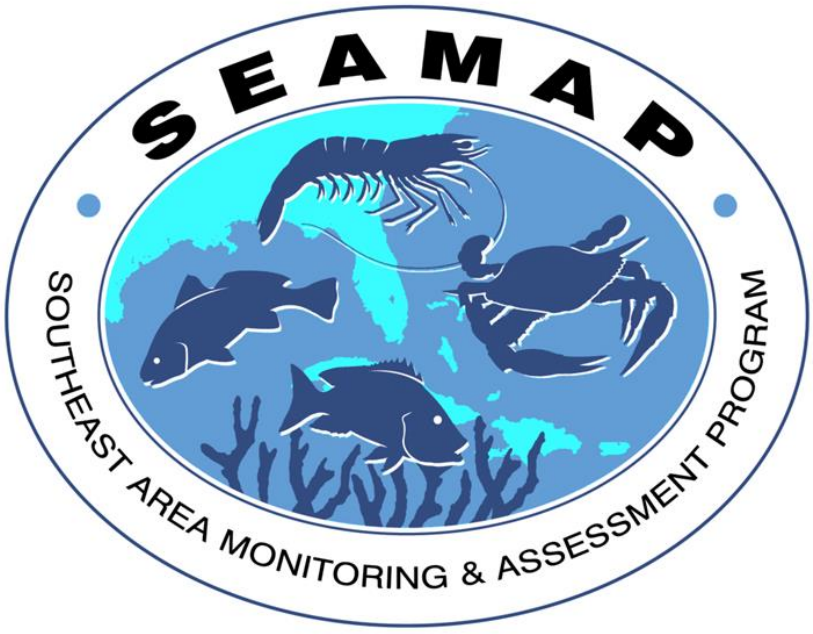
2021-2025 SEAMAP Strategic Plan



Collection, Management, and Dissemination of
Fishery-independent Data from the Waters of the Southeastern United States

Prepared by
Sarah Murray, 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

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PREFACE

Fisheries are a vital part of the nation's economy and, more specifically, the coastal communities and states of the South Atlantic, Gulf of Mexico, and Caribbean. In the region in which the Southeast Area Monitoring and Assessment Program (SEAMAP) is conducted, fisheries resources support valuable commercial and recreational fishing industries. In 2015, in the South Atlantic and Gulf region alone, commercial fishers landed over 2.9 billion pounds of seafood worth almost $1.7 billion[1]. In the same year, recreational anglers across all three regions landed at least 213 million pounds of fish[2]. Recreational fishing is a growing industry in the SEAMAP region, where over 130 million angler trips were taken in 2018[3].

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 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, requires accurate and timely data as a basis for management decisions. SEAMAP plays an integral role in providing fishery-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-based fisheries 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 prey and predator species life histories and interactions, essential fish habitat, and the effects of changing environmental conditions.

Long-term fishery-independent databases provide 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. Ongoing, regional fishery-independent efforts, such as those undertaken by SEAMAP, can generate data critically needed by fisheries management to address these issues.

Adequate funding continues to be a challenge in fisheries science and management. Federal and state government funding for fisheries activities will likely decrease over the coming years in order to meet the fiscal objectives of balanced budgets and reduced spending. Concomitantly, survey costs continue to increase, especially given the need for new data to

[1] Fisheries of the US 2018
[2] Fisheries of the US 2018 (excludes Texas and Louisiana).
[3] Fisheries of the US 2018.

assess the status of emerging fisheries and transition to ecosystem-based fishery management. This could significantly impact the nation's capability to manage its valuable fisheries resources. 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 and 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 35 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.

Ted Switzer	Roger Pugliese	Matthew Kammann
Chair	*Chair*	*Chair*
SEAMAP-Gulf of Mexico	SEAMAP-South Atlantic	SEAMAP-Caribbean

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SEAMAP COORDINATING AGENCIES

Eric Hoffmayer- 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
1050 N. Highland St., Suite 200 A-N
Arlington, VA 22201

Phone: (703) 842-0740
Fax: (703) 842-0741
www.asmfc.org

SEAMAP Gulf Coordinator
Gulf States Marine Fisheries Commission
2404 Government Street
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://seagrantpr.org/

SEAMAP PARTNERS

Alabama Department of Conservation and Natural Resources (ADCNR)
Florida Fish and Wildlife Research Institute (FWRI)
Georgia Department of Natural Resources (GA DNR)
Gulf Coast Research Laboratory (GCRL)
Gulf of Mexico Fishery Management Council (GMFMC)
Louisiana Department of Wildlife and Fisheries (LDWF)
Mississippi Department of Marine Resources (MDMR)
NOAA Fisheries
North Carolina Division of Marine Fisheries (NC DMF)
South Atlantic Fishery Management Council (SAFMC)
South Carolina Department of Natural Resources (SC DNR)
Texas Parks and Wildlife Department (TPWD)
US Fish and Wildlife Service (USFWS)
Puerto Rico Department of Natural and Environmental Resources (PR-DNER)
U.S. Virgin Islands Department of Planning and Natural Resources (USVI-DPNR)
Caribbean Fishery Management Council (CFMC)
University of Puerto Rico, Sea Grant College Program (UPRSGCP)

SEAMAP COLLABORATIONS

Marine Resources Monitoring, Assessment and Prediction Program (MARMAP)
NOAA - Beaufort, NC Laboratory
Southeast Coastal Ocean Observing Regional Association (SECOORA)
Southeast Fisheries Science Center Southeast Fishery-Independent Survey (SEFIS) group

ABBREVIATIONS AND ACRONYMS

ACL	annual catch limits
AM	accountability measures
ASMFC	Atlantic States Marine Fisheries Commission
BRD	bycatch reduction device
CFMC	Caribbean Fishery Management Council
COASTSPAN	Cooperative Atlantic States Shark Pupping and Nursery
CPUE	catch per unit effort
CSC	Coastal Sciences Center
DOC	Department of Commerce
EEZ	exclusive economic zone
EFH	essential fish habitat
FMP	fishery management plan
FSCS	Fisheries Scientific Computer System
FRL	Fisheries Research Laboratory (Caribbean)
FWRI	Florida Wildlife Research Institute
GA DNR	Georgia Department of Natural Resources
GIS	Geographic Information System
GMFMC	Gulf of Mexico Fishery Management Council
GSMFC	Gulf States Marine Fisheries Commission
GSMFC-TCC	Gulf States Marine Fisheries Commission-Technical Coordinating Committee
HMS	highly migratory species
LNG	liquefied natural gas
MARFIN	Marine Fisheries Initiative Program
MARMAP	Marine Resources Monitoring, Assessment and Prediction Program
MSRA	Magnuson-Steven Fishery Conservation and Management Reauthorization Act
NC DMF	North Carolina Division of Marine Fisheries
NCRMP	National Coral Reef Monitoring Program
NMFS	National Marine Fisheries Service (also referred to as NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
PR	Puerto Rico
PRCRMP	Puerto Rico Coral Reef Monitoring Program
PR-DNER	Puerto Rico Department of Natural and Environmental Resources
SAB	South Atlantic State-Federal Fisheries Management Board
SAFIMP	South Atlantic Fishery-Independent Monitoring Program workshop
SAFMC	South Atlantic Fishery Management Council
SC DNR	South Carolina Department of Natural Resources
SEAMAP	Southeast Area Monitoring and Assessment Program
SEAMAP-C	Southeast Area Monitoring and Assessment Program-Caribbean
SEAMAP-Gulf	Southeast Area Monitoring and Assessment Program-Gulf of Mexico
SEAMAP-SA	Southeast Area Monitoring and Assessment Program-South Atlantic
SECOORA	Southeast Coastal Ocean Observing Regional Association
SEDAR	Southeast Data, Assessment, and Review
SEFIS	SEFSC Southeast Fishery-Independent Survey (SEFIS)
SEFSC	Southeast Fisheries Science Center
SERFS	Southeast Reef Fish Survey
SERO	Southeast Regional Office (NOAA Fisheries)
SERTC	Southeastern Regional Taxonomic Center
USFWS	U.S. Fish and Wildlife Service
USVICRMP	USVI Coral Reef Monitoring Program
USVI-DPNR	U.S. Virgin Islands Department of Planning and Natural Resources
UPRSGCP	University of Puerto Rico Sea Grant College Program

INTRODUCTION

The SEAMAP 2021-2025 Strategic Plan provides a prioritized list of future project activities for each of the SEAMAP components. The Strategic Plan complements the SEAMAP 2021-2025 Management Plan, which provides a statement of current goals (Chapter 1), management policies and procedures (Chapter 2), and current activities and accomplishments (Chapter 3). The Management Plan also serves as a reference on SEAMAP history (Appendix B).

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

SEAMAP's mission, detailed in Chapter 1 of the Management Plan, is to provide an integrated and cooperative program to facilitate the 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 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 to provide access to the collected data through documents and accessible databases. Additional roles of SEAMAP are to document long- and short-term needs for fishery-independent data to meet 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.

The SEAMAP Joint Committee has developed a list of future project activities. They are prioritized in three broad categories that maintain and expand upon existing SEAMAP data collection activities and propose new data collection efforts, dependent on the availability of additional funding (Chapter 1). Funding provided in FY2020 for SEAMAP was $4,797,738 which allows for the dissemination of readily available regional fish and habitat data for use in stock assessments of state and federally managed species. Enhancement and expansion of the program will directly improve the ability of scientists to refine existing assessments with better data, as well as perform more assessments of overfished resources, eventually leading to more effective management in the Southeast region.

I. **Operate existing programs at full utilization:** In recent years, SEAMAP activities have been impacted by stagnating and declining funding to the core surveys. SEAMAP activities have been reduced across sea days and stations while entire survey components have been eliminated. Additionally, survey costs will continue to increase over time. In order to bring SEAMAP activities back to full utilization, funding will need to be restored and increased.

II. **Expand current projects to collect additional data on existing platforms:** 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 and capabilities of existing program trawl, plankton, lobster, conch, and bottom mapping surveys. Furthermore, with increasing focus on ecosystem management, there is a critical need for data on stomach contents and environmental variables that can be collected during existing surveys.

III. **Develop new fishery-independent data collection programs:** Additional identified priorities include fishery-independent surveys targeting adult finfish, plankton, crustaceans, identification/mapping of existing live bottom and other essential fish habitat (EFH), pelagic fish monitoring, and assessments of deepwater reef fish, including snapper and grouper stocks.

The most compelling argument to continue funding is SEAMAP's ability to respond to recent and ongoing critical demands for data and information that only the program can provide (see the SEAMAP 2021-2025 for further details on SEAMAP data uses and accomplishments). Accurate population assessments 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 2021-2025 Management Plan sets the guidelines and priorities for fishery-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

1 EXPANDING AND MAINTAINING SEAMAP ACTIVITIES

In the stock assessment process, SEAMAP-based abundance indices now are used routinely both as stand-alone indices of abundance and as criteria for "tuning" stock assessment models. 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 and South Atlantic Trawl Surveys and Gulf Plankton Surveys), Spanish mackerel (Gulf and South Atlantic Trawl Surveys), red snapper (Gulf Trawl and Plankton Surveys), red drum (Gulf Plankton Surveys and Coastal Longline Surveys), red hind (Caribbean Reef Resources Surveys), shrimp (Gulf and South Atlantic Trawl Surveys), striped bass, kingfish, weakfish, spot, and croaker (South Atlantic Coastal Trawl Survey). In addition, there is great potential for expanding SEAMAP to collect data on stocks that are not well covered by current surveys (example, cannonball jellyfish - *Stomolophus meleagris* in the South Atlantic), expanding life history sample collection for species currently encountered, or 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 continually needed by managers.

There is potential for increased use of ongoing SEAMAP data collection for fisheries management, especially as the SEAMAP resource surveys continue to grow into longer time series of fishery-independent data. In addition to providing regional, long-term, fishery-independent data, SEAMAP datasets also provide valuable baseline trends of fishery stocks. These long-term baseline trends can be used to assess the impacts of a tragedy such as the Deepwater Horizon oil spill in the Gulf of Mexico or other environmental perturbations.

The South Atlantic Coastal Trawl Survey and Reef Fish Survey provide immediate feedback regarding the effectiveness of fisheries management regulations. SEAMAP trawl survey data are used by Texas, South Carolina, and Georgia to set seasonal openings for the shrimp fisheries. SEAMAP-Gulf trap videos have been used to judge the effectiveness of various types of artificial reef materials for their structural and geographical stability, biofouling community succession, and fish biomass and diversity. Where catch is limited and fishing is restricted, making catch data unavailable, fishery-independent data are of even greater importance and may be the only source of information for characterizing stocks. Expanding SEAMAP activities can provide for even greater application for evaluating management actions.

More recently, data from the Caribbean Reef Fish Survey has provided data for an ecosystem-based evaluation of temporal trends of fish assemblages (abundance and biomass) associated with coral reefs in the region. These trend analyses, together with analyses of other databases, will feed into a more general quantitative model aimed at describing the structure and composition of these fish assemblages and identifying potential drivers of their temporal change.

The demand for adequate scientific information will likely increase in the future as management moves towards alternative approaches, such as property-rights-based management (including individual transferable quotas or catch shares), habitat-based management, multi-species management, and ecosystem management.

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. For example, SEAMAP data are used to identify the bottom habitat distribution in the South Atlantic region to adopt management measures to protect coral and allow rock shrimp trawling to continue. Using SEAMAP data, SAFMC has developed alternative management options to protect coral areas from rock shrimp trawling, define EFH, and investigate marine protected areas. The nearshore trawl surveys may have a new use in the realm of coastal wind farm development for identifying low and high impact areas when citing farms.

The three SEAMAP committees regularly discuss future SEAMAP activities, and each developed a list of activities that would implement changes according to the following priorities:

1. **Operate existing programs at full utilization**
2. **Expand current projects to collect additional data on existing platforms**
3. **Develop new fishery-independent data collection programs**

The SEAMAP Joint Committee supports priorities that restore and maximize ongoing program activities over the implementation of any new fishery-independent data collection efforts. Lack of adequate funding is the major impediment for maintaining and expanding surveys. In recent years, the level funding and loss of funding has led many of the components to reduce sampling and these reductions are reflected within Tier I of this list. The Committee notes that surveys not included in Tier I currently are at risk of being added in the near future should funding remain level or decrease further. The projects below 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 and all cost estimates are based on current rates (August 2016).

1.1 OPERATE EXISTING PROGRAMS AT FULL UTILIZATION

In recent years, SEAMAP activities have been impacted by stagnating and declining funding to the core surveys. The following items and funding are required to maintain these baseline survey activities or bring SEAMAP to full utilization.

1.1.1 Gulf of Mexico

(Increase of $600,000/year)

Trawl Surveys on the West Florida Shelf

In 2008, Florida began participating in the SEAMAP-Gulf Summer and Fall Shrimp/Groundfish Surveys. Its sampling coverage ranged from just south of Tampa Bay to Pensacola on the west Florida continental shelf. Due to limited funds in 2011, this survey was cut back to once a year. Funding is needed to continue the survey twice a year. This will allow additional information to be collected on shrimp and fish stocks where they have historically not been sampled on a regular basis. ($350,000 annually)

Bottom Longline Survey

The SEAMAP-Gulf Bottom Longline Survey is currently conducted in water depths of 3 to 10m from statistical 10 in northern Florida to statistical zone 21 at the U.S./Mexican border. Funding limitations do not allow sampling in statistical zones 1-9 off Florida. Additional funds would allow the survey to sample the entire Gulf of Mexico during the Spring, Summer, and Fall time periods. ($250,000 annually)

1.1.2 South Atlantic

(Increase of $745,910 annually)

Coastal Trawl Survey

Due to reduced funding and increased cost of the SEAMAP-SA Coastal Trawl Survey (see Section 2.5.1 of the Management Plan), current funding levels will not allow the continuation of three sampling seasons each year. We considered reducing the number of stations, but unless this reduction is in the northernmost and southernmost area, the cost reduction would be marginal, relative to the large loss in data and geographic coverage. We are currently investigating the effect of dropping one of the sampling seasons on data and analyses for assessments etc., which can be considerable. Maintaining the current sampling efforts (3 seasons, 102 stations per season) would require additional funding of ≈$80,000 annually.

Pamlico Sound Survey

Due to funding limitations, staff salaries are currently supplemented with outside funding sources. In particular, 25% of the NC Biologist salary is no longer covered under SEAMAP-SA. An additional $9,950 is required to fully fund the NC Biologist.

SEAMAP-SA Reef Fish Survey and Bottom Mapping

SEAMAP-SA contributes 40% to 45% to the SC DNR Reef Fish Survey efforts (SEAMAP-SA and MARMAP), and about 20% of total current funding for the regional Reef Fish Survey (SERFS). The SC DNR Reef Fish Survey has seen considerable funding reductions over the years, most significantly through reduced funding for MARMAP and SEFIS funding to MARMAP. Increases in vessel cost per sea day, as well as personnel and other costs, have led to a reduction in sea days, suspension of the bottom long-line surveys in 2012 and the gag ingress study in 2015. Due to incidental funding, mostly as a result of the need for data

on deep water snapper/grouper species, the long line surveys were, partially resumed in 2014.

A full utilization of the SEAMAP-SA Reef Fish Survey will require:

1. Restoring sampling effort to at least 50 sea day per year (25 each for MARMAP and SEAMAP-SA). Required funding: $ 66,500 annually (~7 seadays). It's important to realize that the current reef fish survey can only be conducted in collaboration with MARMAP (funding between $600K and $750K annually in recent years), SEAMAP-SA Reef Fish, and the NMFS SEFIS program (funding variable).
2. Restoring the longline surveys as laid out in the SAFIMP and Longline Workshop Reports (See Carmichael et al. 2009, Carmichael et al. 2016, and Kellison et al. in prep). Participants in these workshops, have recognized the importance of a comprehensive fisheries independent deep-water snapper grouper survey. Data for these species are lacking and funding reductions over time have reduced or eliminated sea days for the longline surveys. This would require 10 additional sea days for the R/V *Palmetto* and 15 sea days for the R/V *Lady Lisa.* Required funding: $ 146,000 annually.
3. Note that in 2020, a cooperative-with-industry, regional-scale (northern NC to FL Keys) South Atlantic deepwater longline survey was initiated. The survey, coordinated cooperatively by SCDNR and NMFS, utilizes longline sampling from contracted commercial vessels, targeting predominantly deepwater grouper species and tilefish (golden and blueline) in depths ranging from ~ 75 - 365 m. The main objective of the survey, which is anticipated to continue in subsequent years, is to generate abundance indices and life-history information for focal species, for use in stock assessments.
4. Funding to process all life history samples (in particular the otoliths and reproductive tissues) within one year after collection. This will allow the survey to respond to the frequent and unexpected changes in the stock assessment schedules and continue to provide critical information to all assessments. Required funding: $50,000 annually.
5. The gag ingress study was halted in 2015 as a result of funding cuts. Evaluation of the cost/benefits of resuming this study is needed, and if resumption is considered, this study should become part of a comprehensive larval and juvenile fish survey plan. Full restoration of a multi-state juvenile ingress study at the level of the 2015 efforts is expected to require $150,000 annually.

Coastal Longline Surveys

The SEAMAP-SA Coastal Longline Surveys are designed to provide a long-term fishery independent database on the distribution, relative abundance, catch per unit effort, size distribution and age composition of red drum along the South Atlantic coast. Additionally, the surveys provide information on the relative abundance, size distribution, sex, and maturity of multiple species of small and large coastal sharks.

North Carolina: Unless additional funding is available, there will be a reduction in the number of North Carolina longline days and a reduction of an equivalent amount of data for stock assessments. This means that there is no support to sample the full number of sampling sites per week (72 samples). One week of sampling (8 samples) would need to be

omitted and precision in estimates would be reduced. The survey needs restoration of $6,500 annually to maintain current sampling efforts. ($6,500 annually)

South Carolina: To return to the historical breakdown of funding to this survey (75% federal, 25% state funded) the survey would require a restoration of $39,000 (based on FY17 levels). Increases in staff salary, as well as daily vessel charges have resulted in a higher proportion of outside funding, with current funding sources (xx% SEAMAP and xx% other). As funding for state agencies has also stagnated, we will likely be forced to reduce sampling if additional funds are not available. ($39,000 annually)

Georgia: SEAMAP-SA presently covers 55% the costs to fund this survey May to December (8 months, 44 sea days). GADNR has offset the annual costs for years with a combination of state and other federal fund sources to cover personnel services and vessel maintenance. However, these funds continue to be cut and during the FY2016-2020 cycle we reduced our number of sampling days and discontinued sampling in northeast Florida due to these constraints. The total FY20 cost for this survey was $156,291 (SEAMAP-SA portion was $85,960).

Data Management

To maintain the current level of data management, which would include uploading new survey data annually and minimum maintenance of the data base, an increase in operating costs of $10,000 is needed to cover increases in staff and other costs. Additional funds are also essential for standard database maintenance, application refinements, additional queries, bug correction or programming errors that have been discovered within the structure of the database or associated extraction reports. Furthermore, for other partner data management staff, reduced SEAMAP funding has been temporarily offset by outside funding sources. All SEAMAP-SA partners (including NCDMF, GADNR, and FWRI), which are important contributors to the database and the position accountable for data quality and transferring each individual survey's data to SEAMAP, has experienced reduced funding to support data management. Fully restored funding is necessary to ensure the crucial database support for these critical database aspects. ($30,000 annually)

SERTC

SERTC funding has been severely reduced in recent years. This has significantly affected the support for diet studies in the SEAMAP-SA surveys at SCDNR. To restore SERTC support for the surveys would require a minimum of $82,000 annually, which is roughly the FY14 requested funding level for SERTC through SEAMAP-SA. Note that this would restore activities to fully support for SEAMAP-SA activities, in particular the Coastal Trawl Survey and the SEAMAP-SA Reef Fish Survey. Specifically, this will allow SERTC to once again support the diet studies, curating the SEAMAP-SA biological reference collection, maintain and expand the computerized and searchable literature, and some minor outreach activities (such as publishing diet and other identification guides, etc.). ($82,000 annually)

1.1.3 Caribbean

(Increase of $790,000/year, once every five years)

Sampling efforts have been scaled back significantly for all SEAMAP-C surveys. Level funding over the last several years, coupled with inflation and rising project costs, have resulted in dramatic reductions in overall sampling effort. Maximum effort is needed to increase funding so that initial sampling efforts can be maintained. The last review of the program by the program manager includes the recommendation to conduct all the surveys, reef fish, queen conch and lobster, every year. Other recommendations are to increase the number of sample stations. In order to fully implement these recommendations, an increase in funding is necessary.

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. The proposed budget is $120,000/year, once every five years (USVI) and $120,000/year once every five years (Puerto Rico).

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 is $120,000/year, once every five years (USVI) and $120,000/year, once every five years (Puerto Rico).

Video Cameras, and Hook and Line Surveys

The level of effort for fishery-independent hook and 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 is $150,000/year, once every five years (USVI) and $160,000/year, once every five years (Puerto Rico).

1.2 EXPAND CURRENT PROJECTS TO COLLECT ADDITIONAL DATA ON EXISTING PLATFORMS

1.2.1 Gulf of Mexico

(Increase of $6,150,000/year)

Hooked-Gear Survey of Reef Fish

The SEAMAP-Gulf Reef Fish video camera survey, which has recently been expanded through supplementary grant funding, provides valuable data on the relative abundance, size composition, and habitat associations of reef fish assemblages on natural and artificial reefs

throughout the U.S. Gulf of Mexico. While data from this survey are critical to most reef fish stock assessments in the Gulf, periodic supplementary life history information (primarily size/age, fecundity, sex and sex ratio) is necessary to translate size-based information provided by the non-extractive video survey into age-based information for age-based stock assessments. Existing sampling programs initially relied on the use of chevron traps and, more recently, vertical longline sampling to provide both measures of relative abundance and size composition data. However, both approaches are limited by notable issues of species and size selectivity. Accordingly, a complementary hooked gear approach is required to provide biologic samples in support of the reef fish camera survey. Because of the diversity of managed reef fishes for which life history data are necessary, it is likely that a set of species- or guild-specific survey methods may be required; however, because estimated life history parameters are unlikely to change quickly, only periodic (e.g., every 5 years) synoptic sampling should be required. Target species or guilds would be determined based on upcoming stock assessment schedules and most critical life history data needs. ($1,000,000 annually)

Expanded Reef Fish Video and Vertical Line Sampling

SEAMAP-Gulf surveys of reef fish using stationary camera arrays have been conducted on natural hard bottom habitat along the shelf break since the 1990s and long-term funding is in place. Additional surveys of shallow hard bottom reef habitat in the Panama City region began in 2004 and in mid-peninsular Florida in 2008. Additional funding is required to continue these existing surveys, expand these surveys into regions where fishery-independent surveys of managed reef fish are lacking, and target critical habitat types that are excluded from current surveys (e.g., artificial reefs). Current funding only allows vertical line sampling off Alabama, Louisiana, and Texas during the Vertical Line Survey. The Vertical Line Survey collects much needed information on red snapper and other reef fish. Additional funds are needed to expand the Vertical Line Survey across the Gulf of Mexico. ($3,300,000 annually)

Otolith Processing

Age and growth data are invaluable when conducting stock assessments for managed fish, especially those data collected from fishery-independent surveys that target a much broader size-range than fishery-dependent surveys. In addition, the emerging field of otolith microchemistry has exhibited increasing utility in recent years to examine connectivity among various life history stages as well as discern the relative contribution of presumed estuarine and nearshore nurseries to the fishery. Most fishery-independent surveys have the ability to provide a large quantity of material for the examination of age/growth and otolith microchemistry; however, any substantial increase in the amount of material collected would rapidly exceed processing capabilities of existing age and growth facilities. Funds are requested to support expansion of one or two otolith processing laboratories in the Gulf of Mexico. This will ensure that collected otoliths and spines are sectioned and aged in a timely manner, as well as foster the application of otolith microchemistry techniques in assessing recruitment dynamics and connectivity of spatially explicit life history stages for managed fish. ($500,000 annually)

Dietary Analysis

Though management is moving toward an ecosystem-based approach, its utility has been severely compromised by the lack of sufficient trophodynamic data. To better understand predator/prey dynamics, trophic interactions, and to support the development of ecosystem-based fisheries management, gut contents analysis is essential. As with age and growth analyses, gut contents can readily be collected from existing fishery-independent surveys at little to no additional cost. Identifying and quantifying gut contents is a time intensive process that requires specialized skills, so funds are requested to establish a diet analysis lab in the Gulf of Mexico. This lab would focus on integration of traditional gut content analyses with genetic barcode identification of unidentifiable prey items to the lowest possible taxonomic level, as well as the addition of stable isotope analyses to more broadly define predator-prey relationships. Inclusion of genetic barcoding techniques for more discrete prey identification allows for finer resolution of specific trophic interactions, thereby enhancing the utility for ecosystem-based models. Stable isotope analysis offers an alternative to gut content analysis and involves using a mass spectrophotometer to identify the isotopic signature from fish tissue. Variations in isotopic concentrations can be applied to the food web to draw direct inferences regarding diet and trophic level. ($1,000,000 annually)

Reproductive Histology

Reproductive data (e.g., fecundity, size/age at maturity, spawning frequency, and periodicity) are essential when conducting stock assessments for managed fish. As with age, growth, and dietary analyses, biological material can be readily obtained from fishery-independent surveys. Reproductive analyses, which include the preparation and interpretation of histology slides, require specialized skills, so funds are requested for the establishment of a reproductive biology lab in the Gulf of Mexico. ($350,000 annually)

1.2.2 South Atlantic

(Increase of $649,000 annually and $410,000 once)

Coastal Trawl Survey

After an initial increase in life history study activities in 2009/2010, these studies have gradually been reduced as a result of available funding. However, age information, reproductive parameters, and other data such as diet composition in fish and black gill disease in shrimp, are critical for stock assessment and management decisions. As the samples are being collected as part of the ongoing survey, the cost of obtaining this important information is mostly in processing on-board and in the laboratory. The additional cost to the Coastal Trawl Survey of collecting and processing of relevant life history information for key managed species is expected to be $50,000, mostly in staff cost and some supplies.

SEAMAP-SA Reef Fish Survey

If activities under "Tier I" are realized, the R/V *Palmetto* will be fully utilized and further expansion of activities may require additional vessels. However, life history studies (in particular diet studies) and additional data acquisition equipment are expansions that can be made without additional vessel time and will greatly enhance data collection, especially in the areas of oceanographic and bottom habitat characterization and ecosystem-based assessment and management. Reef Fish diet studies were mostly halted in 2015 due to reduced funding. Resuming these studies would require minimal field effort. Costs would mostly be in supporting staff to examine the sample and analyze the data and some supplies. One biologist would allow processing and samples of 2-6 species each year, depending on the number of samples collected for each species, each year. The collected species would rotate on a set schedule to collect and update diet composition for most managed species over time (estimated costs $80,000 annually, including fringe, overhead, and supplies). Note: many species of management interest (snappers, groups) require DNA barcoding to adequately characterize the diet, which would require additional funding for processing and sequencing.

An Acoustic Doppler Current Profiler will allow estimates of the current speed and direction (corrected for vessel speed and direction) throughout the water column. This ocean current data can be used in the survey and provided to other (SEAMAP) programs and researchers to improve sampling efficiency and enhancement and ground-truthing of oceanographic modeling efforts in the region (e.g., SECOORA efforts). It is also important in decisions for safe gear deployment and reducing the risk of losing gear. The cost of purchase and installation of an ADCP is $60,000)

Multi-beam equipment can provide information on bottom relief and habitat type. Various vessels utilized by SEAMAP-SA surveys cross the southeast region on a regular basis. During transit (or during sampling, depending on the survey) multibeam equipment (either towed or on independently operated under water vehicles) could be used to obtain bottom habitat information that would otherwise not become available unless additional targeted cruises are conducted. Besides the cost of the equipment, a possible additional crew member on the research cruises is needed to operate and maintain the equipment and assure proper data collection and potentially extra sea days to augment the reductions in vessel speed during transit that would be required to produced accurate data in deeper water. Extra costs would be associated with post sampling data analysis, but this can be done in collaboration with academic or federal partners. The advantage of integrating the field activities is that there is no need for additional cruises, which would otherwise come at a considerable additional cost. (The cost of a multibeam unit is dependent on the type of gear/vehicle, estimated $350,000; one full-time trained technician and analyst, including fringe, estimated $65,000-$110,000 annually; the cost of indirect, and sea days would be $19,000 annually)

Bottom Mapping

Managed areas offshore of South Atlantic states, of specific concern to fishery managers, include Marine Protected Areas (MPAs), deepwater coral HAPCs, Spawning Special Management Zones and other bathymetric features or unique benthic habitats that warrant specific characterization due in part to their unique habitat characteristics or importance as essential fish habitats for managed species (see Appendix B, Figures 1-7 for existing managed areas). Bottom mapping priorities and objectives vary at both the state and management council levels (at least 20 managed areas are identified in the South Atlantic Habitat and Ecosystem Atlas[4]). Bottom mapping initiatives conducted under SEAMAP would build from previous efforts to expand coverage of known benthic habitats to essentially begin filling the gaps along depth contours (current coverage is shown in Figure 7. in Appendix B). Offshore habitat has been subdivided into 10 depth strata to capture target species and significant habitat distribution evaluate mapped and characterization accomplished to date and focus future mapping on priority needs for management. These areas were identified for a baseline of the South Atlantic Mapping Strategy being developed as a supporting tool for the SAFMC Fishery Ecosystem Plan II. Further review of existing habitat and mapping information and species associated will provide the opportunity to direct sampling to expand and complete mapping habitat north and south between known habitats and in managed areas.

Bottom mapping can be accomplished with use of side-scan (generally for shallower depths) or multi-beam sonar systems (generally for deeper depths). For areas within 200 m bottom depths and utilizing a multi-beam system on a vessel moving at 10 knots, during a 24-hour period of survey operations with a bottom resolution swath width of 200 m, 24 n. mi.^{2} of bottom can be mapped.

Using SEAMAP-SA/MARMAP vessels of opportunity, SCDNR/SAFMC is developing regional partnerships investigating purchase or lease new technology such as an AUV (e.g., Submarine by Ocean Areo) to be used in conjunction with existing operations. For bottom mapping costs, 25 sea days of bottom mapping could be accomplished for $300,000 and would provide approximately 600 n. mi^2 of bottom mapping coverage. In general, the final data product would include raw and processed multibeam sonar data in ArcVIEW and ASCII formats, metadata describing survey methods, and processed image files. ($300,000 annually)

The newer NOAA fisheries research vessels (NOAA Ships *Pisces* and *Henry Bigelow* in the Atlantic) are equipped with the Simrad ME70 multibeam sonar capable of mapping the bottom. The NMFS SEFSC Southeast Fishery-Independent Survey (SEFIS) group typically has ~ 30 days at sea each year in the South Atlantic region on the NOAA ship *Pisces*, during which mapping efforts occur at night (trap-video surveys occur during the day). SEFIS mapping efforts typically result in ~ 250 km^2 of newly mapped areas each year.

[4] http://safmc.net/habitat-and-ecosystems/safmc-habitat-and-ecosystem-atlas/

Pamlico Sound Survey

The Pamlico Sound Survey began in March 1997 and initially covered the months of March, June, September, and December. The December, leg of the cruise was discontinued in 1990, and the March portion was discontinued in 1991. This decision was made because it was felt that limited data was being collected during winter months and effort would be better allocated towards other projects. However, recent Pamlico Sound Survey annual reports have recommended adding an additional leg of the cruise at the end of July/beginning of August to increase temporal coverage. Adding additional cruises would increase the amount, and temporal distribution of biological data collected including length frequency and age data. Expanded sampling may also be useful in producing more accurate indices of abundance for target species and potentially for species not currently targeted. In addition, reinitiating sampling during the winter would begin a baseline of winter estuarine habitat use by species as ranges shift due to environmental changes. Approximately $25,000 are budgeted each year to cover expenses for the June and September cruises. Adding two additional months would double this figure while adding one would require an additional $12,500. ($25,000 annually)

Coastal Longline Surveys

The longline surveys were initiated in 2006 as part of ACFCMA supplemental funding with the primary objective to monitor the adult population of red drum as they move offshore in the fall. However, the surveys have also proven to be successful at monitoring coastal shark species with SEAMAP-SA data from SC and GA being used in multiple shark stock assessments. Biological samples (fin clips, reproductive tracts, stomachs and vertebrae) are currently only taken from sharks when outside funding is available, additional funds would allow these samples to be taken opportunistically (from moribund individuals) as well as under a sampling regime. These samples could then be archived and available when life history updates are requested for these species. ($15,000 annually)

Data Management

The SEAMAP-SA data management system would require expansion to address new data sets or analytical needs that arise with expanded SEAMAP-SA surveys. There is a likelihood of the need to take advantage of technological advances, as well as expanding to include database aspects such as diet study data, an image library of sampled species, the winter tagging cruise, and bottom habitat information into the comprehensive SEAMAP-South Atlantic data management system. These things can be accomplished in a cost-reasonable manner in the new SECOORA data system, but would require data management staff time and Axiom Data Science programmer time. An estimated budget increase of $50,000 for SEAMAP-SA data management would be needed to accommodate these expansions. ($50,000 annually)

1.2.3 Caribbean

(Increase of $835,000/year, plus $540,000/once every two years)

Lobster Surveys

Pueruli lobster studies have been ongoing for several decades. More recently, scientists associated with the program have recommended that greater emphasis be given to study the stages of individuals present in the coral reef system (juveniles and adults). These studies would not only offer information on potential existing juvenile stocks, but help tie in the larval settlement data USVI and Puerto Rico have collected over the past decade (settlement-recruitment relationship studies). Proposed additional budget is $120,000/year, once every two years (USVI) and $150,000/year, once every two years (Puerto Rico) to include other coasts around Puerto Rico.

Conch Surveys

Diver surveys of conch have been ongoing 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. For this reason, a new methodology was developed with technological innovations in the use of cameras and GPSs. Here also a budget is required to be able to work considering the prevention of infectious diseases. Proposed additional budget is $120,000/year, once every two years (USVI) and $150,000/year, once every two years (Puerto Rico).

Video Cameras, and Hook-and-Line Surveys

At the SEDAR 8 meeting, the limitations of the SEAMAP-C trap and hook-and-line survey data were 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 use. Video Cameras and hook-and-line surveys have been geographically limited due to personnel and budget constraints. Surveys need to be expanded to the whole of the U.S. Caribbean. Proposed additional budget is $150,000 annually (USVI) and $175,000 annually (Puerto Rico).

Reproductive Histology

Reproductive data (e.g., fecundity, size/age at maturity, spawning frequency, and periodicity) are essential when conducting stock assessments for managed fish. As with age and growth and dietary analyses, biological material can be readily obtained from fishery-independent surveys. Reproductive analyses, which include the preparation and interpretation of histology requires specialized skills, so funds are requested for the expansion of activities undertaken by the reproductive biology lab in Puerto Rico to process the samples gathered at the USVI at $175,000 annually, and for samples gathered at Puerto Rico $335,000 annually.

1.3 DEVELOP NEW FISHERY INDEPENDENT DATA COLLECTION PROGRAMS

These items include new fishery-independent surveys for data that is needed on a regional basis and is not sufficiently collected now. Specific survey methodology will be determined at the time of survey design with known funding.

1.3.1 Gulf of Mexico

(Increase of $3,000,000/year and $3,000,000 once)

Synoptic Life History Surveys

The accurate assessment of managed fisheries stocks often requires life history data that cannot be provided from ongoing fishery-independent surveys alone. Of particular importance are size- or age-specific estimates of fecundity and fraction of the population capable of spawning through time, which can be used to improve the accuracy of estimated annual stock reproductive potential, and sex ratios of hermaphroditic species such as groupers. To be most useful, these life history data require systematic (e.g., monthly) synoptic sampling covering the full spatial distribution and spawning season of the species of interest. Species vary with respect to both spawning season and susceptibility to various fishing techniques, so sample collection will likely require species- or guild-specific survey methods; however, because estimated life history parameters are unlikely to change quickly, only periodic (e.g., every 5 – 10 years) sampling would be required. Target species or guilds would be determined based on upcoming stock assessment schedules and most critical life history data needs. ($1,000,000 annually)

Habitat Mapping

Managed offshore areas of concern to fishery managers include MPAs, deepwater coral, HAPCs, and other bathymetric features or unique habitats that warrant characterization due in part to their importance as EFH for managed species. Habitat mapping surveys utilize remote sensing technologies to identify and describe features of the sea floor and habitats that reside on it. Mapping used in conjunction with fishery-independent surveys will allow ecosystem models to describe the interactions of species or multi-species complexes with a variety of habitats or bottom types. Mapping is best accomplished with use of side-scan in shallower depths or multi-beam sonar systems in deeper waters. ($1,000,000 annually for approximately 700 km^2 mapped)

Fisheries Acoustics Surveys

Several ongoing Gulf-wide surveys (groundfish trawling, bottom longline, plankton, reef fish video) are conducted at various times throughout the year. Because of this, there is tremendous potential for adding value to these surveys and providing important information through no additional vessel costs. One component that has tremendous potential is the incorporation of fisheries acoustics to existing surveys. Active fisheries acoustics can provide valuable information on the distribution, abundance, and size/biomass of nekton throughout the water column. Pairing fisheries acoustics surveys with ongoing survey operations provides insight into the catchability, selectivity, and overall effectiveness of existing surveys, which will

aid in the development of more accurate estimates of population-level abundance. Additionally, data provided by these surveys would be extremely useful in support of ecosystem modeling efforts by providing estimates of overall system productivity, especially in terms of baitfish for which effective surveys are somewhat lacking. Estimated costs are an initial cost of $3,000,000 for equipment, software, and training, and approximately $300,000 - $1,000,000 annually thereafter.

1.3.2 South Atlantic

(Increase of $2,394,000/year and $320,000 once)

Pelagic Survey

Currently, there is no fishery-independent survey to monitor pelagic fish such as mackerels, dolphin, wahoo, cobia, and other species in the Southeast region, all of which are of considerable importance for commercial and recreational fisheries. Several pelagic species have undergone SEDAR stock assessments and the need for fishery-independent survey data was clearly identified in research recommendations A pelagic survey would require initiating a new monitoring effort since it would require gear specific to the pelagic environment (pelagic long line and acoustic equipment). This cannot be done in a consistent manner during any of the current SEAMAP-SA monitoring efforts, and a new survey would require new funding. The level of funding would depend on the level of effort and geographic area covered, but is estimated to be between $500,000-$750,000/year if an appropriate survey vessel is available. This new survey could potentially be done in collaboration with the fishing industry. (750,000 annually)

Cobia Survey

No coast wide index of abundance is available for the Atlantic Migratory Group of cobia. Reliable regional indices of abundance cannot be generated due to the lack of targeted monitoring programs and low incidental catch of cobia in most existing surveys. In particular, few surveys consistently encounter and sample adult fish due to their size and gear avoidance in primary survey methods, such as trawls. The Fishery Management Plan and SEDAR stock assessments for cobia outline multiple research recommendations that a new fishery-independent survey could address:

- Develop fishery-independent survey methods to monitor adult abundances
- Continue to collect and analyze current life history data from fishery independent and dependent programs, including full size, age, maturity, histology samples and information on spawning season timing and duration; increase spatial and temporal coverage of age samples collected regularly in all states.

Cobia at times co-occur with Spanish mackerel (fall) and sharks (summer). A nearshore, cooperative research survey with fishermen, using hook and line or gillnet gear, targeting multiple species groups could be achieved at relatively low cost aboard recreational or commercial vessels. ($180,000 annually)

Regional (Ichthyo) Plankton Surveys

The initial concept for SEAMAP-SA included a plankton survey. Larval distribution of fish and crustacean species remains largely unknown. Such a survey, which was recommended as part of an optimal fishery-independent sampling strategy in South Atlantic waters (SAFIMP)[5], might be run as a stand-alone project standardized among researchers regionally or associated with the trawl survey. The lower tiers (phyto- and non-ichthyo-zooplankton) should also be considered. ($500,000/yr.).

Early Life Stage Sampling; Support Collaborator Subregional Ichthyoplankton Surveys

Long-term ichthyoplankton surveys are operated out of the NOAA Beaufort, North Carolina Laboratory and the Belle W. Baruch Institute for Marine and Coastal Sciences in Georgetown, South Carolina. In combination with a long-term ichthyoplankton survey in New Jersey operated by Rutgers University, these fixed-site collection programs offer the potential for combined, large-scale assessments of changes in larval recruitment patterns over space and time, with implications ranging from fishery applications (developing recruitment indices for use in stock assessments) to assessing impacts of climate change.

The NOAA Beaufort Bridgenet Ichthyoplankton Sampling Program

Initiated in 1986, the Beaufort Bridgenet Ichthyoplankton Sampling Program (BBISP) at the NOAA Beaufort Laboratory represents a multi-decade time series of larval fish ingress through Beaufort Inlet, North Carolina. Fall/winter spawned larvae are sampled weekly from mid-November through April/May at the Pivers Island Bridge. As of 2016, more than 868,000 larval fish from > 100 taxa have been identified from BBISP samples, including multiple species of recreational and management importance [e.g., Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), summer and southern flounder (*Paralichthys dentatus* and *lethostigma*, respectively), American eel (*Anguilla rostrata*), Atlantic menhaden (*Brevoortia tyrannus*) and striped mullet (*Mugil cephalus*)]. Research efforts using these data include examining the link between estuarine ingress, juvenile abundance, adult abundance, and climate variability for a variety of estuarine-dependent fish species along the U.S. East Coast. Operational indices of larval abundance have been used as tuning indices for stock assessments of southern flounder (NC DMF 2008). Ingress densities for other species could serve similar needs in stock assessments (American eel, Atlantic croaker, striped mullet, spot, summer flounder) or as fish community indicators of climate variability or anthropogenic impacts. Catch and densities are available for 1986-2013. The sampling is ongoing and performed by volunteers, but sample processing from 2013-present is currently unfunded. ($29,000 annually including data uploads to SEAMAP database)

North Inlet-Winyah Bay, SC Ichthyoplankton Survey

Collections of larval fishes and more that 45 zooplankton (invertebrate) taxa have been made in North Inlet estuary, South Carolina since the survey's inception in 1981. Based out

[5] SAFIMP. 2009. Final report: South Atlantic fishery independent monitoring program workshop. In: Willams EH, Carmichael J (eds), Beaufort, NC, 85 pp.

of the Belle W. Baruch Institute for Marine and Coastal Sciences, University of South Carolina in Georgetown, the survey samples biweekly and year-round. Replicated collections with 365- and 153-micron nets have provided insights into seasonal and interannual patterns of occurrence for fishes and crustaceans of economic importance. The collections have also provided an understanding of the factors that influence early life stages of fishes and other planktonic species. Impacts of climate variability on the timing of larval production of resident species and the timing of ingress of ocean-spawned larvae have been demonstrated. This program appears to be the longest, comprehensive zooplankton time series from Atlantic and Gulf estuaries. Along with other multi-decadal time series from North Carolina and New Jersey, South Carolina ichthyoplankton data through 2013 are now available at http://www.seamap.org/seamapDatabase.html . The survey and associated short-term studies have been supported by multiple, non-permanent sources over the decades including the North Inlet- Winyah Bay NERR. Additional funds are necessary to sustain the collection program and sample processing. ($35,000 annually including data uploads to SEAMAP-SA database)

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 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. Include purchase of passive mapping system, e.g., towfish. ($475,000/yr.)

Stock Structure Studies

Several state fisheries agencies and university researchers in the South Atlantic region conduct tagging studies of fish, sea turtles, and marine mammals to better understand movements, migrations, and geographic population structure. A variety of acoustic and conventional physical tags have been deployed on species ranging from red drum, cobia, striped bass, and sturgeon. Applying tagging study results to stock identification, stock assessments, and other products for fisheries management can be challenging because individual studies are often 1) limited in temporal and geographic scale, and 2) inhibited by inconsistencies between research groups in data storage and sharing capabilities. Presently, the southeast has several acoustic arrays located off the Georgia, South Carolina, and Florida coast extending from the shoreline out to approximately 12 miles. These arrays have proven effective at capturing the migratory behavior of many species including Atlantic Sturgeon, Lemon Sharks, Bull Sharks, White Sharks, Red Drum, Black Drum, and Tripletail. Expansion of these arrays could include additional array transacts to fill in gaps off north Georgia (Savannah region), north Florida (Jacksonville region) and North Carolina, in addition to providing funding for maintenance and tagging supplies. SEAMAP, in conjunction with the ASMFC Interstate Tagging Committee, could expand evaluations of tag

types and protocols in conjunction with ongoing SEAMAP surveys. Funds could be allocated to complete and maintain strategically placed ocean acoustic gates in order to track migration across states. Given its experience with developing the SEAMAP_SA database in Oracle, its Data Management Work Group could evaluate the various tagging projects data schemas and databases and recommend best data processes, and data sharing considerations in order to enhance the use of tagging study results to answer stock structure and other fisheries management questions. ($300,000 initially, divided between the three states and $225,000 divided between each state annually for subsequent maintenance)

Cooperation of the SE Regional Estuarine Trawl Surveys

There are several trawl surveys conducted in the southeast that SEAMAP has identified as partners or potential partners. These surveys all have a long time-series that can provide information for Commission managed species. Additionally, SEAMAP's Crustacean Committee would greatly benefit from data sharing from many of these surveys. Ultimately, these data can be shared within the SEAMAP data portal for broader use. Costs per survey (or state) would be similar to that for the Pamlico Sound Trawl Survey ($50,000) to provide QA/QC, management, and uploading of the data to the portal. Surveys may include:

State	Agency and Survey
NC	NCDMF Anadromous Trawl Survey (Program 100)
	NCDMF Estuarine Trawl Survey (Program 120)
SC	SCDNR Crustacean Monitoring Trawl Sampling
FL	FWC Fishery Independent Monitoring (FIMS)
GA	GADNR Ecological Monitoring Trawl Survey (EMTS)
	GADNR Juvenile Trawl Survey (JTS)

Crustacean Assessments

A regional crustacean stock assessment would improve management coordination between states and inform crustacean status throughout the region. If there is an issue in one state, it may be an indication of an issue in the larger population as a whole. SEAMAP SA proposes to coordinate a regional South Atlantic blue crab and/or shrimp stock assessment, incorporating fisheries-dependent and independent data as well as environmental data ($10,000 per species for one data workshop and assessment workshop, $20,000 total). The SEAMAP Crustacean Workgroup recommends investigating the feasibility of a comprehensive fishery independent golden crab survey, possibly in collaborations with the industry ($150,000/year) to monitor this species which has only a limited entry trap fishery, operating off the coast of Florida. ($150,000 annually, $20,000 once)

1.3.3 Caribbean

(Increase of $270,000/once every three years; $400,000 annually; and $100,000/once every two years)

Whelk – In 2003-2004, whelk surveys were substituted for one of the St. Croix and Puerto Rico trap and hook-and-line survey years, providing the first U.S. Caribbean-wide information on this species. These surveys should be continued on a periodic basis. Recommended additional studies on whelk should include conducting reproduction and maturity studies. The capture of specimens at two to four-week intervals over a calendar year can help determine the period of maximal spawning activity, in which some type of gonadal index to examine this can be used. Data should also be collected on shell length, height, total weight, and tissue/ weight relationships. Proposed additional budget is $120,000/year, once every three years (USVI) and $150,000/year, once every three years (Puerto Rico).

Priority Fish Species – At the recent CFMC meeting, priority fish species (yellowtail snapper, lane snapper, and parrotfish in the USVI) were identified for seasonal closures. In PR predator reef species (barracudas, moray eels) and commercially important species (parrotfishes, mutton snapper, hogfish, queen triggerfish, trunkfishes and deep-water snappers) are of concern. Information on these fish species is extremely limited, and it would be appropriate to develop fishery-independent data collection programs so that future management can be based on data, rather than subjective opinions. Other species under management by the CFMC through annual catch quotas and data is needed to evaluate those resources. Proposed additional budget is $180,000 annually (USVI), and $220,000 annually (Puerto Rico).

2 APPENDICES

A. SEAMAP Committees Membership 2020

(check www.seamap.org for current membership)

SEAMAP-Gulf of Mexico Committee

CHLOE DEAN, Louisiana Department of Wildlife and Fisheries
JOHN FROESCHE, Gulf of Mexico Fishery Management Council
JILL HENDON, Mississippi Department of Marine Resources/Gulf Coast Research Lab,
JOHN MARESKA, Alabama Department of Conservation and Natural Resources, *Chair*
FERNANDO MARTINEZ-ANDRADE, Texas Parks and Wildlife Department
TED SWITZER, Florida Fish and Wildlife Conservation Commission
ADAM POLLACK, National Marine Fisheries Service, Pascagoula Laboratory, MS
JEFF RESTER, Gulf States Marine Fisheries Commission, *Coordinator*

SEAMAP-South Atlantic Committee

PATRICK CAMPFIELD, Atlantic States Marine Fisheries Commission
JARED FLOWERS, Georgia Department of Natural Resources, Coastal Resources Division
SARAH MURRAY, Atlantic States Marine Fisheries Commission, *Coordinator*
ROGER PUGLIESE, South Atlantic Fishery Management Council, *Chair*
TINA UDOUJ, Fish and Wildlife Research Institute, FL
TODD KELLISON, National Marine Fisheries Service, Beaufort Laboratory, NC
MARCEL REICHERT, South Carolina Department of Natural Resources
KATY WEST, North Carolina Department of Environment and Natural Resources

SEAMAP-Caribbean Committee

NICOLE ANGELI, Virgin Islands Department of Planning and Natural Resources/Division of Fish and Wildlife
MATTHEW KAMMANN, Virgin Islands Department of Planning and Natural Resources Division of Fish and Wildlife. *Chair*
JUAN JOSE CRUZ-MOTTA, Puerto Rico Sea Grant College Program / University of Puerto Rico Department of Marine Sciences
RICHARD S. APPELDOORN, Independent consultant
GRACIELA GARCÍA-MOLINER, Caribbean Fishery Management Council
MIGUEL ROLON, Caribbean Fishery Management Council
RICARDO LOPEZ, Puerto Rico Department of Natural and Environmental Resources
VERONICA SEDA, Puerto Rico Department of Natural and Environmental Resources
AIDA ROSARIO, Emeritus Puerto Rico Department of Natural and Environmental Resources contractor
EDWIN MUÑIZ, U.S. Fish and Wildlife Service
EDGARDO OJEDA SERRANO, University of Puerto Rico/Sea Grant College Program, *Coordinator*
RUPERTO CHAPARRO, University of Puerto Rico Sea Grant College Program

B. Bottom Mapping Priority Areas

Source for spatial layers presented in Appendix B: SAFMC Digital Dashboard– (http://ocean.floridamarine.org/safmc_dashboard/)

Figure 1. Existing Managed Areas- Deepwater Snapper Grouper Marine Protected Areas

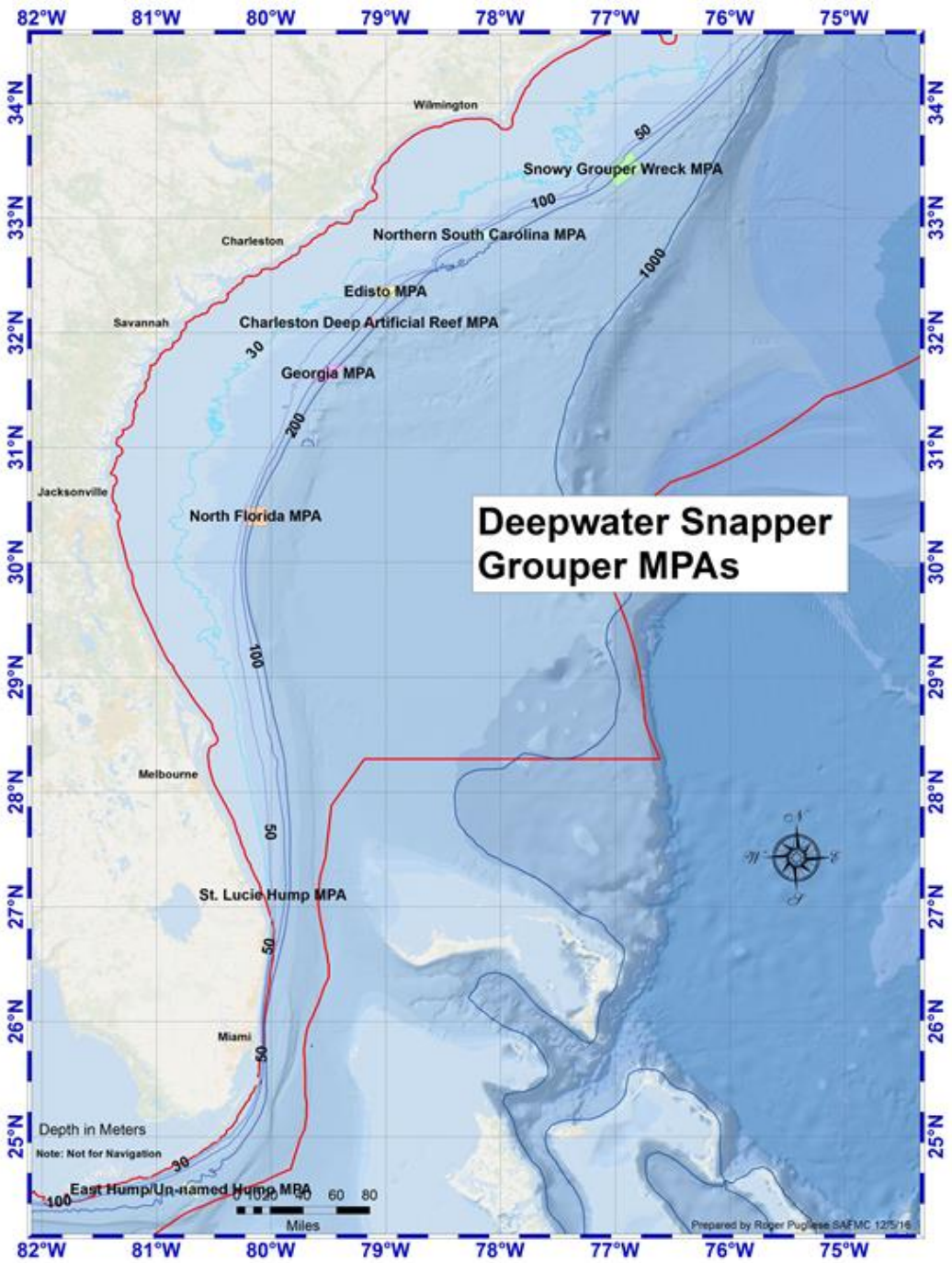
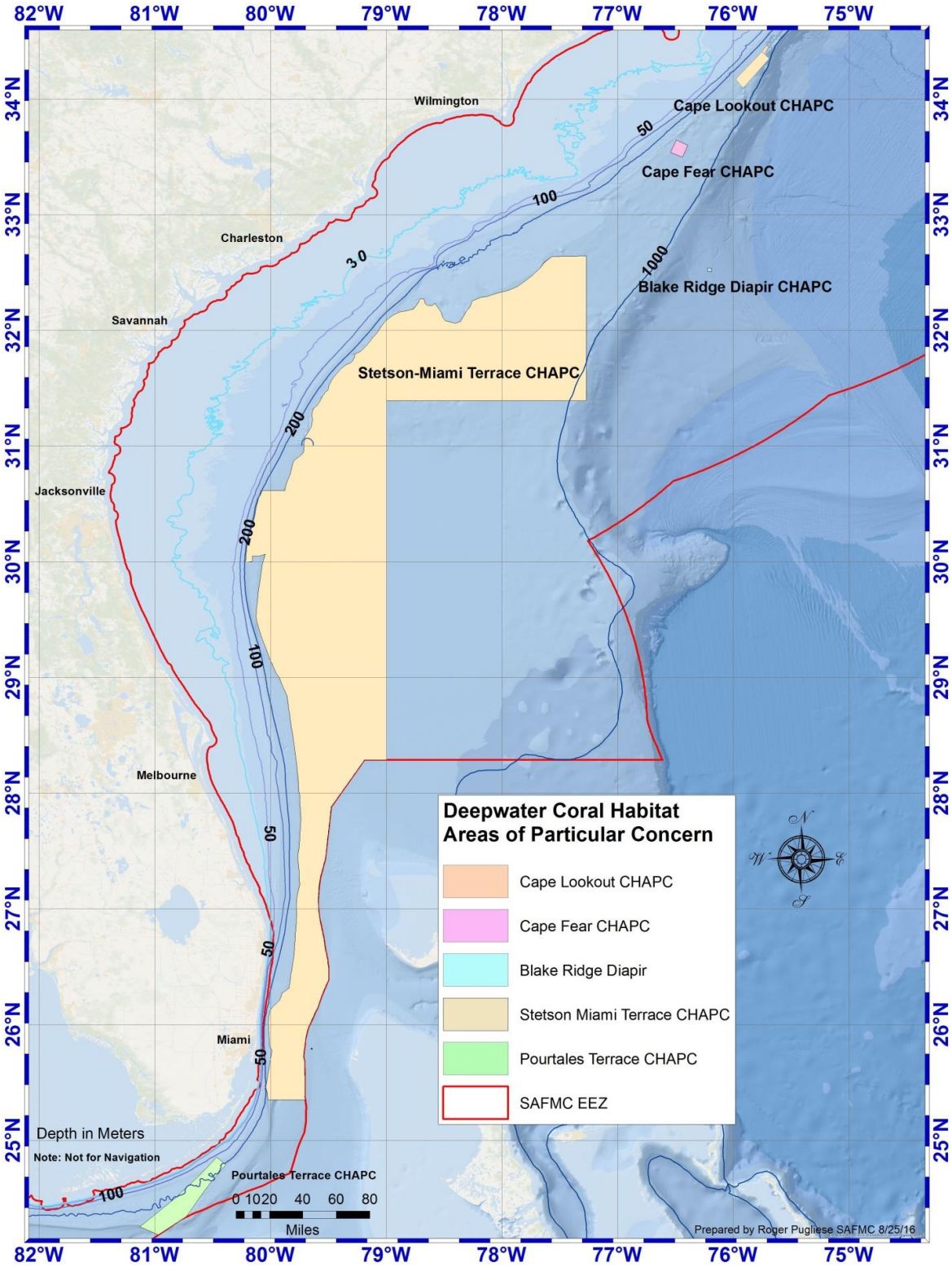


Figure 2. Existing Managed Areas- Oculina Bank Coral Habitat Area of Particular Concern and Oculina Experimental Closed Area.

Figure 3. Existing Managed Areas- Deepwater Coral Habitat Area of Particular Concern.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25°N
Wilmington
Charleston
Savannah
Jacksonville
Melbourne
Miami
Cape Lookout CHAPC
Cape Fear CHAPC
Blake Ridge Diapir CHAPC
Stetson-Miami Terrace CHAPC
Pourtales Terrace CHAPC
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200
200
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Deepwater Coral Habitat
Areas of Particular Concern
Cape Lookout CHAPC
Cape Fear CHAPC
Blake Ridge Diapir
Stetson Miami Terrace CHAPC
Pourtales Terrace CHAPC
SAFMC EEZ
N
W
E
S
Depth in Meters
Note: Not for Navigation
0 10 20 40 60 80
Miles
Prepared by Roger Pugliese SAFMC 8/25/16

Figure 4. Snapper Grouper Spawning Special Management Zones (SMZs) off South Carolina.

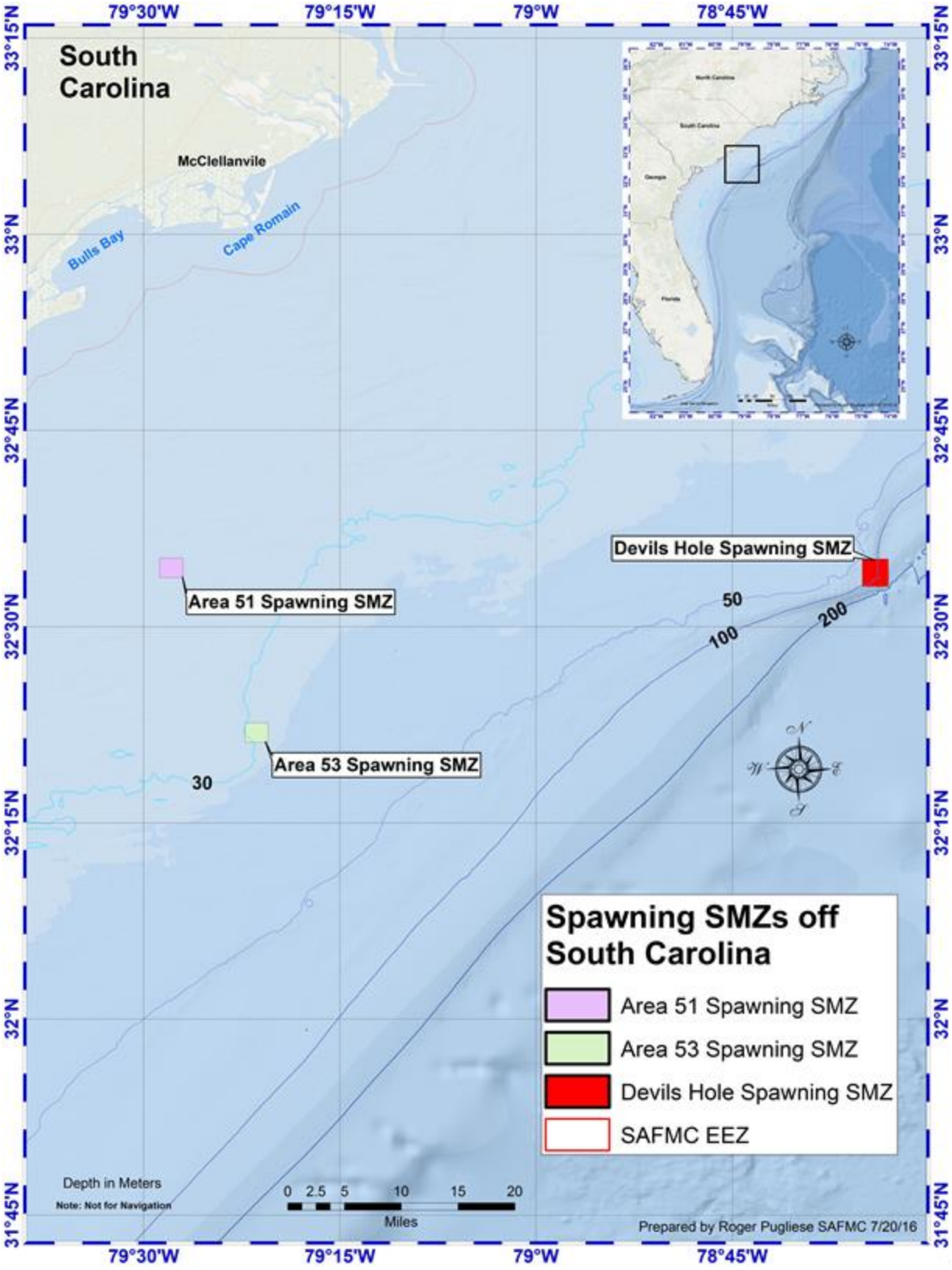

Figure 5. Snapper Grouper Spawning Special Management Zones (SMZs) off North Carolina.

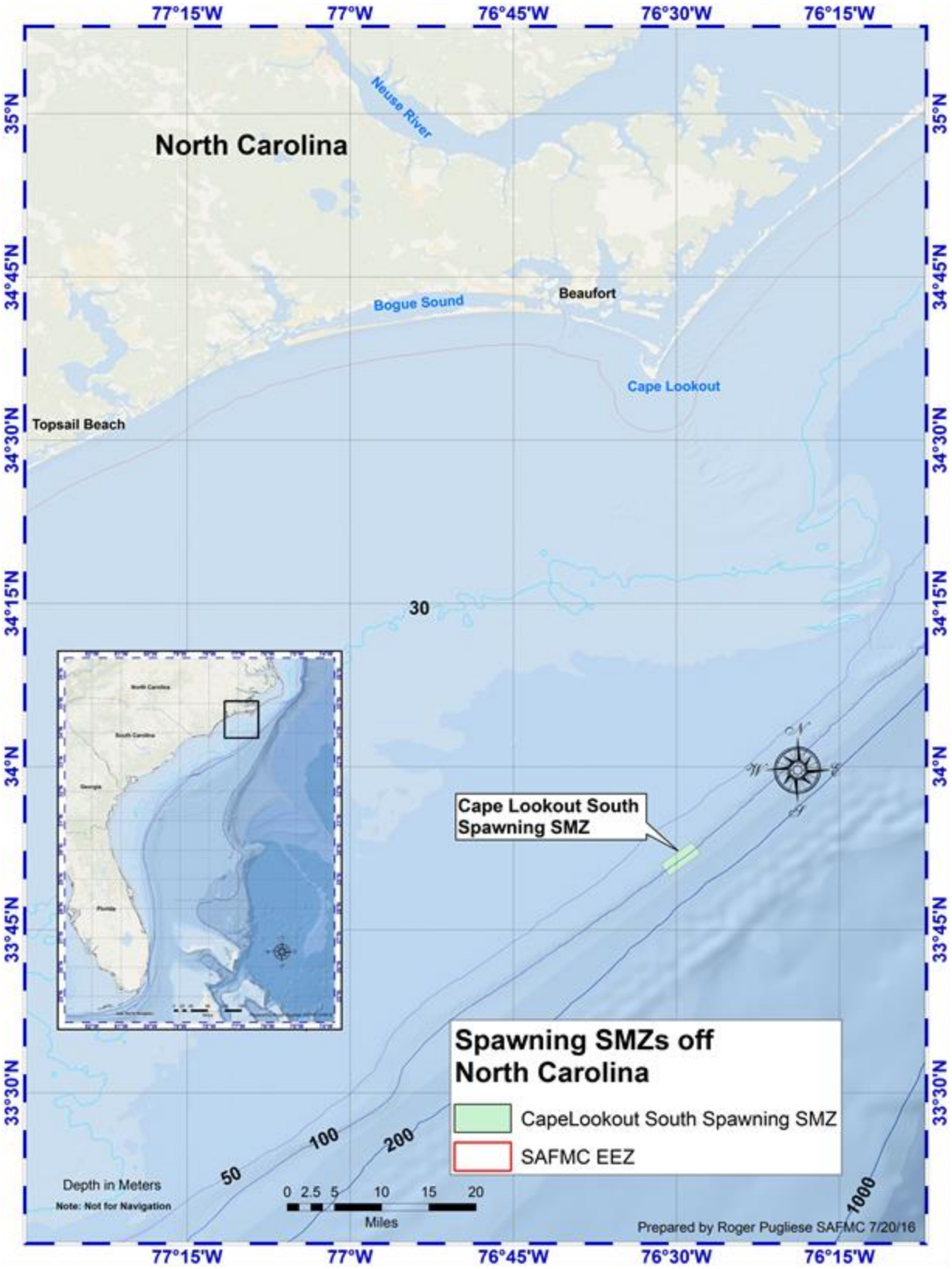

Figure 6. Snapper Grouper Spawning Special Management Zones (SMZs) off Florida East Coast.

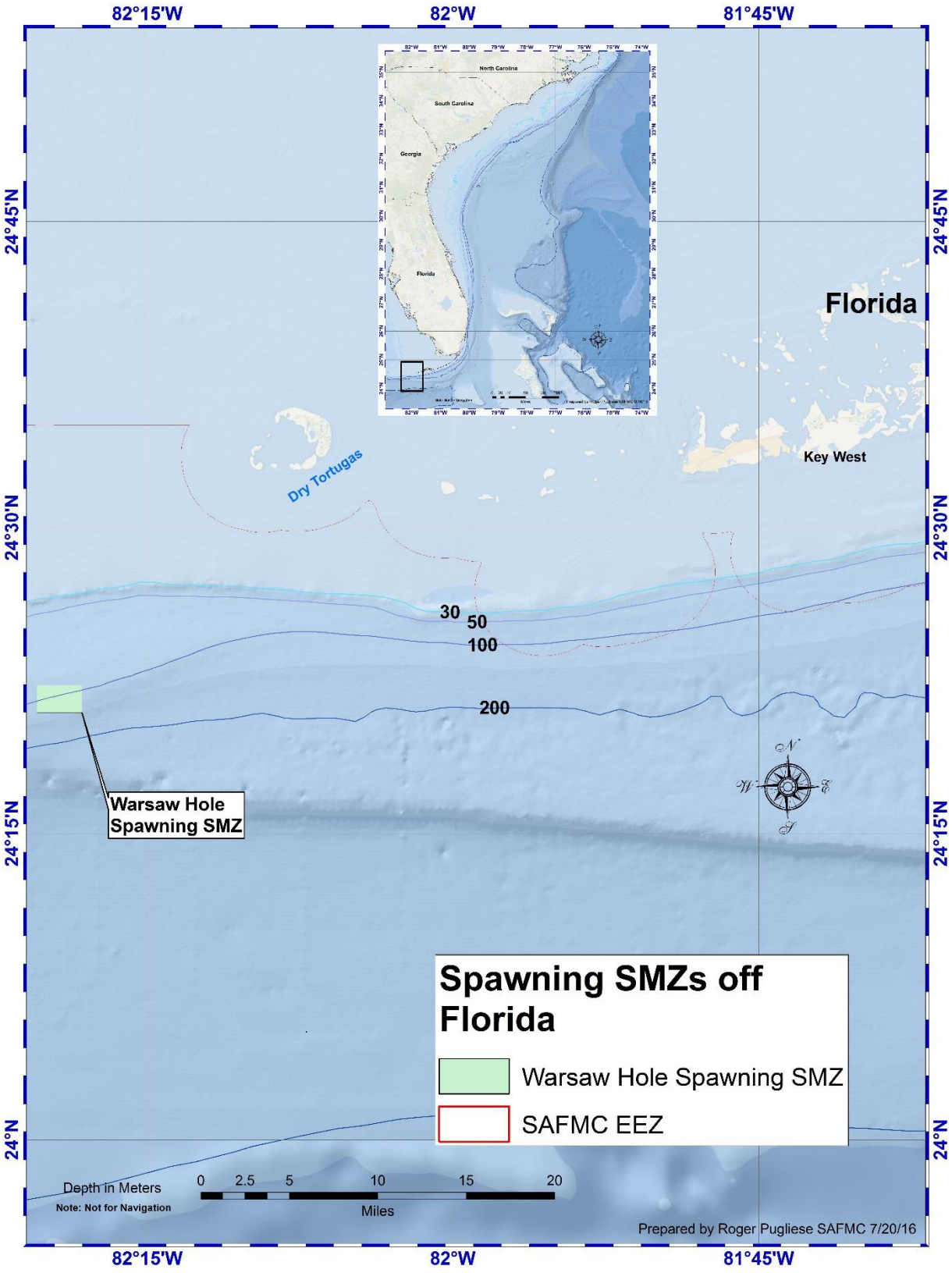

Figure 7. Habitat Zones and SEAMAP Bottom mapping data - Developing SA Mapping Strategy SAFMC FEP II.