveys have decreased over the last few decades. Without an adequate sample size, results may not be statistically valid. Funding should be increased so that adequate sampling can be completed to be statistically valid. Proposed budget \$150,000/year, three years every five years (USVI). Proposed budget \$160,000/year, one year every five years (PR). (\$122,000/year average)

II. EXPAND CURRENT PROJECTS TO COLLECT ADDITIONAL DATA ON EXISTING PLATFORMS (\$2,880,500/yr)

Gulf Component (increase of \$30,000)

1. An additional \$10,000 is needed yearly to expand the Fall Plankton Survey into deeper waters of the Gulf of Mexico. This would include 2.5 days of additional sampling by NMFS. Expanding into deeper waters would target mackerel larvae.
2. If the current SEAMAP surveys were restored to full utilization and the Fall Plankton Survey was expanded, an additional \$20,000 would be needed yearly for plankton sorting by the Polish Sorting Center.

South Atlantic Component (\$2,278,000/year)

South Atlantic Coastal Survey:

1. Increase station sampling—an external review of the SEAMAP trawl survey found that outer strata sampling was not yielding the desired data set possibly due to constraints on the number of outer strata stations sampled. Because it was also found that variability in inner strata data was higher than desired, all sampling effort was and continues to be directed to the inner strata. With increased funding there could be a return to the outer strata with sufficient sample numbers to provide confidence in results. Based largely on vessel time and gear, it would cost \$1,000-1,500/station to return to trawling the outer strata. Cost would also depend on whether it was associated with inshore sampling or became a separate effort. An accurate cost estimate cannot be given without knowing approximately how many stations would be needed to produce statistically significant data. The cost of returning just the previously used outer stations (43/year), which were found to be insufficient, would cost approximately \$660,000/yr.
2. Necessary equipment for expanded sampling. (\$120,000)
3. Life history/gut content—additional biologist for expanded sampling effort. (\$84,000/yr)

Bottom Mapping and Fish Habitat Characterization Work Group:

1. Early life history sampling (\$80,000)
2. Additional trap and longline equipment/gear (\$85,000)
3. Study of life history/gut content, include additional biologist for expanded effort (\$112,000/yr)
4. Nearshore sampling expansion (\$600,000)
5. MARMAP station complement (\$120,000)

6. Processing and cooperative sampling support (\$50,000)

Pamlico Sound Survey

1. Retain one biologist for report writing and analysis, and support transfer and presentation in the Ecosystem IMS (\$45,000/yr)

Data Management

1. Biologist to manage and process current and historical data for quality control (\$57,000/yr)
2. Development of GIS Products, including processing for increased stations (\$20,000)
3. Environmental data processing (CTD and other data). (\$90,000)
4. Data updates: increased stations and data would necessitate more effort for data updates (\$60,000)
5. Development/enhancement of ecosystem IMS (\$40,000/yr)
6. Webpage (\$10,000)

ASMFC Administrative

1. Coordinator partial salaries, meetings and travel costs (\$85,000/year)

Caribbean Component (increase of \$572,500/year)

1. Lobster Surveys – Pueruli lobster studies have been on-going for several decades. However, results have not been useful in lobster assessment or management work. At the SouthEast Data, Assessment, and Review (SEDAR) 8 meeting, it was suggested that timed diver surveys be included as part of a long term monitoring program for lobsters. It was also suggested at the SEDAR 8 meeting that pueruli lobster survey protocols could be refined to better catch relative peaks in settlement. Lobster pueruli surveys have been geographically limited due to budget constraints. Pueruli and diver surveys need to be expanded to the whole of the U.S. Caribbean (Puerto Rico and the USVI). Proposed additional budget \$120,000/year, once every two years (USVI). Proposed budget \$135,000/year, once every two years (PR) to include other coasts around PR. (\$127,500/year average)
2. Conch Surveys - Diver surveys of conch have been on-going for several decades. However, during recent CFMC meetings the validity of the protocol used was raised. It would be appropriate to assess the current protocol and refine it as necessary so that statistically valid data are collected that can be used as the basis for stock assessment and management. Conch surveys are already Caribbean-wide, so they do not have to be expanded any further. Proposed additional budget \$120,000/year, once every two years

(USVI). Proposed budget \$120,000/year, once every two years (PR). (\$120,000/year average)

3. Trap and Hook & Line Surveys – At the recent SEDAR 8 meeting, the limitations of the SEAMAP-C trap and hook & line survey data was revealed as stock assessment scientists attempted to assess key stocks of fish. It would be appropriate to assess the current protocols and refine them as necessary so that statistically valid data are collected that can be used as the basis for stock assessment and management. Trap and hook & line surveys have been geographically limited due to budget constraints. Surveys need to be expanded to the whole of the U.S. Caribbean (Puerto Rico and the USVI). Proposed additional budget \$150,000/year, on an annual basis (USVI). Proposed budget \$175,000/year, on an annual basis (PR). (\$325,000/year)

III. DEVELOP NEW FISHERY INDEPENDENT DATA COLLECTION PROGRAMS (\$2,129,000/yr): These items include new fisheries independent surveys for data that is needed on a regional basis that is not sufficiently collected now. Specific survey methodology will be determined at the time of survey funding and design.

Gulf Component (increase of \$999,000)

1. Priority data needs call for conducting the Gulf Winter Plankton Survey on an annual basis specifically targeting mullet and grouper in order to obtain complete seasonal long-term trends and abundances. In order to conduct this new survey, \$77,500 is needed yearly. This would include 41 days of sampling effort in January through February.
2. A Deepwater Reefish Survey would target reefish in water depths of 1,500 to 3,000 meters in the Gulf of Mexico. An additional \$53,000 would be needed yearly to conduct this 30-day survey. A one-time purchase of \$171,000 is needed for cameras and equipment to work in these depths.
3. In order to conduct a Winter Shrimp/Groundfish Survey off Louisiana, an additional \$130,000 would be needed annually.
4. In order to conduct nearshore sampling off Louisiana with 16-foot trawl nets would require an additional \$100,000 annually.
5. A Vertical Habitat Reefish Survey would cost \$250,000 yearly.
6. Developing an inshore Gulf Shark Survey would cost \$167,500 yearly. One-time purchases for gear are \$50,000.

South Atlantic Component (\$750,000)

This section would be addressed after restore and expand are met, and so do not include those research needs in the budget amount.

1. Coordinate a cooperative blue crab tagging project and stock identification (DNA analysis). Cost would include tags, PCR (polymerase chain reaction) time, and a ½ year technician. \$50,000/yr.
2. Coordinate cooperative tagging studies and regional testing of gear modification that reduce bycatch (FFEs (Florida FishEye), BRDs (bycatch reduction device), and degradable crab pots materials). \$40,000/yr of project (tags, gear, ½ year salary for biologist; this assumes state vessel time donated similar to shrimp tagging effort in 1986-87 or work on existing platforms).
3. Explore gears that could allow development of indices for pelagic species (mackerel, herring, etc.) (\$90,000/yr)
4. Encourage exploration techniques to develop assays to quickly evaluate the diseased organisms' concentrations in local waters. \$50,000/yr for pilot studies.
5. Develop Nearshore Live Bottom Surveys—Most studies of "live bottom" habitats have been conducted seaward of the ten-fathom line off the Carolinas and Georgia. Biologists acknowledge that substantial live bottom areas exist inside of ten fathoms and these are important fishing grounds for recreational fishermen. These areas provide habitat for black sea bass, red drum, weakfish, and others. A combined live-bottom mapping and finfish trapping program could identify and categorize these poorly-known habitats. These nearshore habitats are at risk to channel-deepening projects, dredge material disposal and heavy fishing pressure. (\$300,000/yr)
6. Develop a plankton survey—The initial concept for SEAMAP-SA included a plankton survey. Larval distribution of fish and crustacean species remains largely unknown. Such a survey might be run as a stand-alone project standardized among researchers regionally or associated with the trawl survey. The lower tiers (phyto- and zooplankton) should also be considered. (\$100,000/yr)
7. Whelk Surveys—The conch/whelk fishery from NC to GA is poorly understood and it is believed the population is in decline. These species are caught in commercial quantities in crab and whelk pots and crab/conch trawls. In addition, there is little known about the hand retrieval harvest (both commercial and recreational) along the beaches. A trawl survey can be conducted to gather information on abundance, size, age, and maturity (\$50,000/yr).
8. Develop and implement a survey program to detect and monitor invasive species. Invasive species can take hold very rapidly, especially if not detected early. A survey that

monitors for key problem species could save the region a great amount of time and expense later. (\$70,000/yr)

Caribbean Component (increase of 380,000/year)

1. Whelk – In 2003-04, whelk surveys were substituted for one of the St. Croix and Puerto Rico trap and hook & line survey years. Results provided the first U.S. Caribbean-wide information on this species. These surveys should be continued on a periodic basis. Proposed additional budget \$120,000/year, once every three years (USVI). Proposed additional budget \$120,000/year, once every three years (PR). (\$80,000/year average)
2. Priority Fish Species – At the recent CFMC meeting, priority fish species were identified for seasonal closures. These were primarily grouper and snapper species. Information on these fish species is extremely limited. It would be appropriate to develop fisheries independent data collection programs for these species so that future management can be based on data, rather than subjective opinions. Proposed additional budget of \$150,000/year, on an annual basis (USVI). Proposed budget \$150,000/year, on an annual basis (PR). (\$300,000/year)

National Marine Fisheries Service

NMFS Data management would have to add additional resources to develop the systems to support the data collection expansions and additional data types collected. If all the proposed data collection were to take place, SEAMAP data would increase dramatically. Expansion of data collection and management capabilities within NMFS and the three SEAMAP components would have to be funded. Without a more detailed explanation of the expansions, an accurate estimate of the increases to data management cost cannot be made.

APPENDIX A -MEMBERSHIP ON SEAMAP COMMITTEES

SEAMAP-Gulf of Mexico Subcommittee

PAUL CHOUCAIR, Texas Parks and Wildlife Department
JAMES HANIFEN, Louisiana Department of Wildlife and Fisheries, *Chair*
STEVENS HEATH, Alabama Department of Conservation and Natural Resources
RICHARD LEARD, Gulf of Mexico Fishery Management Council
MARK LEIBY, Florida Fish and Wildlife Conservation Commission
BUTCH PELLEGRIN, National Marine Fisheries Service, Pascagoula Laboratory, MS
JEFF RESTER, Gulf States Marine Fisheries Commission, *Coordinator*
RICHARD WALLER, Mississippi Department of Marine Resources/Gulf Coast Research Laboratory

SEAMAP-South Atlantic Committee

MEGAN CALDWELL, Atlantic States Marine Fisheries Commission
PATRICK GEER, Georgia Department of Natural Resources, Coastal Resources Division
WILSON LANEY, U.S. Fish and Wildlife Service, South Atlantic Fisheries Coordination Office
MELISSA PAINE, Atlantic States Marine Fisheries Commission, *Coordinator*
ROGER PUGLIESE, South Atlantic Fishery Management Council, *Chair*
TINA UDOUJ, Fish and Wildlife Research Institute, FL
DOUGLAS VAUGHAN, National Marine Fisheries Service, Beaufort Laboratory, NC
ELIZABETH WENNER, South Carolina Department of Natural Resources
KATY WEST, North Carolina Department of Environment and Natural Resources

SEAMAP-Caribbean Committee

RICHARD APPELDOORN, Puerto Rico Sea Grant College Program / University of Puerto Rico Department of Marine Sciences
RUPERTO CHAPARRO, University of Puerto Rico Sea Grant College Program
GRACIELA GARCÍA-MOLINER, Caribbean Fishery Management Council
NILDA JIMÉNEZ, Puerto Rico Department of Natural and Environmental Resources
EDWIN MUÑIZ, U.S. Fish and Wildlife Service
EDGARDO OJEDA SERRANO, University of Puerto Rico / Sea Grant College Program, *Coordinator*
DAVID A. OLSEN, Virgin Islands Department of Planning and Natural Resources/Division of Fish and Wildlife
MIGUEL ROLON, Caribbean Fishery Management Council
ANA M. ROMÁN, U.S. Fish and Wildlife Service
AIDA ROSARIO, Puerto Rico Department of Natural and Environmental Resources, *Chair*
NANCY THOMPSON / PETER THOMPSON / ALEX CHESTER / THEO BRAINERD, NOAA / Southeast Fisheries Science Center
WES TOLLER, Virgin Islands Department of Planning and Natural Resources/Division of Fish and Wildlife, University of the Virgin Islands

APPENDIX B - DOCUMENTS PRODUCED BY SEAMAP

Annual Reports

Annual reports summarize and evaluate survey operations, data management, administration, and information dissemination activities. They also offer a financial statement, listing of official SEAMAP publications, data requests and publications that relied on SEAMAP data, a proposed budget, and recommendations for SEAMAP activities to be conducted the following year.

Joint Reports

Bane, N. and P. Eldridge. 1985. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1984 - 30 September 1985. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 10 pp.

Bane, N. and P. Eldridge. 1986. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1985 - 30 September 1986. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 13 pp.

Bane, N. and T. Van Devender. 1987. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1986 - 30 September 1987. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 10 pp.

Bane, N. and T. Van Devender. 1988. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1987 - 30 September 1988. Gulf States Marine Fisheries Commission, Ocean Springs, MS.

Bane, N. and T. Van Devender. 1989. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1988 - 30 September 1989. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 11 pp.

Donaldson, D., C. Goodyear and S. Laureano. 1990. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1989-30 September 1990. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 15 pp.

Donaldson, D., D. Stephan and S. Laureano. 1991. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1990-30 September 1991. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 10 pp.

Donaldson, D., D. Stephan and A. Rosario. 1992. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1991-30 September 1992. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 10 pp.

- Donaldson, D., D. Stephan and A. Rosario.1993. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1992-30 September 1993. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 13 pp.
- Donaldson, D., D. Stephan and A. Rosario.1994. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1993-30 September 1994. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 12 pp.
- Donaldson, D., R. Peuser and A. Rosario.1995. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1994-30 September 1995. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 12 pp.
- Donaldson, D., R. Peuser and A. Rosario.1996. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1995-30 September 1996. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 12 pp.
- Donaldson, D., R. Peuser and L. Hinkey.1997. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1996-30 September 1997. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 11 pp.
- Rester, J., G. White, and L. Hinkey.1998. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1997-30 September 1998. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 10 pp.
- Rester, J., G. White, and E. Serrano.1999. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1998-30 September 1999. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 10 pp.
- Rester, J., G. White, and E. Serrano.2000. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 October 1999-30 September 2000. Gulf States Marine Fisheries Commission, Ocean Springs, MS.
- Rester, J.K., G.G. White, and E. Ojeda Serrano. 2001. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP), October 1, 2000 to September 30, 2001. Gulf States Marine Fisheries Commission, Atlantic States Marine Fisheries Commission, Puerto Rico Sea Grant College Program. 10 pp.
- Rester, J.K., G.G. White, and E. Ojeda Serrano. 2002. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP), October 1, 2001 to September 30, 2002. Gulf States Marine Fisheries Commission, Atlantic States Marine Fisheries Commission, Puerto Rico Sea Grant College Program. 10 pp.
- Rester, J.K., C. Van Maaren, and E. Ojeda Serrano. 2003. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP), October 1, 2002 to September 30, 2003.

Gulf States Marine Fisheries Commission, Atlantic States Marine Fisheries Commission, Puerto Rico Sea Grant College Program. 14pp.

Rester, J.K., E.L. Griffin, and E. Ojeda Serrano. 2004. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP), October 1, 2003 to September 30, 2004. Gulf States Marine Fisheries Commission, Atlantic States Marine Fisheries Commission, Puerto Rico Sea Grant College Program. 17 pp.

SEAMAP-Gulf of Mexico

SEAMAP-Gulf Subcommittee. 1983. SEAMAP Annual Report to the Technical Coordinating Committee of the Gulf States Marine Fisheries Commission. GSMFC, Ocean Springs, MS, 15 pp.

The annual reports for the Gulf of Mexico follow the citation (as below) for the years 1984-2005. Reports from 1989-99 also have appendices.

SEAMAP-Gulf Subcommittee. 1984. SEAMAP Annual Report to the Technical Coordinating Committee of the Gulf States Marine Fisheries Commission, 1 October 1983 - 30 September 1984. GSMFC, Ocean Springs, MS, 27 pp.

SEAMAP-South Atlantic

The annual reports for the South Atlantic follow the citation (as below) for the years 1984-2005. Reports from 1997-2005 were submitted to the SAB.

SEAMAP-South Atlantic Committee. 1984. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) South Atlantic, 1 October 1983 - 30 September 1984. Atlantic States Marine Fisheries Commission, Washington, DC.

SEAMAP-Caribbean

Rosario, A. 1993. Shallow-water reef fish monitoring/NMFS Cooperative SEAMAP Program. Annual Report. Fisheries Research Laboratory, Dept. of Natural Resources. 73 pp.

Rosario, A. 1994. Southeast Area Monitoring and Assessment Program of the Caribbean (SEAMAP-C) Sampling Protocol Manual. DNER/NMFS SEAMAP-C Program. 1 – 17 pp.

Rosario, A. 1994. Shallow-water reef fish monitoring/NMFS Cooperative SEAMAP Program. Annual Report. Fisheries Research Laboratory, Dept. of Natural Resources. 142 pp.

- Rosario, A. 1995. Queen Conch Stratification Survey. Report to the CFMC/SEAMAP Caribbean Committee. 47pp
- Rosario, A. 1996. Caribbean/NMFS Cooperative SEAMAP Program Shallow-water reef fish monitoring. Progress Rep. NMFS. 1 – 133 pp.
- Rosario, A. 2002. Fisheries independent monitoring of shallow water reef Fisheries. Completion Report to PR-DNER, NMFS/SEAMAP-Caribbean Program. 1 – 106 pp.
- Rosario Jiménez, A. 2004. Shallow water reef fish monitoring SEAMAP-Caribbean fisheries independent monitoring. Comp. Rep. NMFS/SEAMAP-Caribbean Program. PRDNER. 1 – 78 pp.
- Dixon, H. 1994. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 April 1993 to 31 March 1994. Div. Fish. Wildl. Dept. Planning Nat. Res. USVI. 14 pp.
- Meyers, S. 1995. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 April 1994 to 31 March 1995. Div. Fish. Wildl., Dept. Planning Nat. Res. USVI. 10pp.
- Friedlander, A. 1996. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 April 1995 to 31 March 1996. Div. Fish. Wildl., Dept. Planning Nat. Res. USVI.
- Maidment-Caseau, S.L. 1997. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 April 1996 to 31 March 1997. Div. Fish Wildl., Dept. Planning Nat. Res. USVI. 8 pp.
- Maidment-Caseau, S.L. 1998. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP) 1 April 1997 to 31 March 1998. Div. Fish. Wildl., Dept. Planning Nat. Res. USVI. 20 pp.
- Gomez, R. 2000. SEAMAP-C Fisheries Independent Sampling of the Shallow water Reef Resources in the U.S. Virgin Islands. Annual Summary Report. April 1999 to March 31, 2000. Division of Fish and Wildlife. Department of Planning and Natural Resources, U.S. Virgin Islands. 5 pp.
- Tobias, W. 2002. SEAMAP-C Fisheries independent sampling using lines (hooks) and fish traps in the U.S. Virgin Islands. Annual Performance Report, January 1, 2001 to December 31, 2001. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. 2 pp.

- Gordon, S., and B. Volson. 2002. SEAMAP-C USVI queen conch stock assessment. Annual Performance Report, January 1, 2001 to December 31, 2001. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. 2 pp.
- Uwate, K.R. 2003. Caribbean/NMFS Cooperative SEAMAP Program. Annual Performance Report, January 1, 2002 to December 31, 2002. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. 3 pp.
- Gordon, S. and J. Vasques. 2004. SEAMAP-C U.S. Virgin Islands Caribbean Spiny Lobster Assessment. Annual Performance Report January 1, 2003 to December 31, 2003. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. 2 pp.
- Toller, W. 2004. SEAMAP-C U.S. Virgin Islands Whelk Survey. Annual Performance Report, April 1, 2003 to December 31, 2003. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. 3 pp.
- Gomez, R. 2005. SEAMAP-C U.S. Virgin Islands Trap and Hook-and-Line Fishing Surveys. Annual Performance Report, January 1, 2004 to December 31, 2004. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. 2 pp.
- Toller, W., and S. Gordon. 2005. SEAMAP-C U.S. Virgin Islands Whelk Survey. Annual Performance Report, January 1, 2004 to December 31, 2004. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands. 2 pp.

Completion Reports

SEAMAP-South Atlantic

- Atlantic States Marine Fisheries Commission. 2000. SEAMAP 10-Year Trawl Report: Results of trawling efforts in the coastal habitat of the South Atlantic Bight, FY 1990-1999. Atlantic States Marine Fisheries Commission, Special Report No. 71. 143 pp.
- Beatty, H.R. 1991. 1991 Fall SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 5 pp.
- Beatty, H.R. 1992. 1992 Fall SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department. Charleston, SC, 6 pp.
- Beatty, H.R. 1993. 1993 Fall SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department. Charleston, SC, 6 pp.

- Beatty, H.R. 1994. 1994 Spring SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department. Charleston, SC, 6 pp.
- Beatty, H.R. 1994. 1994 Summer SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department. Charleston, SC, 5 pp.
- Beatty, H.R. 1994. 1994 Fall SEAMAP Cruise Report. South Carolina Department of Natural Resources. Charleston, SC, 6 pp.
- Beatty, H.R. 1995. 1995 Spring SEAMAP Cruise Report. South Carolina Department of Natural Resources. Charleston, SC, 6 pp.
- Beatty, H.R. 1995. 1995 Summer SEAMAP Cruise Report. South Carolina Department of Natural Resources. Charleston, SC, 6 pp.
- Beatty, H.R. and E.L. Wenner. 1991. 1991 Spring SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 6 pp.
- Beatty, H.R. and E.L. Wenner. 1992. 1992 Spring SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 6 pp.
- Beatty, H.R. and E.L. Wenner. 1992. 1992 Summer SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 5 pp.
- Beatty, H.R. and E.L. Wenner. 1993. 1993 Spring SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 6 pp.
- Beatty, H.R. and E.L. Wenner. 1993. 1993 Summer SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 6 pp.
- Beatty, H.R., J.W. Hall, and E.L. Wenner. 1988. Results of trawling efforts in the coastal habitat of the South Atlantic Bight, FY87-88. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 94 pp.
- Beatty, H.R., R.P. Webster, and E.L. Wenner. 1989. Temporal and spatial variations in biomass, abundance, and community composition of fishes and invertebrates from the coastal habitat, South Atlantic Bight, 1987-1988. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 141 pp.
- Beatty, H.R., J.M. Boylan, R.P. Webster and E.L. Wenner. 1992. Results of Trawling Efforts in the Coastal Habitat of the South Atlantic Bight. SEAMAP-SA Final Report, FY 1991. South Carolina Wildlife and Marine Resources Department, Marine Resources Research Institute, Charleston, SC, 52 pp.

- Beatty, H.R., J.M. Boylan, R.P. Webster and E.L. Wenner.1994. Results of Trawling Efforts in the Coastal Habitat of the South Atlantic Bight, FY 1993. South Carolina Wildlife and Marine Resources Department, Marine Resources Research Institute, Charleston, SC, 94 pp.
- Boylan, J.M., R.P. Webster, H.R. Beatty and E.L. Wenner. 1991. Results of Trawling Efforts in the Coastal Habitat of the South Atlantic Bight. SEAMAP-SA Final Report, FY 1990. South Carolina Wildlife and Marine Resources Department, Marine Resources Research Institute, Charleston, SC, 48 pp.
- Boylan, J.M., R.P. Webster, H.R. Beatty and E.L. Wenner.1993. Results of Trawling Efforts in the Coastal Habitat of the South Atlantic Bight. SEAMAP-SA Final Report, FY 1992. South Carolina Wildlife and Marine Resources Department, Marine Resources Research Institute, Charleston, SC, 54 pp.
- Low, R.A., and J.D. Whitaker.1986. SEAMAP comparative shrimp trawling study. SC Marine Resources Center Contribution No. 210. SC Wildlife and Marine Resources Department, Charleston, SC, 27 pp.
- Moye, D.W. and M.G. Pulley.1990. Pamlico Sound Survey September 1989 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Divisions of Marine Fisheries. 24 pp. DMF Report #222.
- Moye, D.W, C.D. Stephan and S.K. Strasser.1990. Pamlico Sound Survey June 1989 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Divisions of Marine Fisheries. 21 pp. DMF Report #221.
- North Carolina Division of Marine Fisheries.1998. Survey Population Parameters of Marine Recreational fishes in North Carolina. Annual Progress Report, grant F-42 segment 7 (January 1 - December 31, 1997). North Carolina Department of Environment and Natural Resources, Division of Marine Fisheries. 36 pp.
- North Carolina Division of Marine Fisheries.1999. Survey Population Parameters of Marine Recreational fishes in North Carolina. Annual Progress Report, grant F_42 segment 8 (January 1 _ December 31, 1998). North Carolina Department of Environment and Natural Resources, Division of Marine Fisheries. 39 pp.
- Perkins, T.H., H.A. Norris, D.T. Wilder, S.D. Kaiser, D.K. Camp, R.E. Matheson, Jr., F.J. Sargent, M.M. Colby, W.G. Lyons, R.G. Gilmore, Jr., J.K. Reed, G.A. Zarillo, K. Connell, M.
- Fillingfin, and F.M. Idri. 1997. Distribution of Hard-Bottom Habitats on the Continental Shelf off the Northern and Central East Coast of Florida. Final Report. Florida Marine Research Institute, St. Petersburg, Florida. 54 pp. (plus Appendices 1-4, 474 pp.).

- Pulley, M.G. 1990. Pamlico Sound Survey June 1990 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries, Morehead City, NC. 27 pp.
- Pulley, M.G. 1991. Pamlico Sound Survey September 1990 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries, Morehead City, NC. 33 pp.
- Pulley, M.G. 1991. Pamlico Sound Survey June 1991 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries, Morehead City, NC. 29 pp.
- Pulley, M.G. 1992. Pamlico Sound Survey September 1991 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries, Morehead City, NC. 27 pp.
- Pulley, M.G. 1993. Pamlico Sound Survey June 1992 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries. 27 pp. DMF Report #263.
- Pulley, M.G. 1993. Pamlico Sound Survey September 1992 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries. 33 pp. DMF Report #26.
- Pulley, M.G. 1995. Pamlico Sound Survey June 1993 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries, Morehead City, NC. 27 pp.
- Pulley, M.G. 1995. Pamlico Sound Survey September 1993 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Division of Marine Fisheries, Morehead City, NC. 33 pp.
- Pulley, M.G. 1996. Pamlico Sound Survey, June 1994 Cruise Report, North Carolina Department of Environment, Health, Natural Resources, Division of Marine Fisheries. 26 pp.
- Pulley, M.G. 1996. Pamlico Sound Survey, September 1994 Cruise Report, North Carolina Department of Environment, Health, Natural Resources, Division of Marine Fisheries. 34 pp.
- Pulley, M.G. 1997. Pamlico Sound Survey, June 1995 Cruise Report, North Carolina Department of Environment, Health, Natural Resources, Division of Marine Fisheries. 30 pp.
- Pulley, M.G. 1997. Pamlico Sound Survey, September 1995 Cruise Report, North Carolina Department of Environment, Health, Natural Resources, Division of Marine Fisheries. 36 pp.

- Pulley, M.G. 1998. Pamlico Sound Survey, September 1997 Cruise Report, North Carolina Department of Environment, Health, Natural Resources, Division of Marine Fisheries. 25 pp.
- Pulley, M.G. 1998. Pamlico Sound Survey, June 1997 Cruise Report, North Carolina Department of Environment, Health, Natural Resources, Division of Marine Fisheries. 22 pp.
- Ross, S.W., E.K. Barber, R.B. Searles, and S.R. Riggs. 1987a. An evaluation of methods for mapping hard bottoms in the South Atlantic Bight. Completion Report for Project SM-11, Activity II of the NC/NMFS Cooperative SEAMAP Program. Special Report No. 8 of the Atlantic States Marine Fisheries Commission. ASMFC, Washington, DC, 122 pp.
- Ross, S.W., E.K. Barber, R.B. Searles, and S.R. Riggs. 1987b. An evaluation of methods for mapping hard bottoms in the South Atlantic Bight, Executive Summary. Completion Report for Project SM-11, Activity II of the NC/NMFS Cooperative SEAMAP Program. Special Report No. 9 of the Atlantic States Marine Fisheries Commission, ASMFC, Washington, DC, 13 pp.
- Shallow Water Trawl Work Group, SEAMAP-SA. 1996. SEAMAP-SA Shallow Water Trawl Survey Report to the Crustacean and Trawl Work Group Members. Atlantic States Marine Fisheries Commission, Washington, DC. 11 pp. (Appendix C)
- South Carolina Marine Resources Division. 1995. 1995 Fall SEAMAP Cruise Report. South Carolina Department of Natural Resources. Charleston, SC., 5 pp.
- South Carolina Marine Resources Division. 1995. Results of Trawling Efforts in the Coastal Habitat of the South Atlantic Bight, FY 1994. South Carolina Department of Natural Resources, Charleston, SC. 58 pp.
- *South Carolina Marine Resources Division. 1996. 1996 Fall SEAMAP Cruise Report. South Carolina Department of Natural Resources. Charleston, SC., 7 pp.
- *South Carolina Marine Resources Division. 1996. 1996 Spring SEAMAP Cruise Report. South Carolina Department of Natural Resources. Charleston, SC., 7 pp.
- *South Carolina Marine Resources Division. 1996. 1996 Summer SEAMAP Cruise Report. South Carolina Department of Natural Resources. Charleston, SC., 6 pp.
- **South Carolina Marine Resources Division. 1996. Results of Trawling Efforts in the Coastal Habitat of the South Atlantic Bight, FY 1995. South Carolina Department of Natural Resources, Charleston, SC. 64 pp.

The South Carolina Marine Resources Division additionally produced reports for their fall, spring, and summer cruises (*) as well as a yearly report (**) for the years 1997- 2005 which have the same citation format as those starred references above.

Southeast Area Monitoring and Assessment Program-South Atlantic (SEAMAP-SA). 2003. Summary of Seafloor Mapping and Benthic Sampling Conducted in 200-2000m, from North Carolina through Florida. Final report to the NOAA Coastal Services Center Deep Water Habitat Mapping Project, Phase II. April 2003. 156 pp. Available through the Atlantic States Marine Fisheries Commission, Washington, DC. 166 pp.

Stephan, C.D. and D.W. Moyer. 1989. Pamlico Sound Survey March 1989 Cruise Report. North Carolina Department of Environment, Health and Natural Resources, Divisions of Marine Fisheries. 16 pp. DMF Report #212.

Webster, R.P., H.R. Beatty, and E.L. Wenner. 1990. Results of trawling efforts in the coastal habitat of the South Atlantic Bight. SEAMAP-SA final report, FY 1989, S.C. Wildl. and Mar. Res. Dept., Mar. Resour. Res. Inst., Charleston, SC, 66 pp.

Wenner, E.L. 1989. 1989 Fall SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 14 pp.

Wenner, E.L. 1990. 1990 Spring SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 10 pp.

Wenner, E.L. 1990. 1990 Summer SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 10 pp.

Wenner, E.L. 1990. 1990 Fall SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 5 pp.

Wenner, E.L. 1991. 1991 Summer SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department, Charleston, SC, 5 pp.

Wenner, E.L., and G. Ulrich. 1987. Exploration for Golden Crab, *Geryon fenneri*, in the South Atlantic Bight: distribution, population structure, and gear assessment final report. SC Wildlife and Marine Resources Dept., Charleston, SC, 60 pp.

Wenner, E.L., H.R. Beatty, and D. Stephan. 1987. Results of trawling efforts in the coastal habitat of the South Atlantic Bight, FY86-87 SEAMAP-SA Final Report. SC Wildlife and Marine Resources Dept., Charleston, SC, 55 pp.

SEAMAP-Caribbean

- Appeldoorn, R.S. 1996. Underwater survey of the queen conch resources in Puerto Rico. April 1995 to March 1996. Final Report. Caribbean/NMFS Cooperative SEAMAP Program. 29 pp.
- Appeldoorn, R.S. 2002. Underwater survey of the queen conch resource in Puerto Rico. Final Report to NMFS/SEAMAP Program. 30 p.
- Jiménez, N. 2004. Study on the juvenile recruitments of the spiny lobster (*Panulirus argus*). Completion report. NMFS/SEAMAP Program. 1 – 13.
- Jiménez, N. 2005. Caribbean/NMFS Cooperative SEAMAP Program Whelk Assessment Project. Final report NMFS/SEAMAP Program. FRL-PRDNER. 1 – 10 pp.
- Rosario, A. 1989. Fisheries-independent monitoring of commercially exploited reef fish and spiny lobster resources in Puerto Rico. Completion Rep. CODREMAR. Mayaguez, Puerto Rico. 114 pp.
- Rosario, A. 1998. Shallow-Water Reef Fish Survey. April 1994 to March. Final Report. Caribbean/NMFS Cooperative SEAMAP Program. 85 pp.
- Rosario Jiménez, A. and M. Figuerola Fernández. 1998. Recruitment of postlarval spiny lobster (*Panulirus argus*) in southwestern Puerto Rico. Completion report NMFS/SEAMAP Program. 1 – 15 pp.
- Rosario Jiménez, A. and M. Figuerola Fernández. 2004. Recruitment of postlarval spiny lobster (*Panulirus argus*) in southwestern Puerto Rico. Completion report NMFS/SEAMAP Program. 1 – 9 pp.
- Gordon, S. 2002. USVI queen conch stock assessment. Caribbean/NMFS Cooperative SEAMAP Program, NAO7FS0100. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands
- Gordon, S., and J. Vasques. 2004. USVI Caribbean Spiny Lobster Assessment. Caribbean/NMFS Cooperative SEAMAP Program, NAO7FS0100. Division of Fish and Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands.
- Gomez, R. 2000. Fisheries independent sampling of the shallow water reef resources in the U.S. Virgin Islands. Summary Report, April 1, 1999 – March 31, 2000. Caribbean/NMFS Cooperative SEAMAP Program. Bureau of Fisheries, Division of Fish & Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands.

Mateo, I., and W.J. Tobias. 2002. Preliminary estimations of growth, mortality and yield per recruit for the spiny lobster *Panulirus argus* in St. Croix, USVI. Proc. Gulf Caribb. Fish Inst. 53: 59-75.

Tobias, W., W. Toller, W. Ventura, and H. Rivera. 2002. St. Croix fisheries independent trap and line survey. Summary Report, April 1, 2000 – August 31, 2002. Caribbean/NMFS Cooperative SEAMAP Program. Division of Fish & Wildlife, Department of Planning and Natural Resources, U.S. Virgin Islands.

Toller, W., and S. Gordon. 2005. A population survey of the West Indian topshell or whelk (*Cittarium pica*) in the U.S. Virgin Islands. Bureau of Fisheries, Division of Fish and Wildlife, Department of Planning and Natural Resources, Government of the U.S. Virgin Islands.

Atlases

Atlases summarize annual ichthyological, shrimp/groundfish, and environmental data collected on cruises.

SEAMAP-Gulf of Mexico

Bane, N., and P.A. Thompson. 1986. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1983. Gulf States Marine Fisheries Commission, No. 13. GSMFC, Ocean Springs, MS, 179 pp.

Donaldson, D.M., N. Sanders, Jr., and P.A. Thompson. 1993. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1991. Gulf States Marine Fisheries Commission, No. 29, GSMFC, Ocean Springs, MS, 321 pp.

Donaldson, D.M., N. Sanders, Jr., and P.A. Thompson. 1994. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1992. Gulf States Marine Fisheries Commission, No. 30, GSMFC, Ocean Springs, MS, 293 pp.

Donaldson, D.M., R. Minkler, N. Sanders, Jr., and P.A. Thompson. 1996. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1993. Gulf States Marine Fisheries Commission, No. 34, GSMFC, Ocean Springs, MS, 284 pp.

Donaldson, D.M., R. Minkler, N. Sanders, Jr., and P.A. Thompson. 1997. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1994. Gulf States Marine Fisheries Commission, No. 40, GSMFC, Ocean Springs, MS, 277 pp.

- Donaldson, D.M., R. Minkler, N. Sanders, Jr., and P.A. Thompson. 1997. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1995. Gulf States Marine Fisheries Commission, No. 41, GSMFC, Ocean Springs, MS, 280 pp.
- Donaldson, D.M., D. Hanisko, N. Sanders, Jr., and P.A. Thompson. 1998. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1996. Gulf States Marine Fisheries Commission, No. 52, GSMFC, Ocean Springs, MS, 263 pp.
- Kelly, S., T. Potthoff, W.J. Richards, L. Ejsymont, and J.V. Gartner. 1986. SEAMAP 1983 - Ichthyoplankton. Larval distribution and abundance of Engraulidae, Carangidae, Clupeidae, Lutjanidae, Serranidae, Sciaenidae, Coryphaenidae, Istiophoridae, Xiphiidae, and Scombridae in the Gulf of Mexico. NOAA Tech. Memo. NMFS-SEFC-167, 77 pp.
- Kelley, S., J.V. Gartner, Jr., W.J. Richard, and L. Ejsymont. 1990. SEAMAP 1986 - Ichthyoplankton. Larval distribution and abundance of Engraulididae, Carangidae, Clupeidae, Gobiidae, Lutjanidae, Serranidae, Sciaenidae, Coryphaenidae, Istiophoridae, and Scombridae in the Gulf of Mexico. NOAA Tech. Memo. NMFS-SEFC-245, 45 pp.
- Kelley, S., J.V. Gartner, Jr., W.J. Richard, and L. Ejsymont. 1993. SEAMAP 1984 and 1985 - Ichthyoplankton. Larval distribution and abundance of Carangidae, Clupeidae, Coryphaenidae, Engraulidae, Gobiidae, Istiophoridae, Lutjanidae, Scombridae, Serranidae, and Xiphiidae in the Gulf of Mexico. NOAA Tech. Memo. NMFS-SEFSC-317, 113 pp.
- Rester, J.K., D. Hanisko, N. Sanders, Jr., and P.A. Thompson. 1999. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1997. Gulf States Marine Fisheries Commission, No. 63, GSMFC, Ocean Springs, MS, 254 pp.
- Rester, J.K., D. Hanisko, N. Sanders, Jr., and P.A. Thompson. 2000. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1998. Gulf States Marine Fisheries Commission, No. 75, GSMFC, Ocean Springs, MS, 243 pp.
- Rester, J.K., D. Hanisko, N. Sanders, Jr., and P.A. Thompson. 2000. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1998. Gulf States Marine Fisheries Commission, No. 75, GSMFC, Ocean Springs, MS.
- Rester, J.K., D. Hanisko, N. Sanders, Jr., and P.A. Thompson. 2001. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1999. Gulf States Marine Fisheries Commission, No. 82, GSMFC, Ocean Springs, MS.
- Rester, J.K., D. Hanisko, N. Sanders, Jr., and P.A. Thompson. 2002. SEAMAP environmental and biological atlas of the Gulf of Mexico, 2000. Gulf States Marine Fisheries Commission, No. 101, GSMFC, Ocean Springs, MS.

- Rester, J.K., D. Hanisko, N. Sanders, Jr., and P.A. Thompson. 2003. SEAMAP environmental and biological atlas of the Gulf of Mexico, 2001. Gulf States Marine Fisheries Commission, No. 118, GSMFC, Ocean Springs, MS.
- Richards, W.J., T. Potthoff, S. Kelly, M.F. McGowan, L. Ejsymont, J.H. Power, and R.M. Olvera. 1984. SEAMAP 1982 - Ichthyoplankton. Larval distribution and abundance of Engraulidae, Carangidae, Clupeidae, Lutjanidae, Serranidae, Coryphaenidae, Istiophoridae, Xiphiidae, and Scombridae in the Gulf of Mexico. NOAA Tech. Memo. NMFS-SEFC-144, 51 pp.
- Sanders, N., Jr., D.M. Donaldson, and P.A. Thompson. 1990. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1987. Gulf States Marine Fisheries Commission, No. 22, GSMFC, Ocean Springs, MS, 337 pp.
- Sanders, N., Jr., D.M. Donaldson, and P.A. Thompson. 1991. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1988. Gulf States Marine Fisheries Commission, No. 23, GSMFC, Ocean Springs, MS, 320 pp.
- Sanders, N., Jr., D.M. Donaldson, and P.A. Thompson. 1991. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1989. Gulf States Marine Fisheries Commission, No. 25, GSMFC, Ocean Springs, MS, 318 pp.
- Sanders, N., Jr., D.M. Donaldson, and P.A. Thompson. 1992. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1990. Gulf States Marine Fisheries Commission, No. 27, GSMFC, Ocean Springs, MS, 311 pp.
- Sanders, N., Jr., T. Van Devender, and P.A. Thompson. 1990. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1986. Gulf States Marine Fisheries Commission, No. 20, GSMFC, Ocean Springs, MS, 328 pp.
- Stuntz, W.E., C.E. Bryan, K. Savastano, R.S. Waller, and P.A. Thompson. 1985. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1982. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 145 pp.
- Thompson, P.A., and N. Bane. 1986. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1984. Gulf States Marine Fisheries Commission, No. 15, GSMFC, Ocean Springs, MS, 171 pp.
- Thompson, P.A., T. Van Devender, and N.J. Sanders, Jr. 1988. SEAMAP environmental and biological atlas of the Gulf of Mexico, 1985. Gulf States Marine Fisheries Commission, No. 17, GSMFC, Ocean Springs, MS, 338 pp.

Marine Directories

SEAMAP-Gulf of Mexico

A directory is produced each year with the same citation format (see below), and are available from 1983-2005. Summarizes information on fisheries research survey activities, personnel, facilities and gear, and is updated annually for distribution to regional fisheries organizations.

SEAMAP-Gulf of Mexico Subcommittee. 1983. 1983 SEAMAP-Gulf of Mexico marine directory fishery-independent survey activities. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 14 pp.

Special Reports

These reports are prepared to provide timely information that fulfills the program's goals and objectives. These may include descriptions of standard sampling protocols and gears, results of gear comparisons, workshop proceedings, etc. Special reports will be available to state agencies, universities, and other researchers concerned with collecting data that will be compatible with those of SEAMAP organizations.

Joint Reports

Data Services Department, Sverdrup Technology, Inc. 1989. Southeast area monitoring and assessment program data management system users manual. Sverdrup Tech., Inc., NASA Tech. Support Services Contractor, Stennis Space Center, MS, 92 pp.

Hennemuth, R.C., R.J. Shephard, W.G. Gordon, and H.A. Clonts. 1987. SEAMAP program review. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 41 pp.

Kemmerer, A.J., A.C. Jones, and N. Bane. 1987. New concepts in cooperative fisheries management. Coastal Zone '87: 2608-2621.

Mississippi Laboratories, Southeast Fisheries Center. 1981. Southeast area monitoring and assessment program (SEAMAP) strategic plan. Southeast Fisheries Center, NMFS, NOAA, Pascagoula, MS, 50 pp.

Peuser, R.L. 1996. Southeast Area Monitoring and Assessment Program (SEAMAP) Management Plan: 1996-2000. Atlantic States Marine Fisheries Commission. 86 pp.

Scientific Computation Section, Sverdrup Technology, Inc. 1986. Data management system requirements for SEAMAP Gulf and South Atlantic. Sverdrup Tech. Inc., NASA Tech. Sup. Serv. Contractor, Stennis Space Ctr, MS, 39 pp.

Scientific Computation Section, Sverdrup Technology, Inc. 1987. Data management system design study for SEAMAP Gulf and South Atlantic 1987. Sverdrup Tech., Inc., NASA Tech. Support Services Contractor, Stennis Space Center, MS, 39 pp.

Stephan, C.D. 1990. Southeast Area Monitoring and Assessment Program (SEAMAP) Management Plan: 1990-1995. North Carolina Department of Environment, Health, and Natural Resources. 85 pp.

Wenner, E.L., and D. Stephan. 1990. Regional fishery problems. Coastal Perspective, S.C. Wildl. Mar. Res. Dept., Summer 1990, pp. 22-25.

SEAMAP-Gulf of Mexico

Bane, N. 1984. Southeast area monitoring and assessment program (SEAMAP) operations plan: 1985-1990. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 86 pp.

Bane, N. 1984. Southeast area monitoring and assessment program (SEAMAP) operations plan: 1985-1990, executive summary. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 9 pp.

Gulf States Marine Fisheries Commission. 1987. SEAMAP operations manual for collection of data. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 120 pp.

SEAMAP Reef Fish Work Group. 1995. Proceedings to the Reef Fish Workshop concerning sampling vertically-distributed habitat in the Gulf of Mexico. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 76 pp.

Watson, J.W., and N. Bane, eds. 1985. Proceedings: SEAMAP shrimp and bottom fish sampling gear workshop, March 14-18, 1983. Gulf States Marine Fisheries Commission, Ocean Springs, MS, 80 pp.

SEAMAP-South Atlantic

ASMFC. 2004. SEAMAP Deep water (200 - 2,000 meters) Bottom Mapping Protocols to Capture and Transform Data into Standardized Database. 22 pp.

ASMFC. 2004. Status of the Blue Crab (*Callinectes sapidus*) on the Atlantic Coast. Special Report No. 80. Washington, D.C. 53pp.

Crustacean Work Group, SEAMAP-SA. 1989. South Atlantic Crustacean Newsletter. South Carolina Wildlife and Marine Resources Department, Charleston, South Carolina. March 1989, 6 pp.

- Crustacean Work Group, SEAMAP-SA. 1994. South Atlantic Crustacean Newsletter. South Carolina Department of Natural Resources, Charleston, South Carolina. 9 pp.
- Crustacean Work Group, SEAMAP-SA. 1998. South Atlantic Crustacean Newsletter. South Carolina Department of Natural Resources, Charleston, South Carolina. 7 pp.
- Crustacean Work Group, SEAMAP-SA. 1999. South Atlantic Crustacean Newsletter. South Carolina Department of Natural Resources, Charleston, South Carolina. 5 pp.
- Crustacean Work Group, SEAMAP-SA. 2000. South Atlantic Crustacean Newsletter. South Carolina Department of Natural Resources, Charleston, South Carolina. 8 pp.
- Peuser, R.L. 1996. Southeast Area Monitoring and Assessment Program (SEAMAP) Management Plan: 1996-2000. Atlantic States Marine Fisheries Commission, Washington, DC. 86 pp.
- Peuser, R.L. 1996. Southeast Area Monitoring and Assessment Program (SEAMAP) Management Plan: 1996-2000 [summary]. Atlantic States Marine Fisheries Commission, Washington, DC. 8 pp.
- Peuser, R.L. 1997. Southeast Area Monitoring and Assessment Program (SEAMAP) Management Fact Sheets: Determining Year to Year Trends in Abundance, Essential Fish Habitat, Real-Time Monitoring for Shrimp Management, and Collection of Fish Eggs and Larvae. Atlantic States Marine Fisheries Commission, Washington, DC. 4 pp.
- SEAMAP-South Atlantic Committee. 1984. SEAMAP-South Atlantic operations plan: 1986-1990. Special Report No. 6 of the Atlantic States Marine Fisheries Commission, ASMFC, Washington, DC. 97 pp.
- SEAMAP-South Atlantic Committee. 1985. SouthEast Area Monitoring and Assessment Program-South Atlantic SEAMAP Operations Plan: 1985-1990, Executive summary. Atlantic States Marine Fisheries Commission, Washington, DC. 9 pp.
- SEAMAP-SA. 1998. South Atlantic Bight Hardbottom Mapping CD-ROM, Version 1.0. Southeast Area Monitoring and Assessment Program - South Atlantic (SEAMAP-SA) Bottom Mapping Work Group. Available: ASMFC (202) 289-6400, September 1998.
- SEAMAP-SA. 1999. South Atlantic Bight Hardbottom Mapping CD_ROM, Version 1.1. Southeast Area Monitoring and Assessment Program _ South Atlantic (SEAMAP_SA) Bottom Mapping Work Group. Available: ASMFC (202) 289_6400, February 1999.

- SEAMAP-SA. 2001. Distribution of Bottom Habitats on the Continental Shelf from North Carolina through the Florida Keys. SEAMAP-SA Bottom Mapping Workgroup, Atlantic States Marine Fisheries Commission, Washington, DC. 166 pp.
- SEAMAP-SA. 2001. South Atlantic Bight Bottom Mapping CD-ROM, Version 1.2. SEAMAP-SA Bottom Mapping Workgroup. Atlantic States Marine Fisheries Commission, Washington, DC.
- SEAMAP-SA. 2003. Summary of Seafloor Mapping and Benthic Sampling Conducted in 200-2000m, from North Carolina through Florida. Final report to the NOAA Coastal Services Center Deep Water Habitat Mapping Project, Phase II. April 2003. 156 pp. Available through the Atlantic States Marine Fisheries Commission, Washington, DC. 166 pp.
- Shallow Water Trawl Work Group, SEAMAP-SA. 1997. SEAMAP-SA Nearshore Trawl Survey: 1987 & 1988 Results. Special Report No. 65 of the Atlantic States Marine Fisheries Commission. 120 pp.
- Shallow Water Trawl Work Group, SEAMAP-SA. 2000. SEAMAP-SA 10 Year Trawl Report: Results of trawling efforts in the coastal habitat of the South Atlantic Bight, FY 1990-1999. Special Report No. 71 of the Atlantic States Marine Fisheries Commission. 143 pp.
- Shrimp Bycatch Work Group, SEAMAP-SA. 1996. Estimates of Finfish Bycatch in the South Atlantic Shrimp Fishery. Atlantic States Marine Fisheries Commission, Washington, DC. 64 pp.
- South Carolina Marine Resources Division. 2004. Deep-Water (200-2000m) Benthic Sampling by SC Department of Natural Resources, Marine Resources Division (1973 – 2002) - Summary Report of Pilot Study to Capture Datasets.
- White, G.G. 2001. Southeast Area Monitoring and Assessment Program (SEAMAP) Management Plan: 2001-2005. Atlantic States Marine Fisheries Commission, Washington, DC. 105 pp.

SEAMAP-Caribbean

- Rosario, A. 1994. Sampling protocol manual. NOAA/NMFS SEAMAP-Caribbean Program. 60 pp.
- SEAMAP-Caribbean Committee. 1990. Fishery-independent Database Directory SEAMAP-Caribbean. Sea Grant College Program. 43 pp.
- Pagan, F.E., A.R. Marshak, I. Ruiz, and E.O. Serrano. 2004. Caribbean-SEAMAP Program Reef Fish: USVI Summary Overview, 1992-2000. Final Report: Caribbean-SEAMAP

Program Reef Fish: USVI Summary Overview prepared for UPR Sea Grant College Program/NMFS SEAMAP-C.

Rothschild, B.J. and J.S. Ault. 1991. Statistical Survey Design Analysis of the Puerto Rico Fishery-Independent Survey and Design Recommendations for a long-term Reef Fish Monitoring Program in Puerto Rico and the U.S. Virgin Islands.

Russell, G.M. 1992. Reef Fish Assessment Methodology for SEAMAP Surveys of Hardbottoms Areas. Mississippi Laboratories, Southeast Fisheries Science Center, NMFS.

Smith, S. G. and J.S. Ault. 1993. Statistical Sampling Design Analysis of the 1991-1992 Puerto Rico Shallow-Water Reef Fish Monitoring Survey. Final Report to SEAMAP-Caribbean Program and CFMC.

Thompson, N.R. 1993. Technical Reports of the Caribbean SEAMAP. NOAA Technical Memorandum NMFS-SEFSC-331. 203 pp.

Whiteman, E.A. 2005. SEAMAP-C USVI St. Croix & St. Thomas/St. John fisheries independent trap and line surveys, 1992-2002. Summary report: data analysis and conclusions. Prepared for UPR Sea Grant College Program/NMFS Cooperative Southeast Area Monitoring and Assessment Program-Caribbean (SEAMAP-C), University of Puerto Rico Sea Grant Program, Mayaguez, Puerto Rico.

APPENDIX C - BIBLIOGRAPHY OF PUBLICATIONS BASED UPON SEAMAP COLLECTED DATA OR SPECIMENS

- Ahlstrom, E.H., W.J. Richards, and S.H. Weitzman. 1984. Families Gonostomatidae, Sternoptychidae and associated stomiiform groups: Development and relationships, pp. 184-198, In: Moser, H.G., W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr., and S.C. Richardson, eds., *Ontogeny and Systematics of Fishes*. Amer. Soc. Ichthyol. Herp. Spec. Publ. 1.
- Armstrong, Michael J. 2004. Report on the 2004 Assessments of Black Seabass, Sea Scallop and Atlantic Bluefish in the Northeast United States. *Prepared for* University of Miami Independent System for Peer review.
- Baba, K. and D.K. Camp. 1988. Two species of galatheid crustaceans (Decapoda: Anomura) new to Florida, *Munida spinifrons* Henderson, and *Munidopsis kucki*, new species. *Proceedings of the Biological Society of Washington* 101(2): 414-422.
- Bannerot, S., B.J. Rothschild and J.S. Ault. 1991. Statistical sampling design analysis of the Puerto Rico fishery-independent survey. Final rep. The Rothschild\Ault\Group. SEAMAP-Caribbean Program. 100 pp.
- Baumgartner, M.F. 1995. The distribution of select species of cetaceans in the northern Gulf of Mexico in relation to observed environmental variables. Master's Thesis. University of Southern Mississippi, Hattiesburg, Mississippi. 89 p.
- Baumgartner, M.F., K.D. Mullin, L.N. May, and T.D. Leming. In Press. Cetacean habitat in the northern Gulf of Mexico. *Fishery Bulletin*.
- Beets, J. 1993. Fisheries-independent trap sampling in the U.S. Virgin Islands 1988-1992. Report to the SEAMAP-Caribbean Committee. 33 pp.
- Benefield, R.L., T.J. Cody, B.E. Fuls, and P.C. Hammerschmidt. 1983. Monitoring of coastal shellfish resources, January-December 1982. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Management Data Series No. 55. (P.L. 88-309/2-385-R), 75 pp.
- Benefield, R.L., P.C. Hammerschmidt, R.P. Hofstetter, and B. Bowling. 1986. Monitoring of coastal shellfish resources, January-December 1984. Texas Parks and Wildlife Department, Coastal Fisheries Branch, Management Data Series No. 88. (P.L. 88-309/2-400-R Segment 2), 130 pp.

- Boyd, N., B.E. Fuls, and L.W. McEachron. 1995. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975-December 1992. Texas Parks and Wildlife Department. Coastal Fisheries Division, Management Data Series No. 112 (PL 99-659), 105 pp.
- Bohnsack, J.A. and A. Woodhead. 1995. Proceedings of the 1987 SEAMAP Passive Gear Assessment Workshop at Mayaguez, Puerto Rico. NOAA Technical Memorandum NMFS-SEFSC-365. 177 pp.
- Bryan, C. E. 1983. Abundance of brown shrimp (*Penaeus aztecus*) as related to the 1982 closure of the Texas territorial sea to shrimping. Management Data Series Number 52. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.
- Bryan, C. E. 1985. Closure dates for the 1984 Texas gulf shrimping season. Management Data Series Number 82. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.
- Bryan, C. E. 1988. Closure dates for the 1985 Texas gulf shrimping season. Management Data Series Number 127. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.
- Collins, Mark R., P.J. Harris, and P. P. Maier. 1998. Fishery-Independent Recruitment Indices for King and Spanish Mackerels. *North American Journal of Fisheries Management* 1998;18:181-186.
- Chapman, R.W., C.L. Browdy, S. Savin, S. Prior, E. L. Wenner. 2004. Sampling and evaluation of white spot syndrome virus in commercially important Atlantic penaeid shrimp stocks. *Dis. Aquat. Org.* 59(3): 179-185.
- Collette, B.B., T. Potthoff, W.J. Richards, S. Ueyanagi, J.L. Russo, and Y. Nishikawa. 1984. Scombroidei: Development and relationships, pp. 591-619, In: Moser, H.G., W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr., and S.C. Richardson, eds., *Ontogeny and Systematics of Fishes*. Amer. Soc. Ichthyol. Herp. Spec. Publ. 1.
- Cortés, Enric. 2002. Stock Assessment of Small Coastal Sharks in the U.S. Atlantic and Gulf of Mexico. National Marine Fisheries Service Southeast Fisheries Science Center, Sustainable Fisheries Division Contribution SFD-01/02-152.
- Craig J.K., L.B. Crowder. 2005. Hypoxia-induced habitat shifts and energetic consequences in Atlantic croaker and brown shrimp on the Gulf of Mexico shelf. *Mar Ecol Prog Ser* 294:79-94.

- Cross, Jeffrey N. et al. 1999. *Essential Fish Habitat Source Document: Butterfish, *Peprilus triacanthus**, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-145.
- Dailey, J.A., J.C. Kana, and L.W. McEachron. 1991. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975-December 1989. Texas Parks and Wildlife Department. Fisheries and Wildlife Division, Management Data Series No. 53 (PL 99-659), 241 pp.
- Dailey, J.A., J.C. Kana, and L.W. McEachron. 1991. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975-December 1990. Texas Parks and Wildlife Department. Fisheries and Wildlife Division, Management Data Series, No. 74 (PL 99-659), 128 pp.
- De Silva, Janaka A. and Robert G. Muller. 2001. An update of the stock assessment and status of Florida east coast weakfish, *Cynoscion regalis*. Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute.
- DeVries, D.A., C.B. Grimes, K.L. Lang, and D.B. White. 1990. Age and growth of king and Spanish mackerel larvae and juveniles from the Gulf of Mexico and U.S. South Atlantic Bight. *Env. Biol. Fish.* 29(2): 135-143.
- Diamond, Sandra L., L.B. Crowder, and L.G. Cowell. 1999. Catch and Bycatch: The Qualitative Effects of Fisheries on Population Vital Rates of Atlantic Croaker. *Transactions of the American Fisheries Society* 1999;128:1085-1105.
- DiCosimo, J. 1990. Regional News, South: South Atlantic and Gulf of Mexico. Fisheries Management Section Newsletter 10(1): 8-9. February 1990. American Fisheries Society.
- Ditty, J.G. 1986. Ichthyoplankton in neritic waters of the northern Gulf of Mexico off Louisiana: composition, relative abundances and seasonality. *U.S. Fish. Bull.* 84(4): 935-946.
- Ditty, J.G. 1989. Separating early larvae of sciaenids from the western North Atlantic: A review and comparison of larvae from the northern Gulf of Mexico off Louisiana and the Atlantic coast of the Bull. *Mar. Sci.* 44(3): 1083-1105.
- Ditty, J.G. and R.F. Shaw. 1992. Larval development, distribution, and ecology of cobia *Rachycentron canadum* (Family: Rachycentridae) in the northern Gulf of Mexico. *U.S. Fishery Bulletin.* Vol. 90:668-677.
- Ditty, J.G. and R.F. Shaw. 1993. Larval development of tripletail, *Lobotes surinamensis* (Pisces: Lobotidae), and their spatial and temporal distribution in the northern Gulf of Mexico. *Fishery Bulletin.* Vol. 92:33-45.

- Ditty, J.G., E.D. Houde, and R.F. Shaw. 1994. Egg and larval development of Spanish sardine, *Sardinella aurita* (family: Clupeidae), with a synopsis of characters to identify clupeid larvae from the northern Gulf of Mexico. *Bul. Mar. Sci.* 54(2): 367-380.
- Ditty, J.G., R.F. Shaw, and J.S. Cope. 1994. A re-description of Atlantic spadefish larvae, *Chaetodipterus faber* (family: Ephippidae), and their distribution, abundance, and seasonal occurrence in the northern gulf of Mexico. *Fishery Bulletin* 92:262-274.
- Ditty, J.G., G.G. Zieske, and R.F. Shaw. 1988. Seasonality and depth distributions of larval fishes in the northern Gulf of Mexico above 26° N latitude. *U.S. Fish. Bull.* 86(4): 811-813.
- Ditty, J.G., R.F. Shaw, C.B. Grimes, and J.S. Cope. 1994. Larval development, distribution, and abundance of common dolphin, *Coryphaena hippurus*, and pompano dolphin, *C. equiselis* (Family: Coryphaenidae), in the northern Gulf of Mexico. *Fishery Bulletin*. Vol. 94:275-291.
- Drass, D.M., K.L. Bootes, J. Lyczkowski-Shultz, B.H. Comyns, G.J. Holt, C.M. Riley, and R.P. Phelps. In press. Larval development of red snapper, *Lutjanus campechanus*, with comparisons to co-occurring snapper species. *Fishery Bulletin*. Vol. 98(3).
- Ehrhardt, N.M., and C.M. Legault. 1997. The role of uncertainty in fish stock assessment and management: A case study of the Spanish mackerel, *Scomberomorus maculatus*, in the U.S. Gulf of Mexico. *Fisheries Research*. Vol. 29:145-158.
- Eldridge, P.J. 1988. The Southeast Area Monitoring and Assessment Program (SEAMAP): a state-federal-university program for collection, management, and dissemination of fishery-independent data and information in the southeastern United States. *Mar. Fish. Rev.* 50(2): 29-39.
- Epperly, S. P., M. L. Snover, J Braun-McNeill, W. N. Witzell, C. A. Brown, L. A. Csuzdi, W. G. Teas, L. B. Crowder, and R. A. Myers. 2001. Stock assessment of loggerhead sea turtles of the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-455:3-66.
- Fahay, M.P. 1989. The ontogeny of *Steindachneria argentea* Goode and Bean with comments on its relationships, In: D.M. Cohen, ed., *Papers on the Systematics of Gadiform Fishes*. Los Angeles Cty. Mus. Spec. Publ.
- Friedlander, A., R. Appeldoorn, and J. Beets. 1994. Spatial and temporal variations in stock abundance of queen conch, *Strombus gigas*, in the U.S. Virgin Islands. In: *Strombus gigas* queen conch biology, fisheries and mariculture. R. Appeldoorn and Bladimir Rodriquez, Eds. Fundacion Cientifica Los Roques Caracas, Venezuela. pp. 51-61.

- Fuls, B. E. 1990. Closure dates for the 1987 Texas gulf shrimping season. Management Data Series Number 23. Texas Parks and Wildlife Department, Fisheries Division, Coastal Fisheries Branch. Austin, Texas.
- Fuls, B. E. 1990. Closure dates for the 1988 Texas gulf shrimping season. Management Data Series Number 26. Texas Parks and Wildlife Department, Fisheries Division, Coastal Fisheries Branch. Austin, Texas.
- Fuls, B. E. 1990. Closure dates for the 1989 Texas gulf shrimping season. Management Data Series Number 31. Texas Parks and Wildlife Department, Fisheries Division. Austin, Texas.
- Fuls, B. E. 1990. Closure dates for the 1990 Texas gulf shrimping season. Management Data Series Number 45. Texas Parks and Wildlife Department, Fisheries Division. Austin, Texas.
- Fuls, B. 1991. Abundance and size of adult red drum off the central Texas coast during December – April 1977-80 and 1989-90. Management Data Series Number 80. Texas Parks and Wildlife Department, Fisheries and Wildlife Division. Austin, Texas.
- Fuls, B. E. 1993. Closure dates for the 1991 and 1992 Texas gulf shrimping seasons. Management Data Series Number 104. Texas Parks and Wildlife Department, Fisheries and Wildlife Division. Austin, Texas.
- Fuls, B. and L. W. McEachron. 1997. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975 - December 1995. Management Data Series Number 137. Texas Parks and Wildlife Department, Coastal Fisheries Division. Austin, Texas.
- Galloway, B.J., J.G. Cole, R. Meyer, and P. Roscigno. 1999. Delineation of essential habitat for juvenile red snapper in the northwestern Gulf of Mexico. Transactions of the American Fisheries Society. Vol. 128:713-726.
- Gledhill, C.T. and J. Lyczkowski-Shultz. 2000. Indices of larval king mackerel, *Scomberomorus cavalla*, for use in population assessment in the Gulf of Mexico. U.S. Fishery Bulletin. Vol. 98(4):684-691.
- Goodyear, C.P. 1988. Recent trends in the red snapper fishery of the Gulf of Mexico. Report to the Gulf of Mexico Fishery Management Council.
- Goodyear, C.P. 1989. Status of the red drum stocks of the Gulf of Mexico report for 1989. Report to the Gulf of Mexico Fishery Management Council, NOAA, NMFS, SEFC, Contrib. CRD 88/89-14, 64 pp.

- Goodyear, C.P. 1993. Status of the red drum stocks of the Gulf of Mexico report for 1993. Report to the Gulf of Mexico Fishery Management Council, NOAA, NMFS, SEFC, Contrib. No. MIA 92/93-47, 32 pp.
- Goodyear, C.P. 1995. Red snapper in U.S. waters of the Gulf of Mexico. National Marine Fisheries Service, Southeast Fisheries Science Center, Contribution MIA-95/96-05, Miami.
- Goodyear, C.P. 1997. An evaluation of the minimum reduction in the 1997 red snapper shrimp bycatch mortality rate consistent with the 2019 recovery target. Report to the Gulf of Mexico Fishery Management Council. 14 p. + appendix.
- Goodyear, C.P. and P. Phares. 1990. Status of red snapper stocks of the Gulf of Mexico report for 1990. Report to the Gulf of Mexico Fishery Management Council, NOAA, NMFS, SEFC, Contrib. CRD 89/90-05, 72 pp.
- Goodyear, C.P., J.E. Powers, and S. Nichols. 1991. Additional evaluation of regulatory options for red snapper in the Gulf of Mexico. Report to the Gulf of Mexico Fishery Management Council.
- Goodyear, C.P. 1995. Red snapper in the U.S. waters of the Gulf of Mexico. NMFS-SEFSC Miami Laboratory Contribution MIA-95/96-05. 171 p.
- Govoni, J.J., B.W. Stender, and O. Pashuk. 2000. Distribution of larval swordfish, *Xiphias gladius*, and probable spawning off the southeastern United States. Fishery Bulletin. Vol. 98(1):64-74.
- Grace, M., K.R. Rademacher and M. Russell. 1994. Pictorial guide to the groupers (Teleostei: Serranidae) of the western North Atlantic. NOAA Tech. Report. NMFS 118. 46 p.
- Grimes, C.B., J.H. Finucane, L.A. Collins, and D.A. DeVries. 1990. Young king mackerel (*Scomberomorus cavalla*) in the Gulf of Mexico. A summary of the distribution and occurrence of larvae and juveniles, and spawning dates for Mexican juveniles. Bull. Mar. Sci. 46(3): 640-654.
- Guénette, S., V. Christensen, and D. Pauly, (eds.). 2001. Fisheries impacts on North Atlantic ecosystems: models and analyses. University of British Columbia, Fisheries Centre Research Reports 9(4).
- Hammerschmidt, P.C., and L.W. McEachron. 1986. Trends in relative abundance of selected shellfishes along the Texas coast: January 1977-March 1986. Texas Parks and Wildlife Department, Coastal Fisheries Branch, Management Data Series No. 108. (P.L. 88-309/2-400-R and D.J. 15.505/F34R), 149 pp.

- Hammerschmidt, P.C., L.W. McEachron, and K. Meader. 1988. Trends in relative abundance of selected shellfishes and finfishes along the Texas coast: January 1977-December 1986. Texas Parks and Wildlife Department, Coastal Fisheries Branch, Management Data Series No. 133, (PL 88-309), 77 pp.
- Hammerschmidt, P.C., R.L. Benefield, T.J. Cody, and B.E. Fuls. 1985. Monitoring of coastal shellfish resources, January-December 1983. Texas Parks and Wildlife Department, Coastal Fisheries Branch, Management Data Series No. 80, (P.L. 88-309/2-400-R1), 102 pp.
- Hanifen, J.G., W.S. Perret, R.P. Allemand and T.L. Romaine. 1995. Potential impacts of hypoxia on fisheries: Louisiana's fishery-independent data. In proceedings of the Gulf of Mexico Program's Hypoxia Conference. November 1995, New Orleans, LA.
- Hanisko, D.S. 1996. Ichthyoplankton from natural reef sites in the Gulf of Mexico. Master's Thesis. University of Southern Mississippi, Hattiesburg, MS. 99 pp.
- Hensley, R. A. and B. E. Fuls. 1998. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975 - December 1998. Management Data Series Number 159. Texas Parks and Wildlife Department, Coastal Fisheries Division. Austin, Texas.
- Herke S.W. and D.W. Foltz 2002. Phylogeography of two squid (*Loligo pealei* and *L. plei*) in the Gulf of Mexico and northwestern Atlantic Ocean. *Marine Biology*. 140 : pp.103-115
- Jones, A.C., and E.F. Klima. 1984. Overview of the 1983 Texas closure. Report to the Gulf of Mexico Fishery Management Council.
- Kana, J.C., J.A. Dailey, B.E. Fuls, and L.W. McEachron. 1993. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coasts: November 1975-December 1991. Texas Parks and Wildlife Department. Fisheries and Wildlife Division, Management Data Series No. 103 (PL99-659), 92 pp.
- Kahn, Desmond. Stock Assessment of Weakfish 2000, Including Estimates of Stock Size on January 1, 2001. A Report to the Weakfish Technical Committee of the Atlantic States Marine Fisheries Commission. April 30, 2002.
- Klima, E.F. 1989. Approaches to research and management of U.S. fisheries for penaeid shrimp in the Gulf of Mexico, pp. 87-113, In: John F. Caddy, ed., *Marine Invertebrate Fisheries: their assessment and management*. John Wiley and Sons, Inc.
- Klima, E.F. and S. Nichols. 1985. Overview of the 1984 Texas Closure. Report to the Gulf of Mexico Fishery Management Council.

- Klima, E.F., K.N. Baxter, and F.J. Patella. 1985. Review of the 1984 Texas closure for the shrimp fishery off Texas and Louisiana. NOAA Tech. Memo. NMFS-SEFC-156, 92 pp.
- Klima, E.F., S. Nichols, and J. Poffenburger. 1986. Summary report of the 1985 Texas Closure. Report to the Gulf of Mexico Fishery Management Council.
- Klima, E.F., K.N. Baxter, F.J. Patella, and G.A. Matthews. 1984. Review of the 1983 Texas closure for the shrimp fishery off Texas and Louisiana. NOAA Tech. Memo. NMFS-SEFC-136, 28 pp.
- Knott, B. P. III. 1998. Species identification of individual sciaenid eggs using analysis of mtDNA. Master's Thesis. University of Charleston, Charleston, SC. 86 p.
- Laney, R.W. and W.W. Cole, Jr. 1994. Tagging Summary for Mixed Striped Bass Stock Offshore North Carolina and Virginia. pp. 116-117. In Shepherd, G., ed., Striped Bass Study Annual Workshop for 1994. NMFS, Woods Hole, MA.
- Legault, C.M. 1999. Updated Projections for King and Spanish Mackerel in the Gulf of Mexico and Atlantic Ocean. Sustainable Fisheries Division Contribution SFD-98/99-49. Mackerel Stock Assessment Panel Contribution MSAP/99/01. 33p. + appendices.
- Legault, C. M., N. Cummings, and P. Phares. 1998. Stock assessment analyses on Atlantic migratory group king mackerel, Gulf of Mexico migratory group king mackerel, Atlantic migratory group Spanish mackerel, and Gulf of Mexico migratory group Spanish mackerel. NMFS-SEFSC Sustainable Fisheries Division Contribution MIA-97/98-15. Mackerel Stock Assessment Panel Contribution MSAP/98/09. 89 p. plus appendices
- Legault, C.M., and M. Ortiz. 1998. Delta lognormal estimates of bycatch for Gulf of Mexico king and Spanish mackerel and their impact on stock assessment and allowable biological catch. NMFS-SEFSC Sustainable Fisheries Division Contribution SFD-97/98-11. Mackerel Stock Assessment Panel Report MSAP/98/12. 11 p.
- Legault, C.M., M. Ortiz, G. Scott, N. Cummings, and P. Phares. 2000. Stock assessment analyses on Gulf of Mexico king mackerel. MSAP/00/02. NMFS Sustainable Fisheries Division Contribution SFD-99/00-83. Miami, FL. 48 p.
- Leiby, M.M. 1990. Family Ophichthidae, In: B.B. Collette, ed., Fishes of the Western North Atlantic, Sears Found. Mar. Res., Volume 9.
- Leis, J.M., and W.J. Richards. 1984. Acanthuroidei: Development and relationships, pp. 547-551, In: Moser, H.G., W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr., and S.C. Richardson, eds., Ontogeny and Systematics of Fishes. Amer. Soc. Ichthyol. Herp. Spec. Publ. 1.

- Lyczkowski-Shultz, J. and R. Brasher. 1996. Ichthyoplankton data summaries from SEAMAP Summer Shrimp/Groundfish Surveys. In. Uses of Fishery-Independent Data, General Session Proceedings, GSMFC October 1996 No.35:27-42.
- Lyczkowski-Shultz, J., M. Konieczna, and W. J. Richards. 2000. Occurrence of the larvae of beryciform fishes in the Gulf of Mexico. In. K. Sherman (ed.), Proceedings of the Gydnia Symposium on Fisheries Recruitment. Vol. 151(3):1-12.
- Lyons, W.G. 1985. *Chaetopleura staphylophera* (Polyplacophora: Chaetopleuridae), a new species from the southeastern United States and Bahamas. Nautilus 99(2-3): 35-44.
- Mackerel Stock Assessment Panel. 1990. 1990 report of the Mackerel Stock Assessment Panel. NOAA, NMFS, SEFC, Miami Lab. Contrib. No. MIA 89/90-7, 30 pp.
- Maier, Philip et. al. 2004. Development of an Index of Sea Turtle Abundance Based Upon In-water Sampling With Trawl Gear. Final Project Report to NMFS, National Ocean and Atmospheric Administration Grant Number NA07FL0499.
- Mambretti, J.M., J.A. Dailey, and L.W. McEachron. 1990. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975-December 1988. Texas Parks and Wildlife Department, Fisheries Division, Management Data Series No. 20 (PL 88-309), 261 pp.
- Mateo, I., R. Appeldoorn, and W. Rolke. 1998. Spatial Variations in Stock Abundance of Queen Conch, *Strombus gigas*, (Gastropoda: Strombidae) in the West and East Coasts of Puerto Rico. GCFI 50:32-48.
- Matthews, G.A. 1984. Relative abundance and size distribution of *Penaeus* shrimps based on samples collected during 1983 SEAMAP/Texas closure survey in the north and northwestern Gulf of Mexico. Report to the Gulf of Mexico Fishery Management Council.
- McEachron, L. W. and B. Fuls. 1996. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975 - December 1993. Management Data Series Number 115. Texas Parks and Wildlife Department, Coastal Fisheries Division. Austin, Texas.
- McEachron, L. W. and B. E. Fuls. 1996. Trends in relative abundance and size of selected finfishes and shellfishes along the Texas coast: November 1975 - December 1994. Management Data Series Number 124. Texas Parks and Wildlife Department, Coastal Fisheries Division. Austin, Texas.
- McGowan, M.F., and W.J. Richards. 1984. Atlantic bluefin tuna spawning and larval index of spawning stock 1977-1986. Univ. of Miami, Rosenstiel School of Marine and Atmospheric Sciences, Tech. Rep. TR-88-033, 12 pp.

- McGowan, M.F., and W.J. Richards. 1986. Distribution and abundance of bluefin tuna (*Thunnus thynnus*) larvae in the Gulf of Mexico in 1982 and 1983 with estimates of biomass and population size of spawning stock for 1977, 1978 and 1981-1983. Int. Comm. Cons. Atl. Tunas, Collective Vol. Sci. Pap. 24: 182-195.
- McGowan, M.F., and W.J. Richards. 1987. Atlantic bluefin tuna spawning and larval index of spawning stock 1977-1986. Univ. of Miami, Rosenstiel School of Marine and Atmospheric Science, TR-88-003, 12 pp.
- McGowan, M.F., and W.J. Richards. 1989. Bluefin tuna spawning in the northwestern Atlantic outside the Gulf of Mexico, with respect to satellite and shipboard observations of environmental variables. Fish. Bull. U.S. 87(3): 615-631.
- Meador, K. L., L. W. McEachron, and T.J. Cody. 1988. Trends in relative abundance of selected shellfishes and finfishes along the Texas coast: January 1977 – December 1987. Management Data Series Number 153. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.
- Miller, J.E. and R.L. Turner. 1986. *Psolus pawsoni* (Echinodermata: Holothuroidea), a new bathyal sea cucumber from the Florida east coast. Proc. Biol. Soc. Wash. 99(3), pp. 478-485.
- Mitchell, Thomas (Ed.) 1988. Physical oceanography of the Louisiana-Texas continental shelf: proceedings of a symposium held in Galveston, Texas, May 24-26, 1988. Prepared by Geo-Marine, Inc. OCS Study MMS 88-0065. U.S. Dept. of Interior, Minerals Management Service, New Orleans, LA, 198 pp.
- Munro, J.L. An assessment of the fisheries of PR and the USVI. Report to the CFMC.
- Nichols, S. 1983. Impacts of the 1981 and 1982 Texas closure on brown shrimp yields. NOAA Tech. Mem. NMFS-SEFC-110, 20 pp.
- Nichols, S. 1983. Development of the June-July Texas Closure/stock assessment sampling program for brown shrimp. Report to the Gulf States Marine Fisheries Commission.
- Nichols, S. 1984. Impacts of the 1982 and 1983 closures on the Texas FCZ brown shrimp yields. NOAA Tech. Mem. NMFS-SEFC-142, 15 pp.
- Nichols, S. 1984. Impacts of the combined closure of the Texas territorial sea and the Fishery Conservation Zone on brown shrimp yields. NOAA Tech. Mem. NMFS-SEFC-141, 7 pp.
- Nichols, S. 1984. Impacts of the 1982 and 1983 closure of the Texas EEZ on brown shrimp yields. Report to the Gulf of Mexico Fishery Management Council.

- Nichols, S. 1985. Impacts of the Texas closure on brown shrimp yields. Final report of 1983; preliminary report for 1984. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1986. Analysis of alternative closures for improving brown shrimp yields in the Gulf of Mexico. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1986. Impacts of the Texas closure on brown shrimp yields. Final report for 1984; preliminary report for 1985. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1988. An estimate of the size of the red drum spawning stock using mark/recapture. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1989. Potential changes in yield from the closed portion of the Texas EEZ, based on research vessel sampling, 1987 and 1988. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1990. Potential changes in yield due to the Texas Closure. Estimates based on 1989 SEAMAP sampling. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1990. Report of the workshop to evaluate potential management alternatives for reducing directed effort and shrimp trawl bycatch of red snapper. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1990. The spatial and temporal distribution of the bycatch of red snapper by the shrimp fishery in the offshore waters of the U.S. Gulf of Mexico. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1991. The 1990 Texas Closure - Results of SEAMAP Sampling. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1992. The 1991 Texas Closure - Results of SEAMAP Sampling. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1993. The 1992 Texas Closure - Results of SEAMAP Sampling. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1994. The 1993 Texas Closure - Results of SEAMAP Sampling. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. 1995. The 1994 Texas Closure - Results of SEAMAP Sampling. Report to the Gulf of Mexico Fishery Management Council.

- Nichols, S. 1996. An update on some issues relating to the distribution of red snapper bycatch. National Marine Fisheries Service, Southeast Fisheries Science Center, Pascagoula, Mississippi.
- Nichols, S. and G. Pellegrin, Jr. 1989. Trends in catch per unit effort for 157 taxa caught in the Gulf of Mexico Fall Groundfish Survey, 1972-1988. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S. and G. Pellegrin, Jr. 1992. Revision and update of estimates of shrimp fleet bycatch, 1972-1991. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S., A. Shah, G. Pellegrin, Jr., and K. Mullin. 1987. Estimates of annual shrimp fleet bycatch for 13 finfish species in the offshore waters of the Gulf of Mexico. Report to the Gulf of Mexico Fishery Management Council.
- Nichols, S., A. Shah, G. Pellegrin, Jr., and K. Mullin. 1990. Updated estimates of shrimp fleet bycatch in the offshore waters of the U.S. Gulf of Mexico, 1972-1989. Report to the Gulf of Mexico Fishery Management Council.
- NMFS/SERO Southeast Regional Ecosystems Plans: Southeast Continental Shelf Ecosystem, Atlantic Oceanic Ecosystem. 119p.
- Okey, T.A. 2001. A 'straw-man' Ecopath model of the Middle Atlantic Bight continental shelf, United States. U. of British Columbia, Fisheries Centre Research Reports 9(4):151-166.
- Okey, T.A. and R. Pugliese. 2001. A preliminary Ecopath model of the Atlantic continental shelf adjacent to the Southeastern United States. University of British Columbia, Fisheries Centre Research Reports 9(4):167-181.
- Ortiz, Mauricio. 2002. Even Further Projections for Gulf and Atlantic King and Spanish Mackerel Migratory Groups. Sustainable Fisheries Division Contribution SFD-01/02- 152.
- Ortiz, M., C.M. Legault, and N.M. Ehrhardt. 2000. An alternative method for estimating bycatch from the U.S. shrimp trawl fishery in the Gulf of Mexico, 1972-1995. Fishery Bulletin. Vol. 98:583-599.
- Ortiz, Mauricio and C. M. Legault. March 2001. Further Projections for Gulf and Atlantic King and Spanish Mackerel Migratory Groups. National Marine Fisheries Service Southeast Fisheries Science Center. Sustainable Fisheries Division Contribution SFD-00/01- 121.
- Pawson, D.L. and J.E. Miller. 1992. *Phyllophorus (Urodemella) arenicola*, a new sublittoral sea cucumber from the southeastern United States (Echinodermata: Holothuroidea). Proc. Biol. Soc. Wash. 105(3): 483-489.

- Poffenberger, J.R. 1984. Estimated impacts of Texas closure regulation on ex-vessel prices and values, 1982 and 1983. Report to the Gulf of Mexico Fishery Management Council.
- Potthoff, T., and S. Kelley. 1990. Larval and juvenile *Scomberomorus* species captured on SEAMAP 1982 cruises and additional historical data. NMFS-SEFC Miami Lab., 16 pp.
- Powers, J.E. 1989. Report of the Mackerel Stock Assessment Panel. Report to the Gulf of Mexico and South Atlantic Fishery Management Councils.
- Powers, J.E., C.P. Goodyear, and G.P. Scott. 1987. The potential effect of shrimp fleet bycatch on fisheries production of selected fish stocks in the Gulf of Mexico. Report to the Gulf of Mexico Fishery Management Council.
- Powers, J.E., N. Parrack, and P. Phares. 1995. Projections of the status of Gulf of Mexico and Atlantic king mackerel and Spanish mackerel. NMFS-SEFSC Miami Laboratory Contribution MIA-94/95-28. 60 p.
- Powers, J.E., N. Parrack, and P. Phares. 1996. Stock assessment analyses on Gulf of Mexico migratory group king mackerel and Atlantic migratory group king mackerel. NMFS-SEFSC Miami Laboratory Contribution MIA-95/96-32. 137 p.
- Powers, J.E., N. Parrack, and P. Phares. 1996. Stock assessment analyses on Gulf of Mexico migratory group Spanish mackerel and Atlantic migratory group Spanish mackerel. NMFS-SEFSC Miami Laboratory Contribution MIA-95/96-31. 80 p.
- Procarione, L.S. and B. E. Fuls. 1990. Closure dates for the 1986 Texas gulf shrimping season. Management Data Series Number 25. Texas Parks and Wildlife Department, Fisheries Division, Coastal Fisheries Branch. Austin, Texas.
- Reichert, J.M. 2002. On the life history of the fringed flounder (*Etropus crossotus*) A small tropical flatfish in the South Atlantic Bight. Doctoral dissertation. The Netherlands Institute for Sea Research. 214 p.
- Reid, Robert N., F.P. Almeida, and C.A. Zetlin. 1999. *Essential Fish Habitat Source Document: Fishery-Independent Surveys, Data Sources, and Methods*. NOAA Technical Memorandum NMFS-NE-122.
- Renaud, M.L. 1984. Hypoxia in Louisiana coastal waters during 1983; implications for fisheries. Fish. Bull. 84(1): 19-26.
- Richards, W.J. 1984. Elopiformes: Development, pp. 60-61, In: Moser, H.G., W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr., and S.C. Richardson, eds., *Ontogeny and Systematics of Fishes*. Amer. Soc. Ichthyol. Herp. Spec. Publ. 1.

- Richards, W.J. 1985. Status of the identification of the early life stages of fishes. *Bull. Mar. Sci.* 38(2): 754-760.
- Richards, W.J. 1987. MEXUS-Gulf ichthyoplankton research 1977-1984. *Mar. Fish. Rev.* 49(1): 39-41.
- Richards, W.J. 1987. Identification, distribution and abundance of larval labroid fishes from the western Atlantic (Abstract). *Bull. Mar. Sci.* 41:641.
- Richards, W.J. (ed.). 1988. Research accomplishments of the Southeast Fisheries Center. *Mar. Fish. Rev.* 50(40): 77-94.
- Richards, W.J. 1989. Preliminary guide to the identification of the early life history stages of scombroid fishes of the western central Atlantic. NOAA Tech. Memo. NMFS-SEFC-240, 101 pp.
- Richards, W.J. 1990. Results of a review of the U.S. bluefin tuna larval assessment with a brief response. *Int. Conv. Cons. Atl. Tunas. Coll. Vol. Sci. Paps.* 32(2): 240-247.
- Richards, W.J. 1990. Early life history - Western Atlantic. pp. 93-94, In: E. Clay, ed., World Bluefin Meeting, May 25-31. La Jolla, Calif.
- Richards, W.J., and J.M. Leis. 1984. Labroidei: Development and relationships, pp. 542-547, In: Moser, H.G., W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr., and S.C. Richardson, eds., *Ontogeny and Systematics of Fishes*. Amer. Soc. Ichthyol. Herp. Spec. Publ. 1.
- Richards, W.J., T. Leming, M.F. McGowan, J.T. Lamkin, and S. Kelley-Fraga. 1989. The distribution of fish larvae in relation to hydrographic features of the Loop Current boundary in the Gulf of Mexico. *Rapp. p-v. Cons. Int. Explor. Mer.* 191: 169-176.
- Richards, W.J., and K.C. Lindeman. 1987. Recruitment dynamics of coral reef fishes: planktonic processes, settlement and demersal ecologies, and fishery analysis. *Bull. Mar. Sci.* 41:392-410.
- Richards, W.J., and M.F. McGowan. 1989. Biological productivity in the Gulf of Mexico: identifying the causes of variability in fisheries, pp. 287-325, In: K. Sherman and L. Alexander, eds., *Biomass Yields and Geography of Large Marine Ecosystems*. AAAS Selected Symposium, 111, Westview Press, Boulder, CO.
- Richards, W.J., T. Potthoff, and J. Kim. 1990. Problems identifying tuna larvae species (Pisces: Scombridae: *Thunnus*) from the Gulf of Mexico. *Fish. Bull.* 88:607-609.

- Rosario, A. and M. Figuerola. 2001. Tag and Recapture Study of Red Hind and Coney at Three Spawning Aggregations Sites Off the West Coast of Puerto Rico. GCFI 52: 15-25.
- Rothschild, B.J., A.F. Sharov, and A.Y. Bobyrev. 1997. Red snapper stock assessment and management for the Gulf of Mexico. Report by the University of Massachusetts, Center for Marine Science and Technology, North Dartmouth for the National Marine Fisheries Service, Office of Science and Technology, Washington, D.C.
- Rubec, R.J., J.D. Christensen, W.S. Arnold, H. Norris, P. Steele, and M. Monaco. 1998. GIS and Modeling: Coupling Habitats to Florida Fisheries. Journal of Shellfish Research, Vol. 17, No. 5, 1451-1457.
- Sadovy, Y., A. Rosario, and A.M. Roman. 1994. Reproduction in an aggregating grouper, the red hind, *Epinephelus guttatus*. Env. Biol. Fish. 41: 269-286.
- Saksenna, V.P., and W.J. Richards. 1986. A new species of gadiform fish, *Bregmaceros houdei*, from the western North Atlantic Ocean. Bull. Mar. Sci. 39(2): 285-292.
- Savastano, K.J., and L.B. Stogner. 1983. Satellite data communications system for near real time processing and distribution of marine fishery research data. Proceedings IEEE, pp. 516-519.
- Savastano, K.J., and N. Bane. 1986. SEAMAP data management system and products. Proceedings Marine Technology Society, Gulf Coast Section, pp. 509-517.
- Schirripa, M.J. 1998. Status of the red snapper in U.S. waters of the Gulf of Mexico: Updated through 1997. NMFS-SEFSC Sustainable Fisheries Division Contribution SFD-97/98-30. 10 p.
- Schirripa, M.J. 1998. Status of the vermilion snapper fishery of the Gulf of Mexico: Assessment 4.0. NMFS-SEFSC Sustainable Fisheries Division Contribution SFD-97/98-09A. 79 p.
- Schirripa, M.J., and C.M. Legault. 1997. Status of the red snapper in U.S. waters of the Gulf of Mexico: Updated through 1996. NMFS-SEFSC Miami Laboratory Contribution MIA-97/98-05. 37 p.
- Schirripa, M.J., and C.M. Legault. 1999. Status of the red snapper in U.S. waters of the Gulf of Mexico: Updated through 1998. Sustainable Fisheries Division Contribution SFD-98/99-75. 86 p. +appendices.
- Schirripa, M.J., and C.M. Legault. 2000. Status of The Vermilion Snapper Fishery In The U.S. Gulf of Mexico: Assessment Update (Version 4.5). NMFS Sustainable Fisheries Division Contribution SFD-99/00-108. 33p.

- Scott, G.P., S.C. Turner, C.B. Grimes, W.J. Richards, and E.B. Brothers. 1990. Indices of larval bluefin tuna, *Thunnus thynnus*, abundance from ichthyoplankton surveys in the Gulf of Mexico. SCRS/90/77 pages 257-270.
- Scott, G.P., and S.C. Turner. 1991. Updated indices of larval bluefin tuna (*Thunnus thynnus*) abundance from ichthyoplankton surveys in the Gulf of Mexico. SCRS/91/95.
- Scott, G.P., S.C. Turner, C.B. Grimes, W.J. Richards, and E.B. Brothers. 1993. Indices of larval bluefin tuna, *Thunnus thynnus*, abundance in the Gulf of Mexico: modeling variability in growth, mortality, and gear selectivity. Bulletin of Marine Science. Vol. 53(2):912-929.
- Shaw, R.F., and D.L. Drullinger. 1985. The early life history of coastal pelagic finfish off Louisiana. Final Rep. to Louisiana Board of Regents Research and Development Program, Baton Rouge, LA, 115 pp.
- Shaw, R.F., and D.L. Drullinger. 1986. Early life history of coastal pelagic finfish off Louisiana. Final Report to Louisiana Board of Regents Research and Development Program, Baton Rouge LA, 272 pp.
- Shaw, R.F., and D.L. Drullinger. 1990. Early life history profiles, seasonal abundance and distribution of four species of clupeid larvae from the northern Gulf of Mexico. NOAA/NMFS Tech. Rep. 88, 60 pp.
- Shaw, R.F., and D.L. Drullinger. 1990. Early life history profiles, seasonal abundance and distribution of four species of carangid larvae off Louisiana during 1982 and 1983. NOAA/NMFS Tech. Rep. 89, 37 pp.
- Shaw, R.F., J.G. Ditty, and J. Lyczkowski-Shultz. 1987. Fisheries-independent data on coastal herrings and associated species (including mackerels) from the northern Gulf of Mexico. Final Rep. to MARFIN (NOAA contract No. NA86-WC-H-06117) for FY 1986-87, NMFS-SEFC, 104 pp.
- Sheridan, P.F., D.L. Trimm, and B.M. Baker. 1984. Reproduction and food habits of seven species of northern Gulf of Mexico fishes. Contr. Mar. Sci. 27: 175-204.
- Smith, S.G. and J.S. Ault. 1993. Statistical sampling design analysis of the 1991-1992 Puerto Rico shallow-water reef fish monitoring survey. The Rothschild\Ault\Group final report for SEAMAP-Caribbean Program. unpublished, 74 pp.
- Southeast Fisheries Center Staff. 1989. Data and analytical methods available to the Mackerel Stock Assessment Panel. Report to the Gulf of Mexico and South Atlantic Fishery Management Councils.

- Turner, R.L. and C.M. Norlund. 1988. Labral morphology in heart urchins of the genus *Brisopsis* (Echinodermata: Spatangoida), with an illustrated revised key to western Atlantic species. *Proceedings of the Biological Society of Washington* 101(4): 890-897.
- Turner, R.L., D.A. Bruzek, S.E. Lochmann, and C.M. Norlund. 1986. Distribution of sea urchins, sand dollars, and heart urchins off the Atlantic coast of Florida. *Florida Academy of Sciences*, Gainesville, April 1986. *Florida Scientist* 49 (Supplement 1): 16 (abstract).
- Vaughan, Douglas S. et al. 2001. Analyses on the Status of the Atlantic Menhaden Stock. Report to the ASMFC Menhaden Technical Committee.
- Vaughan, Douglas S. et al. 2002. Analyses on the Status of the Atlantic Menhaden Stock. Report to the ASMFC Menhaden Technical Committee.
- Washington, B.B., H.G. Moser, W.A. Laroche, and W.J. Richards. 1984. Scorpaeniformes: Development, pp. 405-428, In: Moser, H.G., W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr., and S.C. Richardson, eds., *Ontogeny and Systematics of Fishes*. Amer. Soc. Ichthyol. Herp. Spec. Publ. 1.
- Wood, R.S. and D.A. Olsen. 1983. Application of biological knowledge to the Management of the Virgin Islands conch fishery. *Proc. Gulf and Carib. Fish. Inst.* 35: 115-121.
- Zieske, G.G. 1988. Redescription of larvae of the pinfish, *Lagodon rhomboides*, (Linnaeus) (Pisces, Sapridae). *Cont. Mar. Sci.* 31

APPENDIX D - PROGRAM OPERATIONS

RESOURCE SURVEYS

Survey Policies

Scheduled dates and participating agencies for each survey will be publicized in advance to encourage awareness and participation in SEAMAP among interested persons and organizations. Surveys within each component area will be initiated, approved, and directed by the respective committee.

Sampling methodologies may be recommended to each committee by work groups established for such purposes. Surveys should be conducted using standardized procedures and standardized, calibrated gear. The standardized sampling procedures will be collected and distributed as a "SEAMAP Shipboard Operations Manual." Currently, a shipboard operations manual is in use for SEAMAP-Gulf shrimp/groundfish, environmental, and plankton surveys. At the request of any committee, the appropriate working group will draft or modify documentation of operating procedures, and submit this documentation to the joint committee for approval and incorporation as part of the "SEAMAP Shipboard Operations Manual." As directed by the committee, pre- and post-survey research and analysis will be conducted to evaluate methodologies to insure compatibility of data among surveys and areas.

Surveys will be documented with cruise reports, submitted to the coordinators for timely distribution. Formats and reporting requirements will be included in the "SEAMAP Shipboard Operations Manual."

SPECIAL STUDIES

Policies

Long-term time series data are the foundation of SEAMAP. Short-term data requests will be considered by SEAMAP, but will be implemented only if collections do not detract from the long-term programs. SEAMAP has and will continue to coordinate broad-scale, short-term research programs (using funding external to SEAMAP) as the need arises and in accordance with SEAMAP survey policies.

DATA MANAGEMENT

Overview

The initial data management system for SEAMAP was the SEAMAP Information System, which was established for the Gulf component. Replacement of the SEAMAP Information System with the SEAMAP Data Management System was completed during FY 1990. Appendix E provides more detailed information about SEAMAP's Data Management System and procedures.

SPECIMEN ARCHIVING

Overview

Specimens archived from SEAMAP collections are the property of SEAMAP and are maintained or disposed of in accordance with SEAMAP and NOAA/NMFS policies and procedures. Selected SEAMAP-collected specimens and samples, and results of sample sorting procedures, are available to all SEAMAP participants and other fishery researchers and management organizations approved by the appropriate committee. Procedures for distributing specimens should be specified in the annual SEAMAP operation plan. SEAMAP policies pertaining to specimen archiving and loans apply only to samples and specimens maintained in the SEAMAP archiving centers, and collected during approved SEAMAP survey activities. Results from analyses of samples and specimens not collected during approved SEAMAP activities, but meeting SEAMAP goals and objectives, may be added to the SEAMAP data base with approval of the committees. Appendix F provides detailed information regarding the curator's responsibilities, archiving procedures, and specimen loans.

INFORMATION DISSEMINATION

Overview

Products resulting from SEAMAP activities may be divided into two basic categories: data sets and program information. Data sets include both digital and analog data, as well as specimen collections. Data sets are covered in more detail in the previous "data management" and "specimen archiving" sections. Program information is defined as those communications that are released to current and prospective participants, cooperators, investigators, or other interested agencies or persons. This information may be produced in a number of different types of documents, described below. A complete listing of the documents which have been produced by SEAMAP is found in Appendix B.

Program Information Products

- Annual Reports** Prepared by the coordinators and committees. These reports summarize and, to some extent, evaluate survey operations, data management, administration, and information dissemination activities. Annual reports also offer a financial statement, listing of official SEAMAP publications, listing of data requests and publications that relied on SEAMAP data, a proposed budget, and recommendations for SEAMAP activities to be conducted the following year. Annual reports are distributed to management bodies and funding agencies to be used in evaluating the performance of SEAMAP.
- Cruise Plans** Provide agencies and organizations with advance notice of intended surveys. These brief notices detail scheduled sampling activities and describe itineraries of vessels participating in the surveys. Cruise plans are distributed upon approval by the appropriate committee.
- Public Relations Communications** Newspaper and journal articles, and interagency reports that may be helpful in fulfilling the program's goals and objectives.
- Newsletters** Have been used to provide agencies and organizations with advance notice of intended SEAMAP surveys. These brief notices detail scheduled sampling sites and activities, and describe the itineraries of vessels participating in the surveys.
- Quick Reports** Issued periodically during survey operations. The reports contain information such as shrimp catch rate, satellite transmission of chlorophyll concentrations, and surface temperatures that may be useful to scientists, management agencies, and the fishing industry. The reports are prepared for the committee under the supervision of the SEAMAP data manager and are distributed by the coordinator to persons responding to periodic SEAMAP data summary use questionnaires and others expressing a desire to receive these reports.
- SEAMAP Atlas** Summarizes annual ichthyological, shrimp/groundfish, and environmental data collected on cruises. Atlases are joint products of two or more work groups under the supervision of the coordinator, and are distributed to participants, cooperators, investigators, and interested fisheries research organizations.
- SEAMAP Marine Directory** Summarizes information on fisheries research survey activities, personnel, facilities and gear, and is updated annually for distribution to regional fisheries organizations. The directory was previously prepared for

SEAMAP by NMFS personnel, but is now be under the supervision of the SEAMAP coordinator.

Special Reports Supervised by the committee and prepared to provide timely information that fulfills the program's goals and objectives. These may include descriptions of standard sampling protocols and gears, results of gear comparisons, workshop proceedings, etc. Special reports will be available to state agencies, universities, and other researchers concerned with collecting data that will be compatible with those of SEAMAP organizations.

External Publications SEAMAP encourages participants, cooperators, and investigators to use SEAMAP data and publish in peer-reviewed publications. Additionally, several publications have been produced, and presentations to technical groups have been made describing SEAMAP. This information was prepared to help coordinate research and make researchers and organizations in need of technical data aware of the availability of SEAMAP data and specimens. A bibliography of publications which utilized SEAMAP data is given in Appendix C.

Improvements in Information Dissemination

Adequate information dissemination about SEAMAP is recognized as a major and continuing program need. Dissemination of SEAMAP information will help avoid unnecessary and often costly duplication of work, and will help to ensure better research and improved management decisions. For example, better use of time and funds would occur when a researcher used SEAMAP data and concentrated on the analysis of a region-wide database, which could be supplemented with limited field collections or by cooperating on a SEAMAP cruise, rather than independently collecting and analyzing data from a limited area.

Because of the importance of good information dissemination, each annual operations plan will contain a section dedicated to this issue. The section will detail the efforts that will be undertaken by the affected program component in the upcoming year.

Examples of these efforts may include:

- Formal written requests to Sea Grant advisory groups to aid in distributing real time reports for specific SEAMAP cruises;
- Presentations by committee members to local sport fishing organizations and commercial fishing associations about the program;
- Presentations on the program at specific technical meetings and symposia;

- Preparation of visual aids, including video tapes, and pamphlets about the program. Normally, the preparation of these materials will be coordinated across program components;
- Preparation of news releases to cover some unusual event such as hypoxia in the Gulf and red tide in the South Atlantic; and
- The distribution of information on upcoming cruises to universities in the region in the event researchers or students may desire to participate or obtain certain types of data or information from a cruise.

APPENDIX E -SEAMAP DATA MANAGEMENT

Overview

The original SEAMAP Information System (1981-1990) was a centralized system dependent upon skilled programmers and computer operators for data entry, retrieval, and display. Data entry, correction, and verification included a time consuming, mail-oriented loop.

Implementation of a revised SEAMAP Data Management System was completed in 1990. The current system is decentralized, allowing SEAMAP participants to locally and directly enter and retrieve data via a special software program and file transfer protocols (FTP) with the NMFS computers. Local data retrieval has allowed data access by SEAMAP participants in a timely manner, with minimal effort and programming skills. In 1998, the data manager began to migrate the SEAMAP data from dBase format into Oracle, a true relational database. The conversion to Oracle has also involved some redevelopment and expansion of the data formats. SEAMAP hopes to complete the new system soon. The development, implementation, and operation of the Data Management System are supported by SEAMAP funds.

All SEAMAP-collected data (1989 forward) will be maintained in the SEAMAP Data Management System in an approved format, to assure maximum availability. Older data will be converted or reformatted and placed in the SEAMAP Data Management System based on available resources. Fully documented data meeting SEAMAP goals and objectives, but not collected during approved SEAMAP activities, may be added to the SEAMAP database with approval of the appropriate committee. Verified data classified as non-confidential shall be available to fishery research and SEAMAP oversight agencies and other organizations in the most timely and cost-effective manner possible. Unverified data will be controlled by the agency or organization responsible for collecting the data, and will only be released with authorization from the agency or organization controlling the data. Data are classified as verified when reviewed and edited by collectors and approved as verified by the SEAMAP Data Manager.

Data Manager

The SEAMAP data manager is currently located at the NMFS Mississippi Laboratories in Pascagoula, Mississippi. The data manager receives administrative support from NMFS and is currently supervised by the NMFS SEAMAP manager. The data manager is responsible for ensuring that verified data collected during SEAMAP survey activities are processed, archived, and made available in a manner consistent with the approved SEAMAP and applicable NOAA policies and procedures. Specific responsibilities of the SEAMAP data manager include:

- Maintain the Data Management System in accordance with the protocols and procedures outlined in the SEAMAP Data Management System Operations Manual;

- Approve as verified those incoming data which have been reviewed and edited by the collectors and supervise their input into the designated data files;
- Coordinate the generation of additional files and formatting procedures as necessary to ensure efficient data management;
- Process external requests and provide SEAMAP data in accordance with approved policies and procedures;
- Maintain information on SEAMAP data requests; and
- Assist the program coordinators in the preparation of each annual report and review of the data management segment of SEAMAP.

Data Input

Data collectors may be classified in two categories, SEAMAP participant or SEAMAP cooperator, and are defined as follows:

SEAMAP Participant	SEAMAP committee members or their designees. A designee should usually be a person from the state or federal organization represented by the committee member, and normally full supervisory responsibility will be assumed by that committee member;
SEAMAP Cooperator	Person actively involved in SEAMAP operations, such as a work group member, or otherwise directly involved in collecting data.

Prior to field activities, SEAMAP participants and cooperators will submit their data recording forms to the data manager for assurance that data will be recorded in a form compatible with the SEAMAP Data Management System and applicable NOAA data management policies and procedures. Additionally, participants and cooperators will provide the data manager with information on data collection methods and systems (documentation). This information will be maintained by the data manager, with copies provided on request to data requesters and others concerned with appropriate data use.

A Data Management System Operations Manual will be prepared to provide specific guidelines for SEAMAP participants concerning user site data management procedures. Within these guidelines, data will be verified at the participant's field site and entered into the SEAMAP Data Management System as a verified data set. Verification and data input should follow the timetable specifications of the Operations Manual.

After verified data are received from collectors, the data manager will verify the data for administrative accuracy, and the data will be added to the SEAMAP database, ensuring that all data have been received and stored utilizing approved SEAMAP data management protocol. The data manager will be responsible for properly preserving SEAMAP data and insuring that data are not lost when system problems are encountered. Copies of data will be provided to collectors when requested.

Data Retrieval

The primary goal of SEAMAP data management is to bring the SEAMAP database online for general access by traditional data users and the public. Access to the database through the Internet is currently under development. As the web access to the SEAMAP database is implemented, a new system for documenting web based data request will be developed to track data use via the Internet.

Until the database is brought online, the following procedures will be followed to provide data to users. SEAMAP normally bears all personnel and computer costs for satisfying data requests.

SEAMAP data users are classified as follows:

SEAMAP Participant	(defined under Data Input section) Person will have ready access to all SEAMAP verified data. Retrieval of SEAMAP data via the user site is limited to SEAMAP participants only; all other requesters will access the data through the data manager;
SEAMAP Cooperator	(defined under Data Input section) Normally, only the specific cooperator, and not a designee will have cooperator privileges;
SEAMAP Investigator	Person funded through a research contract or grant specifically to summarize and analyze SEAMAP data relative to a general need identified by SEAMAP. Normally, an investigator would have coordinated his or her research project with the committee prior to implementation;
Non-SEAMAP Investigator	Person not specifically involved in SEAMAP activities. Included are independent researchers, private research organizations (including those under contract to government agencies), fishing and environmental group representatives, nonparticipating federal and state agencies, and the general public.

Data requests, other than those that may be processed at on-site facilities, shall be directed to the data manager, who will satisfy them in the most efficient manner. The data manager must insure that data management and dissemination activities are within programmatic budget guidelines as well as state and federal regulations. Data requests will normally be handled in the order

received, provided resources are available. In the event of personnel and funding limitations, priorities for data requests will be assigned as follows: SEAMAP participant, SEAMAP cooperator, SEAMAP investigator, and Non-SEAMAP investigator. Questions relating to adjustments in priorities, and use of data will be forwarded to the coordinators for resolution.

A Data Use Agreement Form will be sent to data requesters, requiring the following information:

- (1) Name of requestor and associate investigators who will use data;
- (2) Affiliation and contact information of requestor;
- (3) Required date for receiving data and probable length of use;
- (4) Purpose of data use, including identification of contracts or grants associated with such use;
- (5) Intended publication format (journal, report, etc.) for project;
- (6) Copy of grant, grant proposal, or contract indicating proposed use of SEAMAP data, if applicable; and
- (7) Copies of reports and/or publications incorporating SEAMAP data.

This form will also notify the requestor of the procedure to be used in referencing SEAMAP as the source of data in any presentation, report, or publication resulting from their use. The requestor will be advised to treat all received data in a professional manner, precluding redistribution of the data to other parties. In addition, the requestor will be instructed to provide the appropriate coordinator with two copies of each report or publication which relied upon SEAMAP data. A bibliography of reports generated from SEAMAP data will be published in each SEAMAP Annual Report.

Upon receipt of the completed Data Use Agreement Form, the data manager will approve it if it is a routine request. If not, the SEAMAP coordinator will evaluate the request. The SEAMAP data manager will maintain a log of all requests, noting approval or reasons for rejection, and will provide copies of this log quarterly to the coordinators for distribution to committees. Rejected data requests will be returned to the requestor by the SEAMAP coordinator with an explanatory letter.

APPENDIX F - SEAMAP SPECIMEN ARCHIVING

Curators

The SEAMAP curators are responsible for the maintenance of selected collections of ichthyoplankton, invertebrate organisms, and duplicate plankton samples collected during SEAMAP survey operations. The SEAMAP Ichthyoplankton Archiving Center stores sorted ichthyoplankton samples and is located at the Florida Marine Research Institute, St. Petersburg, Florida. The SEAMAP Ichthyoplankton Archiving Center curator and curatorial assistant are Florida state employees whose positions are supported by SEAMAP funds. The curator and curatorial assistant receive administrative support from the Florida Marine Research Institute and direction from the joint committees. The SEAMAP Invertebrate Plankton Archiving Center (SIPAC) houses unsorted "backup" station samples and sorted larval invertebrate specimens, and is located at Gulf Coast Research Laboratory, Ocean Springs, Mississippi. The SIPAC curator and curatorial assistant are employees of Gulf Coast Research Laboratory, whose positions are partially supported by SEAMAP funds. Administrative support and supervision are received from the Gulf Coast Research laboratory and joint committees.

The SEAMAP curators maintain SEAMAP specimens and samples in the most efficient and effective manner, processing specimen requests and insuring archiving and loans are carried out in accordance with the approved policies and procedures outlined in the SEAMAP Shipboard Operations Manual. Specific responsibilities of the curators include:

- maintain collections in a manner consistent with approved policies and procedures,
- receive authorized specimens and their accompanying information, and catalog these materials,
- process user requests and provide specimens and/or information in accordance with the approved policies and procedures,
- maintain information on specimen requests, and
- assist the coordinators in the preparation of each annual report and reviews of the specimen archiving component of SEAMAP.

Archiving Procedure

Specimen collectors are classified in the same categories as data collectors, which include SEAMAP participant and SEAMAP cooperator. Collected specimens are classified as

ichthyoplankton, invertebrate zooplankton, or phytoplankton. Collections are preserved and processed aboard ship in accordance with the SEAMAP Operations Manual for Collection of Data. Primary collections are shipped to the NMFS Miami Laboratory where data sheets are completed and reviewed. The samples are then packaged and forwarded to the Polish sorting center. Backup collections are shipped to SIPAC where they are stored.

With the concurrence of the affected SEAMAP committee, some plankton samples may be sorted by other organizations, with the sorted samples returned to the appropriate archiving center. Currently, ichthyoplankton samples are collected and sorted by the Louisiana Department of Wildlife and Fisheries and results are sent to the archiving centers. Furthermore, should a requirement to collect specific samples for a specific purpose arise, the requesting organization may sort, archive, and even destroy certain samples, depending upon agreements established with the affected committee.

Specimens sent to the Plankton Sorting and Identification Center in Szczecin, Poland are separated to ichthyoplankton and other plankton fractions. Ichthyoplankton fractions are sorted to the family level and returned to the SEAMAP Ichthyoplankton Archiving Center, where they are catalogued and stored. Currently, all ichthyoplankton archiving information is maintained on a local data base at the SEAMAP Ichthyoplankton Archiving Center. The sorted and unsorted invertebrate fractions are returned to SIPAC and accessioned. All invertebrates are archived and data maintained in a computerized data management system.

Implementation of the SEAMAP Data Management System will improve information management for both archiving centers by allowing user site access to the entire SEAMAP data base at each archiving center. All station information will be readily available to the curators. Specimen data will be entered directly to the SEAMAP data base at the archiving centers. In addition, all archiving information stored on the Data Management System will be readily available to SEAMAP participants.

Specimen Loan

All specimen requests will be directed to the SEAMAP curators. Requests will be processed in accordance with the annual SEAMAP operations plan. The curator will send a Specimen Loan Agreement Form to the requestor, requiring the following information:

- (1) Name of requestor and associate investigators using specimens;
- (2) Affiliation and address of requestor;
- (3) Required date of receiving loan and probable length of use;
- (4) Purpose of specimen use, including identification of contracts or grants associated with such use;

- (5) Intended publication format (journal, report, etc.) for project; and
- (6) Copy of grant, grant proposal, or contract indicating proposed use of SEAMAP data or specimens, if applicable.

This form will also contain notification of charges associated with processing and handling the specimen loan. Except in unusual cases approved by the committee, all costs of shipping specimens should be borne by the requesters. This form will also notify the requestor of the procedure to be used in referencing SEAMAP as the source of specimens in any presentation, report, or publication resulting from their use. Procedures for handling and maintaining loan specimens will be included on this form. Normally, all sorted, unmodified specimens will be returned to the archiving center. When examination of SEAMAP specimens by a recognized expert in marine fish taxonomy leads to re-identification of larval specimens, these changes will be incorporated into the SEAMAP Data Management System. The curator will advise the requestor to provide the appropriate SEAMAP coordinator with two copies of each report and publication which relied on SEAMAP specimens. A bibliography of reports generated from SEAMAP data will be published in the SEAMAP Annual Report. The requestor will be advised to treat all received specimens in a professional manner, precluding redistribution of the specimens to other parties without prior approval by the committee.

Specimen requests will normally be handled in the order received. In the event of personnel or funding limitations, priorities for specimen requests will be assigned as follows: SEAMAP participant, SEAMAP cooperator, SEAMAP investigator, and non-SEAMAP investigator. Questions relating to adjustments in priorities, costs, and use of specimens will be forwarded to the coordinators and committees for resolution.

APPENDIX G – SOUTH ATLANTIC SEAMAP COMMITTEE, 2007 SOUTH ATLANTIC PROGRAM BUDGET JUSTIFICATION – AUGUST 2006

The South Atlantic SEAMAP Committee met August 2-3 and jointly with their Gulf and Caribbean counterparts on August 3-4 to review program accomplishment and plan for 2007 activities and budgets. The three Committees unanimously approved the 2007 budget allocations between programs. The South Atlantic Committee approved a detailed budget to address high priority fishery independent research and monitoring needs for the region.

The 2007 allocations reflect the Committee's response to the South Atlantic Board recommendations and links enhanced future activities with meeting priority fishery independent data needs identified by the States, the Council and in the SEDAR program.

The proposed projects address high priority needs for providing access to data and supporting refined stock assessments in the region. In order to clarify priority needs for assessment the following highlights a recently distributed SEDAR report summarizing previous research recommendations and identifying those items common to previous assessments and therefore likely to present difficulties for future assessments. The following table present assessment research recommendations for life history, fishery, abundance and modeling as presented in the document *Research and Monitoring Needs for Southeast Fisheries, Report by request to the SEDAR Steering Committee (SEDAR/ John Carmichael, 2006)*.

The report highlights the fact that Southeast assessments presently must rely heavily on fishery-dependent abundance information despite widespread knowledge that such sources of information are less than ideal and may at times be biased. Methods for developing indices from fishery data have improved considerably in recent years however, significant effort and discussion is devoted at data and assessment workshops to developing and interpreting abundance indices.

The only source of fishery independent data available in the South Atlantic is the MARMAP program. However, concerns have been raised with this survey primarily related to geographic and temporal coverage as well as the fact the important species such as gag grouper do not appear in the catches with sufficient frequency to develop reliable indices.

The report states the following which provides additional justification for allocation of possible new SEAMAP resources as approved by the South Atlantic SEAMAP Committee.

“Reliability and accuracy of many SEDAR assessments suffer due to inadequate measures of population abundance. Fishery-independent measures of abundance are totally lacking for several species in the South Atlantic, and the spatial and temporal coverage of those surveys which do exist is often questioned. Most assessments must therefore rely upon fishery-dependent surveys and carry forward all the well-known caveats and assumptions related to such sources of information.”

The report also emphasizes that 79% of the assessments cited a need for independent survey data. 47% called for major improvements in or development of fishery-dependent abundance surveys. Specific areas cited include providing recruitment indices. Assessments increasingly

cite the need for spatial information, a need which is can often be carried over into the fishery statistics category as well.

SEAMAP and SEDAR

The Southeast Area Monitoring and Assessment Program (SEAMAP) is a federal/state/university cooperative program for collection of fishery independent data. SEAMAP programs began in the Gulf of Mexico in 1981, expanded to the Atlantic in 1983, and to the Caribbean in 1988. Each region operates as an individual entity, establishing its own objectives and programs.

Unlike the Gulf of Mexico SEAMAP surveys, which have provided important sources of fishery independent information in several SEDAR assessments of Gulf species (e.g., red snapper, Gulf gag grouper, greater amberjack, vermilion snapper, and gray triggerfish), South Atlantic SEAMAP surveys have been considered during several data workshops, but use has been limited to SEDAR 5, king mackerel assessment using an Atlantic SEAMAP index. The proposed funding level was developed and adopted by the South Atlantic Committee to address high priority assessment needs for the region as highlighted by the SEDAR research and monitoring needs report.

SEDAR Recommendations to Address Future Needs

From this review, likely data deficiencies for future assessments include inadequate age samples and imprecise age assignments, inadequate and incomplete commercial landings, incomplete and imprecise private recreational landings and characterization information, inadequate abundance survey information, and inadequate discard information. Some can be met over the short term while others will require a long term investment of resources.

There are many species under the jurisdiction of the Southeast Region Councils. However, many of these contribute only marginally to landings and are unlikely to be assessed in a species-specific, quantitative manner. Given that resources are not infinite, research and monitoring efforts should be addressed toward those species supporting primary fisheries. The Councils and Regional Office should identify primary or 'indicator' species.

Independent Surveys

Comprehensive independent surveys of abundance should be developed for the South Atlantic areas. Spatial and age composition information should be enhanced for existing surveys. Independent surveys are especially critical to evaluating the status of species for which harvest is prohibited or severely restricted, such as Goliath grouper, Warsaw grouper, and speckled hind.

These recommendations could involve expanding and modifying the MARMAP and SEAMAP programs as well as initiating new programs.