

GRAY'S REEF NATIONAL MARINE SANCTUARY

RESOURCE STUDIES PLAN

V. RESOURCE STUDIES PLAN

Gray's Reef National Marine Sanctuary provides opportunities to learn more about live bottom ecosystems and to improve management decisionmaking on issues related to them (Sanctuary Goal 2). The purpose of the Resource Studies Plan is to insure that this goal is achieved in a coordinated and structured fashion. The plan identifies the type of resource information that is needed to assess and manage the Sanctuary and proposes various approaches to acquire this information. The research proposed for the Sanctuary not only serves Gray's Reef, but also forms the basic data for answering a wide range of questions concerning South Atlantic live bottom habitats and their communities.

A. Overview

The Resource Studies Plan encompasses a broad spectrum of disciplines which provide a comprehensive approach to managing the Sanctuary. Five major areas of study have been identified: Data and Information Management (DIM); Geology (GEO); Oceanography (OCY); Ecology (ECO); and Special Projects and Studies (SPS). The fifth area of study (SPS) includes various projects that are of importance to the completeness of the plan but which cannot be adequately categorized under the other four components. Under each major area of study are several study topics (see Table V-1). Each topic is given an identification number (ID#) to facilitate review, comment and reference. Numbering, however, does not indicate priority ranking.

The major areas of study for the most part are interrelated. For example, models developed to describe the live bottom ecosystem require significant input from studies in geology, oceanography and ecology. Data and information management provides a central processing and analysis system into which all other study areas feed and from which information is readily available to potential users.

Resource information needs are discussed in the main text of the plan under each major area of study. Identification of priority studies for Phase 1 of this plan (i.e., 5 years) follows each discussion. Studies recently completed or in progress are listed on Table V-2 and described in Appendix C. Additional studies will be considered at later dates, or sooner if funding in addition to that required for priority studies becomes available or if their status changes following annual review. Selection and scheduling of priority projects during Phase 1 follows procedures summarized at the end of this section and described in more detail in Section VII and Appendix D.

B. Information Needs and Recommended Action For Phase 1

1. RESOURCE DATA AND INFORMATION MANAGEMENT (DIM)

DIM-1 Comprehensive Sanctuary Resource Data Base

The need for a comprehensive resource data base for live bottom areas has been established (Henry, 1981; Appendix B). Existing information is scattered; it is largely unpublished, retained by investigators and dif-

TABLE V-1

MAJOR AREAS OF STUDY FOR GRAY'S REEF NATIONAL MARINE SANCTUARY

DATA AND INFORMATION MANAGEMENT

- DIM-1 Comprehensive Sanctuary Resource Data Base
- DIM-2 Information Management System
- DIM-3 Systematics Collections from Gray's Reef

GEOLOGY

- GEO-1 Hydrography
- GEO-2 Geomorphology
- GEO-3 Sediment Dynamics
- GEO-4 Sedimentation
- GEO-5 Geology and Origin of South Atlantic Live Bottom Reefs

OCEANOGRAPHY

- OCY-1 Weather and Sea Conditions Monitoring
- OCY-2 Water Circulation
- OCY-3 Water Quality

ECOLOGY

- ECO-1 Biological Inventory and Community Maps
- ECO-2 Resource Monitoring
- ECO-3 Selected Studies on Seaweeds at Gray's Reef
- ECO-4 Selected Studies on Invertebrates at Gray's Reef
- ECO-5 Selected Studies on Fishes at Gray's Reef
- ECO-6 Selected Studies on Plankton at Gray's Reef
- ECO-7 Selected Studies on Sea Turtles at Gray's Reef
- ECO-8 Dynamics and Variability of Live Bottom Ecosystems

SPECIAL PROJECTS AND STUDIES

- SPS-1 Census of Sanctuary Users
- SPS-2 Environmental Impacts of Selected Activities in Live Bottom Areas
- SPS-3 Field Guides to Selected Taxa at Gray's Reef
- SPS-4 Cultural and Historic Resource Surveys

difficult to locate without specialized knowledge. Much of the available information should be compiled into a central repository where it would be easily accessible to potential users and continuously updated as new information was acquired. The repository could contain scientific as well as public education materials, including numerical and descriptive data, voucher specimens, slides, video films and other photographic media, reprints from the scientific and popular press and unpublished reports. Also included could be references to pertinent management and scientific research from other reef areas, general information about the national marine sanctuary program and information about other marine resource management programs.

Action: Compile, annotate and update over time a current and historical bibliography of published and unpublished information on live bottom ecosystems. Establish a repository to house this information.

DIM-2 Information Management System

Research and resource monitoring programs are certain to produce a large amount of varied and important information. It is critical from the onset that a comprehensive information management system be in place to process, store and make available for speedy and efficient handling the variety of information generated. A system designed for the Sanctuary should be able to provide the following services: (1) input, analysis, storage and output of data collected in the Sanctuary and selective data from other live bottom areas; (2) reference retrieval; (3) word processing and graphics production for report preparation; and (4) communication with other computers in the national marine sanctuary system. The system should insure timely availability and smooth flow of information to potential users.

Action: Design and implement an information management system to incorporate information generated by DIM-1, proposed and ongoing projects and administrative activities. Establish a mechanism to make information available to potential users.

DIM-3 Systematics Collections from Gray's Reef

Representatives of major plant, invertebrate and fish taxa have been collected at Gray's Reef in conjunction with past and present research efforts. For the most part, collections are scattered and not easily accessible for use as voucher specimens for research. This is of particular significance since further collection of sanctuary resources is prohibited by sanctuary regulations, except in special cases where limited collection is essential for identification purposes and specimens cannot be found outside of the Sanctuary. A project should be undertaken to locate existing collections, designate permanent repositories to house them and any additional specimens collected in the Sanctuary (also see DIM-1) and curate them using standard methods. A loan system should be devised to make specimens available for study by researchers, students and the interested public.

TABLE V-2

GRAY'S REEF NATIONAL MARINE SANCTUARY RESOURCE STUDIES
IN PROGRESS OR RECENTLY COMPLETED

GEOLOGY

- GEO-1 Reconnaissance Hydrographic Survey of Gray's Reef National Marine Sanctuary

ECOLOGY

- ECO-2 Assessment of Contemporary Visual Fish Censusing Techniques in Live Bottom Areas
- ECO-4 Determination of Faunal Communities Associated with Selected Sponges and Octocorals.

SPECIAL PROJECTS AND STUDIES

- SPS-1 Gray's Reef National Marine Sanctuary Visitation Study
- SPS-2 Assessment of Roller-Rigged Trawl Impacts on Benthic Habitats
- SPS-3 A Field Guide to the Fishes in the Vicinity of Gray's Reef National Marine Sanctuary, Georgia

Note: See Appendix C for details on these studies.

A project to curate systematics collection of fishes from the vicinity of Gray's Reef is in progress (see Appendix C).

Action: Complete a systematics collection of fishes from Gray's Reef. Provide curatorial services.

Locate and catalogue existing systematics collections from the vicinity of Gray's Reef. Identify missing information. Design a loan system.

2. GEOLOGY (GEO)

GEO-1 Hydrography

Henry and van Sant (1982) conducted a reconnaissance hydrographic survey of Gray's Reef using high resolution bathymetric, topographic, photographic, and sub-bottom profiling systems. The findings documented the occurrence and distribution of live bottom and pertinent biological features and conditions in an 80 square nautical mile area. The results support earlier works (Hunt, 1974) and confirm that 95% of live bottom encountered in the survey area is located in the Sanctuary.

The results of the reconnaissance survey are to be used to design a more indepth survey. Detailed and accurately located baseline maps showing rock outcrop location and distribution and possibly indicating outcrop dimensions, relief, profile, and orientation are needed for support in other research and monitoring projects. It is possible that biological maps (ECO-1) showing biotic zonation in relation to geological features could be built upon the results of this proposed effort.

Action: Design and conduct an indepth hydrographic survey to produce detailed maps suitable for use by researchers, resource managers and sanctuary visitors.

GEO-2 Geomorphology

Hunt (1974), Continental Shelf Associates (1979), South Carolina Marine Resource Research Institute and the Georgia Department of Natural Resources (1981) and Riggs, Hine and Snyder (1981) have studied, though to a limited degree, the geomorphology of selected hardgrounds on the South Atlantic Continental Shelf. Investigators in South Florida and the Caribbean have looked at the relationship between habitat complexity and community development (Risk, 1972; Talbot and Goldman, 1972; Dahl, 1973; and Luckhurst and Luckhurst, 1978. Hunt (1974) provided an initial study of live bottom geomorphology in the Sanctuary in his analysis of sedimentary rock color, structural stratigraphy, induration, surface features, and structural constituents. Additional studies are needed to further define the rock types comprising the outcrops and to determine their shear strength and fragility. The latter study would provide data for interpreting the impact of anchoring on outcrops. An analysis of habitat complexity and associated biological communities (ECO-1) would provide a more composite picture of the habitat.

Action: Studies will be recommended following analysis of findings from GEO-1.

GEO-3 Sediment Dynamics

Observations in the Sanctuary and at other live bottoms in the Georgia Bight suggest that a measurable degree of sand transport occurs along the ocean bottom seasonally. Geological records suggest that sand movement alternately covers and exposes rock outcrops, perhaps in a cyclic pattern (Henry and Giles, 1979). The effects of sand movement on live bottom habitats and their communities is unknown, yet it may affect such things as community structure, ecological succession, biological productivity and evolution. A better understanding of the dynamics of sand movement is needed. Objectives of studies addressing this subject should include determining aspects of the source and transport of sand, erosion and deposition rates of sedimentary materials, and effect of sand movement on live bottom habitat and communities.

Action: Studies will be recommended following analysis of findings from GEO-1.

GEO-4 Sedimentation

The rate that suspended particulate matter settles out of the water column onto the live bottom is suspected to be low. Some baseline measurements should be taken to provide background information in the event that development activities such as minerals mining or dredge material disposal occur near the Sanctuary and change the status quo. Information on sedimentation rates would be applicable to GEO-3, water circulation (OCY-2) and water quality (OCY-3) studies, plankton studies (ECO-3) and live bottom community metabolism studies (ECO-7).

Action: Studies will be recommended following analysis of findings from GEO-1.

GEO-5 Geology and Origin of South Atlantic Live Bottom Reefs

Several investigators have explored the geological history of the South Atlantic Continental Shelf (Pilkey and Giles, 1965; Uchupi, 1968; Hunt, 1974; Henry and Giles, 1978). Geological records indicate that prominent bottom features -- sand swells, submerged terraces, river valleys and hard bottom outcrops -- were formed many thousands of years ago during lower stands of sea level. It is proposed that Gray's Reef was formed in a shallow, possibly sheltered marine environment (Hunt, 1974). Further investigations on the age, origin and composition of Gray's Reef should be considered. Similar investigations in coastal areas and outer shelf locations for comparison to Gray's Reef would also provide excellent subjects for study.

Action: Studies will be recommended following analysis of findings from GEO-1.

3. OCEANOGRAPHY (OCY)

OCY-1 Weather and Sea Conditions Monitoring

There are currently no observation programs to provide accurate or timely information on weather and sea conditions in the Sanctuary or surrounding areas. Very limited data are available from distant monitoring stations and from on-site and regional oceanographic studies programs. During portions of the year, Navigational Light Towers off Savannah, GA, Charleston, SC, and Jacksonville, FL, monitor wind, ocean currents, ocean temperature, salinity and turbidity. These data are only remotely applicable to the Gray's Reef area due to distance from source (at least 40 km away) and differences in microclimate. Moreover, the availability of these data for sanctuary user groups is limited by lack of weather reporting stations in the vicinity and poor weather radio reception from the closest stations (i.e., Savannah and Jacksonville).

The objective of this study would be provide a means for obtaining and disseminating timely and accurate data on meteorological and oceanographic conditions in the Sanctuary and surrounding area. Some of the parameters which could be studied include: meteorological conditions (e.g., temperature, barometric pressure, humidity, illumination, cloud cover and wind speed and direction); sea surface state and wave conditions (e.g., wave height, appearance, length, period and velocity, wave pattern and shape and storm surge); water temperature and salinity; water circulation (see OCY-2); light transmission; transmissiometry; and sound. Measurements could be made with on-site recording instruments retrieved periodically or with more permanent facilities which provide a continuous outflow of real-time data, such as weather buoys.

Action: Identify essential weather and sea condition information that is currently lacking and assess alternative methods of acquiring the information. Investigate the feasibility of stationing at Gray's Reef a NOAA weather buoy or other recording and transmitting instrumentation.

OCY-2 Water Circulation

The state of knowledge of water circulation patterns in the South Atlantic Bight is probably adequate enough to describe general patterns in the Sanctuary. However, more detailed information is needed to understand the effects of small-scale events in the sanctuary area, such as outwellings from the coast, indrafts of the Gulf Stream, seasonal fluctuations in wind- and wave-induced currents, and topography-mediated events (e.g., upwellings, eddies and gyres). Information on these events is important to studies on population dynamics (e.g., dispersal, retention and recruitment of larvae), community metabolism, water quality and nutrient cycles, and sedimentation.

It may be possible to determine flow structure in and around the Sanctuary with only a few monitoring devices since non-tidal current in this mid-shelf region of the Georgia Bight is primarily wind-driven and the alongshore coherence is about 100 miles, which includes the sanctuary

area. On and offsite monitoring devices and satellite information may be utilized. Submersible current meters and tide gauges are presently being used at Key Largo National Marine Sanctuary; some may be available for use in other national marine sanctuaries in late 1984.

Action: Investigate the feasibility of deploying NOAA submersible current meters at Gray's Reef. Identify potential information gains and uses for this information.

OCY-3 Water Quality

Effective management of the Sanctuary depends in part on the ability to monitor resource conditions and to predict changes and associated impacts. Yet, field data on water quality in the Sanctuary are currently lacking, and information on ecological requirements of live bottom organisms and their response changes in required conditions is limited. Many tropical organisms are at the northern limit of their geographical range and may not tolerate even subtle changes. Porter (pers. comm.) suggests that corals at Gray's Reef are living fairly close to the lower limits of temperature and light tolerance.

Long-term objectives of this study would be to (1) design and implement a program to monitor selected parameters, such as temperature, salinity, PH, nitrate, nitrite ammonia, phosphate, chlorophylls and possibly pesticides, hydrocarbons, and heavy metals, (2) design a study to analyze community metabolism and nutrient flux in the live bottom system, and (3) incorporate evolving information into a predictive model (also see ECO-8). Efforts should use state of the art equipment which avoids labor intensive methods.

Action: Conduct a water quality feasibility study.

4. ECOLOGY (ECO)

ECO-1 Biological Inventory and Community Maps

Research efforts have only begun to accumulate the data needed to understand the structure and function of live bottom ecosystems. The relationship between living marine resources and geological features has not been fully ascertained. Additional baseline and group specific investigations are needed to describe biological communities and to document their occurrence in space and time. Detailed biological community maps built on hydrographic maps (GEO-1) and in conjunction with studies on reef geomorphology (GEO-2) will be useful in future research and resource monitoring endeavors.

Action: Verify existing species lists. Recommend additional studies during the design phase of GEO-1. If feasible, conduct baseline mapping during GEO-1.

ECO-2 Resource Monitoring

In addition to monitoring ambient oceanographic conditions in the Sanctuary (OCY-1, OCY-2 and OCY-3), a monitoring program directed at living marine resources is also needed. Monitored resources should include those that are representative of the ecosystem and those that are most likely to indicate changes in the environment at an early state of change. Whereas data concerning live bottom ecosystems are incomplete, there should be sufficient information available to identify "indicator" species (at least initially), and to establish a reasonable monitoring program. If necessary, changes in the program could be made as more information about the system becomes available.

Monitoring programs are currently being conducted in other national marine sanctuaries (i.e., at the Channel Islands, Key Largo, and Looe Key) and in national parks and monuments (i.e., Biscayne, Everglades, Dry Tortugas, Buck Island and the Virgin Islands). Studies in progress may provide guidance for developing a monitoring program for Gray's Reef.

Action: Complete an assessment of various visual techniques for monitoring fishes at Gray's Reef (see Appendix C).

Identify indicator species and appropriate monitoring techniques. Implement a resource monitoring program coordinated with a census of sanctuary users (see SPS-1).

ECO-3 Selected Studies on Seaweeds at Gray's Reef

The ecological importance of benthic marine algae to live bottom ecosystems has not been ascertained. Recent investigations off the Carolinas and northeastern Florida have discovered suitable hardbottom to support seaweeds. Studies off Georgia are more limited. Continental Shelf Associates (1979) collected 19 species of seaweeds off Georgia and, in a limited sampling effort at Gray's Reef, Searles (1981) collected 15 species of which there are eight new records for Georgia, two extensions of the southern ranges of distribution and one new species.

Further investigation of plant species composition, abundance and distribution in the Sanctuary is needed. It is possible that selected seaweeds can serve as indicator species for resource monitoring purposes (ECO-2). Studies on community dynamics (e.g., seasonality of reproduction, colonization and metabolism) are needed to determine the role and trophic significance of seaweeds in live bottom systems and to identify species in need of special protection and study (i.e., species with limited reproductive rates and capabilities and/or limited geographic distribution (Richardson, pers. comm.)).

Action: Complete the survey and identification of seaweeds from Gray's Reef (Searles, 1981). Recommend selected seaweeds and monitoring techniques for ECO-2.

ECO-4 Selected Studies on Invertebrates at Gray's Reef

Benthic invertebrate communities are an important element in live bottom ecosystems, yet these groups remain largely undescribed. Several studies on invertebrate communities of the South Atlantic Bight are in progress and should supply much invaluable data (see Appendix C); however, it is likely that many questions regarding specific invertebrate assemblages will remain. Areas in which more information is needed include: (1) species identifications and life histories; (2) biologic community mapping (ECO-1); (3) descriptive community studies; (4) trophic relationships, including the roles of predation and competition; (5) population dynamics (e.g., seasonality of reproduction, sources and rates of larval recruitment and requirements for settlement and colonization); (6) community metabolism; (7) endangered, threatened, rare or otherwise special species; and (8) identification of indicator species for resource monitoring purposes (ECO-2).

Action: Complete the study in progress to determine faunal communities associated with selected sponges and octo-corals in live bottom areas (see Appendix C).

Recommend selected invertebrates and monitoring techniques for ECO-2.

Recommend additional studies following analysis of studies in progress.

ECO-5 Selected Studies on Fishes at Gray's Reef

Fishes not only constitute an important component of the live bottom communities, but also attract the major attention from sanctuary user groups (i.e., sports fishermen and divers). At the present time, the identification and description of fish species at Gray's Reef remains incomplete, especially among the small, sedentary and cryptic species which may have important ecosystem positions. Studies are needed to assess and monitor harvested and unharvested species, their life histories and their patterns of resource utilization (e.g., partitioning of food and habitat resources). Selected studies include (Note: listing does not indicate priority order):

- ° General purpose studies to determine the identity, abundance, distribution, seasonality, patterns of resource use and life history of selected fish species which have some degree of association or dependence upon the reef, including infaunal and cryptic species and resident and seasonal tropically-derived species.
- ° Studies on pelagic fishes associated with Gray's Reef.
- ° Descriptive reef fish community studies and mapping of fish communities in relation to physical features within the Sanctuary (ECO-1).
- ° Identification of indicator species and monitoring methods (ECO-2).
- ° Development of a field guide to the identification of fishes at Gray's Reef (In progress, see SPS-3 and Appendix C).

- ° A study of reef fish community ecology to examine the roles of competition, predation, and random events in determining community structure.
- ° An investigation of patterns of reproduction and recruitment of fishes to Gray's Reef to determine sources of fish propagules (i.e., eggs and larvae) and the reef's self-sustaining potential versus a dependence upon distant sources.
- ° A study of trophic dynamics to determine the feeding ecology of Gray's Reef fishes and the effect of large pelagic predators and fishing effort on the reef associated species (also see SPS-3).
- ° A study of reef fish species' adaptability to live bottom reefs and susceptibility to stress by examining energy budgets, including daily energy rations, metabolic and growth rates, production estimates, ecological efficiencies, and the effect of changes in environmental parameters on ecological energetics.

Action: Complete year-round observations in progress on the identity, distribution, seasonality and patterns of resource utilization of selected species of resident and tropically derived fishes at Gray's Reef (see SPS-3 and Appendix C). Augment knowledge with studies on infaunal and cryptic species.

Recommend selected fishes and monitoring techniques for ECO-2.

Implement additional studies following analysis of studies in progress.

ECO-6 Selected Studies on Plankton at Gray's Reef

Plankton communities associated with live bottom habitats have not been described. Areas in which information is needed include: (1) species identifications and life histories; (2) distribution in time and space; (3) population dynamics and community relationships; (4) trophic and ecological significance; and (5) identification of "indicator" species.

Action: Identify studies as more information becomes available.

ECO-7 Selected Studies on Sea Turtles at Gray's Reef

The Atlantic loggerhead sea turtle (Caretta caretta) is listed as threatened under the Endangered Species Act of 1973. It is common in Georgia's coastal and offshore waters. Although much is known about the nesting behavior of the loggerhead on Georgia's beaches, little is known about other aspects of its life history. During the last decade, divers have observed loggerhead sea turtles at artificial and natural reefs off Georgia. It is not known what role these reefs play for the sea turtles, but it is suspected that they provide refuge for overwintering, resting and feeding.

Action: Investigate the feasibility of monitoring spatial and temporal movements and activities of Atlantic loggerhead sea turtles associated with natural and artificial reefs off Georgia. Determine the significance of these reefs to sea turtles.

ECO-8 Dynamics and Variability of Live Bottom Ecosystems

The information needs described thus far are directed primarily at the major components of the live bottom ecosystem (i.e., plants, invertebrates, fishes) and their relationship to the surrounding environment (i.e., geological structures and processes, oceanographic conditions). As this information becomes available, it should be synthesized, analyzed and incorporated into a conceptual ecosystems model that describes the dynamics and variability of the live bottom ecosystem. Conceptual ecosystem models graphically describe in words and symbols, rather than numbers, ecological relationships. As management tools, conceptual models help identify information gaps and direct multidisciplinary research, and provide the framework for developing mathematical models (Dahl et al, 1974).

Action: Incorporate information on live bottom areas into a conceptual ecosystems model. Use the model to identify information needs and to direct multidisciplinary research. Investigate the feasibility of developing a mathematical model to describe live bottom ecosystems.

5. Special Projects and Studies (SPS)

SPS-1 Census of Sanctuary Users

There is much emphasis in this plan on geological, oceanographic and ecological studies that will provide resource information for future management needs. Of equal importance is a comprehensive picture of the magnitude and the spatial and seasonal patterns of sanctuary use. Information on user group activities should be collected using a variety of methods including intercept interviews of boaters at various launch sites, on-site interviews with boaters in the Sanctuary, over-flight surveys (in progress, see Appendix C) and socio-economic questionnaires. The type of information collected on field surveys should include date and time of day, weather and sea conditions, type and estimated size of vessels observed, type of activity engaged in and number of visitors per boat. In addition, interviews and questionnaires should obtain various sociological characteristics of the participants (i.e., age, sex, income, education, tourist or resident, single or multi-purpose trip, number of previous trips, distance travelled and cost of trip to launch site, rental cost of gear, boat cost per trip, etc.).

Action: Evaluate existing methods of obtaining information on sanctuary users. Recommend and implement modified strategies as necessary to acquire needed information. Use information to define relationship between sanctuary resource conditions and harvest sectors (ECO-2), to

identify target audiences for interpretive and recreational programs and to better apportion law enforcement personnel.

SPS-2 Environmental Impact of Selected Activities
on Live Bottom Habitats and Communities

To date, research at Gray's Reef has been directed largely at natural resources and processes in the Sanctuary. Studies under SPS-1 will ascertain the type and extent of activities occurring in the Sanctuary. For management purposes, it may be necessary to study the effects of existing or changed levels of activities on the natural environment. Areas of interest include the impact of anchoring, hook-and-line fishing, spearfishing, and selected research gears. Many activities that are known or suspected to have adverse impact on live bottom areas are prohibited by sanctuary regulations.

Environmental impact assessments often involve manipulative research. It is recommended that potentially damaging studies be conducted outside of the Sanctuary. A study in progress -- environmental impact of roller-rigged trawls in live bottom areas -- is sponsored by NOAA but is being conducted at live bottom locations outside of the Sanctuary for this reason. (see Appendix C).

Action: Complete a study on the environmental impact of roller-rigged trawls in live bottom areas.

Recommend additional studies as needs arise.

SPS-3 Illustrated Field Guides to Selected Taxa at Gray's Reef

Illustrated guidebooks to the major taxonomic groups associated with live bottom reefs are lacking. Most of the guides available for use by fishermen, divers and students are for tropical coral reef organisms and therefore have only minor application to Gray's Reef. Because live bottom areas such as Gray's Reef are rapidly coming under increasing use, information on the marine life that inhabit them is of interest to user groups and is paramount to resource management. For maximum resourcefulness, guidebooks should aid in the identification and classification of selected taxa, describe key aspects of their life history and preferred habitat and provide reference to additional literature on the group. Guidebooks which are concise, well-illustrated and easily understood by both technical and non-technical persons will fill a noticeable void in scientific and popular literature related to live bottom habitats and communities. A guidebook to the fishes in the vicinity of Gray's Reef is in preparation (see Appendix C).

Action: Complete and distribute a field guide to the fishes in the vicinity of Gray's Reef. Evaluate its usefulness.

Identify other taxonomic groups for future possible field guides.

SPS-4 Cultural and Historical Resource Surveys

Archeological and paleontological investigation in and around Gray's Reef may uncover artifacts of historical or cultural significance. To date, several different types of fossils have been found, including estuarine invertebrates and a mastodon's bone, which provide clues to the earth's geologic history. Also of importance is whether any historically important shipwrecks exist within the vicinity of Gray's Reef. If important cultural or historical resources are found, appropriate management strategies will have to be devised.

Action: Locate and catalogue existing fossils from Gray's Reef. Consider the feasibility of conducting further paleontological studies at Gray's Reef.

Consider the feasibility of conducting a magnetometer study for shipwrecks in the vicinity of Gray's Reef.

C. Implementation Strategies

The Resource Studies Plan is designed to provide a comprehensive, long-term agenda for research and monitoring. It is to be reviewed on an annual basis and revised every five years. This review is of particular importance since the results of studies in progress may alter or reinforce other studies recommended in the plan or change their priority listing. Procedures for reviewing the Resource Studies Plan are presented in Section VIII, Management Plan Review.

Selection and scheduling priority studies is based on a consideration of several criteria, including: (1) relevance or importance to sanctuary management; (2) scientific or educational merits; (3) immediacy of need (i.e., existing or potential threat to the marine environment, in general, or to the Sanctuary, in particular); (4) environmental consequence (i.e., consequences of conducting or not conducting the project, compatibility with other sanctuary activities, and whether the study should be conducted in the Sanctuary or outside its boundary); and (5) NOAA policy and funding considerations. In the course of selecting priority studies, biologists, ecologists, geologists, oceanographers and others with knowledge or interest in South Atlantic live bottoms are consulted. The selection process is described in more detail in Section VIII and in Appendix D, Guidelines for Research in National Marine Sanctuaries.

Funding for studies is normally provided by NOAA through a competitive process whereby requests for proposals (RFP) are announced in the Commerce Business Daily; however, unsolicited proposals of outstanding merit are considered. Additionally, NOAA enters into cooperative agreements with other federal and state agencies for special research projects. Guidelines for preparing, submitting, evaluating and selecting proposals for research in national marine sanctuaries is presented in Appendix D.

NOAA collaborates with other organizations to enhance opportunities for research related to sanctuary areas. It is anticipated that NOAA can fund many of the projects described in the Resource Studies Plan, as funds are available over time. Other funding sources and cost-sharing are encouraged to support projects identified in the plan.

APPENDIX C

SUMMARY OF RESOURCE STUDIES IN PROGRESS OR RECENTLY COMPLETED

I. PLAN COMPONENT: GEOLOGY

ID# GEO-1

II. TOPIC: Hydrography

A. Study Title: Reconnaissance Hydrographic Survey of the Gray's Reef National Marine Sanctuary

B. Information Needs and Study Objectives:

The actual extent of live bottom within and adjacent to the Sanctuary remains undetermined. It has been proposed that live bottom areas lie outside of the 12 sq. nmi. area originally mapped by Hunt (1974) and perhaps outside of the 16 sq. nmi. Sanctuary. Hydrographic survey maps and descriptions of outcrop features are needed.

The objectives of the study are to:

- ° Obtain continuous and simultaneous regional bathymetric, topographic, and shallow subbottom information on an 80 sq. nmi. area centered around the Sanctuary;
- ° Document the occurrence and distribution of reef/live bottoms in the survey area as well as other pertinent biological conditions and features;
- ° Report the results of the survey in such a manner as to facilitate planning/evaluation of any further detailed and accurately located baseline mapping, monitoring, and biogeological studies of the Sanctuary.

C. Study Description:

1. Status: COMPLETED

2. Contract Number: NA-81-AA-H-CZ098

3. Principal Investigator:

Dr. Vernon J. Henry, Jr.
Marine Geology Program
Skidaway Institute of Oceanography
Savannah, GA 31406

4. Methods:

A field survey was carried out by Dr. Vernon J. Henry, Jr. on the Skidaway Institute of Oceanography research vessel, BLUE FIN, in the fall of 1981 and spring of 1982, using high

resolution bathymetric, topographic and sub-bottom profiling systems. An EdWestern precision depth recorder was used to obtain continuous depth profiles over the survey track lines. An EG&G sidescan sonar was used to map the occurrence and distribution of reefs, hardgrounds, sand waves, and other bottom morphology beneath and 150 meters on each side of the survey track lines. An ORE 3.5 kHz tuned transducer and EG&E UNIBOOM high resolution profiling system was used to obtain shallow (-50 m) sub-bottom stratigraphic information. These data were used to determine the thickness of sand cover over the hard substrate and to help answer questions concerning reef location and time and mode of origin. A sled-mounted close circuit underwater television was towed on the bottom along the track lines. The bottom was continuously viewed on the monitor and recorded on videotape. On the basis of notes taken during CCTV monitoring, supplemented by videotape re-view and sidescan sonar data, several stations were selected for SCUBA observations, photography, and limited sampling. Station keeping and track line course were maintained by LORAN C and RADAR. In the latter case, reflector buoys were dropped at selected locations to aid in adherence to pre-plot track lines.

5. Study Area:

Within an 80 sq. nmi. area centered around the Sanctuary.

6. Products:

Maps, bathymetric, topographic and sub-bottom profiles, video tapes, still photographs and a final report (Henry and Van Sant, 1982)

D. Continuing or Related Studies:

Hunt (1974) described the live bottom hydrography in his Masters thesis "The Geology and Origin of Gray's Reef." Rock specimens collected as part of the BLM Living Marine Resources of the South Atlantic OCS (Studies 1 and 2) provide additional information on the geomorphology of the Sanctuary. Several regional hydrographic surveys are being or have been conducted using the same or similar survey techniques, including Henry and Giles (1978), Continental Shelf Associates (1979), Henry (1981), Riggs, Hine, and Synder (1981).

III. REMARKS/RECOMMENDATIONS:

The results of this study should be used to design an indepth survey of the Sanctuary to produce detailed hydrographic maps for future research and monitoring purposes.

I. PLAN COMPONENT: ECOLOGYID# ECO-2II. TOPIC: Resources MonitoringA. Study Title: Assessment of Contemporary Visual Fish Censusing Techniques in Live Bottom AreasB. Information Needs and Study Objectives:

A variety of visual methods have been developed and are being used in coral reef areas to measure the abundance of fish species abundance and to determine aspects of community structure. Some methods utilize direct human sighting (Thompson and Schmidt, 1977; Jones and Thompson, 1978; Bohnsack, 1979; Tilmant, Schmahl and Morrison, 1979; Parker et. al., 1979; Stone et. al., 1979) and others rely on photography (Smith and Tyler, 1973; Alevison and Brooks, 1975). Visual fish censuses are recommended because they (1) provide reliable data; (2) are simple, non-destructive, and highly portable; (3) have low equipment and time requirements; and (4) provide data for comparing different reef fish assemblages in different habitat areas.

The objectives of this study are to analyze, modify as necessary, and field test at Gray's Reef the various fish count techniques currently used in coral reef fish assessment and monitoring programs.

C. Study Description1. Status: IN PROGRESS2. Contract Number: NA-81-AA-H-CZ0983. Principal Investigator/Coordinator:

Georgia Department of Natural Resources
Coastal Resources Division
1200 Glynn Avenue
Brunswick, Georgia 31523-9990

4. Methods:

Modified Jones and Thompson (1978) species-time visual fish count technique.

5. Study Area:

Ledge break and plateau zones within selected live bottom areas of the Sanctuary.

D. Continuing or Related Studies:

Visual fish count techniques, such as the species/time random count technique, have been used in reefal areas for a variety of purposes, including: (1) monitoring reef fish assemblages

in Key Largo Coral Reef National Marine Sanctuary and Fort Jefferson National Monument at the Dry Tortugas (Thompson and Schmidt, 1977; Jones and Thompson, 1978); (2) assessing the impact of recreational activities on reef fish at Biscayne National Park (Tilmant, Schmahl and Morrison, 1979); and (3) studying the role of predation in determining the community structure of coral reef fishes in Key Largo and Looe Key National Marine Sancturies (Bohnsack, unpublished data, 1981).

III. REMARKS/RECOMMENDATIONS:

After an appropriate technique has been agreed upon, reef fishes at Gray's Reef could be monitored using a visual census. Periodic sampling of cryptic fish species, which are often missed using visual techniques, should be conducted. Voucher specimens for all fish species identified should be maintained in a central repository (Ross, 1982, pers. comm.).

I. PLAN COMPONENT: ECOLOGY

ID# ECO-4

II. TOPIC: Selected Studies on Invertebrates at Gray's Reef

A. Study Title: Determination of Faunal Communities Associated with Selected Sponges and Octocorals

B. Information Needs and Study Objectives:

South Atlantic sponges and octocorals support epifaunal and in-faunal invertebrate assemblages which are thought to be food items for major demersal fisheries and sea turtles. Little information is available to describe these associations. McCloskey (1970) studied the flora and fauna associated with isolated Oculina coral heads off North Carolina and found over 70 species of invertebrates living in or on a single coral head. Information is needed on the type and abundance of invertebrates associated with sponges and octocorals at Gray's Reef and other Georgia Bight live bottoms and the value of their contribution to the maintenance of these ecosystems.

The objective of this study is to describe and quantify the invertebrate communities supported by selected sponge and octocoral species. Comparison of these data with an on-going assessment of the diets of important fish species associated with the live bottom area will help evaluate whether disturbance of sponge and octocoral communities has serious consequences on the stability of fish populations which feed in these areas (SCMRRI & GADNR, 1981).

C. Study Description:

1. Status: IN PROGRESS
2. Contract Number: NA-81-AA-H-CZ098
3. Principal Investigators:

Georgia Department of Natural Resources (GADNR)
Coastal Resources Division
1200 Glynn Avenue
Brunswick, Georgia 31523-9900

South Carolina Wildlife and Marine Resources Department
Marine Resources Research Institute (SCMRRI)
P.O. Box 12559
Charleston, SC 29412

4. Methods:

Selected sponge and octocoral species will be bagged and removed intact by divers. Each sample will be analyzed in the laboratory to identify and quantify associated fauna. Sampling will be performed in conjunction with roller trawl assessment study (ID# SPS-2).

5. Study Area:

Live bottom near Artificial Reef J (see Fig. II-4, p. II-9).

6. Products:

Analysis of sponge and octocoral communities. Final report incorporated into roller trawl assessment report.

D. Continuing or Related Studies:

Information on invertebrate communities of live bottom areas exists as a result of the South Atlantic OCS Area Living Marine Resources Study, Years 1 and 2 (SCMRRI & GADNR, 1981). The diets of important fish species associated with live bottom areas are also being assessed under this study. These data will be available for comparison. Also see ID# SPS-2 and McCloskey (1970).

III. REMARKS/RECOMMENDATIONS:

Some damage will occur as a result of selected sampling, although it is expected to be minimal. Because of this, the principal investigators decided to use an off-sanctuary sampling location.

I. PLAN COMPONENT: SPECIAL PROJECTS AND STUDIES

ID# SPS-1

II. TOPIC: Census of Sanctuary Visitors

A. Study Title: Gray's Reef National Marine Sanctuary Visitation Study

B. Information Needs and Study Objectives:

Sanctuary visitors are defined as those people actually present within the sanctuary at any given time (Dobbin, 1982). People visit Gray's Reef for a variety of purposes, including recreation, research, and education. For management purposes, it is important to know the magnitude and the spatial and seasonal patterns of sanctuary use.

The objective of this study is to monitor visitor activities at Gray's Reef by conducting overflight surveys.

C. Study Description:

1. Status: IN PROGRESS

2. Contract Number: NA-82-AA-H-CZ030

3. Principal Investigator:

Nick Nicholson, Sanctuary Coordinator
Gray's Reef National Marine Sanctuary
Georgia Department of Natural Resources
Coastal Resources Division
3300 Glynn Avenue
Brunswick, Georgia 31523-9990

4. Methods:

Aerial overflights are conducted on a random basis as determined by a random numbers table. At an elevation of <3,000 feet AGL, the following information is recorded: date/time of day; weather conditions (wind speed and direction, wave height and condition); number of vessels observed under categories of commercial, recreation and other; type of activity (e.g., anchored, drifting, trolling, bottom fishing, diving, in transit, research activities); and any additional observations or remarks. Similar observations are made by on-site sanctuary personnel when in the Sanctuary conducting research or checking sanctuary buoy conditions. Observations by volunteer aviators and boat captains are encouraged and are reported to the Sanctuary Coordinator.

5. Study Area:

Within the Sanctuary.

7. Products:

Analysis of sanctuary visitation patterns reported in required quarterly reports.

D. Continuing or Related Studies:

Visitation studies are being conducted in other national marine sanctuaries.

III. REMARKS/RECOMMENDATIONS:

Data accumulated to date confirms that Gray's Reef does not receive a high level of use.

I. PLAN COMPONENT: SPECIAL PROJECTS AND STUDIES ID# SPS-2

II. TOPIC: Environmental Impact of Selected Activities in Live Bottom Areas

A. Study Title: Assessment of Roller-Rig Trawl Impacts on Benthic Habitats

B. Information Needs and Study Objectives:

The use of roller trawls in live bottom areas has caused considerable recent controversy over the possible adverse impacts on sessile benthos, fish stocks, and the recreational value of the affected areas. In recent years, use of fish trawls has increased in the South Atlantic, due in part to development of new gears, the high value of target species, and an increasing need to diversify the current fishing industry. Several research programs are using standardized, roller-rigged, high fly trawls to investigate the groundfish communities of live bottom habitats. The effects of using this type of gear on live bottom communities are unknown.

The objectives of the study are to:

- ° Determine the number and species of large benthic invertebrates damaged or removed from an inshore live bottom habitat by trawling with a standard research trawl; and
- ° Determine the rate at which large sessile invertebrate populations grow, recover and recolonize after a research trawl has been pulled across a live bottom area.

C. Study Description:

1. Status: IN PROGRESS

2. Contract Number: NA-81-AA-H-CZ098

3. Principal Investigators:

Georgia Department of Natural Resources
Coastal Resources Division
1200 Glynn Avenue
Brunswick, GA 31523-9990

South Carolina Wildlife and Marine Resources Department
Marine Resources Research Institute
P.O. Box 12559
Charleston, SC 29412

4. Methods:

Because of the potential for damage to the sanctuary resources, a study site was chosen outside of the sanctuary boundary. During late summer 1982, Georgia Department of Natural Resources (DNR) divers conducted in situ quantitative assessment of selected sponges and octocorals inhabiting a pre-designated area of the study site. Afterwards, the South Carolina Wildlife and Marine Resource Department's research vessel OREGON towed a modified URI roller-rigged fish trawl through the area. Divers made an immediate visual assessment of damage and will return to the same area six months and one year after trawling to assess recovery. An assessment of trawl entrapment will also be conducted.

5. Study Area:

Live bottom near Artificial Reef J (see Fig II-4, p. II-9).

6. Products:

Documentation of the impact to and recovery of live bottom areas in response to roller-rigged trawling. Final Report expected fall, 1983.

D. Continuing or Related Studies:

This study will be conducted in conjunction with ID# ECO-4 "Determination of Faunal Communities Associated with Selected Sponges and Octocorals." Much information on the invertebrate community of Gray's Reef and other live bottom areas exists as a result of the South Atlantic OCS Area Living Marine Resources Study, Years 1 and 2 (SCMRRI & GADNR, 1981). This information will be available for comparison with results of this study. In addition, SCMRRI is assessing the diets of important fish species associated with live bottom areas. Comparison of this data with the faunal composition associated with sponges and octocorals will help evaluate whether repeated trawling may have serious consequences on the stability of fish populations associated with these areas.

III. REMARKS/RECOMMENDATIONS:

It was recommended that this study be conducted outside of the Sanctuary to avoid damage to the sanctuary resources. It was further recommended that the impact of trawling on fish community behavior and distribution be studied (Ross, 1982, pers. comm.).

I. PLAN COMPONENT: SPECIAL PROJECTS AND STUDIES

ID# SPS-3

II. TOPIC: Field Guides to Selected Marine Taxa of the Gray's Reef National Marine Sanctuary

A. Title: A Field Guide to the Fishes in the Vicinity of the Gray's Reef National Marine Sanctuary, Georgia

B. Information Needs and Study Objectives:

A need exists among user groups for a simple illustrated guide to the fishes of the Gray's Reef National Marine Sanctuary. The field guide is to be used by technical and non-technical persons to identify the most common, conspicuous or abundant fish species present on the reef. It will provide basic and introductory information on seasonality and habitat characteristics of the unique ecological community that exists at the reef.

C. Study Description:

1. Status: IN PROGRESS

2. Contract Number: NA-82-AAA-02924

3. Principal Investigator:

Dr. Mathew R. Gilligan, Coordinator
Marine Biology Program
Department of Biology and Life Sciences
School of Sciences and Technology
Savannah State College
Savannah, Georgia 31404

4. Methods:

Existing information on the fishes of Gray's Reef is being compiled. Visual observations of reef fish are being made throughout the year. Some specimens of selected species are being collected for photography and illustration purposes. Where possible, fish are photographed to avoid collecting. Using photographs, live and preserved specimens or existing illustrations, illustrations of selected species for the guide will be prepared. The text will include an introduction, species accounts, natural history information, an index and an annotated bibliography.

D. Continuing or Related Studies:

Two other guidebooks to the major taxa of national marine sanctuaries are being prepared: An Illustrated Guidebook to the Shallow-Water Gammaridean Amphipods of the Looe Key National Marine Sanctuary (Thomas, in prep.); An Illustrated Guidebook to the Shallow-Water Polychaetes of the Looe Key National Marine Sanctuary (Johnson, in prep.).

III. REMARKS/RECOMMENDATIONS:

The need for more information about the marine life of the Sanctuary and for studies to identify the species present on the reef and to characterize the nature of the biotic community was expressed at the Gray's Reef National Marine Sanctuary Management Planning Workshop. The development of a simple field Guide to the identification of the fishes of the Sanctuary will satisfy a need among user groups, provide student training opportunities, and provide preliminary data for continued fish studies of the Sanctuary and other Georgia coastal reef habitats.

APPENDIX D

DRAFT GUIDELINES FOR RESEARCH IN NATIONAL MARINE SANCTUARIES

I. GUIDELINES FOR PREPARING AND SUBMITTING PROPOSALS FOR RESEARCH IN NATIONAL MARINE SANCTUARIES

Types of Research Supported

Management of national marine sanctuaries is based upon information acquired through basic and applied research. The Sanctuary Programs Division (SPD) of the Office of Ocean and Coastal Resource Management in the National Oceanic and Atmospheric Administration (NOAA) provides limited support for outstanding projects which will enhance scientific understanding of sanctuary environments, improve management decisionmaking, or enhance public awareness, understanding or wise use of the sanctuary areas. The SPD considers proposals for support of research in any field of science or resource management. To determine the appropriateness of a project for potential sanctuary support, applicants are encouraged to consult sanctuary management plans, sanctuary regulations, and proposal evaluation criteria (see Guidelines for Evaluating Proposals).

Types of Proposals

The SPD provides limited financial support through grants, contracts, and cooperative agreements. Cost-sharing and coordination with other government agencies, universities and private institutions are encouraged.

The SPD considers proposals from U.S. universities and colleges acting on behalf of their faculty members; nonprofit, nonacademic research institutions (e.g., research laboratories, independent museums, professional societies); private profit organizations; local, state or other Federal government agencies; and unaffiliated scientists who have the capability and facilities needed to perform the work and otherwise meet conditions described in these guidelines.

Proposals for research in national marine sanctuaries fall under one of several categories as defined below:

1. Competitive Proposals

Any procurement for which bids, quotations, or proposals are solicited or requested from several qualified sources for competitive evaluation. Requests for proposals (RFP) and scope of work are published in the Commerce Business Daily.

2. Noncompetitive Proposals

Any procurement for which bids, quotations or proposals are solicited or requested from only one source or for which only one bid, proposal or quotation is received. Noncompetitive proposals are considered when: (1) no other source has the capabilities and/or experiences; (2) efforts to find other firms are unsuccessful; (3) only the one proposed contractor can meet the required delivery schedule; or (4) it would be less than economic if the requirement was not procured by the specified source.

3. Unsolicited Proposals

Any formal written offer to perform a proposed task or effort that is initiated and submitted by a qualified perspective contractor without a solicitation by SPD. SPD encourages the submission of ideas, concepts or suggestions that may help to improve or enhance its mission or activities through unique or innovative methods or approaches.

General Policies

Proposals for research in national marine sanctuaries are evaluated in accordance with stated evaluation criteria (see Guidelines for Evaluating Proposals). All proposals are carefully reviewed by appropriate NOAA and SPD officials, on-site sanctuary officials, and outside experts in the particular field(s) represented by the proposal.

SPD does not normally support open-ended projects, projects with vague goals, projects with untested and unproven methods, or projects that will have adverse impacts on the sanctuary environment. New methods should be field tested and evaluated in small projects before use in major projects supported by SPD in order to ensure a high probability of successful project completion.

SPD will consider providing support for research conducted outside of the sanctuary if the proposed effort is of importance to the sanctuary. When proposals include activities prohibited by sanctuary regulations, it may be determined that all or part of the research should be conducted outside the sanctuary boundary. Sanctuary regulations and Guidelines for Research/Education Permits should be consulted to determine the appropriateness of the research approach considered before a proposal is submitted to SPD. Under special circumstances, activities otherwise prohibited by sanctuary regulations may be permitted under NOAA permit or otherwise conditioned to reduce the threat of harm to the environment.

When research supported by other sources is to be conducted in the sanctuary, SPD and on-site sanctuary personnel should be notified in advance by the principal investigator to help assure that responsible program personnel are aware of all research activities in a particular sanctuary.

Provisions for emergency response and funding in crisis situations that may affect the sanctuary are being considered. During the past, several potential emergency situations have occurred, including oil spills, massive fish kills, apparent epidemics of disease, and boat groundings for which no contingency plan was in place to respond to the crisis and assess its impact in an organized and timely fashion.

Proposal Content

The information contained herein should provide sufficient guidance for the preparation and submission of proposals suitable for evaluation by SPD and qualified reviewers. Proposals should cover the points described below, where applicable, in the order indicated.

1. Cover Sheet. The cover sheet should identify the following, where applicable:

- Announcement or solicitation number and closing date (if any) or identify as unsolicited
- Name of national marine sanctuary where proposed project would be conducted
- Title of proposed project
- Name and address of organization to which the award should be made
- Type of organization
- Name, address and phone number of principal investigator and additional key project representatives
- Requested amount
- Proposed project duration
- Desired start date
- Other funding sources (actual or potential)
- Previous award numbers for renewal or continued support

The title of the proposed research project should be brief, informative and intelligible to the general public. The SPD may edit the title or recommend changes before making an award.

Specification of a desired starting date does not guarantee award by that date (see page D-6). Work on the project should not begin before the effective date designated on the official notification of the award.

A proposal should be cleared through and signed by the organizational official authorized to contractually obligate the organization. The principal investigator is also signatory.

2. Project Summary

A 250-word project summary should include a brief statement of research objectives, scientific methods and significance of the proposed work to a particular sanctuary or to the national marine sanctuary system. The summary should be informative and suitable for use in the public press.

3. Project Description

The main body of the proposal should be concise, but detailed. The project description normally should not exceed 10 single-spaced pages. It should include:

a. Description of Current State of Knowledge

Discuss significant previous work in the area and how the proposed effort will enhance or contribute to improving the state of knowledge.

b. Project Objectives

State the objectives of the study and expected significance. Describe how the anticipated results relate to sanctuary and national information needs and to other works in progress.

c. Methods

Describe the tasks which must be performed to accomplish the objectives described above. Provide adequate description of experimental methods and procedures. Describe the rationale for selecting the proposed methods over any alternative methods. Identify any environmental consequences. Cite references. If approach involves removal or manipulation of sanctuary resources or activities prohibited by sanctuary regulations, a request for a sanctuary permit is required -- see Guidelines to Research/Education Permits. It should be noted that this request may be denied.

List and describe use of equipment to be purchased, leased or rented. List and describe facilities and equipment to be used by principal investigator at no additional cost to the government. Collaborative arrangements and cost-sharing are encouraged and should be documented in the proposal.

4. Research Team

Describe the research team and the assignment of team members to specific tasks. Provide a brief resume of each participant. Include the highest degree, experience and qualifications related to the proposed program. In an appendix, list each investigator's publications during the past 5 years.

5. References

Cite only those used in the text.

6. Budget

The applicant may request funds under any of the categories listed below as long as the item is considered necessary to perform the research. The applicant should provide justification for major items requested.

a. Salaries and wages. Salaries and wages of the principal investigator and other members of the project team constitute direct costs in proportion to the effort devoted to the project. The number of full-time person months or days and the rate of pay (hourly, monthly or annual) should be indicated. Salaries requested must be consistent with the institution's regular practices. The submitting organization may request that salary data remain proprietary information.

b. Fringe Benefits. Fringe benefits (i.e., social security, insurance, retirement) may be treated as direct costs so long as this is consistent with the institution's regular practices.

c. Equipment. Itemize equipment to be purchased, leased or rented by model number and manufacturer, where known. Describe purpose of use. SPD defines equipment as an item of property that has an acquisition cost of \$300 or more and an expected service life of 2 years or more. Equipment becomes the property of SPD at the termination of the contract. Where possible and economically advantageous, equipment should be rented or leased for the duration of the project.

d. Travel. Describe the type and extent of travel and relation to the proposed research. Travel expense should not exceed 40 percent of total direct costs. Funds may be requested for field work and subsistence and for consultant's travel.

e. Other Direct Costs. The budget should itemize other anticipated costs under the following categories:

(1) Materials and Supplies. The budget should indicate in general terms the types of expendable materials and supplies required and with their estimated costs.

(2) Research Vessel or Aircraft Rental. Include unit cost and duration of use.

(3) Laboratory Space Rental. Funds may be requested for use of laboratory space at research establishments away from the grantee institution while conducting studies specifically related to the proposed effort.

(4) Reference Books and Periodicals. Funds may be requested for reference books and periodicals only if they are specifically required for the research project.

(5) Publication and Reproduction Costs. This includes costs of preparing written text and illustrations and publishing results.

(6) Consultant Services. Consultant services should be justified and information furnished on consultant's expertise, primary organizational affiliation, daily compensation rate (not to exceed \$193 per day), and number of days of expected service. (Travel should be listed under travel in the budget).

(7) Computer Services. The cost of computer services, including data analysis and storage, word processing for report preparation and computer-based retrieval of scientific and technical information, may be requested and must be justified.

(8) Subcontracts. Subcontracts must be disclosed in the proposal for approval by SPD.

f. Indirect Costs. Appropriate or established indirect cost rate.

7. Other Sources of Financial Support

List all current, pending, and soon to be submitted research to which the principal investigator or other key personnel have committed their time during the same period as the proposed work, regardless of the source of support. Indicate the number of person-months or percentage of time devoted.

If the proposal submitted to SPD is being submitted to other possible sponsors, list them and describe the extent of support sought. Disclosure of this information will not jeopardize chances for SPD funding.

8. Request for Sanctuary Support Services

SPD has limited on-site sanctuary personnel, facilities and equipment which may be used on loan or lease to support research under special circumstances. Requests should include the following information: (1) type of support requested; (2) justification; (3) dates and duration of use; and (4) alternative plans if support is not available.

9. Coordination with Other Research In Progress or Proposed

Collaborative field work and data interpretation is encouraged. If plans are being made to coordinate aspects of the proposed effort with ongoing or proposed research in the sanctuary, describe the nature and extent of the coordination effort.

Submission of Proposals

Dates for submission of solicited proposals are announced in solicitations in the Commerce Business Daily. Unsolicited research proposals may be submitted at any time but in order to be funded in a particular fiscal year (ending September 30), proposals should be received no later than January 31 of that year. Applicants should allow at least three (3) months for review.

Five (5) copies of the proposal should be submitted to:

Dr. Nancy Foster
Deputy Chief
Sanctuary Programs Division
Office of Ocean and Coastal Resources Management
National Oceanic and Atmospheric Administration
3300 Whitehaven Street, N.W.
Washington, D.C. 20235

II. GUIDELINES FOR PROCESSING AN EVALUATING RESEARCH PROPOSALS

Receipt and Acknowledgement of Proposals

Receipt of research proposals is acknowledged by the Deputy Director of SPD. Proposals are checked for completeness and adherence to the stated guidelines. Complete proposals are recorded and assigned tracking numbers. Incomplete proposals are returned to sender for clarification. NOAA and Department of Commerce criteria and guidelines for consideration of proposals are followed.

Selecting Review Boards for Evaluating Proposals

SPD has assembled a registry of recognized scientists and resource managers who have indicated a willingness, or who have been recommended by their peers, to serve on proposal review boards in their particular fields. After a proposal has been screened, SPD selects a review board of 3 to 10 persons including, but not limited to, inhouse staff, on-site sanctuary personnel, and persons on the registry. Review board members must have a demonstrated understanding of the particular sanctuary and the problem represented by the proposal and a lack of bias to enable performance in a meaningful evaluation.

Criteria for Evaluating Proposals

The criteria presented below are applied to all proposals in a balanced and judicious manner in order to select the most meritorious proposals for support by SPD.

- ° Relevance or Importance of the Research to Sanctuary Management -- this criterion is used to assess the relevance or importance of the research to site-specific, regional, or national marine resource management issues and the likelihood that the research will contribute to improved sanctuary management decisionmaking. Also considered under this criterion is the proposal's demonstrated grasp of the problem (i.e., does the proposal demonstrate a clear understanding of the problem, the total research requirement, the mission of the national marine sanctuary program, the goals and objectives of the site-specific sanctuary, and other integral factors which are germane to achieving the objectives of the proposal?). Also considered here are factors such as the project's uniqueness, innovation, or meritorious approach.
- ° Scientific or Educational Merits of the Research -- this criterion is used to assess the likelihood that the research will contribute to improving scientific understanding of the sanctuary environment, and thus improve management capabilities, or contribute to promoting public awareness, understanding and wise use of the sanctuary environment. The value of the particular contribution is also considered.

- ° Research Quality -- this criterion is used to assess the following:

(1) Qualifications, Capabilities, and Experience of the Principal Investigator and Key Personnel (i.e., experience related to the procedures, methodologies and techniques to be employed; education and experience in the general technical field; and publishing record);

(2) Technical Approach (i.e., the degree to which the offeror states clear objectives, assumptions and possible solutions; the soundness of approach--the degree to which the offeror's proposed methods, techniques and procedures are suited to the program objectives and the affected environment; the degree to which the proposal demonstrates an understanding of those methods, techniques, and procedures; the adequacy in satisfying project requirements and tasks; the probability of success; the degree to which the proposed program scheduling is realistic and comprehensive; the degree to which the offeror demonstrates an understanding of past and on-going research programs; the adequacy to which the offeror will utilize other resources; and the degree to which the proposed technical program plans to integrate, interpret, and synthesize specialized and interdisciplinary data).

(3) Available Support (i.e., facilities, equipment, and degree of support available to the proposed effort at no additional cost to the government; program management support; accountability).

In addition to the criteria listed above, proposals are evaluated to determine:

(1) environmental consequences of conducting or not conducting the research (2) whether or not the research should be conducted in the national marine sanctuary or outside of its boundary; (3) if it is germane to the interests of the National Marine Sanctuary Program; (4) whether or not the material contained in the proposal is already available to the Government from other sources; and (5) if any other local, private, state, or Federal program would have an interest in the proposed project.

During the evaluation period, proposals and any other relevant materials are closely safeguarded. Proposals can only be duplicated by SPD. If additional copies are required for evaluation, they must be obtained from SPD.

Proposal Acceptance and Declination

Review board members will provide final recommendations to NOAA/SPD within 30 working days after receipt of proposals for review. All copies of proposals will be returned to SPD.

SPD is responsible for making the final award decision. Declined proposals are returned. Applicants may request and receive the reasons for the action.

Proposals that are selected for support are forwarded to the NOAA Grants Office for negotiation with the organization to which the award is to be made. SPD recommends any special award conditions at that time. The award is signed by the NOAA Grants Officer and sent to the organization and principal investigator for acceptance. The award period begins on the day of acceptance by the organization unless otherwise stated in the award. A signed copy of the award is returned to NOAA.

III. GUIDELINES FOR REQUESTS FOR SANCTUARY PERMITS

Introduction

Permits may be issued by the Assistant Administrator for National Ocean Service or his or her designee under special circumstances for activities otherwise prohibited by sanctuary regulations when related to (1) research to enhance scientific understanding of the sanctuary environment or to improve management decisionmaking; (2) education to further public awareness, understanding, and wise use of the sanctuary environment; or (3) salvage and recovery operations. Requests for permits are carefully reviewed by SPD program officials, on-site sanctuary officials, and outside experts where necessary. A person in possession of a valid permit must abide by all provisions set forth in the permit and sanctuary regulations.

Application for a Permit

1. Title Page. This includes (1) name of the national marine sanctuary in which the proposed activity will take place; (2) title of project; (3) name, address, telephone number, and affiliation of applicant; (4) name, affiliation, and relationship of colleagues to be covered by the permit; (5) dates of proposed work; (6) key words; and (7) signature of applicant on letterhead stationary.

2. Abstract. This includes a clear and concise description of the proposed effort in approximately 250 words. The abstract should include a brief statement of research objectives, scientific methods and significance of the proposed work to a particular sanctuary or to the national marine sanctuary system. The abstract should be informative and suitable for use in the public press.

3. Technical Information. This includes clear, concise and complete statements of the following:

a. Need. Establish need. Discuss significant previous work in the area of interest and how the proposed effort will enhance or contribute to improving the state of knowledge. Explain why the proposed effort should be performed in the sanctuary and the potential benefits of the proposed effort to: (1) further scientific understanding of the sanctuary environment; (2) improve management decisionmaking; (3) further the

educational value of the sanctuary; or (4) aid in necessary salvage or recovery operations.

b. Objectives. State the objectives of the study and expected significance. Describe how the anticipated results relate to sanctuary or national information needs and to other works in progress.

c. Methods. Describe what is to be studied, measured, observed, collected, assessed, modified, and/or constructed. Describe prime apparatus, equipment, systems, and approach to be used. State how each will be used and the rationale of selecting proposed approach over alternative methods. Indicate the type and quantity of collections to be made. Indicate whether these collections could be made outside of the sanctuary.

d. Study Location. Provide a map and indicate study location. Describe habitat areas of particular concern. Indicate where the laboratory procedures will be conducted, if applicable.

e. Project Team. Describe the research team composition and the assignment of team members to specific tasks. Note that only those persons specifically listed on the permit will be allowed to participate in permitted activities.

f. Environmental Consequences. Indicate the environmental consequences of conducting an otherwise prohibited activity.

g. Treatment of Results. Describe the nature and extent of anticipated results. Indicate how the results will be treated (e.g., published in a reference journal, incorporated into academic curriculum, used in management decisionmaking, published in the public press). If specimens are to be collected, indicate where they will be deposited (e.g., in a museum, sanctuary repository, herbarium, etc). Note that NOAA/SPD reserves the right to designate repositories for specimens removed from national marine sanctuaries.

4. Supporting Information

a. Financial Support. Provide contact number, performance period, and name of sponsoring agency.

b. Sanctuary Support Services. Personnel and facilities at most sanctuary sites are extremely limited. However, depending on need and availability of sanctuary support services (i.e., personnel, boats, or equipment), some support may be provided. Requests for support should accompany the permit application and include the following information: (1) type of support requested; (2) justification; (3) dates and length of use; and (4) alternative plans if support is not available.

c. Coordination with Studies in Progress. SPD encourages coordination and cost-sharing among investigators to enhance scientific capabilities and avoid unnecessary duplication of effort. Applications should include a description of these efforts, if applicable.

Submission of Requests for Permits

Requests for permits should be submitted in five (5) duplicate copies at least three (3) months in advance of the effective date requested to allow sufficient time for evaluation and processing. In proven emergency situations, exceptions to this requirement may be considered.

Requests for permits should be addressed as follows:

Assistant Administrator for National Ocean Service
ATT: Sanctuary Programs Division
Office of Ocean and Coastal Resources Management
3300 Whitehaven St., N.W.
Washington, D.C. 20235

Requests for Amendments to Active Permits

Requests for extension of permit period, change in study design or other form of amendment to active permits should also conform to these guidelines. All pertinent information needed to make an objective evaluation of the amendment should be included in the request. The applicant may reference the original application in his or her request. Unless otherwise indicated, the terms of the original permit will remain in effect.

Evaluation of Permit Requests

Permit requests are checked for completeness and adherence to these guidelines. Complete requests are forwarded to the appropriate NOAA/SPD program officials, on-site sanctuary personnel, and outside experts, where necessary, for review and evaluation. Requests are judged on the basis of (1) relevance or importance to fulfilling sanctuary goals and objectives; (2) scientific or educational merits; (3) appropriateness and environmental consequences of technical approach; (4) experience and expertise of applicant and team members; (5) proposed treatment of results; and (6) whether the proposed effort could or should be conducted outside of the sanctuary. Reviewers are requested to provide their recommendations within 30 working days after receipt of the application.

Conditions of Permits

Based on the findings of the evaluation, SPD recommends an appropriate action to the Assistant Administrator. If denied, applicants are notified of the reason for denial. If approved, the Assistant Administrator signs and issues the permit. The applicant must counter-sign the permit and return a copy to SPD.

As instructed in the permit, Permit holders must contact on-site sanctuary personnel prior to conducting permitted activities in the sanctuary. NOAA/SPD Research Flag will be issued to the permit holder. The flag must be displayed by the permit holder while conducting the permitted activity and returned to on-site personnel upon completion of the permitted activity. This requirement not only assures that sanctuary personnel are aware of permitted activities, but also alerts other sanctuary users that research is in progress.

Permits must be carried on the research vessel and made available upon request for inspection by sanctuary personnel or law enforcement officials.

Only persons specifically listed as colleagues on the permit may participate in permitted activities. Permits and NOAA/SPD flags are non-transferrable.

Permitted activities must be conducted with adequate safeguards for the environment. Insofar as possible, the environment shall be returned to the condition which existed before the activity occurred.

Permitted activities will be monitored to ensure compliance with the conditions of the permit.

Any information obtained pursuant to the permitted activity shall be made available to the public. Submission of one or more reports to SPD on the permitted activity may be required.

The Assistant Administrator may amend, suspend, or revoke a permit granted pursuant to these guidelines and sanctuary regulations, in whole or in part, temporarily or indefinitely, if in his/her view the permit holder(s) acted in violation of the terms of the permit or of applicable sanctuary regulations, or for any good cause shown. Any such action shall be communicated in writing to the permit holder, and shall set forth the reason for the action taken. The permit holder in relation to whom the action is taken may appeal the action as provided for in sanctuary regulations.

Monitoring of Performance

NOAA/SPD and on-site sanctuary personnel have established a recording and tracking system for sanctuary permits. Officials review performance in relation to the conditions of the permit and may also periodically assess work in progress by visiting the study location and observing any activity permitted by the permit or by reviewing any required oral or written progress reports. The discovery of any potential irregularities in performance under the permit shall be promptly reported and appropriate action taken. Permitted activities will be evaluated and the findings will be used to evaluate future applications.