

ANNUAL REPORT
OF THE
SOUTHEAST AREA MONITORING
AND ASSESSMENT PROGRAM
(SEAMAP)

OCTOBER 1, 1993 - SEPTEMBER 30, 1994

SEAMAP - Gulf of Mexico
Gulf States Marine Fisheries Commission

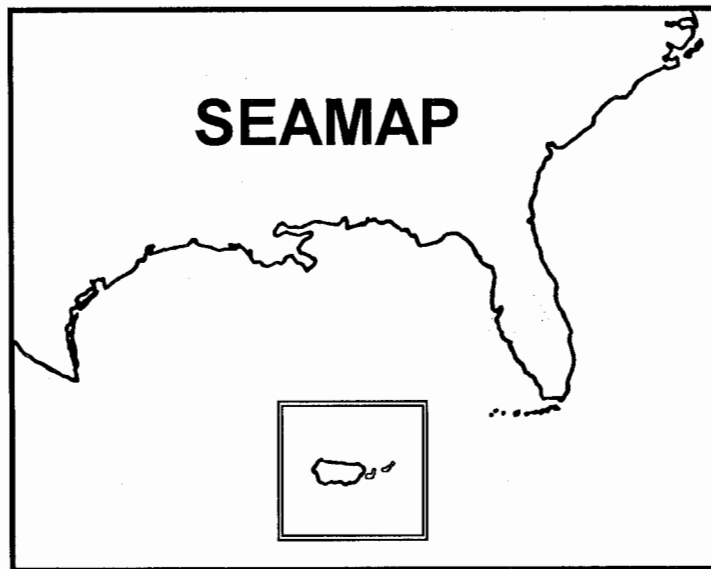
SEAMAP - South Atlantic
Atlantic States Marine Fisheries Commission

SEAMAP - Caribbean
Puerto Rico Department of Natural and Environmental Resources

DECEMBER 1994

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ANNUAL REPORT of the Southeast Area Monitoring and Assessment Program October 1, 1993 - September 30, 1994

INTRODUCTION

The Southeast Area Monitoring and Assessment Program (SEAMAP) is a State/Federal/university program for collection, management and dissemination of fishery-independent data and information in the southeastern United States. 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.

Each SEAMAP component operates independently, planning and conducting surveys and information dissemination in accordance with administrative policies and guidelines of the National Marine Fisheries Service's Southeast Regional Office (SERO). Agencies and organizations directly involved with the SEAMAP are shown in Table 1.

Federal programmatic funding for SEAMAP activities and administration was appropriated in Federal Fiscal Years 1985-1994. Funding allocations to participants for FY1985-FY1994 were handled through State/Federal cooperative agreements, administered by SERO and the Southeast Fisheries Science Center (SEFSC), National Marine Fisheries Service (NMFS).

This report provides an overview of the SEAMAP Gulf, South Atlantic and Caribbean programs. It outlines the program management, resource survey operations, information services activities and publications for FY1994 and proposed activities for FY1995.

PROGRAM MANAGEMENT

Activities and operations of each SEAMAP component are wholly defined by the respective managing units: the SEAMAP-Gulf Subcommittee of the Gulf States Marine Fisheries Commission's Technical Coordinating Committee, the SEAMAP-South Atlantic Committee of the Atlantic States Marine Fisheries Commission's South Atlantic Board, and the SEAMAP-Caribbean Committee of the Puerto Rico Department of Natural and Environmental Resources. The Gulf and South Atlantic committees consist of designated representatives from each member state and NMFS and the Gulf of Mexico and South Atlantic

Fishery Management Councils. The Caribbean component consists of members from Puerto Rico Department of Natural and Environmental Resources, Virgin Islands Division of Fish and Wildlife, Puerto Rico Sea Grant College Program, NMFS, and U.S. Fish and Wildlife Service. Each committee meets yearly to review operations, examine priorities, and plan future activities. Daily operations are carried out by the respective SEAMAP coordinators, assisted by staffs of the two Commissions and Puerto Rico Department of Natural and Environmental Resources and personnel associated with the SEAMAP Information System (SIS), SEAMAP Archiving Center (SAC) and SEAMAP Invertebrate Plankton Archiving Center (SIPAC).

SEAMAP - Gulf of Mexico

Major SEAMAP-Gulf Subcommittee meetings were held in October 1993 and April 1994, in conjunction with the Annual Fall and Spring Meetings of the Gulf States Marine Fisheries Commission (GSMFC). All meetings included participation by various work group leaders, coordinator, Data Manager, and the GSMFC Executive Director. In addition, Representatives from the Gulf program also met with the South Atlantic and Caribbean representatives in August 1994 to discuss respective program needs and priorities for FY1995.

SEAMAP-Gulf work groups met this past year to provide recommendations to the Subcommittee for survey and data management needs. The Red Drum Work Group met in January 1994 to discuss the development of an age and growth study concerning red drum in the northern Gulf of Mexico. And the Adult Finfish Work Group met in September 1993 (via conference call) to discuss the election of a new work group leader and development of a sampling protocol for sharks in the Gulf of Mexico. Where additional discussion was needed, the Subcommittee also deliberated plans and needs via conference calls.

Coordination of program surveys and distribution of quick-report summaries of the Summer Shrimp/Groundfish survey to management agencies and industry were major functions of SEAMAP management in FY1994. Other

TABLE 1.

SEAMAP ORGANIZATION

Program	Administering Organization	Participating Agencies
SEAMAP-Gulf of Mexico	Gulf States Marine Fisheries Commission	Alabama Department of Conservation and Natural Resources Florida Department of Environmental Protection Louisiana Department of Wildlife and Fisheries Mississippi Department of Marine Resources/Gulf Coast Research Laboratory Texas Parks and Wildlife Department National Marine Fisheries Service/Southeast Fisheries Science Center Gulf of Mexico Fishery Management Council
SEAMAP-South Atlantic	Atlantic States Marine Fisheries Commission	Florida Department of Environmental Protection Georgia Department of Natural Resources North Carolina Department of Environment, Health and Natural Resources South Carolina Department of Natural Resources National Marine Fisheries Service/Southeast Fisheries Science Center South Atlantic Fishery Management Council
SEAMAP-Caribbean	Puerto Rico Department of Natural and Environmental Resources	Puerto Rico Department of Natural and Environmental Resources Puerto Rico Sea Grant College Program Virgin Islands Division of Fish and Wildlife National Marine Fisheries Service/Southeast Fisheries Science Center U.S. Fish and Wildlife Service

important management activities included coordinating data provision and specimen loans, preparing publications and documents and assisting in the preparation of State/Federal cooperative agreements, including amendments to permit extension of activities previously not detailed in the agreements.

SEAMAP - South Atlantic

The SEAMAP - South Atlantic Committee met once during FY 1994, in conjunction with the SEAMAP joint annual meeting in Atlanta, Georgia. Topics for the meeting, held August 9 and 11, 1994 included: work group reports, reports of survey activities and special studies, utilization of SEAMAP - South Atlantic data, South Atlantic needs and funding priorities, funding for 1995, 1995 South Atlantic operations plan, and election of officers. The Committee also discussed the need for an updated management plan and a strategic planning exercise to guide SEAMAP into the next 10 years. Work group reports were presented for the Crustacean, Bottom Mapping and

Shallow Water Trawl Work Groups. The Data Management Work Group did not meet during FY 1994.

The Crustacean Work Group and Shallow Water Trawl Work Group met jointly on March 28-30 at the Waddell Mariculture Center, South Carolina to discuss shrimp management, bycatch, landings and effort reporting systems, and the effects of habitat alteration on crustacean production. The Shallow Water Trawl Work Group also began planning for the Trawl Survey Data Workshop. The fifth annual crustacean newsletter was published during FY 1994. The work groups found the joint meeting to be very successful, and plan to meet jointly in FY 1995.

The Bottom Mapping Work Group published their final report for mapping efforts in South Carolina and Georgia, entitled *Distribution of Bottom Habitats on the Continental Shelf off South Carolina and Georgia*. Data for North Carolina are currently being entered into the database.

SEAMAP - Caribbean

During FY1994, the SEAMAP-Caribbean Committee met four times to consider several issues concerning the status of ongoing projects in Puerto Rico and the U.S. Virgin Islands, and budget matters. The Reef Resources Work Group (RRWG) also met four times to evaluate the status of ongoing projects. Among the issues considered were the validity of the data gathered by both the U.S. Virgin Islands and Puerto Rico. In order to evaluate the necessary number replicates needed for each sample station, the RRWG decided that Puerto Rico would sample 10 stations, 10 times. This data would be analyzed to determine if this was an appropriate number of replicates for the different stations. From this analysis, the necessary adjustments were made to the sampling strategies in the U.S. Virgin Islands. The SEAMAP-Caribbean Committee approved this recommendation.

RESOURCE SURVEYS

In FY1994, collection of resource survey information continued for the twelfth consecutive year. Surveys by each program component reflect distinct regional needs and priorities, however, survey operations in one geographic area often provide information useful to researchers in all three regions. For instance, the South Atlantic program's Bottom Mapping will be useful in SEAMAP-Gulf gear calibration efforts, while plankton and environmental surveys in the Gulf program have set the standards for the entire region's much-needed long-term data base. Because of the diverse scope and target species involved in the SEAMAP's survey operations, activities are discussed here by geographic region.

SEAMAP - Gulf of Mexico

Fall Shrimp/Groundfish Survey

The Fall Shrimp/Groundfish Survey was conducted from October 4 to November 22, 1993, from off Mobile, Alabama to the U.S.-Mexican border. Vessels sampled waters out to 60 fm, covering a total of 410 trawl stations, in addition to plankton and environmental sampling.

Sampling design was similar to the Summer Shrimp/Groundfish Survey. The objectives of the survey were:

- (1) sample the northern Gulf of Mexico to determine abundance and distribution of demersal organisms from inshore waters to 60 fm;
- (2) obtain length-frequency measurements for major finfish and shrimp species to determine population size structures;

- (3) collect environmental data to investigate potential relationships between abundance and distribution of organisms and environmental parameters; and
- (4) collect ichthyoplankton samples to determine relative abundance and distribution of eggs and larvae of commercially and recreationally important fish species.

During the survey the NOAA Ship OREGON II sampled 263 stations in offshore waters and territorial Louisiana and Texas waters. The R/V VERRILL sampled 9 stations in Alabama territorial waters. The R/V TOMMY MUNRO sampled 27 stations in Mississippi territorial and offshore waters. The R/V PELICAN sampled 31 stations in Louisiana territorial and offshore waters. And Texas vessels sampled 80 stations within their territorial waters.

In addition, ichthyoplankton data were collected by NMFS and Louisiana vessels, at sample sites occurring nearest to half-degree intervals of latitude/longitude. A total of 36 stations was sampled with bongo and/or neuston nets, as encountered along cruise tracks. NMFS completed 31 ichthyoplankton stations and Louisiana completed 5 stations. The samples, except those taken by Louisiana, will be sorted by the Polish Sorting and Identification Center (PSIC). Once sorted, the specimens and data will be archived at the SAC.

Louisiana Seasonal Day/Night Surveys

The Louisiana Department of Wildlife and Fisheries (LDWF) conducts seasonal day and night surveys as part of its continuing effort to provide comparative information on the abundance and distribution of critical life stages of major Gulf species, especially shrimp and associated environmental parameters. The sampling design for these surveys has changed little from similar day/night surveys in past years.

Sampling was conducted aboard the R/V PELICAN during four segments: October and December 1993 and March and July 1994. A stratified random station selection design was maintained, varying from the transects previously surveyed. During each segment, 31 stations were sampled during day and night at depths up to 20 fm. The July sampling was completed as part of the SEAMAP Summer Shrimp/Groundfish Survey.

All seasonal trawls were completed with the standard SEAMAP net and doors. All organisms captured were identified, counted, measured and weighed. Environmental data and plankton/neuston sampling were conducted at trawl stations as well. Plankton samples were archived and sorted at the LDWF Plankton Laboratory. Specimens and data will be shipped to the SAC. The area sampled covered Louisiana territorial and EEZ waters from 28°30' to 29°00' N. latitude and from 89°30' to 91°30' W. longitude.

Spring Plankton Survey

For the twelfth year, plankton samples were collected during the spring in the northern Gulf of Mexico. The NOAA Ships OREGON II and CHAPMAN and Florida's R/V HERNAN CORTEZ II sampled offshore waters from the western edge of the West Florida Shelf to the Texas-Louisiana border from April 4 to June 10, 1994. A total of 154 stations was sampled. The OREGON II sampled 89 stations and the CHAPMAN sampled 60 stations. The R/V HERNAN CORTEZ II sampled 19 stations along the west Florida shelf.

Plankton samples were taken with standard SEAMAP bongo and neuston samplers. The bongo sampler consisted of two conical 61-cm nets with 333-micron mesh. Tows were oblique, surface to near bottom (or 200 m) and back to surface. Wire angle was maintained at 45 degrees. Neuston samples were taken with 947-micron mesh nets on 1 x 2-meter frames towed at the surface for ten minutes. Right bongo and neuston samples were initially preserved in 10% buffered formalin and after 48 hours were transferred to 95% ethyl alcohol for final preservation. Left bongo samples were preserved via an ethanol/ethanol transfer to aid in preservation of larval otoliths. In addition, hydrographic data (surface chlorophylls, salinity, temperature and dissolved oxygen from surface, midwater and near bottom and Forel-ule color) were collected at all stations.

Right bongo and neuston samples collected from SEAMAP stations will be transhipped to the PSIC. Left bongo samples will be archived at the SIPAC. Salinity data from the Florida vessel were sent to the NMFS Pascagoula Laboratory for interpretation.

Spring Reef Fish Survey

The third Spring Reef Fish Survey was conducted from June 8 to December 13, 1994. Vessels from NMFS, Mississippi, Alabama and Florida sampled inshore and offshore waters, covering approximately 180 stations, in addition to plankton and environmental sampling. Texas is in the process of procuring the necessary equipment and will conduct preliminary work to address any problems. Randomly selected sites from Brownsville, Texas to Key West, Florida are chosen from known hard bottom locations. The objectives of the survey are:

- (1) assess relative abundance and compute population estimates of reef fish using a video/trap technique;
- (2) determine habitat using an echo sounder and video camera;
- (3) determine if bioacoustics assessment methodology can be applied to reef fish communities;

- (4) collect environmental data at each station; and
- (5) collect ichthyoplankton samples at selected reef sites.

The primary purpose of this survey is to assess the relative abundance and compute population estimates of reef fish. Stations are randomly-selected 100 m² sites which are designated as "reef areas". There are several aspects of the reef fish survey: 1) locating and compiling known hard bottom reef habitat locations; 2) survey site selection; 3) sampling protocol using a fish trap and video camera and 4) analyses of video records. Data were collected using the trap/video methodology where a fish trap containing a video camera is deployed onto the selected reef site. Trap soak time is one hour. After trap deployment, hydrographic data including a STD/light meter, transmissometer drop, secchi disk reading and surface chlorophyll samples were collected. Also, after the last trap/camera set, one ichthyoplankton station was completed each day with a surface neuston net and Tucker trawl. Environmental and plankton samples collected used established SEAMAP protocols and plankton samples will be transhipped to the PSIC.

Final analyses of video tapes are accomplished at the NMFS Pascagoula Laboratory, where data are recorded onto standard SEAMAP forms. Tapes are analyzed either in their entirety or by randomly-selected one minute intervals. The determinant factors for sampling are based on whether the reader can identify and count fish entering the camera field of view and record the data.

Summer Shrimp/Groundfish Survey

During the spring 1994, there was communication between the Shrimp/Groundfish Work Group members to examine the design for the Summer Shrimp/Groundfish Survey and determine the random station locations for each participant. Objectives of the survey were to:

- (1) monitor size and distribution of penaeid shrimp during or prior to migration of brown shrimp from bays to the open Gulf;
- (2) aid in evaluating the "Texas Closure" management measure of the Gulf Council's Shrimp Fishery Management Plan; and
- (3) provide information on shrimp and bottomfish stocks across the northern Gulf of Mexico from inshore waters to 50 fm.

The overall sampling strategy during the 1994 SEAMAP summary survey was to work from the eastern Gulf to the Texas/Mexico border, in order to sample during or prior to migration of brown shrimp from bays to the open Gulf area. The entire survey occurred from June 2 to July 18, 1994.

During the survey, the NOAA Ship OREGON II and R/V TOMMY MUNRO sampled offshore and inshore Gulf waters with 40-ft trawls. Alabama's R/V VERRILL sampled offshore Alabama waters with 40-ft trawls. The R/V PELICAN sampled both Louisiana state waters and offshore waters with 40-ft trawls, and Texas vessels sampled Texas state waters and offshore waters with 20-ft trawls.

A total of 351 trawl samples was taken from coastal and offshore waters out to 50 fm from Mobile Bay, Alabama, to Brownsville, Texas. All vessels took environmental data, including temperature, salinity, oxygen, and chlorophyll at each station.

In June, catch rates of brown shrimp east of the River were very low, with a maximum catch of 13.7 lb/hr of 44-count shrimp. White shrimp catches east of the River were all less than 1.5 lb/hr. The largest pink shrimp catch rate east of the River was 12.8 lb/hr of 60-count shrimp taken in 9 fm of water off the Chandeleur Islands. Finfish catch rates east of the River were moderate, with the largest catch of 7,946 lb/hr with longspine porgy predominating.

High catches of brown shrimp were made off Texas from June 2 to July 8. The largest catch rate occurred June 25 in waters off Brownsville, Texas in 14 fm (325.9 lb/hr of 81-count shrimp). White shrimp catches off Texas were low with the largest catch, 5.5 lb/hr of 15-count shrimp, taken off Corpus Christi in 6 fm. Catch rates for pink shrimp were also low off Texas, though the largest catch was 65.4 lb/hr of 51-count shrimp off the lower Laguna Madre in 9 fm. Finfish catch rates were moderate in Texas inshore and offshore waters. The largest catch of finfish was 1,724 lb/hr in 8 fm off Sabine with bumper predominating.

In July's samples west of the river (Louisiana) brown shrimp catches were low with the largest catch rate of 18.9 lb/hr of 19-count shrimp occurring off Vermilion Bay in 30 fm. White shrimp catches were extremely low, with a maximum catch rate of 11.7 lb/hr of 16-count shrimp taken in 6 fm south of Sabine. Catches of pink shrimp were also very low off the Louisiana coast with a maximum catch rate of 2.1 lb/hr of 44-count shrimp. Finfish catch rates were also low with the largest catch rate of 1,118 lb/hr taken on July 14 with Gulf butterfish predominating.

Fall Plankton Survey

The first fall ichthyoplankton survey to assess abundance and distribution of king mackerel eggs and larvae occurred in August 1984. No sampling survey was conducted in 1985, however expanded surveys in 1986-1993 and in the current year covered Gulf waters from Florida Bay to Brownsville, Texas. Vessels from Florida, Alabama, Mississippi, Louisiana and NMFS surveyed from September 8 to October 9, 1994. Stations were located along a 30-minute latitude/longitude grid from inshore waters to the shelf edge.

The NOAA Ship OREGON II sampled 96 stations from Tampa Bay, Florida to Brownsville, Texas at depths from 5 to 100 fm. The A.E. VERRILL sampled 9 stations at the mouth and outside Mobile Bay. The R/V TOMMY MUNRO sampled 49 stations south of Mississippi Sound along a 30-minute grid. The R/V PELICAN sampled 7 stations in Louisiana territorial waters. And Florida's R/V HERNAN CORTEZ sampled 29 stations off Tampa Bay south to the Florida Straits area.

Stations were sampled with standard SEAMAP bongo nets with 333-micron mesh and/or 1 x 2-meter neuston nets fitted with 947-micron mesh. In addition, hydrographic sampling included chlorophylls, salinity, temperature and dissolved oxygen from surface, mid-water, and bottom, water transparency and water color was conducted at each station. Right bongo samples collected by NMFS and the Gulf States will be transshipped to the PSIC. Left bongo and neuston samples will be stored at the SIPAC for possible future sorting. Louisiana plankton samples will be sorted by LDWF according to SEAMAP protocols and specimens and data provided to the SAC.

Plankton and Environmental Data Surveys

As in previous years, plankton samples and environmental data were collected routinely during most SEAMAP trawling surveys. During the Summer Shrimp/Groundfish Survey, plankton tows were piggybacked on the NMFS and state vessels, sampling randomly generated trawl stations within the standard 30-minute SEAMAP grids. Plankton and environmental data were also taken by Louisiana at all of its seasonal day/night survey stations. Samples were taken by participants with a 60-cm bongo net and a standard SEAMAP neuston net.

Objectives of these piggybacked surveys were: (1) to collect plankton samples throughout the survey area; and (2) to collect associated hydrographic and environmental data at each plankton station. Additionally, environmental data (salinity, temperature, and oxygen from surface, mid-depth and bottom waters, and chlorophyll from surface and bottom waters) were collected during the shrimp/groundfish surveys. Wind direction, wind speed and wave height were taken at all trawl stations.

Samples from the right side of the bongo nets and neuston samples were shipped to the NMFS Pascagoula Laboratory for transshipment to Poland, where they will be sorted to the family level (both ichthyoplankton and selected crustacean and molluscan species). The left bongo sample from each station is retained as a back-up in the event of damage or loss of the specimens and maintained at the SIPAC.

Chlorophyll samples were filtered at each station using GF/C filters. All filters were put in petri disks and wrapped in foil for onboard storage in the freezer. Chlorophyll analysis will be completed ashore.

Preservation of plankton samples was in buffered formalin prior to transfer to ethanol.

In addition to these piggybacked surveys, two major SEAMAP plankton surveys were conducted in FY1994, as detailed earlier.

SEAMAP - South Atlantic

Shallow Water Trawl Survey

The major SEAMAP - South Atlantic survey in FY1994 was the continuing Shallow Water Trawl Survey conducted by the South Carolina Department of Natural Resources (SCDNR). Initiated as a pilot project in 1986, this is a fishery-independent study designed to monitor the distribution and abundance of coastal species in the South Atlantic Bight and to measure associated environmental parameters in nearshore coastal waters. The overall goal is to obtain a long-term database to facilitate management of stocks in the South Atlantic Bight.

The objectives of the survey are to:

- (1) collect data on size, abundance, distribution, and seasonality of target finfish and decapod crustaceans;
- (2) record species composition, biomass, and abundance in order to assess latitudinal and seasonal fluctuations; and
- (3) collect data on size, sex, and gonadal condition of white, pink, and brown shrimp and attempt to locate spawning grounds.

Three multi-legged seasonal cruises were conducted between Cape Hatteras, North Carolina, and Cape Canaveral, Florida, during FY1994: Fall 1993 (October 4 through November 4), Spring 1994 (April 18 - May 20), and Summer 1994 (July 18 - August 12). Inshore strata (4.6 to 9.2m depths) were sampled during each cruise. Offshore strata (9.2 to 19m depths) were sampled only during fall and spring when penaeid shrimp spawning is thought to occur. All samples were collected during daylight hours to maximize the opportunities for collecting juvenile mackerels.

The Fall 1993 cruise completed the fifth full year of standardized sampling under a stratified random survey design. Sampling was conducted during October 4 - November 4 at 94 stations and emphasized 24 target species for additional biological measurements. Spanish mackerel were most abundant in Raleigh Bay while king mackerel were most abundant in South Carolina waters. White shrimp, the most abundant penaeid, made up 79% by number and were also most abundant off South Carolina.

The Spring 1994 cruise sampled 105 stations from April 19 through May 12. Spanish mackerel were most abundant in Georgia waters. White shrimp was the most abundant penaeid collected, and the majority were captured off Georgia.

The Summer 1994 cruise sampled 78 stations and targeted 24 species. Sampling was conducted from July 25 through August 12, 1994. The greatest average number of Spanish mackerel were taken off Georgia. The average number of Spanish mackerel taken outnumbered king mackerel at all stations. White shrimp was the most abundant penaeid shrimp taken during the cruise, and was captured in greatest numbers off Florida.

Data from the spring and summer 1994 cruises are currently being added to the SEAMAP Data Management System (DMS). The results of the entire 1993 cruise season (Spring and Summer 1993 cruises in addition to the Fall 1993 cruise discussed above) are documented in the final 1993 project report, *Results of Trawling Efforts in the Coastal Habitat of the South Atlantic Bight, FY 1993* by Beatty, Boylan, Webster, and Wenner (1994).

Pamlico Sound Survey

During FY1994, the North Carolina Division of Marine Fisheries (NCDMF) continued the ongoing Pamlico Sound Survey with cruises that sampled 53 stations each in June and September 1994. This seasonal trawl survey is designed to provide a long-term fishery-independent database on the distribution, relative abundance, and size composition of target species of estuarine fish and decapod crustaceans for the waters of Pamlico Sound. The data are being processed by NCDMF and are made available to the SEAMAP DMS.

Benthic Characterization

During FY1994, the Florida Department of Environmental Protection (FDEP) continued work to characterize the structure and general ecology of South Atlantic benthic communities. Invertebrates were collected on four SEAMAP survey cruises in the region during 1983-1987. Selected invertebrate groups from northeast Florida are being identified to the lowest appropriate taxonomic level.

Species of mollusk, crustaceans, echinoderms and brittle stars have been catalogued and recorded in a database of benthic shelf fauna from Georgia to Palm Beach, Florida. Upon study termination, identified organisms will be housed in a number of reference collections including Harbor Branch Foundation, Smithsonian Institution, and FDEP. A final year of funding for FY 1995 is planned for development of distributional maps and scientific papers.

Bottom Mapping Project

In 1985, the SEAMAP-South Atlantic Bottom Mapping Work Group developed a plan for establishing a regional database which would include the location and characteristics of hard bottom resources in the South Atlantic Bight. The importance of defining these areas has increased in the face of declining reef fish resources and increased fishing pressure. In order to assess reef fish populations and the effects of changes in fishing pressure, the amount of habitat available for priority species of fishes must be quantified.

Funds for this project resumed in FY1992 after a seven year hiatus. This portion of the study, which is being conducted by SCDNR, represents the next step in developing the regional database for the portion of the South Atlantic Bight from Florida through North Carolina from the beach out to 200 m in depth.

The primary objectives of the study are to:

- (1) Conduct an extensive search of existing databases to identify all known critical hard bottom reef habitats on the continental shelf off South Carolina and Georgia;
- (2) Develop a flexible, easy to use database which will provide researchers and managers with pertinent information concerning the location and extent of these areas, types of data used in determining bottom type, and source of the data for the development of future habitat mapping systems on available PC hardware; and
- (3) Evaluate PC based software programs that will allow researchers to easily obtain graphic outputs of the database.

All reasonably accessible databases available from state and federal agencies and other sources that have sampled or surveyed bottom habitats in the region are being investigated to obtain files for processing. The data available from these sources varies in information content and accuracy in pinpointing reef habitat location. Treatment of each data type and gear is standardized, and the most accurate data for each gear type for each location are being compiled according to procedures developed by the Bottom Mapping Work Group. The database is designed for easy incorporation into GIS or other PC mapping software programs.

The following accomplishments were made during FY 1994: (1) All data available for South Carolina and Georgia were entered into the database; (2) A final report for this region was prepared; and (3) Numerous full-color charts were prepared.

It is anticipated that mapping for the North Carolina region will be complete by the end of calendar year 1994. Data compilation for Florida will begin in calendar year 1995.

SEAMAP - Caribbean

Reef Resources Survey

Starting in April 1994, the mesh size used in the fish traps in Puerto Rico and U.S. Virgin Islands was changed from 1¼ inches to 1½ inches. The reason for this change is that it is not possible to get the smaller mesh size. In an effort to calibrate the results, two surveys are being conducted which will examine the differences between mesh sizes. Preliminary analysis has shown that there is a change in species composition in Puerto Rico but there is no change in the U.S. Virgin Islands.

For the first time, U.S. Virgin Islands Division of Fish and Wildlife sampled the area of St. Croix. Five stations were sampled northeast of St. Croix, U.S. Virgin Islands. A total of 254 fish yielding 53.3 kg were caught in traps and handlines during the period from December 1993 to February 1994. The two most prominent groups, coney and butterflyfish comprised 47.4% of the total catch, by weight. And coney comprised 39.8% of handline catches, by weight. A total of 17 sites were sampled south of St. John, U.S. Virgin Islands. A total of 152 fish yielding 69.5 kg were caught in traps and handlines during the period. The two most prominent groups, queen triggerfish and red hinds, comprised 28.3% of the hook and line catch, by weight.

During the sampling period from April 1993 to March 1994, a total of 31 stations were sampled west of Parallel 67 of Puerto Rico. Hook and line yielded 43 species representing 20 families weighing over 1,180 kg. The two most important commercial groups, snappers and groupers, constituted 61.6% of total catch, by weight. By weight, red hinds and coney represented 38.8% and 16.3%, respectively of the total hook and line catch. Other species that constituted more than one percent of hook and line catches by weight were: sand tilefish (10.9%); blackjack (5.1%); ocean tully (4.6%); amberjack (2.2%); great barracuda (2.0%); longjaw squirrelfish (1.9%); black durgelon (1.8%); blackfin snapper (1.6%); horse-eye jack (1.6%); silk snapper (1.5%); (1.4%); black snapper (1.3%); graysby (1.3%); and queen triggerfish (1.1%). Two dolphinfish accounted for 1.6% of total catch by weight.

Fish traps yielded 40 species representing 17 families weighing over 185 kg. Catches by number were dominated by the same species as for hook and line catches. Red hinds constituted 36.9% of total trap catches by weight, while coney made up 14.9%. Other species that represented significant trap catches by weight were: queen triggerfish (20.9%); banded butterflyfish (6.1%); longjaw squirrelfish (2.2%); ocean surgeonfish (1.7%); white grunt (1.7%); whitespotted filefish (1.6%); silk snapper (1.2%);

graysby (1.1%); and yellowtail snapper (1.1%). The banded butterflyfish constituted the species most caught by fish traps in terms of number representing 25.7% of total fish landed, although, it only represented 6.1% by weight. Two other species of butterflyfishes represented 3.7% of total trap catches in terms of number, although, represented less than 1% of total catch in terms of weight.

Species composition by sampled stations varied according to three factors: area, fishing gear and depth. Nevertheless, observed species composition is believed to reflect actual composition of commercial landings in Puerto Rico for the gears used in this study since landings data collected by port agents underrepresents certain fish groups which are discarded by fishermen due to low economic value (e.g. butterflyfish). Catch per unit effort (CPUE) by stations ranged from 0 to 423 g/trap hours and from 0 to 1,372 g/hook hours. In general, fishermen experience influenced CPUE where more experienced fishermen had a greater CPUE than those with less experience.

For the sampling period from April 1994 to October 1994, a total of 57 trips and 29 stations were sampled off the west coast of Puerto Rico. Combined fishing effort amounted to 270 trap hauls and 2,636 hook hours. Over 289 kg of fish were landed with hook and line and 42 kg with fish traps. The most common caught species during the period were two species of groupers, coney and red hind. Coneys represented 17.4% of hook catches and 32.0% of trap catches, by weight. Red hinds represented 48.2% of hook catches and 42.2% of traps sampled, by weight. The only other species that constituted an important part of hook catches was the sand tilefish with 6.9% of total hook catch, by weight.

The next sampling period which begins in April 1995 will include a survey targeting queen conch. The survey will be conducted for twelve months. The Reef Resources Work Group is currently evaluating the methodology to be used in this survey. All of the agencies involved in the SEAMAP-Caribbean are extremely interested in this survey since there are very little data on queen conch stocks and these data are needed to evaluate and manage the resource. Currently, the Puerto Rico Department of Natural and Environmental Resources and the Caribbean Fishery Management Council are working on FMPs for the queen conch in their respective jurisdiction. The U.S. Virgin Islands has already implemented regulations regarding queen conch but needs additional data to evaluate their management measures.

SPECIAL STUDIES

In addition to the regularly-scheduled surveys, SEAMAP participates in a variety of other projects. The SEAMAP provides guidance, personnel and other contributions to these studies for enhancement and protection of the marine resources.

Winter Trawling and Fish Tagging Cruise

During January 21-25, 1994, personnel from the states of New York, North Carolina and Maryland, the U.S. Fish and Wildlife Service (FWS), the NMFS/SEFSC and Atlantic States Marine Fisheries Commission (ASMFC) participated in a striped bass tagging cruise. This was the sixth year of the cooperative project, initiated in 1988 at the request of SEAMAP-South Atlantic. Adult striped bass overwintering in the area between False Cape, Virginia, and Wimble Shoals, North Carolina, were tagged for assessment of the population structure and estimation of exploitation rates of the migratory Atlantic Coast stock.

A color video sounder was used to locate targets and reduce bycatch. A total of 4,632 striped bass were captured. All healthy fish were measured, tagged with FWS internal anchor tags and released. Nineteen summer flounder were also tagged. Scales were collected from tagged fish for age and growth determinations. Captured tagged striped bass were tested for coded wire tags (CWTs) which indicate hatchery origin; 59 CWT positive fish were identified. A database for striped bass tag returns is managed by FWS in Annapolis, MD.

Trawl Survey Data Workshop

On August 15-17, 1994, the Atlantic States Marine Fisheries Commission convened the *Workshop on the Collection and Use of Trawl Survey Data for Fisheries Management* in Folly Beach, South Carolina. The workshop was funded through grants from the U.S. Fish and Wildlife Service's Federal Aid in Sport Fish Restoration Program and SEAMAP-South Atlantic. At the workshop, over 50 representatives from Atlantic and Gulf coastal state fishery agencies, NMFS, and academia gathered to discuss the problems, issues and opportunities associated with the collection and use of trawl survey data in fisheries management.

Every state along the Atlantic coast, with the possible exception of New Hampshire, conducts trawl surveys for the collection of their fishery independent data. In most states, it is their only source of fishery-independent data. Yet, even with these similarities in terms of needs for and use of the data, there are very few similarities in terms of survey methodologies, protocols and data management systems among states, regions and federal agencies. The goal of the workshop was to bring these similarities and differences to light and work together as a group to develop recommendations that would facilitate data compatibility and accessibility.

Through work groups, workshop participants developed a list of recommendations concerning data utilization, data management, trawl survey logistics and regional coordination. Probably the most cross-cutting recommendation was for the formation of a working group, composed of state, federal and regional interests, that

would begin by surveying all potential users of the trawl survey data with regards to: (1) their specific use of the data (i.e., stock assessment, management programs, research); (2) their data management systems (hardware, software, networks and operating systems); (3) how data requests are handled and in what format; (4) extent and type of documentation (changes in survey methodologies, data codes); (5) error checking mechanisms (i.e., data validation); and (6) sampling strategies. It is believed that from this survey the work group would be able to develop a data exchange protocol that would allow for the transfer conversion of different data formats to a common format.

INFORMATION SERVICES

Information from the SEAMAP activities is provided to user groups through three complementary systems: the SIS, SAC and SIPAC. Products resulting from SEAMAP activities can be grouped into two major categories: data sets managed by SIS, SAC and SIPAC and program documents.

SEAMAP Information System

Biological and environmental data from all SEAMAP surveys are included in the SEAMAP Information System, managed in conjunction with NMFS/SEFSC. Raw data are edited by the collecting agency and verified by the SEAMAP Data Manager prior to entry into the system. Data from all SEAMAP surveys during 1982-1993 have been entered into the system and data from 1994 surveys are in the process of being verified, edited and entered for storage and retrieval.

Verified, non-confidential SEAMAP data are available conditionally to all requestors, although the highest priority is assigned to SEAMAP participants. A total of 143 SEAMAP data requests has been received and processed. In some instances, requests were filled promptly; in many cases, however, a substantial lag occurred because of the extremely large amount of data being collected on an increased number of surveys over those of past years. To date, 142 requests have been completed and work is being performed on those remaining.

The requirements report for an integrated data system, *Data Management System Design Study for Gulf and South Atlantic, 1987*, was completed in March 1987. The document identifies the high-level design specifications and recommended implementation plan for a module-based DMS. The design is based on information contained in the SEAMAP Gulf and South Atlantic DMS Requirements Document developed through a cooperative effort between NMFS and other SEAMAP participants. The document has five sections: (1) background and brief descriptions of current centralized and proposed distributed systems; (2) summary of the Requirements Survey; (3) overview of the system's architecture; (4) description of developmental

modules constituting the DMS design; and (5) modular implementation plan which includes costs and schedule.

Work was completed during FY1990 on the distributed SEAMAP DMS. The modules for the system include those for data entry, edit, upload, data query and download. All of the Gulf and South Atlantic States are equipped with the necessary computer hardware and software.

The system is decentralized, i.e., distributed. Thus, the SEAMAP users are able to locally, and directly, enter and retrieve data. Software for the system has been distributed to participants for data input and retrieval.

This system decreases the time necessary to enter and retrieve data and provides powerful and flexible local data analysis and display capabilities. Each SEAMAP site enters, verifies and edits their data, eliminating the mail-oriented loop necessary to enter/edit/verify data. Secondly, each site has the capability of locally accessing SEAMAP data, utilizing a user-friendly system. Local data retrieval allows the data to be accessed in a timely manner with a minimum amount of effort and programming skills.

Under the system, outside users (e.g., Minerals Management Service, U.S. Army Corps of Engineers, etc.) may request special data sets for research or study. The outside users submit the request to the SEAMAP committees through the SEAMAP Coordinators for approval to proceed. Once the request is approved, the information is provided by the Data Manager and staff members through a priority-based, mail-oriented system. Also, SEAMAP participants may use the Special Request mechanism for data sets too large for economical downloading by telephone. These requests will be handled by a central operations staff in the same priority-based, mail-oriented manner as noted above.

SEAMAP data collected during surveys were used for a multitude of purposes in FY1994:

- Evaluation of the abundance and size distribution of penaeid shrimp in Federal and state waters to assist in determining opening and closing dates for commercial fisheries by NMFS;
- Evaluation of shrimp fishery bycatch and weakfish stock assessment by NMFS;
- Assessment of shrimp and groundfish abundance and distribution and their relationship to such environmental parameters as temperature, salinity, and dissolved oxygen by NMFS;
- Identification of environmental parameters associated with concentrations of larval finfish by NMFS;
- Compilation of the 1992 SEAMAP Biological and Environmental Atlas by NMFS and GSMFC;

- Comparison of catches of shrimp and groundfish captured by 40-ft versus 20-ft trawl nets by NMFS;
- Stock assessment of weakfish, striped bass, bluefish, spot and croaker by the ASMFC;
- Stock assessment of Spanish mackerel by South Atlantic Fishery Management Council and NMFS;
- Species differentiation of Brevoortia smithi and B. tyrannus and age and growth of cobia by NMFS;
- Development of an amendment to the Coral and Coral Reef Fishery Management Plan by South Atlantic Fishery Management Council;
- Development of the striped bass fishery management plan by NCDMF;
- Comparison of South Atlantic portunid crabs with Brazilian assemblages;
- Shrimp viral analysis, life history work on Centropristis striata, and DNA research in Paralichthys dentatus and Cynoscion regalis by SCDNR;
- Age/growth and fecundity of Cynoscion regalis by University of Charleston;
- Analysis of data collected during the Caribbean Reef Resources Survey to determine if other parameters are needed by the SEAMAP-Caribbean Committee;
- Differentiation of shark DNA by NMFS;
- Turtle research by Georgia Department of Natural Resources.

Real-time Data

A major function of the SEAMAP Information System in FY1994 was the processing of catch data from the Summer Shrimp/Groundfish Survey as near-real-time data. Data were transmitted three times weekly via cellular phone to the NMFS Pascagoula Laboratory from the NOAA vessel OREGON II, while the states' data were entered into the system weekly. Plots of station locations and catch rates of shrimp and dominant finfish species were prepared and edited at the NMFS Pascagoula Laboratory, and processed by GSMFC for weekly distribution to management agencies, fishermen, processors and researchers. Management agencies also received comprehensive data listings showing penaeid shrimp length frequencies, sampling parameters and environmental conditions.

SEAMAP Archiving Center

Larval fish and fish egg samples sorted to the lowest taxa level possible by the PSIC are returned to the SAC for archiving and loan to researchers. For FY1994,

approximately 800 vials have been returned from the PSIC. Data entry for most of the returned sorted samples is completed in an improved and simplified DMS. All data are now managed by a dual microcomputer/mainframe program which eliminates coding errors and facilitates faster data entry. Samples cataloged to date represent 18 orders, 125 families, 234 genera and 244 species.

The SAC is managed in conjunction with FDEP in St. Petersburg, Florida and processes both specimen loans and requests for associated plankton survey environmental data. Currently, the SAC is being reorganized and lines of supervisory responsibilities are being changed due, in part, to the departure of Dr. John V. Gartner, Jr. He has done an exemplary job in organizing and running the SAC from its inception. A new collection manager, Ms. Kim Williams, and full-time assistant have been hired. Due to the changing personnel, a backlog of uncatalogued samples has developed, but they are being processed quickly. In addition, the SAC personnel and other staff from FDEP will be participating in the fall ichthyoplankton cruise, to depart on September 28, 1994.

SEAMAP Invertebrate Plankton Archiving Center

The SIPAC is in its ninth year operation. Ken Stuck of Gulf Coast Research Laboratory serves as the SIPAC curator, and is assisted by one technician. The mission of the SIPAC is to archive and manage the large collection of plankton samples acquired during SEAMAP cruises and to obtain specimens and/or data on selected invertebrate larval stages from those samples. The SIPAC provides unsorted plankton samples and data or specimens of larval invertebrates to qualified researchers upon request. SIPAC personnel also participate in SEAMAP cruises.

During FY1994, a total of 1,085 SEAMAP plankton samples were received and logged into the SIPAC data base. The samples were obtained from assorted OREGON II, CHAPMAN, HERNAN CORTEZ II, and TOMMY MUNRO cruises. A total of 237 neuston samples in the SIPAC collection that were collected during 1985 and 1986 have been transferred to the NMFS-Pascagoula Laboratory for transshipment to the PSIC. There are 5,836 samples currently catalogued in the SIPAC. Currently, there are approximately 150 samples on loan. These samples are from OREGON II, CHAPMAN, HERNAN CORTEZ II, SUN COASTER, and TOMMY MUNRO cruises. Also, a request for a listing of SIPAC holdings has been received and provided to Joanne Shultz, NMFS.

In an effort to conserve space of the SIPAC collections, sample that have been in the collection for over 7 years and duplicate samples received from the PSIC, are aliquoted to ¼ their original volume and stored in 100 ml vials. To date, approximately 1,200 samples from 1982-1986 have been aliquoted.

Recently, a 486 desktop computer was purchased for management of the SIPAC data base, and the entire data base was transferred from the old system. The new system should be sufficient to handle SIPAC computer requirements for the next several years.

During FY1994, there were 47 SEAMAP plankton samples sorted for selected invertebrates using established SEAMAP protocols. These samples were collected during various OREGON II and PELICAN cruises. A total of 212 lots of specimens were obtained from those samples. To date, a total of 1,358 SEAMAP samples have been sorted for invertebrates, resulting in 5,797 lots.

During the next fiscal year, the SIPAC will continue to manage SEAMAP plankton collections and generate specimens and data on selected invertebrate species. In addition, the SIPAC is attempting to find a graduate student to work with the collection of invertebrate specimens as part of a master's thesis. The current level of SEAMAP funding and support of the SIPAC should be sufficient to support these activities during the next fiscal year.

Program Documents

The following documents were published and distributed by the SEAMAP program in FY1994:

- Beatty, H.R. 1993. 1993 Fall SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department. 6 p.
- Beatty, H.R. 1994. 1994 Spring SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department. 6 p.
- Beatty, H.R. 1994. 1994 Summer SEAMAP Cruise Report. South Carolina Wildlife and Marine Resources Department. 5 p.
- 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.
- Crustacean Work Group, SEAMAP-South Atlantic. 1994. South Atlantic Crustacean Newsletter, South Carolina Department of Natural Resources, Charleston, South Carolina. 9 p.
- Donaldson, D.M. 1994. SEAMAP Annual Report to the Technical Coordinating Committee (October 1, 1993 to September 30, 1994). Gulf States Marine Fisheries Commission, Ocean Springs, 27 p. + appendices
- Donaldson, D.M., C.D. Stephan and A. Rosario 1993. Annual Report of the Southeast Area Monitoring and Assessment Program (SEAMAP), October 1, 1992 to September 30, 1993. Gulf States Marine Fisheries Commission, Atlantic States Marine Fisheries Commission, Puerto Rico Department of Natural Resources. 13 p.
- Gulf States Marine Fisheries Commission. 1994. SEAMAP Marine Directory. Gulf States Marine Fisheries Commission, Ocean Springs, 1 p. + appendices.
- 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., editor, Striped Bass Study Annual Workshop for 1994. NMFS, Woods Hole, MA.
- 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.
- 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 p.
- 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 p.
- Pulley, M.G. 1993. Pamlico Sound Survey, June 1992 Cruise Report, North Carolina Department of Environment, Health, natural Resources, Division of Marine Fisheries, 27 p. DMF Report #263.
- Pulley, M.G. 1993. Pamlico Sound Survey, September 1992 Cruise Report, North Carolina Department of Environment, Health, natural Resources, Division of Marine Fisheries, 33 p. DMF Report #26.
- Stephan, C.D. In prep. SEAMAP - South Atlantic Annual Report, 1 October 1992 - 30 September 1993. Submitted to the South Atlantic Board of the Atlantic States Marine Fisheries Commission, Washington, D.C. 112 p.

PROPOSED SEAMAP ACTIVITIES, FY1994

Annual program allocations for the SEAMAP programs, Gulf, South Atlantic and Caribbean total approximately \$1.34 million. Proposed FY1995 activities for all participants are shown in Table 2.

TABLE 2.

PROPOSED SEAMAP ACTIVITIES, FY1995

	Fall	Winter	Spring	Summer
Gulf of Mexico Activities				
Resource Surveys:				
Spring Plankton Survey			X	
Spring Reef Fish Survey			X	X
Summer Shrimp/Groundfish Surveys				X
Louisiana Seasonal Surveys	X	X	X	X
Fall Shrimp/Groundfish Surveys	X			
Fall Plankton Survey	X			
Plankton and Environmental Data Surveys	X	X	X	X
Information Operations:				
1992 Biological and Environmental Atlas		X		
1993 Biological and Environmental Atlas				X
1995 Marine Directory			X	
FY1994 Joint Annual Report		X		
Real-time Data Summaries				X
Data Input and Request Processing	X	X	X	X
Specimen Archiving and Loan	X	X	X	X
Program Administration	X	X	X	X
Joint Planning Activities	X	X	X	X
South Atlantic Activities				
Resource Surveys:				
Shallow Water Trawl Survey	X		X	X
Pamlico Sound Survey	X			X
Winter Trawling and Fish Tagging Cruise		X		
Benthic Characterization - Northeast Florida	X	X	X	X
Bottom Mapping Project	X	X	X	X
Information Operations:				
Data Input and Request Processing	X	X	X	X
1994 South Atlantic Annual Report	X			
Data Analysis and Utilization	X	X	X	X
Program Administration	X	X	X	X
Joint Planning Activities	X	X	X	X
Caribbean Activities				
Resource Surveys:				
Reef Resources Survey	X	X	X	X
Information Operations:				
Coordination with Caribbean Countries				
Research Programs		X	X	
Program Administration	X	X	X	X
Joint Planning Activities	X	X	X	X

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