Looe Key
National Marine Sanctuary
Management Plan

U.S. Department of Commerce
National Oceanic and
Atmospheric Administration
Sanctuary Programs Division

Looe Key

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Sanctuary Programs Division

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Looe Key

formation through brochures and posters to visitors and increasing awareness of Sanctuary regulations through enforcement contacts.

The interpretive and research components of this Plan include a detailed description of other activities planned for the Sanctuary over the next five years. On-site activities identified for Phase I include:

- Install National Marine Sanctuary standard boundary and core area markers;
- Determine the feasibility of adding a Sanctuary sign and radar reflector to the navigational marker;
- Install National Marine Sanctuary standard mooring buoys;
- Develop and carry out an enforcement training program;
- Implement measures to increase the program identity of interpretive, surveillance, and enforcement staff;
- Evaluate existing contingency plan and capabilities for responding to emergencies on the reef;
- Undertake a comprehensive baseline resource mapping study;
- Design and implement a biophysical monitoring system; and
- Collaborate with dive boat operators and other Sanctuary user groups to initiate on-site interpretation focussed on understanding of the reef system and its proper use.

During Phase I, a limited number of activities will also proceed on the mainland. These will improve operations and provide visitors who do not go out to the reef an opportunity to learn about and appreciate the unique resources at Looe Key.

The Sanctuary Manager's office is now located at Bahia Honda, the current operating base for the Looe Key National Marine Sanctuary. During Phase 1, this base may expand, depending on available funding, to accommodate more offices and provide space for information and interpretive services. The collaboration of the Department of Natural Resources will be sought in determining improvements to the temporary headquarters to comply with the standards of the area.

The detailed aspects of off-site activities for Phase I are found in Section 3 of this Plan and are likely to include:

- ☐ Establish a temporary Sanctuary Headquarters at Bahia Honda State Recreation Area;
- ☐ Install an out-door interpretive exhibit at Bahia Honda; and
- ☐ Determine the need for land-based signage, and install where appropriate.

In the last three years of the five-year plan (Phase 2), a careful review of the effectiveness of this management framework will take place in light of: (1) the experience gained in actual management of this and other Sanctuaries and (2) the priority given Looe Key's program with respect to the National Marine Sanctuary Program. Services and programs will continue to be based on the objectives and general guidelines presented in this Plan, but adapted and scaled to the evaluation results. Guidelines for program management are presented under four recurring functions: resource management, recreation management, research, and interpretation. A fifth function, administration, is an aspect that oversees all other functions since it establishes who is responsible for implementing the specific programs.

Coordination and cooperation with other agencies will be essential to the successful management of Looe Key. In addition to the Sanctuary Programs Division and the Sanctuary Manager, the Florida Department of Natural Resources and regional interests will be key participants in implementing this Plan.

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The Essence of Looe Key: A National Marine Sanctuary

In the darkness of early morning on February 5, 1744 the *HMS Looe* foundered in heavy seas off the Florida Keys. Miraculously, some 280 sailors survived. At sunrise they were stranded upon the very reef that had destroyed their ship. Today, little of the wreck of the *Looe* remains as testimony to that frightful night, but the adventurous saga lives on and a coral reef by the name of Looe Key preserves the memory. In 1981 the American government recognized Looe Key as a national marine sanctuary. A commitment to the long-term, thoughtful management of the Sanctuary comes with this designation.

A living coral reef and its associated life-forms represents one of the most beautiful and diverse of all communities. Protection and management of such an intricate environment are not simple tasks. Certainly, they require detailed knowledge of the structure of the community, its survival, succesession, and ability to withstand disturbance. And a great deal is yet to be learned. Protective measures for the Looe Key National Marine Sanctuary will be applied cautiously, and the learning process will accelerate through further research. As the secrets of this reef are revealed, not only will scientists and the Sanctuary Manager benefit, but the experiences of all who visit will be enhanced.

Once interpretive programs are established, the Sanctuary's staff will convey the wonders of Looe Key to visitors. A visitor center located on a nearby Key will serve those who come by automobile. Displays and electronic media will provide the sights, sounds, and feelings of the reef to those who sojourn briefly at the visitor center only. The visitor's images, impressions, and perceptions will form a distinctly personal experience. Divers will encounter the reef most intimately, accompanied only by the metallic echoes of their breath. Cradled on the surface, snorkelers will witness through transparent water, the silent beauty below.

How surprising it would be to Captain Utting and the crew of the *HMS Looe* that this reef would be considered not a dreadful threat, but a precious resource! What would they think of today's small synthetic ships delivering a cargo of strangely clad snorkelers and divers, not to fear the reef, but to enjoy it? The story of their reef has waited over two centuries for the second chapter to be written. Few tales beginning with a tempest, a shipwreck, and survival at sea can maintain an exciting pace. The story of Looe Key is an exception: the true excitement lies ahead.

One

A Management Plan
for Loon Key

SECTION 1

A Management Plan for Looe Key

1. INTRODUCTION

In accordance with Title III of the Marine Protection, Research and Sanctuaries Act, Looe Key was formally designated as a national marine sanctuary in 1981. Looe Key represents an area of 5.32 square nautical miles within federal waters of the Florida Reef Tract (Figure 1). Life forms, including spectacular coral formations, represent six ecological zones typical of the Florida Reef Tract. Several rare species of coral occur in the Sanctuary and the endangered Kemp's ridley turtle is an occasional visitor. The beauty of the coral growth and the diversity of finfish and invertebrates that inhabit the reef attract many divers and snorkelers. Sport and commercial fishing throughout the Sanctuary and commercial taking of lobsters outside the Fore Reef area are traditional uses of the Sanctuary.

The draft objectives and recommendations set out in the Final Environmental Impact Statement (Department of Commerce, 1980) have guided the Sanctuary through its initial years until this more comprehensive and forward-looking strategy could be developed. This plan will direct development of the Sanctuary's programs and management practices for the next two to five years.

It provides a framework for managing resource protection, visitor services and facilities, interpretation, research, and administration.

Only information considered essential to such management is presented here and scientific information has been interpreted and analyzed for its management implications. The plan thus provides the Sanctuary's managers with a clear, agreed-upon image of what Looe Key National Marine Sanctuary is to become. The Sanctuary Programs Division (SPD), National Oceanic and Atmospheric Administration (NOAA), the Sanctuary Manager and staff, and the Florida Department of Natural Resources (DNR) are key participants in this management.

Variable funding for staff and program development, changing personnel, and unforeseeable factors may affect specific aspects of the Sanctuary programs. While the overall goals and management objectives will remain unchanged, the timing for the installation of facilities and the quality of those facilities will depend on such variables.

2. SANCTUARY GOALS AND MANAGEMENT OBJECTIVES

Preliminary goals and management objectives for the Sanctuary appeared in the Final Environmental Impact Statement (Department of Commerce, 1980). These have been updated and refined during preparation of this management plan. Four main goals provide the basis for developing a long-term strategy for the Sanctuary's programs, services, and facilities. The goals relate to resource protection, visitor use, interpretation, and research. Detailed management objectives direct specific actions towards achieving the Sanctuary's goals within a five-year plan.

(a) Resource Protection

The overall goal is to protect the marine environment and resources of the Sanctuary, the highest priority for Sanctuary management.

Specific management objectives are:

- ☐ Develop the means to manage the impacts of Sanctuary visitors;
- ☐ Develop contingency and action plans for responding to threats to the Sanctuary;
- ☐ Promote voluntary user compliance with regulations through an educational program stressing resource sensitivity and wise use; and
- ☐ Review the effectiveness of Sanctuary regulations and promulgate revised regulations as needed to protect the Sanctuary.

(b) Visitor Management

The Sanctuary goal for visitor management is to encourage recreational use that is compatible with Sanctuary resources, commercial uses, and research purposes.

Specific management objectives are:

- ☐ Improve public awareness of compatible recreational opportunities within the Sanctuary;
- ☐ Increase opportunities for a wider variety of users to enjoy and appreciate the Sanctuary;
- ☐ Improve visitor safety within the Sanctuary; and
- ☐ Direct visitors to varied areas of the Sanctuary thereby lessening impacts on any one resource management unit.

(c) Interpretive Management

Interpretation should increase public awareness of the resources and significance of the Sanctuary. Specific management objectives are:

- [ ] Direct and orient visitors to the Sanctuary and its services;
- [ ] Increase public understanding of marine issues related to and affecting the Sanctuary;
- [ ] Develop public appreciation of the need for Sanctuary management and resource conservation; and
- [ ] Promote public understanding and appreciation of the marine processes and significant features represented in the Sanctuary.

(d) Research Management

The goal for Sanctuary research programs is to direct research activities towards increased understanding of the Sanctuary and apply that research to resolving management issues. Such research programs should identify and recommend projects of very high priority for immediate implementation. The knowledge gained through this research will help implement other programs such as interpretation, visitor management, and resource protection.

The Sanctuary research program seeks to achieve this goal by meeting the following management objectives:

- [ ] Establish a framework for a research program that is primarily directed toward effective management of Sanctuary resources;
- [ ] Identify those projects for the Sanctuary that should be given the highest priority for early implementation; and
- ☐ Make effective use of research results by incorporating them into information and interpretation programs.

Figure 1

The Sanctuary

Approximate Sanctuary Boundary

TWO

Looe Key:
The Setting for a
National Marine
Sanctuary

SECTION 2

Looe Key: The Setting for a National Marine Sanctuary

1. THE REGIONAL CONTEXT

(a) Sanctuary Location

Looe Key National Marine Sanctuary lies approximately six nautical miles from Big Pine Key, the nearest land mass. The reef is located in the Florida Keys about 129 miles from Miami and 30 miles from Key West (Figure 2). Its boundaries, currently unmarked by navigational aids, form the shape of a parallelogram. At this time an upright, triangular, steel marker in a shallow portion of the reef represents the single identifiable surface structure in the Sanctuary. During 1983, NOAA marker buoys (SPD and DNR Co-operative Agreement CZ 125) will be installed for both the Sanctuary boundary and that of the Fore Reef.

(b) Access to the Sanctuary

No single land-base facility serves as a primary launching point for the Sanctuary. Rather, a variety of boat launches associated with recreation areas and commercial facilities serve visitors going to the Sanctuary (Figure 3). Most visitors depart from points between Marathon and Sugarloaf Key for the shortest and least expensive access. Under calm sea conditions, the boat trip to Looe Key from Bahia Honda State Recreation Area takes about forty minutes. Other visitors reach the Sanctuary directly by boat along the Intercoastal Waterway.

(c) Existing Public Facilities

Many areas in the Keys are protected as parks or reserves. Programs for these areas vary in their emphasis on interpretation and marine conservation (Figure 4).

For example, Key Largo National Marine Sanctuary and John Pennekamp Coral Reef State Park maintain well-established programs in marine protection, interpretation, and recreation. Biscayne National Park, an outstanding reef and marine complex of 104,036 acres (42,120 hectares), provides visitors with a well-managed recreation and interpretive service. Fort Jefferson National Monument, located in the Dry Tortugas some 70 miles (112 kilometers) west of Key West, includes the surrounding waters and islands managed by the National Park Service. Visitors arriving by both air and sea enjoy the warm waters and abundant sea life associated with the shallow coral reefs.

The land areas of Key Deer, Great White Heron, and Key West National Wildlife Refuges are managed by the U.S. Fish and Wildlife Service. The National Marine Fisheries Service administers the larger marine components of these refuges (Kosin, 1982: pers. comm.).

The most important public facility providing boat access to Looe Key is Bahia Honda State Recreation Area. In addition to the usual land-based recreation facilities, a general concession provides services to boaters, divers, and snorkelers near the boat-launching ramp. The Sanctuary Manager's temporary office is also located beside the marina.

(d) Existing Commercial Recreation Facilities

Throughout the Keys numerous commercial businesses offer a variety of services and facilities for marine recreation (Figure 5). Visitors can therefore participate in sport fishing, snorkeling, SCUBA diving, and boat touring. Twelve dive-boat operators are immediately accessible to the Sanctuary and most offer daily trips there. These operators are stationed on the Overseas Highway from Marathon to Big Pine Key.

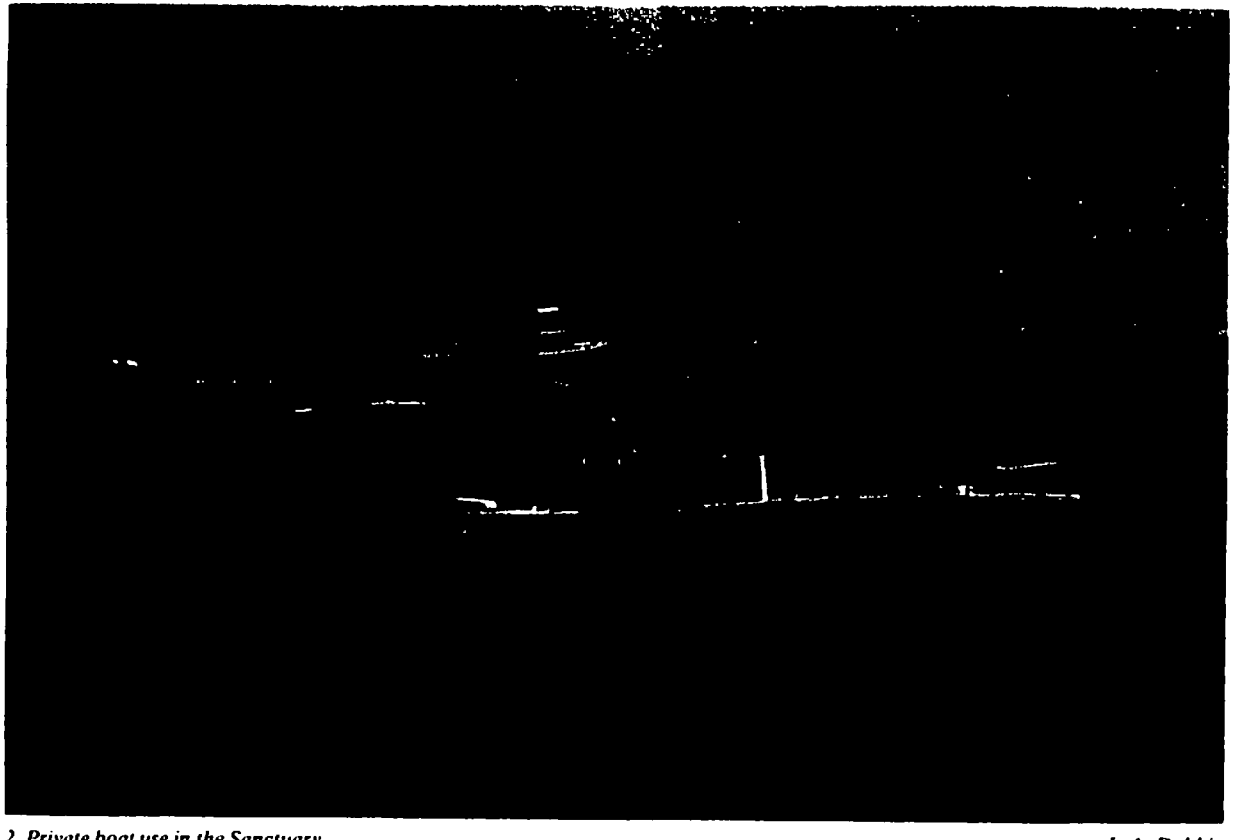
2. EXISTING AND POTENTIAL USERS

Over one million out-of-state tourists travel to the Florida Keys each year, most participating in a variety of water-based activities. Most visitors arrive in the Keys during the winter months from December through April. However, Looe Key accommodates the majority of its visitors during the summer months when the lower humidity, higher water temperatures, and calmer waters provide the best diving and snorkeling conditions.

(a) Recreational Use

By far the greatest use of Looe Key is and will continue to be by recreationists. In the Sanctuary the most frequent recreational activities are diving, snorkeling, fishing, and pleasure boating.

The Florida Keys are an established destination of national significance for divers and those interested in snorkeling or observing and photographing marine life. A total of 1,424 respondents to a national survey conducted by *Skin Diver* magazine (Leslie A. Riffkin & Associates, Inc.,



2. Private boat use in the Sanctuary *J. A. Dobbin*

1979) for underwater recreationists concluded that:

- 38.8% took one or more out-of-state trips for underwater activity during the previous 12 months;
- of those, 35.6% travelled to the Florida Keys; this represents a significantly higher percentage than any other underwater activity destination in the U.S.; and
- 48.1% of the respondents identified reef exploration as a special interest.

General recreational use of the Sanctuary has been increasing since its designation. This trend is consistent with that of nearby Bahia Honda State Recreation Area which experienced a 20% increase in use from 1978 to 1979 (Department of Commerce, 1980). As Bahia Honda is increasingly recognized as a public access point to Looe Key, shifts there to greater participation in marine-oriented uses will undoubtedly occur.

No systematic surveys of recreational visits to Looe Key have been undertaken to date. However, observations by researchers, DNR Park Rangers, and dive boat operators are helpful in developing a general understanding of recreational use.

Rangers patrolled Looe Key from March 17, 1982 to March 10, 1983 and they kept a "Daily Boat Patrol Log" indicating the number of boats, divers, fishermen, crawfishermen as well as records for arrests and warnings (DNR, unpublished data). While the statistics and format of the log do not provide a reliable basis for calculating Sanctuary use, an estimate of peak use can be made on an ideal summer holiday weekend. On the July 4, 1982 holiday weekend, during a 5-hour patrol under ideal weather conditions, 68 boats were observed with 198 divers and 18 fishermen, all within the Core Area (Sanctuary Fore Reef area).

Novice snorkelers form an increasing proportion of those participating in organized tours. For them, one of the special attractions of Looe Key is its shallow Reef Flat. Its triangular edges form a protected lagoon that snorkelers can use even when rough seas prevail along the Fore Reef.

Hook and line fishing occurs mainly along the Fore Reef and in the southwest corner of the Sanctuary. Hook and line sport fishermen consider the ban on spear-fishing to have increased their success.

Another important visitor to consider is the one who cannot visit the reef to view its beauty firsthand. These people, including the elderly, the

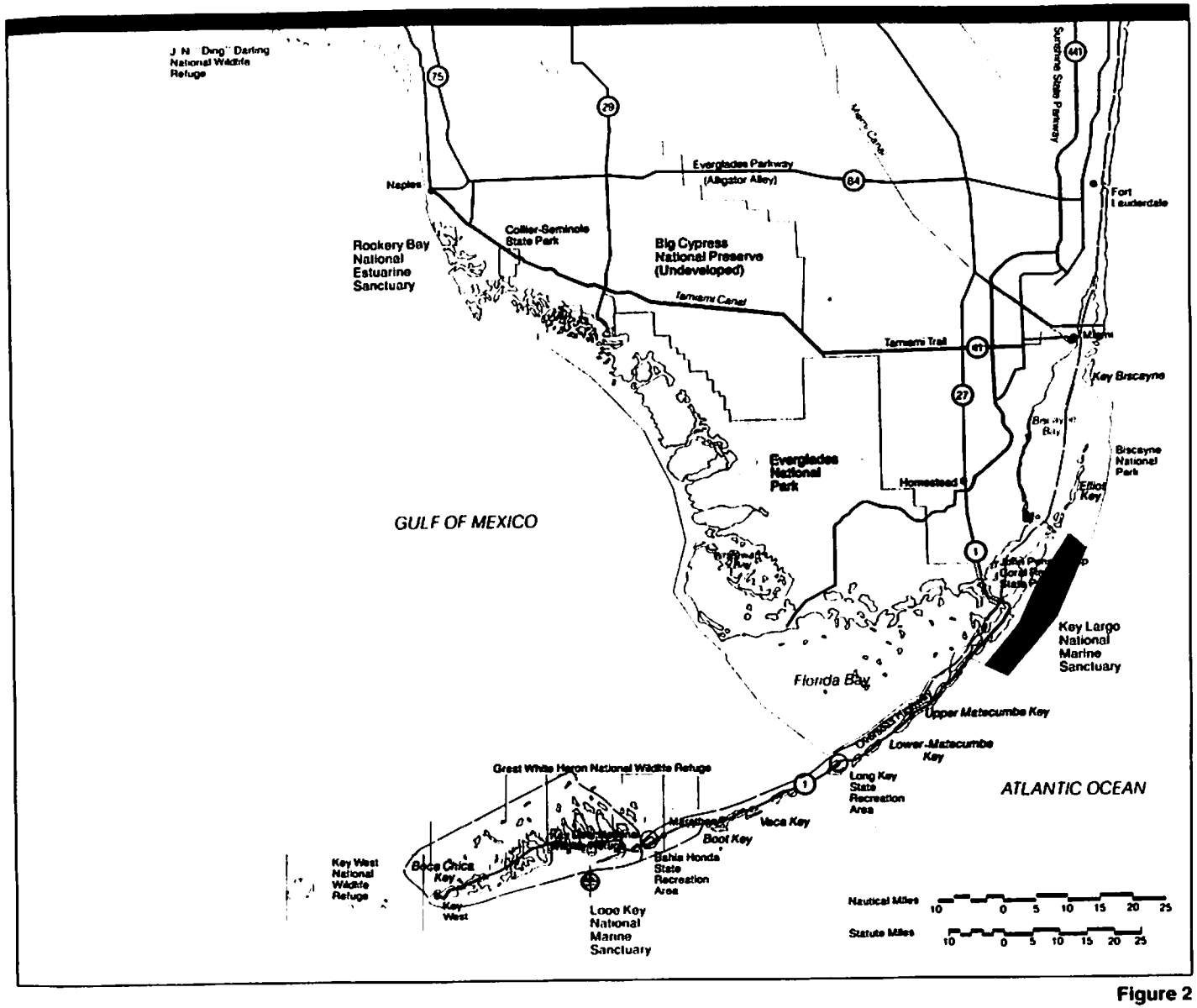


Figure 2

Regional Context

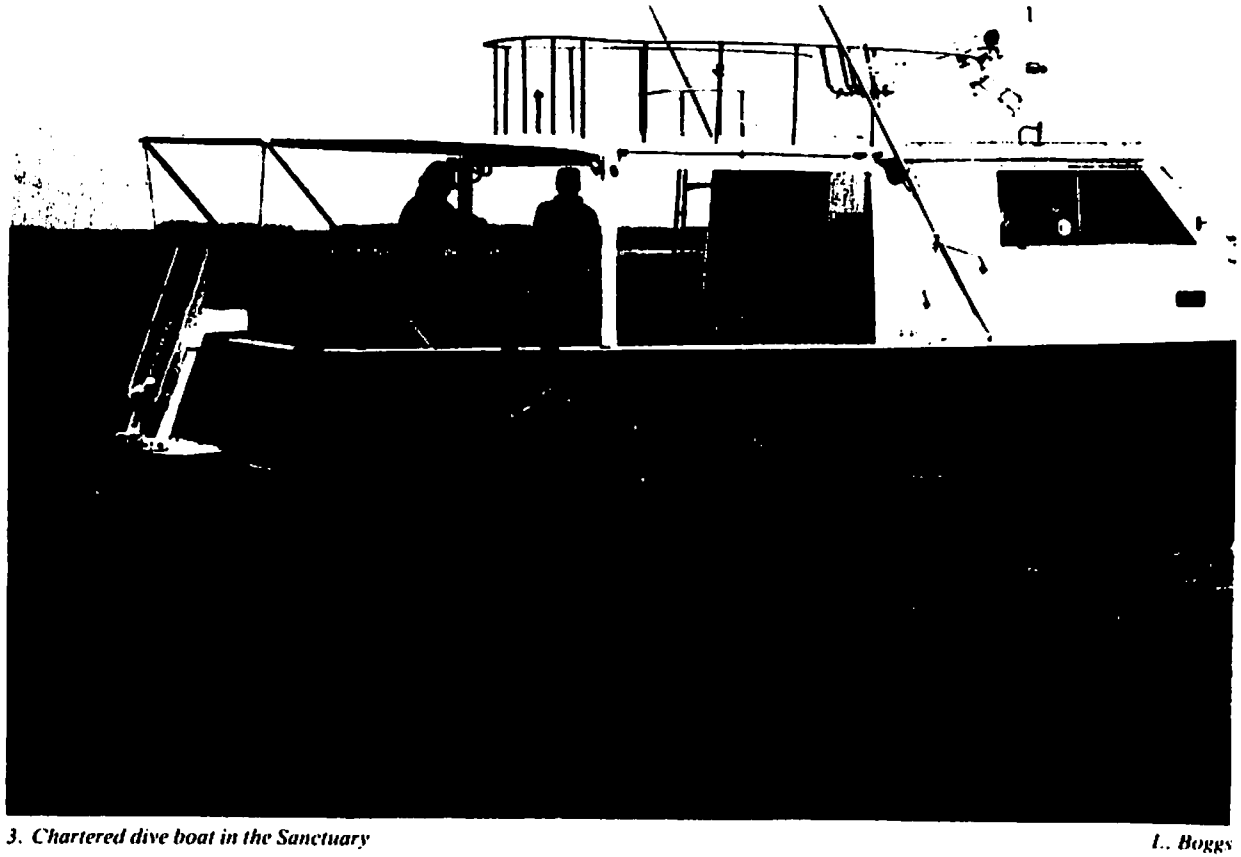
- Looe Key National Marine Sanctuary
- National and State Parks
- National Wildlife Refuge
- Key Largo National Marine Sanctuary
- Rookery Bay National Estuarine Sanctuary
- Intercoastal Waterway

handicapped, parents with young children, and children themselves may consitute the largest group interested in the Sanctuary. Interpretive programs must therefore consider carefully this group of vicarious users. (See Interpretive Management.)

As more people learn of Looe Key's existence and opportunities, visiting will increase. Monitoring of visitor use levels and activities will be a vital mandate for a responsive management program. Since visitors will tend to congregate in a relatively small part of the Sanctuary (the Fore Reef which offers the best diving conditions), the Manager must ensure that neither the reef nor the visitor experience is adversely affected by overuse.

(b) Economic Value of Recreational Uses

Increasing interest in underwater activities at Looe Key has brought on substantial benefits to the local regional economy. The greater numbers of visitors using the area in recent years have resulted in increased revenues to the charter dive boat businesses and to other local operations supporting private boaters, divers, and sport fishermen. At the time of the Final Environmental Impact Assessment, the total value to the local economy in 1978 of tourist-related activities associated with, or stimulated by, Looe Key may have exceeded $1.5 million (Department of Commerce, 1980). Demand for charter services, accommodation, food, purchases of compressed air, and rentals of diving equipment continue to contribute to local businesses.



3. Chartered dive boat in the Sanctuary *L. Boggs*

(c) Research and Educational Use

Looe Key's natural diversity and its isolation from other reef populations have attracted researchers for several decades. In 1977 and 1978 the Florida Reef Foundation completed the first comprehensive resource inventory (Antonius et al, 1978). Research funded by the National Marine Sanctuaries program since designation has been directed mainly to projects that identify species and the relationships among species. This preliminary work has provided the basis for describing Sanctuary resources in the sections that follow.

This description will be updated once a detailed resource mapping study that is currently underway and other baseline studies are completed. A listing of research projects, researchers, and papers

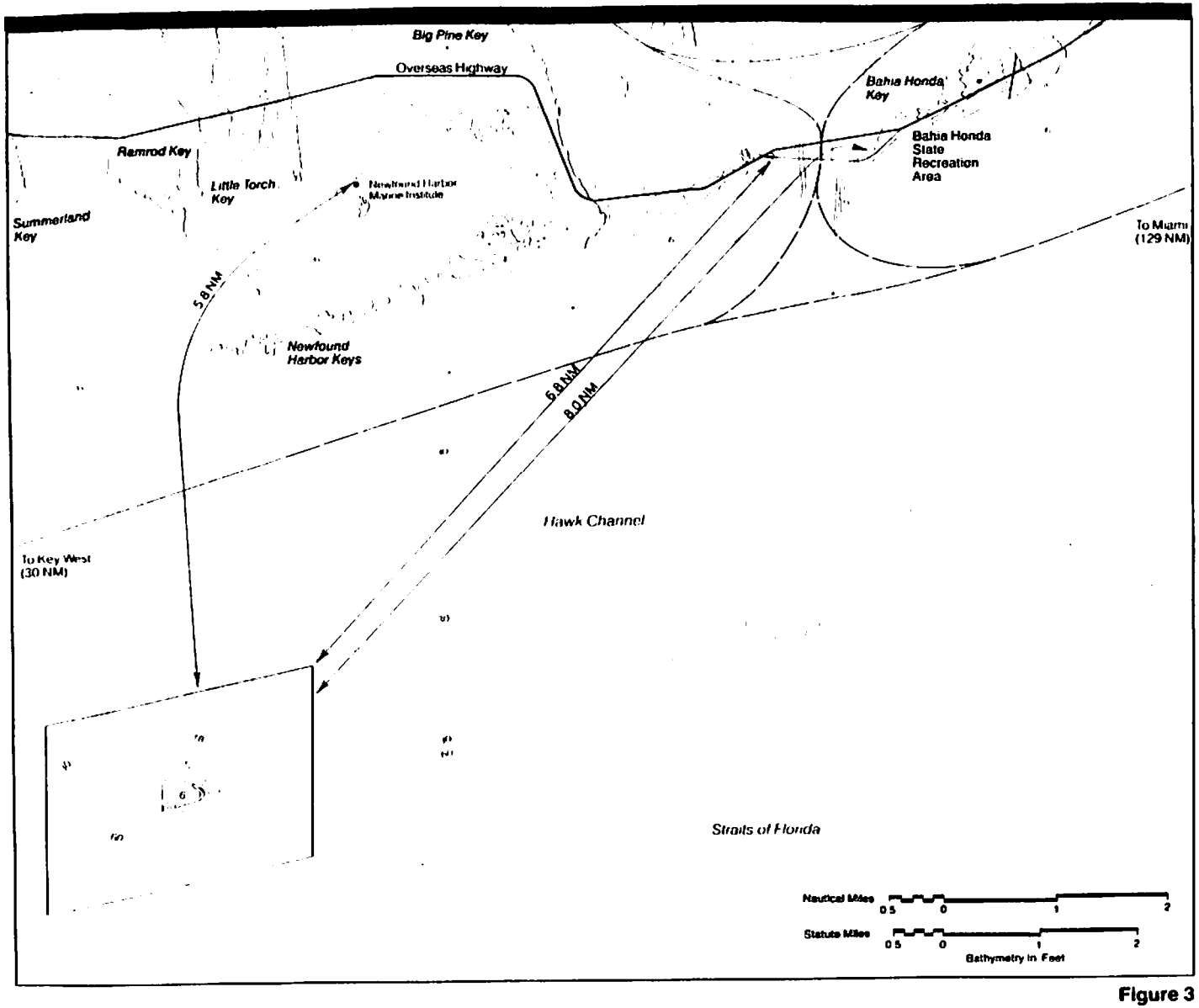


Figure 3

Local Access

- Approximate Sanctuary Area
- Approximate Core Area
- Intercoastal Waterway
- Overseas Highway
- Distance from Selected Mainland Points

published is included in Appendix 3 of this plan.

Research on coral reefs within American waters by U.S. university scientists will likely increase as an effort to avoid the escalating costs of foreign travel with study elsewhere. Looe Key's ecological significance makes it a suitable candidate for further research.

The Newfound Harbour Marine Institute on Big Pine Key currently makes educational use of the Sanctuary. Seacamp, a part of the Institute, offers a variety of educational programs to students from the fourth grade through graduate school. Between 5,000 and 6,000 persons participated in the 3-to 30-day programs in 1978 (Department of Commerce, 1980).

3. SANCTUARY RESOURCES

(a) The Environmental Context

The major processes that determine the location, form, and community structure of Looe Key appear under the headings of geological history, currents, climate and weather.

In the continental United States, barrier reefs occur only adjacent to the southeastern coast of Florida. Florida's reefs are considered particularly fragile because they occur at the northernmost range for sustained coral reef growth and hence are subject to natural environmental conditions that can be stressful to such areas. Since the reefs are adjacent to one of the nation's most populous coastal areas, they are also subject to a wide range of human-induced stresses such as pollution, siltation, and damage resulting from careless diving and boating practices.

Geological History and Processes

The literature reports preliminary studies on the geology and origin of Looe Key (Shinn et al.,1981). A brief geological history is presented here according to Shinn.

Growth of the existing shallow fore reef coral formations began about 6,500 years ago, but ended 800 years ago. A rise in the Pleistocene shelf provided a platform for coral growth. Elkhorn coral, a thickly branched, fast growing species was the primary spur builder and predominated in the active, clear water conditions of the outer reef.

Looe Key exhibits features representing two distinct geological origins. The older deeper reef developed on a former shoreline and exhibits spurs and grooves that are closely spaced and probably originated through erosion of bedrock. In contrast, the shallow active coral reef may not have originated in bedrock topography (Shinn et al., 1981).

Rising sea levels during recent geologic history have significantly influenced the structure of present day Looe Key. Coral growth has varied in its ability to keep pace with this rise. Studies suggest that the Deep Reef and steep drop-off area were drowned by rising sea levels. This occurred much too rapidly for the shallow water corals to grow and keep pace with the rising sea level. As a result, elkhorn coral is virtually absent on most parts of the spurs today. The corals presently inhabiting the deep water zones are young and highly diverse, but are slow growing, deeper water replacements.

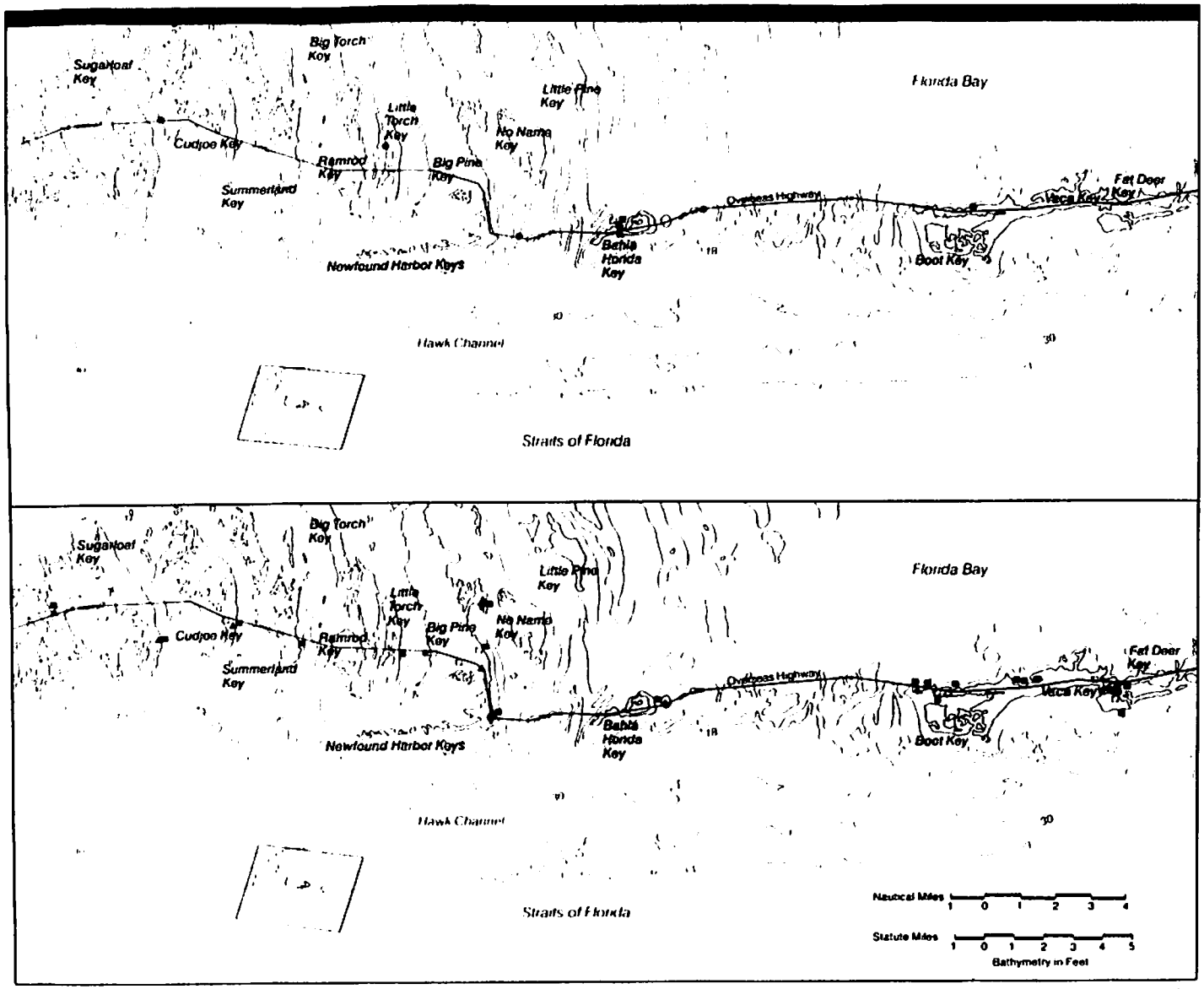
The last two hundred years have witnessed other dramatic changes. Formerly, a small sand island rose several feet above the sea. Today, remnants of this island are barely awash during low tides. In time, strong winds, waves, and possibly hurricanes may cause sand to gradually move westward to encroach upon the deeper portions of the reef.

Currents

The Florida Current, flowing easterly through the Straits of Florida, provides a steady flow of warm, clear water required for optimal coral growth. Driven by the clockwise circulation of the Gulf of Mexico, the Florida Current meanders through the relatively deep, narrow passage of the Strait before turning northwards to form the Gulf Stream. Local variations in the location and direction of the main axis of the current are not well understood. It can move offshore as well as remain quite close to the edge of the Reef Tract.

Weaker current systems occur within Hawk Channel to the north of the Sanctuary. Both tidal effects and a counter-current are considered important in this shallow nearshore zone although these processes are not as yet well studied. Water clarity tends to be poor in comparison with Florida Current waters because of algae blooms and sediments stirred up or suspended in the nearshore areas.

A significant determinant of coral distribution in the Middle Keys is exposure to Florida Bay



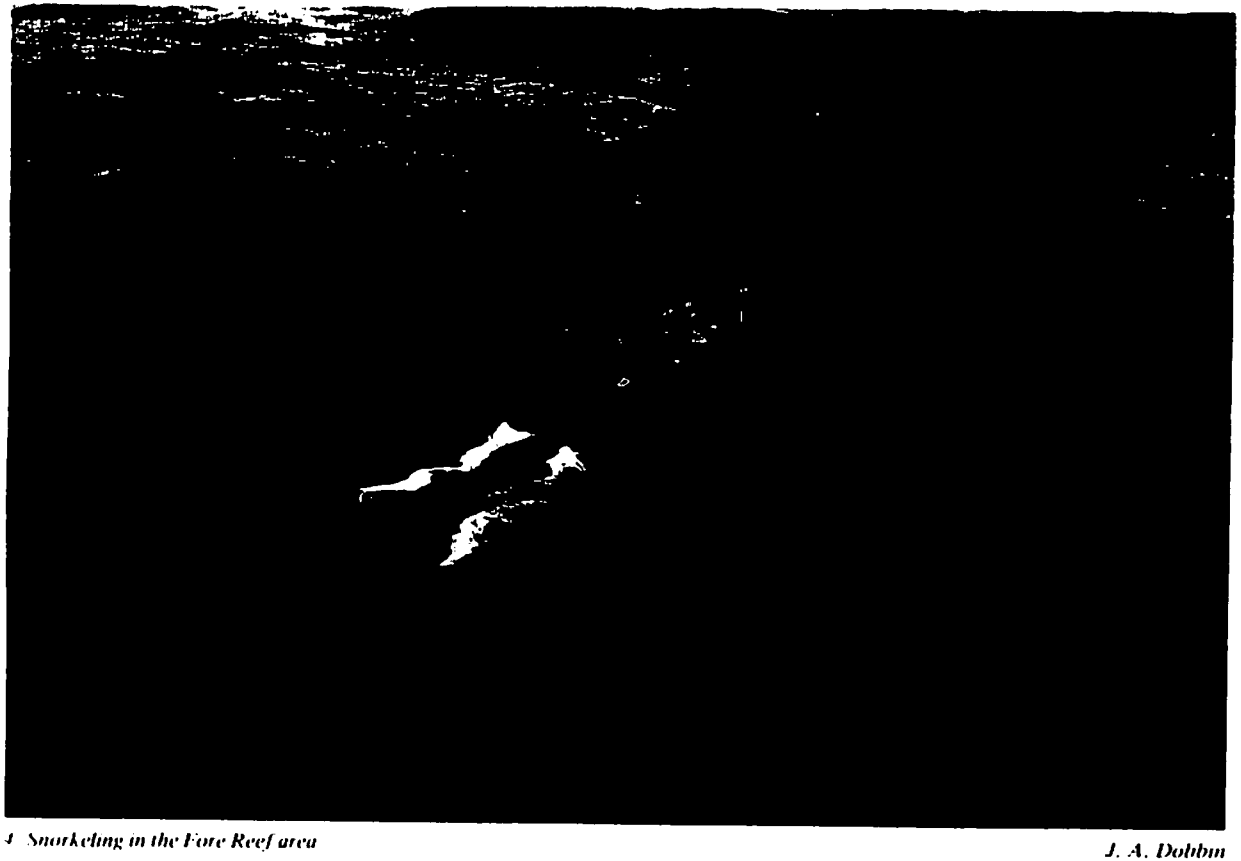
Figures 4 and 5

Existing Public Facilities

- Approximate Sanctuary Boundary
- Dive Shop and/or Tour Operator
- Marina
- Boat Launch
- Campground

Existing Commercial Recreation Facilities

- Approximate Sanctuary Boundary
- Dive Shop and/or Tour Operator
- Marina
- Campground
- Fishing Camp



4 Snorkeling in the Fore Reef area

J. A. Dobbin

waters. Numerous inlets and passages through islands to the east of Looe Key allow waters of Florida Bay to flow out onto the shelf and across coral reefs. The unfavorable salinity, temperature, and turbidity regimes of such waters expose the reefs to potentially stressful conditions. Looe Key appears to have been protected from the effects of these intrusions by its local current regime and the Big Pine Key land mass, while reef areas to the east have occasionally been subject to stress and perhaps widespread kills.

Climate and Weather

Summer weather conditions (from May to September) are close to optimal for reef building corals and recreational diving. Winds are primarily from the southeast and air temperatures can climb to 98° F (35° C). Surface water temperatures on the outer reefs average 87° F (30° C to 31° C) and weather conditions are generally ideal for diving. From May to September, surface water conditions are also at their best. Approximately 50% of the days are good to excellent (wave heights less than 2 feet [0.6 meters]) while 50% may be fair to marginal.

In the winter months (October to April), a northeasterly flow of air is most common with air temperatures occasionally reaching the freezing mark. Water temperatures average 71° F (22° C) in the winter although under the extreme conditions mentioned above, these can be lower than 68° F (20° C). This seasonal drop in water temperatures is the most severe natural factor controlling coral reef development in Florida waters. Most coral species die at 60° F (16° C), if exposed for several days, while exposure to 64° F (18° C) will inhibit growth, but these conditions rarely occur at Looe Key. The surface water conditions from October to April are fair to marginal about 60 to 75% of the time. Typical windspeeds for this period result in 2- to 4- foot (0.6 to 1.2 meter) wave heights at the Sanctuary.

Hurricanes are a potentially major disruptive force in the evolution of Looe Key. Hurricanes, when they occur, usually do so between June 1 and November 30. There is an 11 to 13% probability in the Keys that a hurricane with wind speeds greater than 73 miles per hour (117 kilometers per hour) will occur in any one year. This falls to 4% for a great hurricane with winds greater than 125 miles per hour (201 kilometers per hour) (Simpson et al., 1971). Statistically, a hurricane of this force is overdue.

Figure 6

Resource Management Units

- Approximate Sanctuary Boundary
- ① Fore Reef
- ② Intermediate and Deep Reef
- ③ Reef Flat
- ④ Back Reef
- ⑤ Sand Plain and Side Channels
- ⑥ Deep Ridge (Approximate Location)

Note: A resource mapping project being undertaken in Phase I will further delineate the resource management units.

5 *Corals and sponges in the Fore Reef area* — *Sanctuary Programs Division File*

(b) Significance of Sanctuary Resources

Nowhere else in Florida can beginning snorkelers anchor their boat on a shallow sandy reef flat, wade a short distance, swim through a channel in the reef crest, and find themselves surrounded by some of the most remarkable coral scenery in the continental United States. . . . No other reef system in Florida displays such a remarkable combination of awesome scenery and accessibility (Stone, 1979).

Such exuberant terms used by divers, snorkelers, and naturalists to describe the Key testify to the value people place on this coral reef resource. Considered the most spectacular reef in the Lower Keys (Frebsee, 1982), it attracts serious and novice divers visiting the region.

The extensive and well-developed spur and groove relief, the compressed zonation, and the superb shallow water diving conditions have all contributed to the reputation attached to Looe Key. And found throughout the reef are diverse forms of stony coral, intricately branched octocorals, brightly colored schooling fish, and larger predator fish. For although the reef is isolated from other major coral reefs, the biota here is rich and diverse

In addition to its aesthetic and educational value, the reef offers unusual and even unique natural features suitable for study and research. Unlike any other reef in the Florida Reef Tract, the spurs and grooves found here formed over sand rather than a hard outcrop (Bohnsack, 1982). And Looe Key has extremely well-developed zonation relative to other Florida reefs. Other distinct habitat types surround the reef including deeper water areas of the Straits of Florida, seagrass beds, sand flats, and rubble bottoms. Researchers can readily study the dynamic interactions between the coral reef and these adjacent habitats (Bohnsack, 1982).

Cultural resources in the form of shipwreck remains are limited. However, investigations by the Smithsonian Institute in 1955 led to the removal and storage of ballast blocks from the *HMS Looe*.

Such distinctive resources as those to be found on this reef call for a careful and balanced management approach for the Sanctuary.

(c) Resource Management Units

It is convenient for describing, managing, and interpreting the resources of Looe Key to identify

portions or units of the reef that have similar characteristics. Each unit has a distinctive identity imparted by its form and features that distinguishes it to users and to managers of the Sanctuary. Unit definition is based on previous research (Antonius et al., 1978; Jaap, 1980: pers. comm.) and a recent reconnaissance level air-photo interpretation. A resource mapping study currently being undertaken will help further delineate unit boundaries. The units are illustrated in Figure 6 and are characterized briefly as follows:

Fore Reef

The Fore Reef is the most dramatic portion of the Sanctuary. Approximately 2,620 feet (800 meters) in length (E-W) and 325 to 655 feet (100 to 200 meters) across, the Fore Reef is located seaward of the Reef Flat. Structurally, the Fore Reef is dominated by a spur and groove formation (coral spurs 10 to 23 feet [3 to 7 meters] in relief dissected by sandy "grooved" channels). Looe Key is considered a classic example of this formation in the Florida Reef Tract.

The shallow, upper layers of the coral spurs are encrusted with fire coral covering a non-living foundation of elkhorn coral. In the deeper areas, a great variety of coral and sponges occur providing diverse habitat for fish and other invertebrates.

Intermediate and Deep Reef

Located in 33 to 98 feet (10 to 30 meters) of water seaward of the Fore Reef, the Intermediate and Deep Reef has a different origin from the more prominent spur and groove structure of the

6. Schooling reef fish in the Sanctuary *Sanctuary Programs Division File*

Fore Reef. It exhibits a low amplitude, narrow form of spur and grooves. Sand deposition has partially covered the middle and eastern portion of the Deep Reef. The Reef drops steeply into a sand flat in 98 to 115 feet (30 to 35 meters) depths.

Reef Flat

The shallowest zone within the Sanctuary, the Reef Flat is an area of sand, rubble, and seagrasses that rises between the Back Reef and the Fore Reef. Roughly forming an isosceles triangle in shape, the Reef Flat has very little relief and averages from 3.2 to 10 feet (1 to 3 meters) in depth. The shallowest areas lie along the southern

edge of the reef flat adjacent to the Fore Reef and in two rubble "horns" which continue a short distance back from this edge along the two sides of the triangle. These areas are occasionally exposed at spring low tides.

The shallower rubble areas act as a breakwater for the center of the Reef Flat, creating an area protected from the wave action that builds up from the prevailing winds from the west and southwest. Most of the organisms found in this zone inhabit the sediments, hidden from view, or graze in the seagrass beds.

Back Reef (Lagoon and Patch Reefs)

A broad, shallow area 16 to 26 feet (5 to 8 meters) deep, extending from Hawk Channel in the north to the southern, leading edge of the Reef Tract. The Back Reef includes extensive seagrass flats and scattered patch reefs defined on the west, north, and east by sandy channels.

Occasional sand blowouts occur forming bowl-shaped depressions within the seagrass beds. These are interspersed with slight rises which are coral associations known as patch reefs. The patch reefs are comprised of numerous soft corals (sea fans and sea feathers) and some sediment-tolerant species of hard corals. The patch reefs offer protected habitat and abundant food resources for juvenile fish and invertebrates such as the spiny lobster. However, visibility due to suspended sediments is much reduced compared to conditions typically found in other zones.

Sand Plain and Side Channels

Two wide channels consisting of sand plains cut across the east-west trending Reef Tract on either side of the Reef Flat. Currently there is not much known about this resource management unit.

Deep Ridge

This zone is the least known resource management unit in the Sanctuary. It was discovered through use of the Johnson Sea-Link Submersible research vessel in 1973. The ridge, running parallel to the margin of the continental shelf, is separated by approximately 0.6 mile (1 kilometer) of sand from the Deep Reef. It displays very little profile and is only a few yards wide (Antonius et al., 1978).

Once confirmed through initial research, these resource management units could be used as a geographic framework to:

- ☐ Assist Sanctuary users and managers to organize user management strategies according to the distinctive resource values of each unit;
- ☐ Illustrate the characteristics that are common to all units and highlight those features that are peculiar to individual units; and
- ☐ Present the specific resources, recreation, interpretive, and research management policies and action plans for each unit.

Detailed baseline data are not consistently available for all six units. Existing information for each resource unit has been compiled as a basis for preparing this plan and is summarized in the following table (Table 1).

Table 1: Summary Description of the Resource Management Units

RESOURCE MANAGEMENT UNITS

	BACK REEF	REEF FLAT	FORE REEF	INTERMEDIATE & DEEP REEF	DEEP RIDGE	SAND PLAIN & SIDE CHANNELS
I PHYSICAL CHARACTERISTICS						
(a) Configuration and Dimensions	Stretches along most of Sanctuary's northern boundary (3.2 km), extends well to the south and grades into Reef Flat	Isosceles triangle approx. 180m on 2 sides, base faces south toward Straits of Florida; apex points north toward land	Approx. 800m long (east-west), approx. 300m across center, coral spurs 3-7m. in relief, dissected by sandy channels ("grooves"), both spurs and grooves typically 3-5m. across	Intermediate Reef with imperfectly formed spurs extends seaward from main Fore Reef system at north and extreme south ends; northern portion approx. 1km. long; narrow, sinuous deep reef spur and groove zone found seaward of Intermediate Reef; in west, Intermediate Reef becomes inseparable from Deep Reef formation; 183m. at its widest point, Deep Reef continues approx. 1.6km. to west	An outcrop of living coral reef only a few meters wide with very little profile, discovered by the Johnson Sea-Link Submersible Research Vessel in 1975, the Ridge was parallel to margin of continental shelf	Two sand channels approx. 1.6km wide, cut across east-west trending Reef on each side of main reef; they separate Looe Key from senescent reefs along Sanctuary's eastern and western boundaries, both Channels more open across seaward mouths, narrow towards north; Channels grade into deeper Sand Plain extending across Sanctuary's seaward edge
(b) Water Depth and Bathymetry	From 4.8 m deep, Hawk Channel to north forms trough, occasionally reaching depths of 12 m	Becomes gradually shallower during transition from patch reef zone; 1.5 m across main body of zone to 0.5 m where it terminates in a rock and rubble zone; at low tides, parts of ridge may be exposed, breaking waves typically observed in southeast corner.	Reef crest just below water surface at low tide causing turbulent waters, wave surges; tops of spurs at shallowest portion not deeper than 2m.; in most spectacular section, tops of spurs 3-8 m. deep and bottom of grooves as deep as 10-15 m.	Intermediate Reef zone begins in approx. 7-9m. water; it displays little relief; tightly spaced, highly encrusted spurs of Deep Reef found in 14m. water, extending seaward to 18m. depth; the Reef drops precipitously to 27m. and growth terminates on a horizontal coral-free sand flat that continues seaward.	Depths of 41 m just within southern boundary of Sanctuary along Florida Straits	Western cut is one of deeper channels through Reef Tract, at its shallowest point, is 10 m.; eastern channel is shallower seldom exceeding 8 m; portion of Sand Plain begins at foot of Fore Reef in 6 m depths, this continues seaward over sandy embankment at 9 m; a further, more gradual increase in depth (18-30 m) then occurs
(c) Substrate and Composition	Generally a sandy bottom held together by root structure of seagrasses; areas of sand blowouts from storms and hurricanes occur sporadically; numerous patch reefs occur, both small, poorly developed (or senescent) reefs and larger mature reefs surrounded by halo of coarse, unconsolidated sediments	Gradual transition from sea grass association of Patch Reef zone to extensive elevated sand flats of the Reef Flat; a mixture of calcareous sand, coral rubble, coarse sediments, and seagrass beds; rubble ridges on eastern and western boundaries of Reef Flat ("rampart islands") composed of cobble (small boulder sized pieces of eroded coral rubble) and other reef debris that has been swept behind the Fore Reef by strong overwash currents and winds during storms	Spur and groove system result of coral build up initiated on top carbonate sand; elkhorn coral was main constructional element of spurs, while mountainous star coral built massive buttresses that form most of spur's deep sides; grooves composed of calcareous reef sand and rock-litter	Drifting sand has covered central portion of Intermediate Reef and is encroaching on portions of Deep Reef, expanding submerged Sand Flat; central portion of Deep Reef area and drop-off smothered in white, coarse, carbonate sand; base of drop-off is gray and silty, sand flat extends seaward into deeper water; reef accumulation is thin (< 2m.) and topography is of bedrock origin	Composition of deep sand flat near Deep Reef is silty sand, while this sand flat continues seaward towards Deep Reef, latter has not been investigated for either depth, composition, or presence of bedrock outcrops	Deposition has not been studied in detail, but air photos suggest sand transport has covered coral formations, inhibiting growth, ridges both parallel and perpendicular to Florida Current can be found, in deeper Sand Plain, active transport by storms appears to originate from northeasterly direction

Table 1: Summary Description of the Resource Management Units—Continued

	BACK REEF	REEF FLAT	FORE REEF	INTERMEDIATE & DEEP REEF	DEEP RIDGE	SAND PLAIN & SIDE CHANNELS
BIOLOGICAL RESOURCES						
(a) Flora	Dominated by mixed association of turtle and manatee seagrasses and epiphytic green algae	Pure stands of turtle grass, mixtures of turtle and manatee grass and algae, older blades of turtle grass and much of manatee grass covered with epiphytic algae, algal community of rock and rubble sector restricted to species that require hard substrate for attachment; coverage by these grasses 50% within "lagoon" formed by rubble ridges, turtle and manatee grasses form tight mat of rhizomes that stabilizes sandy substrate	Dominant vegetation of encrusting species of red algae with some widely scattered clumps of green algae; fleshy and filamentous algae are conspicuously absent, probably a result of grazing pressure.	Flora associated with Deep Reef are sparse; diverse, but slow-growing, deeper-water assemblage of corals.	Sparse due to depth, but have not been studied	Seagrasses have partly colonized some ridges, but are of little areal extent here (< 10%)
(b) Fauna Invertebrates	Small patch reefs covered by patchy living coral; mature patch reefs covered by more or less continuous living cover, dominated by octocorals accompanied by small to medium stony corals and sponges, some octocoral growth dense with sea whips and seafeathers reaching 2 m in height; abundance of corals generally low compared with Fore Reef structure, with most important corals including fire coral, brain and star corals; staghorn coral in greater abundance than anywhere else in reef complex, and the rare pillar coral; sponges well represented; other frequently observed inhabitants of Patch Reef includes sea anemones, mat forming zoanthids, and a variety of small crustaceans; sea stars, brittle stars, and sea urchins dominate grass bed areas adjacent to Patch Reef	Compared to plant life, sessile invertebrates represent a minor component; sponges are rare and stony corals limited in number, small, encrusting and scattered; medium-sized coral colonies and octocorals form patches in zone almost within 100 m. of seaward terminus of Reef Flat; soft corals such as seafans, feathers and whips sparsely distributed in Reef Flat, but are the only benthic fauna of significance on Reef Flat; mobile invertebrates include queen conch, pen shell, sea slug, and reef squid within and adjacent to sea grass beds; rock and rubble areas provide excellent habitat for small invertebrates including a variety of polychaete worms in tubes, brittle stars, spider crabs, and reef crabs; small snails and bivalve mollusks are abundant; cryptic invertebrates, though not studied in detail, are prevalent but usually hidden by camouflage or burrowed into the benthos.	Reef crest comprised of massive growth of fire coral transected by valleys into huge, block-like segments; considerably more live coral present along seaward ends of spurs; this includes delicately branched staghorn and other more massive corals such as mountainous star coral and brain coral; various species of sponges are intermingled, often indistinguishable among coral growth and grow freestanding in grooves; fire coral is dominant stony coral of vertical wall at leeward end of coral spurs while tops covered by soft mats of colonial blue-green algae; elkhorn coral found seaward of fire coral complex; bivalve mollusks common in recesses along coral spurs but are difficult to distinguish from the background, snails and brittle stars numerous, but again are cryptic; spiny lobster found backed into crevices; octopus and eels similarly hidden and more difficult to observe	Octocorals dominant in Deep Reef, most frequently encountered species is bushy searod, a plexaurid; sponges fairly common and grow to large sizes; a number of stony corals with branching and flower-like growth forms occur on Deep Reef that are either absent or extremely rare in more accessible areas; spiny lobster plan suggests adults migrate to deeper waters in the autumn, but their presence here not verified.	Colonies of large star coral have plate-like appearance; several species of lettuce coral also occur, but display considerable sedimentation damage; deep water octocorals are reported to be more abundant here than on Deep Reef.	No information available on the life forms likely to be found in these channels; given the lack of cover, most invertebrates and fish can be assumed to make little use of this zone except for diurnal movement and migration paths; cryptic organisms, either benthic infauna or epifauna, are principal inhabitants

Table 1: Summary Description of the Resource Management Units—Continued

	BACK REEF	REEF FLAT	FORE REEF	INTERMEDIATE & DEEP REEF	DEEP RIDGE	SAND PLAIN & SIDE CHANNELS
		a large population of long-spine sea urchins resides here, occasionally octopus inhabit rubble rampart islands				
(c) Fauna: Fishes	Many species use Patch Reef for protective habitat; medium to large size snapper, grouper, and hogfish often found in great numbers	Little cover available for schooling and grazing fish although abundant algae attract foraging species from Fore Reef, most common are schools of parrotfish, surgeon fish, and wrasses	Damselfishes and wrasses are the most abundant species in terms of individuals, one species of grunt family, the tomtate, almost completely dominates community structure in abundance and biomass; smaller species of snapper and grouper are most prevalent piscivores; larger species of snapper are rare	Purple reef fish, sunshine fish, spotfin hogfish, and scamp are reported for Deep Reef; other species abundant in these deeper coral environments are butterfly fish, hamlets, groupers, blue chromes, and creole wrasse	Not reported at this time	
3 CHARACTERISTICS RELATED TO POTENTIAL USE						
(a) Resource Vulnerability	Anchors potentially damaging to sea grasses (at high levels of use) and to Patch Reefs, although latter are difficult to locate without sophisticated equipment Propwash from motorboats can stir up sediment which in turn can have smothering effect on sea grasses	Seagrass beds can be damaged by anchors dragged along bottom Soft corals are easily overturned when "bumped" by snorkelers Beachcombers on the rampart island can unknowingly disturb cryptic fauna that are hidden under coral rubble	Anchoring between or adjacent to spurs requires skill in boat handling; improper anchoring and boat grounding can damage coral Illegal souvenir collecting by visitors could result in disappearance of both common and rare species and thereby disturb the complex ecological balance	Beyond anchor range of most small boats (approx. 9m) but could be damaged if used for holdfast by larger boats	Only significant risk is created by inshore ship traffic in Straits of Florida should a ship run aground; depths inside Deep Ridge too shallow for ocean traffic	Few sensitive resources are found here
(b) Recreational Potential	Visibility is often minimal due primarily to algae blooms Patch Reefs not as dramatic for divers although species of rare corals are of interest. Zone is too deep for snorkelers to appreciate, especially because of poor visibility	Good area for snorkeling in rougher seas Visual attraction for snorkelers and divers not as exciting as Reef areas Shallow areas are suitable for snorkeling instruction - immediately adjacent to fore reef Sea urchins and fire coral are potential hazards	Greatest diversity of coral and fish species within Reef Tract occurs here; high attractiveness and interest to visitors Extensive spur and groove development allows many visitors to experience reef simultaneously without sense of overcrowding	Too deep for observation by snorkelers (visibility reaches 14 - 18 meters only on best days) Some interest by divers in Intermediate Reef, Deep Reef likely to be little explored because of depth	Inaccessible to public	Except for surface boating, little recreational use is made of most of this zone, however senescent reefs adjacent to Sand Plain are extensively used by hook and line fishermen

Table 1: Summary Description of the Resource Management Units—Continued

	BACK REEF	REEF FLAT	FORE REEF	INTERMEDIATE & DEEP REEF	DEEP RIDGE	SAND PLAIN & SIDE CHANNELS
(c) Interpretive Potential	Back Reef's relationship to overall ecology of Reef Tract is of potential interest, particularly abundance and unusual height of octocorals; significance of Patch Reef for providing habitat and protection in an area of abundant food; the contrast between senescent and mature patches; the significance of patch reef "halos" that result from both biological and physical factors. Direct contact is highly limited because of visibility constraints; zone is perhaps best presented using photographs obtained under ideal conditions or models.	Direct contact with resource is readily available to most visitors through snorkeling. Rubble ridges appear devoid of life - organisms either not present during day or hidden from view; trained interpreter can reveal life forms that are actually present. Relationship between Reef's natural and cultural history is very interesting and important.	Reef structure and beauty of life forms offer exitement and interest to visitors. Accessible to all who can snorkel. Principal zone of interest in Sanctuary.	Relationship to geological and natural history is interesting subject; Accessible to accomplished divers for direct contact; films and slides from Deep Reef of interest to most Sanctuary visitors.	Relationship to Fore Reef not established; some geological relevance might be important in explaining general structure of the reef tract.	Hypothesized role in circulation can be presented, subject to verification by oceanographic research. Flora and fauna are not localized in specific areas or readily observable.
(d) Research Potential	Important relationships to Fore Reef and high productivity of finfish, shellfish, and lobster are subjects for further study. Experimental equipment likely to face less disturbance by fewer numbers of recreational visitors.	Some potential in elucidating ecological relationships among different zones and species. High level of use creates difficulties for experiments and equipment.	Many aspects of Reef remain poorly understood. Isolation from adjacent reefs provides favorable experimental conditions. Disruption of experimental areas and monitoring stations by visitors may be a problem.	Difficult access for public creates some advantages but also presents a problem for researchers.	Difficulties of access and remoteness of Deep Ridge are limiting. Origin of deep hard bottom community subject of potential value in understanding coral distribution.	As above; role in circulation between Hawk Channel and Florida Current is an important aspect.

Three

Loose Key:
Management Issues,
Analysis, and Action
Plan

SECTION 3

Looe Key: Management Issues, Analysis and Action Plan

1. OVERALL MANAGEMENT AND DEVELOPMENT CONCEPTS

During the preparation of this plan, the Sanctuary Programs Division reviewed various concepts and alternatives for management and development. Options developed progressively through consideration of the constraints and opportunities of the Sanctuary's setting and program priorities.

The overall concept presented here reflects the fact that the basis for management is long-term protection of the resources. The most important factors affecting Looe Key's management over the long term relate to the size and characteristics of the Sanctuary, communication needs for visitors, and access requirements.

Significantly, Looe Key is among the smallest of designated sanctuaries, and the one most heavily used for recreation per unit of area. This plan addresses the difficult task of managing a small area of fragile resources used by large numbers of people for diving, snorkeling, fishing, and other activities. The plan calls for continuing to allow compatible recreational use of the Sanctuary while gradually undertaking management actions concentrated in the Fore Reef area to protect the quality of the resources. It strikes a balance between encouraging public awareness and appreciation of the Sanctuary through interpretive and educational programs while not increasing on-site visitor use beyond already forecasted increases.

Inherent in this task is the important role of communication and education to gain public understanding and hence, support for management objectives. Looe Key is an ideal setting for explaining the wonders and fragility of the coral reef environment to a public with varied needs and interests. Effective communication will depend on carefully prepared brochures, guidebooks, and exhibits that include the findings and recommendations of scientific research. Interpretive programs provided at a Sanctuary Headquarters will offer the numerous visitors who cannot see the reef first-hand an opportunity to experience the reef "at a distance".

As Looe Key becomes better known, the demand for access will increase. It is not known what the capacity of the reef is to accommodate additional use, either from an ecological or recreational perspective. However, alternatives to direct access would certainly be beneficial in helping to avoid problems of congestion on the reef. A Headquarters building may provide such an alternative, offering an interesting marine experience to visitors, especially when unfavorable weather conditions hinder even those who would otherwise visit the reef.

The management plan presents two phases for Looe Key. Phase 1 includes programs for the first two years after publication of this plan. Phase 2 introduces program and development proposals for the next 3 years of this 5-year plan.

(a) Phase 1 Concept

The general approach during the first two years (Phase 1) will be to resolve the current management issues, improve existing operations, and undertake the necessary research and feasibility studies to proceed into Phase 2. This will entail the development of programs for both the land and the water.

Management in the Sanctuary

On-site management during Phase 1 will focus on establishing an identity for the Sanctuary "on the water" and on implementing mechanisms for continued compatible recreational use of the Fore Reef area. Markers will be installed to delineate both the 5.3 square nautical miles of the Sanctuary and the Core Area. These will help Sanctuary visitors distinguish the area from its surrounding marine environment and associate it with the National Marine Sanctuary program. The presence in the Sanctuary of an enforcement vessel will also contribute to establishing the Sanctuary's identity.

Mooring buoys will be installed in appropriate places to improve boating and diving safety during peak use periods, reduce anchor damage to corals, and generally improve the recreational experience on the reef. Other means of encouraging compatible use will include providing relevant information through brochures and posters to visitors and increasing awareness of Sanctuary regulations through enforcement contacts. These on-site activities, including other lesser priority tasks, are described in detail in the next section ("Phase 1 Management Actions").

Land-based Sanctuary Headquarters

The Sanctuary Manager's office is now located at Bahia Honda State Recreation Area, the current operating base for the Looe Key National Marine Sanctuary. During Phase 1, this base may expand depending upon available funding to accommodate additional Sanctuary staff and provide space for information and interpretive services. A low cost approach to such expansion would

be the purchase of a prefabricated structure which, with the approval of DNR, could be installed near the Bahia Honda Marina. The collaboration of DNR would also be sought in determining the scale and design of the structure so that it complies with the standards of the area.

The Bahia Honda facility will serve as the primary contact point between visitors and the Sanctuary Programs Division until the land base for a permanent structure is acquired. The prefabricated mobile structure could be installed rapidly to serve immediately as an interim headquarters on the land base, and later be moved to the permanent site.

After careful survey of the region from Marathon to Big Pine Key, West Summerland Key was selected as the most attractive location for future land-based developments and a permanent Sanctuary Headquarters. The highest priority should be given to securing the property for future Sanctuary use.

2. MANAGEMENT ISSUES, ANALYSIS, AND ACTIONS

Management of the Sanctuary will be organized to focus on the objectives articulated in Section I of this plan. The degree to which facility development and major program implementation can be realized is controlled by decisions made annually with respect to staffing, budgets, and overall Sanctuary Programs Division priorities within the system. This annual variation influences the type and number of management actions, but not the objectives. All management actions, no matter how modest, are governed by the objectives.

There are several ways of analyzing the current situation of the Sanctuary to determine management actions that are required now and over the next few years. An effective approach—and the one used here—is to analyze the immediate problems, or issues, and impending questions that need to the resolved if Sanctuary objectives are to be met. A number of important management issues have been identified in the sections on regional context, existing and potential uses, and Sanctuary resources.

These issues have formed the basis for the 3-step analysis presented in Table 2. In Step 1, the management issues are defined and described. In Step 2, we have provided evidence to ensure that real issues have been identified. In Step 3, management actions are formulated to address the identified issues. Some management actions may address simultaneously several issues (Table 3) in which case they may be given higher priority than actions resolving a single issue. After specific management actions are thus determined, they are assigned priorities and scheduled to meet Sanctuary goals and objectives.

The following example illustrates the approach taken in our analysis to identify, verify, and resolve issues by undertaking specific management actions:

TABLE 2: Method of Analysing Management Issues to Formulate Management Actions

STEPS IN ANALYSING ISSUES	THE ANALYSIS OF A SAMPLE ISSUE
Step 1: Define the Management Issue	[ ] Sanctuary use is concentrated in a small area in the Lore Reef
Step 2: Provide Evidence to confirm the Issue.	[ ] Personal observations and area calculations
Step 3: Formulate Management Actions	[ ] Provide information on safe use of the Sanctuary [ ] Establish properly spaced mooring buoys to disperse visitors throughout the core area and reduce concentration of users

The issues and questions underlying the management of Looe Key were analyzed using this approach, resulting in a set of actions for program initiative (Table 3).

TABLE 3: Management Issues, Evidence and Actions

Management Issues and Questions	Evidence for the Issue	Management Actions
(1) Use Concentrated in a Small Area The greatest proportion of users tend to concentrate in a small area of the Sanctuary – the Fore Reef. Recreationists snorkel, fish, S.C.U.B.A. and boat in this area. Commercial dive boat operators and educational groups use the Fore Reef for similar activities. The resource values attract researchers to this location.	☐ Use patterns are well established and have been observed and reported by researchers, planners, and general visitors (JDA, DNR, pers. comm.); and ☐ The Sanctuary is relatively limited in area and the intensively used Fore Reef and its Core Area cover an even smaller area.	☐ Determine the need for and feasibility of a designated boating access zone; ☐ Install National Marine Sanctuary standard mooring buoys; ☐ Refine surveillance and enforcement reporting procedures; ☐ Develop and carry out an enforcement training program; and ☐ Implement measures to increase the program identity of interpretive, surveillance, and enforcement staff.
(2) Capacity of the Reef to Sustain Use The reef is and will continue to receive additional pressures from various users. The main issue is determining the capacity of the reef to sustain use. The current ecological status (i.e. health) of the reef is poorly understood. Consequently, it is not known how the reef is withstanding existing recreational use and if it could withstand additional use. It is known that the reef changes in response to natural environmental processes such as storms. However, we do not know how natural limiting factors combined with human impacts affect the overall carrying capacity of the living reef.	☐ This question is implicit in all management issues. Its identification as a paramount concern has been addressed by researchers, planners, and resource managers in virtually every resource inventory or study related to the use of Looe Key (Antonius et al., 1978; Bohnsack, 1982).	☐ Refine surveillance and enforcement reporting procedures; ☐ Undertake a comprehensive baseline resource mapping study; and ☐ Design and implement a temporary and permanent biophysical monitoring system.

TABLE 3: Management Issues, Evidence and Actions—Continued

Management Issues and Questions	Evidence for the Issue	Management Actions
(3) Conflicts Among Users		
Conflicts will likely occur, particularly in the highly used Fore Reef area, as use increases. For example, use of motorized boats in shallow waters presents a danger as well as conflict with divers and snorkelers. Conflicts may also occur between fishermen and divers and between recreational divers and scientific researchers in that natural curiosity may lead to disturbance of instruments placed on the reef.	☐ Numerous observations in the Sanctuary (JDA; Davidson, pers. comm.; Lt. Leve, pers. comm.); and ☐ The largest number of verbal warnings relate to the lack of use of dive flags (Daily Boat Patrol Log, DNR, 1983).	☐ Determine the need for and feasibility of a designated boating access zone; ☐ Install National Marine Sanctuary standard mooring buoys; ☐ Develop and carry out an enforcement training program; ☐ Collaborate with dive boat operators and other Sanctuary user groups to initiate on-site interpretation; and ☐ Design, produce, and distribute basic orientation and information materials for the Sanctuary.
(4) Physical Damage to Reef by Direct and Indirect Users		
The reef is subject to physical impacts as a result of visitor activities such as damage to coral from anchors and grounded vessels. The damage reveals itself in the form of broken coral heads and rubbed areas. From an aesthetic point of view, the reef is at least temporarily marred. The extent of ecological damage over time is not known since there have been no programs to monitor such changes. The reef is also susceptible to damage from shipping accidents involving hazardous or polluting cargoes.	☐ Direct physical damage, in the form of broken corals, is obvious and has been reported by researchers (Antonius, 1978, Bohnsack, 1982) and recreational divers; ☐ Boats, on occasion, ground on the reef; during the winter of 1982 two boats ran aground; ☐ Anchoring on coral still accounts for major verbal warnings by DNR enforcement personnel (Daily Boat Patrol Log, DNR, 1983); and ☐ The largest commodity flows of oil in the USA are shipped through the Strait of Florida one mile due south of Looe Key (NOAA/CEQ, 1980).	☐ Determine the need for a new navigational marker equipped with a light, Sanctuary sign, and radar reflector; ☐ Install National Marine Sanctuary standard mooring buoys; ☐ Develop and carry out an enforcement training program; ☐ Evaluate existing contingency plans and capabilities for responding to emergencies on the reef; ☐ Undertake a comprehensive baseline resource mapping study; ☐ Design and implement a temporary and permanent biophysical monitoring system; and ☐ Design, produce, and distribute basic orientation and information materials for the Sanctuary.

TABLE 3: Management Issues, Evidence and Actions—Continued

Management Issues and Questions	Evidence for the Issue	Management Actions
(5) Lack of Sanctuary Identity		
The Sanctuary lacks identity both to the travelling public on the Overseas Hig' vay and on-the-water to boaters. The Sanctuary neither appears on highway maps nor is it identified as a distinct national program by signage to the visitor to the Keys. Visitors who come by boat have no indication of the Sanctuary by boundary markers or signage. The Sanctuary is not marked on nautical charts at a scale which assists small boaters or divers.	☐ There is no land base at which the highway traveller can be introduced to the Sanctuary; ☐ There are no on-site markers that depict the spatial extent of the Sanctuary; ☐ The temporary administrative location within Bahia Honda State Recreation Area results in difficulty separating the National Marine Sanctuary Program from the State Program; and ☐ Rangers in DNR uniform patrolling the Sanctuary in DNR marked vessels contribute to the confusion of program identity.	☐ Install National Marine Sanctuary standard boundary and core area markers; ☐ Install National Marine Sanctuary standard mooring buoys; ☐ Implement measures to increase program identity of interpretive, surveillance and enforcement staff; ☐ Collaborate with dive boat operators and other Sanctuary user groups to initiate on-site interpretation; ☐ Establish a temporary Sanctuary Headquarters at Bahia Honda State Recreation Area; ☐ Install an outdoor interpretive exhibit at Bahia Honda; ☐ Determine the need to install land-based signage; ☐ Investigate the feasibility of acquiring the land base at West Summerland Key for a permanent Sanctuary Headquarters; ☐ Formulate program graphic standards; and ☐ Design, produce, and distribute basic orientation and information materials for the Sanctuary.
(6) Equal Opportunities to Appreciate the Sanctuary		
The opportunity to appreciate and enjoy the Sanctuary through a visit, either directly or vicariously, is not equally available to all potential user groups.	☐ There are no displays, publications, or visitor facilities that assist travellers to appreciate the reef without physically travelling to it;	☐ Expand the temporary Sanctuary Headquarters at Bahia Honda State Recreation Area;

TABLE 3: Management Issues, Evidence and Actions—Continued

Management Issues and Questions	Evidence for the Issue	Management Actions
Many visitors who visit the Keys by automobile are unable to appreciate Looe Key because they do not have a boat, the time, or find the cost of getting to the Sanctuary prohibitive. Others are not able to visit because of family structure, i.e., small children; senior citizens; or physical disability. At this time, potentially interested visitors in these categories are not offered anything by the Sanctuary Program. At the same time there are others who would like to visit the Sanctuary but the prevailing weather conditions of that particular day may not permit access e.g., especially during the fall and winter.	☐ A visit requires a minimum of four hours; ☐ A user requires certain skills to enjoy the reef, i.e., must be able to swim; ☐ Weather statistics support the fact that water temperatures drop, and seas are more frequently rough during fall and winter, decreasing opportunities for direct access; and ☐ There is no reef-associated experience on land for visitors who come on days when inclement weather prevails.	☐ Install an outdoor interpretive exhibit at Bahia Honda; ☐ Determine the need to install onshore signage; ☐ Investigate the feasibility of acquiring the base at West Summerland Key for a permanent Sanctuary Headquarters; and ☐ Design, produce, and distribute basic orientation materials for the Sanctuary.
(7) Lack of Public Information on Sanctuary		
There is lack of public information on the Sanctuary, such as a map/brochure which introduces the Sanctuary, preferred distribution of uses, regulations, access points, etc. There is no organized distribution system for brochures.	☐ One out-of-date brochure is available from Bahia Honda State Recreation Area and other selected places; and ☐ Presently, no interpretive/educational program is being offered to visitors.	☐ Undertake a comprehensive baseline resource mapping study; ☐ Collaborate with dive boat operators and other Sanctuary user groups to initiate onsite interpretation; ☐ Establish a temporary Sanctuary Headquarters at Bahia Honda State Recreation Area; ☐ Install an outdoor interpretive exhibit at Bahia Honda; ☐ Determine the need to install land-based signage; ☐ Formulate program graphic standards; and ☐ Investigate the feasibility of acquiring the land base at West Summerland Key for permanent Sanctuary Headquaters.

TABLE 3: Management Issues, Evidence and Actions — Continued

Management Issues and Questions	Evidence for the Issue	Management Actions
(8) Increased Levels of Use		
Increased levels of use are anticipated from recreationists and scientific researchers because of Looe Key's significant resources, accessibility, and national exposure through dive-related press and media.	☐ Local recreation areas have experienced increases in use in recent years (Johns, 1983; pers. comm.); ☐ The popularity of the Florida Keys and reef environments with underwater recreationists (Leslie A. Riffkin & Assoc. Inc., 1979).	☐ Determine the need for and feasbility of a designated boating access zone; ☐ Install National Marine Sanctuary standard mooring buoys; ☐ Develop, and carry out an enforcement training program; ☐ Define surveillance and enforcement reporting procedures; ☐ Undertake a comprehensive baseline resource mapping study; ☐ Design and implement a temporary and permanent biophysical monitoring system; ☐ Establish a temporary Sanctuary Headquarters at Bahia Honda State Recreation Area; ☐ Investigate the feasibility of acquiring the land base at West Summerland Key for permanent Sanctuary Headquaters; and ☐ Design, produce, and distribute basic orientation and information materials for the Sanctuary.

3. PHASE I MANAGEMENT ACTIONS

The Sanctuary Programs Division will undertake specific actions to initiate a comprehensive and balanced management program in Phase I. These actions are aimed at solving the immediate issues (Table 3) and at setting the framework for full implementation of the plan.

During these first two years, the SPD will work closely with the Sanctuary Manager and the Florida DNR to implement these actions and monitor their effectiveness. A complete list of overall and specific responsibilities for program initiation appears under Administration in Section 4.

The distinction is made in this section between what will be undertaken within the boundaries of the Sanctuary (water-based) versus off-site (land-based). Another category of actions relate to both water-based and land-based programs. These are aimed at making all management programs consistent and coordinated.

(a) Phase I Management Actions in the Sanctuary (Figure 7)

Install National Marine Sanctuary standard boundary and core area markers

To clearly establish the legal boundaries of the Sanctuary and the Fore Reef, fixed markers will be installed at the four points of the Sanctuary and the four corner points of the Core Area. The markers are currently being designed to comply with program graphic standards. Once the design is finalized, the markers will be installed.

Determine the feasibility of adding a Sanctuary sign, and radar reflector to the navigational marker.

This initiative will involve discussions with the U.S. Coast Guard concerning recent vessel groundings to determine if a new marker could improve navigational safety in the vicinity of the Sanctuary.

Determine the need for and feasibility of a designated boating access zone.

The Sanctuary Programs Division will initiate a study to determine the extent and frequency of accidents caused by motor boats interfering with snorkelers, divers, and fishermen. If the study indicates a need, the possibility of designating a motorized boat access zone along the outer edge of the Fore Reef will be considered. Options such as enforcing the zone only during weekends and peak use periods will be assessed.

Install National Marine Sanctuary standard mooring buoys.

To reduce anchor damage and improve boating conditions in the Fore Reef area, mooring buoys which comply with program graphic standards are being considered. This initiative will require (1) ordering the mooring buoys currently being designed for the Sanctuary Programs Division. (2) preparing a preliminary placement plan; (3) conducting on-site surveys to confirm placement; and (4) installing the mooring buoys.

Develop and carry out an enforcement training program.

A series of training sessions will be prepared for the enforcement staff stationed on the reef. The sessions will be aimed at familiarizing enforcement staff with the intent and scope of the program, the intent of the regulations, and how interpretive contacts can be integrated into ongoing surveillance activities.

Refine surveillance and enforcement reporting procedures.

A "Daily Boat Patrol Log" is currently being used to record visitor statistics, citations, and warnings. The reporting sheets will be modified so that reliable and pertinent statistics can be derived from them. This initiative may also require testing several reporting forms.

Implement measures to increase the program identity of interpretive, surveillance, and enforcement staff.

This initiative will entail designing a "uniform" (e.g., jackets, name tags) to ensure that Sanctuary staff are clearly identified with the program while stationed on the reef.

Evaluate existing contingency plans and capabilities for responding to emergencies on the reef.

This will involve consultation and discussion with the other divisions of NOAA, the Coast Guard and state agencies to assess the existing capability to respond to accidents on the reef. An emergency

Figure 7

Phase 1: Management Actions in the Sanctuary

- Approximate Sanctuary Boundary
- Boundary Marker
- Core Area Marker (Approximate Location)
- Navigational Marker
- Mooring Buoy Zone (Approximate Location)
- Resource Mapping Study Area

response policy and procedures will be formulated subsequent to this assessment.

Undertake a comprehensive baseline resource mapping study.

Detailed site surveys are being undertaken as part of this initiative. The results of these surveys will be compiled into a series of large scale resource maps which in fact will represent a baseline for the Sanctuary. The maps will cover a broad range of topics including the distribution of habitats and life forms, community structure, bathymetry, and sediments. Initiating the project will involve the following tasks:

- [ ] Prepare and circulate a complete Terms of Reference;
- [ ] Assemble the interdisciplinary team;
- [ ] Finalize the research design and mapping procedures;
- [ ] Conduct site surveys; and
- [ ] Compile maps and validate through peer review.

Design and implement a temporary and permanent biophysical monitoring system.

The aim of the Biophysical Monitoring Program will be to document and measure the occurrence and effect of natural events and human activities on the Sanctuary ecosystem. Periodic analysis of monitoring data will help determine if change is taking place, what consequences the change (or lack of change) has on the coral reef system, and what management decisions should be made. Designing a comprehensive and integrated monitoring program will be a long-term process taking place over several years. A critical task will be to determine what organisms, life history functions, physical parameters, and human activities should be monitored, and determining the most effective and reliable procedures to monitor them. These decisions will entail designing and undertaking some basic research projects which will form part of an operational plan for research.

While a permanent monitoring program is being developed and tested, temporary measures will be taken to periodically record conditions within the Fore Reef area. For example, a simple monitoring program could be initiated by installing fixed underwater photographic stations on the reef or by periodically taking photographs along fixed underwater transects.

Collaborate with dive boat operators and other Sanctuary user groups to initiate on-site interpretation.

To initiate on-site interpretation, meetings will be held with dive boat operators currently transporting visitors to the Sanctuary. Interpretive materials for the Sanctuary will be presented and supplied to local businesses providing on-site services at Looe Key. Input will be sought on how to develop and distribute additional material for on-site use by visitors.

(b) Phase I Offsite Management Actions (Figure 8)

Establish a temporary Sanctuary Headquarters at Bahia Honda State Recreation Area.

The Sanctuary Programs Division will require a Sanctuary Headquarters from which it can initiate and administer a comprehensive management program for Looe Key. The Sanctuary Manager's office is located at Bahia Honda State Recreation Area which is the current operating base for the program.

Additional temporary facilities will be required at Bahia Honda until a decision is made concerning a permanent Sanctuary Headquarters at West Summerland Key (see below) or other appropriate sites. These temporary facilities will provide the Sanctuary Programs Division: (1) a primary staging point for distributing information; (2) working and meeting space for Sanctuary staff; and, (3) space for displaying interpretive exhibits.

A low cost approach to establishing a temporary Headquarters would be to purchase a prefabricated structure which, with the approval of DNR, could be installed near the Bahia Honda Marina. The mobile structure could later be moved to the permanent Headquarters site.

Install an outdoor interpretive exhibit at Bahia Honda.

Installation of this facility will require: (1) designing the exhibit using the standards for land-based signage currently being developed; (2) issuing a contract for its production; and (3) installation. This exhibit will serve to orient visitors at Bahia Honda to the National Marine Sanctuary. It will provide basic information on its location, how to get there, possible recreational activities, regulations, and an indication of the offshore weather conditions that day.

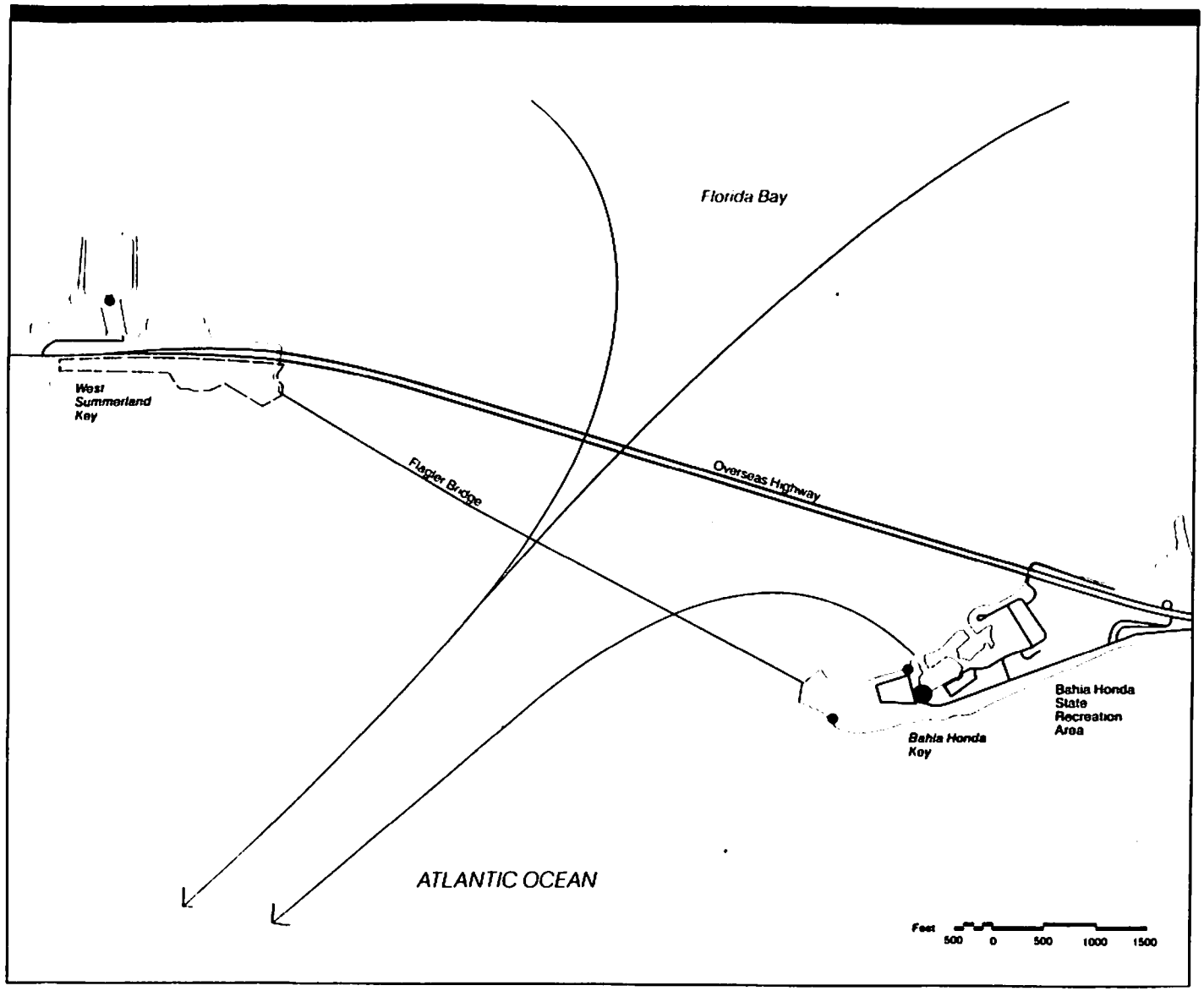


Figure 8

Phase 1: Offsite Management Actions

- ● Temporary Sanctuary Headquarters
- • Interpretive Exhibit/Sign
- o Land-based Signage
- ▭ Land-base Feasibility Study Area
- ⟶ Access to the Sanctuary

Note: West Summerland Key is one of several possible land-base sites that will be investigated in the Phase I feasibility study. It is used here for illustration purposes only.

Determine the need and install land-based signage.

Installing a standard Sanctuary sign at staging points along the Keys is being considered by the SPD. The sign will identify the location of the Sanctuary and highlight what can and cannot be done there. The signage will be informational in nature given the management concern not to increase visitor use.

This initiative will involve: (1) designing the content and structure of the standard sign using the general graphic and industrial design standards being developed for the Sanctuary Programs Division; (2) surveying the region to determine suitable locations; and (3) issuing a contract for production and installation.

Investigate the feasibility of acquiring the land base at West Summerland Key for a permanent Sanctuary Headquarters.

The site is currently owned by the Florida Department of Transportation. After a careful survey of the area between Marathon and Big Pine Key, this site was selected for further study. Reasons for selection were as follows:

- [ ] The land is state-owned;
- [ ] The area is free of commercial development and adjacent to mangrove habitat on one side and the ocean on the other;
- [ ] It is adjacent to Bahia Honda State Recreation Area;
- [ ] It has excellent panoramic views towards Looe Key, the Straits of Florida, and Florida Bay;
- [ ] Access to the Overseas Highway is excellent;
- [ ] Visibility from the Overseas Highway to the site is excellent;
- [ ] There is a sufficient land area to accommodate moderate growth; and
- [ ] An area suitable for a marina development is located on Florida Bay.

Determine the feasibility of developing services and facilities at the permanent Sanctuary Headquarters following an incremental, gradual development program.

The services and facilities to be located at the permanent Sanctuary Headquarters should offer visitors the following:

- [ ] Information about and orientation to the offshore Sanctuary;
- [ ] Audio-visual programs introducing the Sanctuary, Sanctuary resources, and the National Marine Sanctuary Program;
- [ ] Guidance on recreational use of the Sanctuary, identification of potential safety and navigational hazards, and other general safety conditions;
- [ ] Information about local tours and dive boats;
- [ ] Comfort facilities (showers and change rooms); and
- [ ] Opportunity to appreciate the Sanctuary during inclement weather.

Depending on funding availability, the following facilities related to ongoing management of the Sanctuary will also be located within the land base area:

- [ ] Sanctuary administrative offices;
- [ ] Research facilities (laboratory and office space, reference library on coral reefs, docking, and additional support services);
- [ ] Marina facilities for visitors arriving at the Center by water;
- [ ] Boat launching facilities for visitors trailoring their own boats; and
- [ ] Parking.

The feasibility study should include both a detailed site plan and architectural program that allows for a deliberate and phased approach to construction. Architectural standards and guidelines should be developed that reflect a number of important considerations:

- [ ] The national significance of Looe Key National Marine Sanctuary;
- [ ] The highly specific environmental conditions presented by an exposed ocean site in the Florida Keys;
- [ ] The vernacular architecture of South Florida; and
- [ ] The funding that is available.

The following steps should be undertaken following acquisition of the land base to develop the Sanctuary Headquarters:

- [ ] Establish budget levels and establish an incremental construction program;
- [ ] Determine potential visitor demand, preferences, and visitor patterns to confirm the feasibility of the proposed concept and to provide programming and infrastructure requirements for architects;
- [ ] Select an architect to prepare a brief concept plan developing specific architectural standards and programming relationships among the proposed activities; and
- [ ] Select a landscape architect to develop site planning and design guidelines for the entire land base and all stages for expansion of the Sanctuary Headquarters.

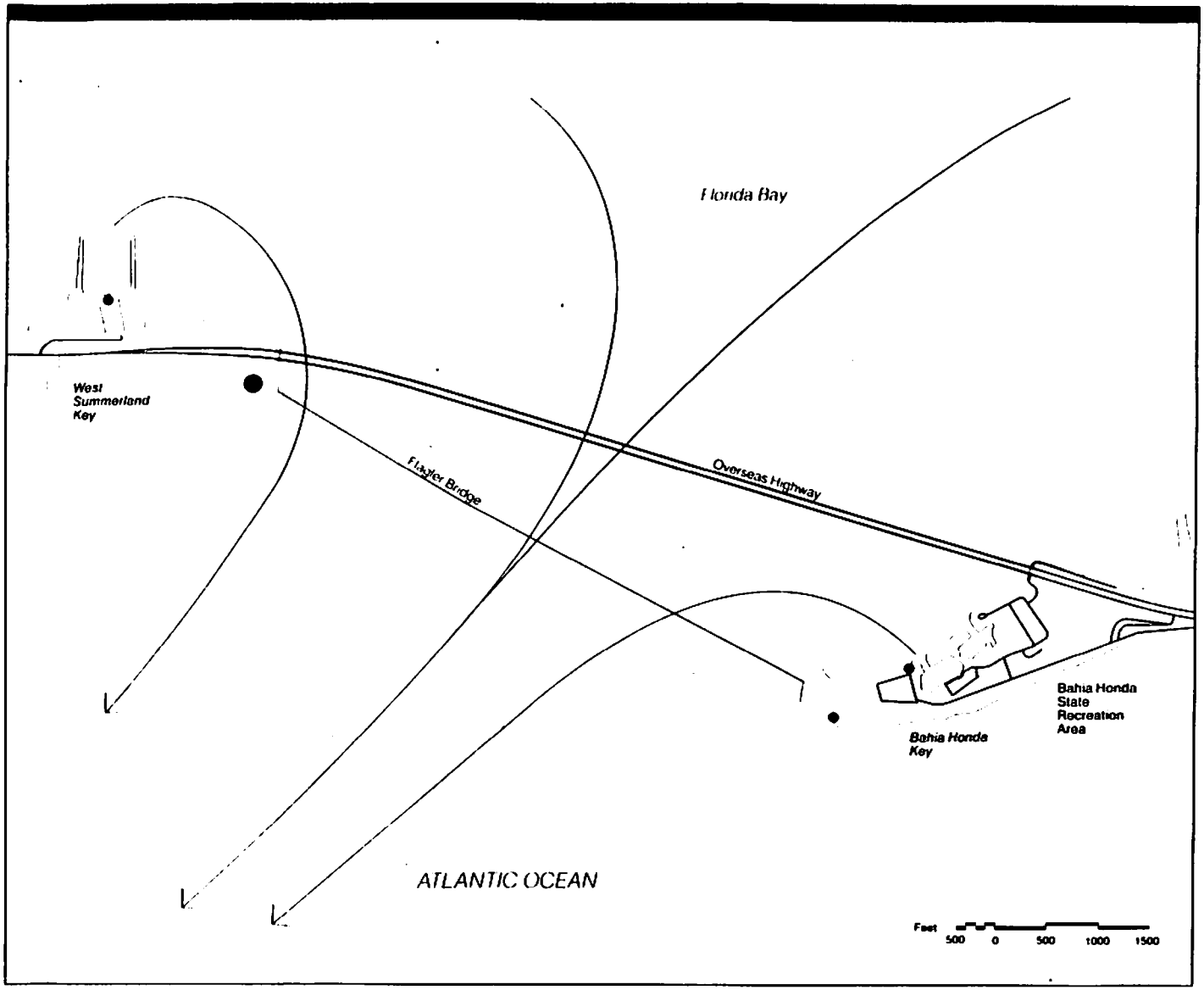


Figure 9

Phase 2: Offsite Management Actions

Proposed Sanctuary Land-base

● Proposed Sanctuary Headquarters

• Interpretive Exhibit/Sign

⟶ Access to the Sanctuary

Note: West Summerland Key is one of several possible land-base sites that will be investigated in the Phase I feasibility study. It is used here for illustration purposes only.

(c) General Management Actions (Applicable to On-site and Off-site Programs)

Formulate Program Graphic Standards

Prior to the design of any additional material, the Sanctuary Programs Division will formulate graphic standards to be applied to all Looe Key National Marine Sanctuary documentation, exhibits, structures, signage and uniforms. The standards will have two main components:

- Industrial design component (structural requirements, vandalproofing, durability, repairability, cost effective design etc.); and
- Graphic design component (color, letter size for readability, format, graphic standards etc.).

The standards will be kept on file at the Sanctuary Manager's office and used as specifications for developing and updating the facilities and materials discussed throughout this plan. The visual continuity ensured by the standards will reinforce the identity of both the Sanctuary and the program.

Design, produce, and distribute basic orientation and information materials for the Sanctuary.

The development of orientation and information materials will involve the following tasks:

- Updating the existing brochure for Looe Key to comply with program graphic standards. A detailed map locating markers and buoys, with keyed sketches and photographs will be integrated into the brochure for effective orientation of visitors on-site and off-site;
- Preparing a habitat guidebook for use by divers and snorkelers; and
- Designing a Sanctuary poster.

Establish and finalize overall administrative procedures.

The Sanctuary Programs Division, in consultation with the other agencies participating in management of the Sanctuary, will establish overall administrative procedures for implementing this plan. This will ensure that all management actions are coordinated, consistent with long-term goals, and undertaken effectively.

A broad administrative framework is outlined in Section 4. Initiating operational procedures will require the following tasks:

- Formalize roles and responsibilities;
- Formalize lines of communication and approval;
- Develop and agree on tentative schedule for phasing tasks; and
- Assign specific tasks.

In the last three years of the five-year plan (Phase 2), a careful re-assessment of the situation will take place in light of: (1) the experience gained in actual management of the Sanctuary, and (2) the priority given Looe Key's program with respect to the National Marine Sanctuary program. The future services, programs, and facilities will continue to be based on the objectives (Section 1) and general guidelines (Section 4) but adapted and scaled to future circumstances. Management actions for consideration for Phase 2 are illustrated in Figure 9 and presented as part of the guidelines which form the remainder of the plan. Figures 9 and 10 present the concept for land-based development at the Permanent Sanctuary Headquarters.

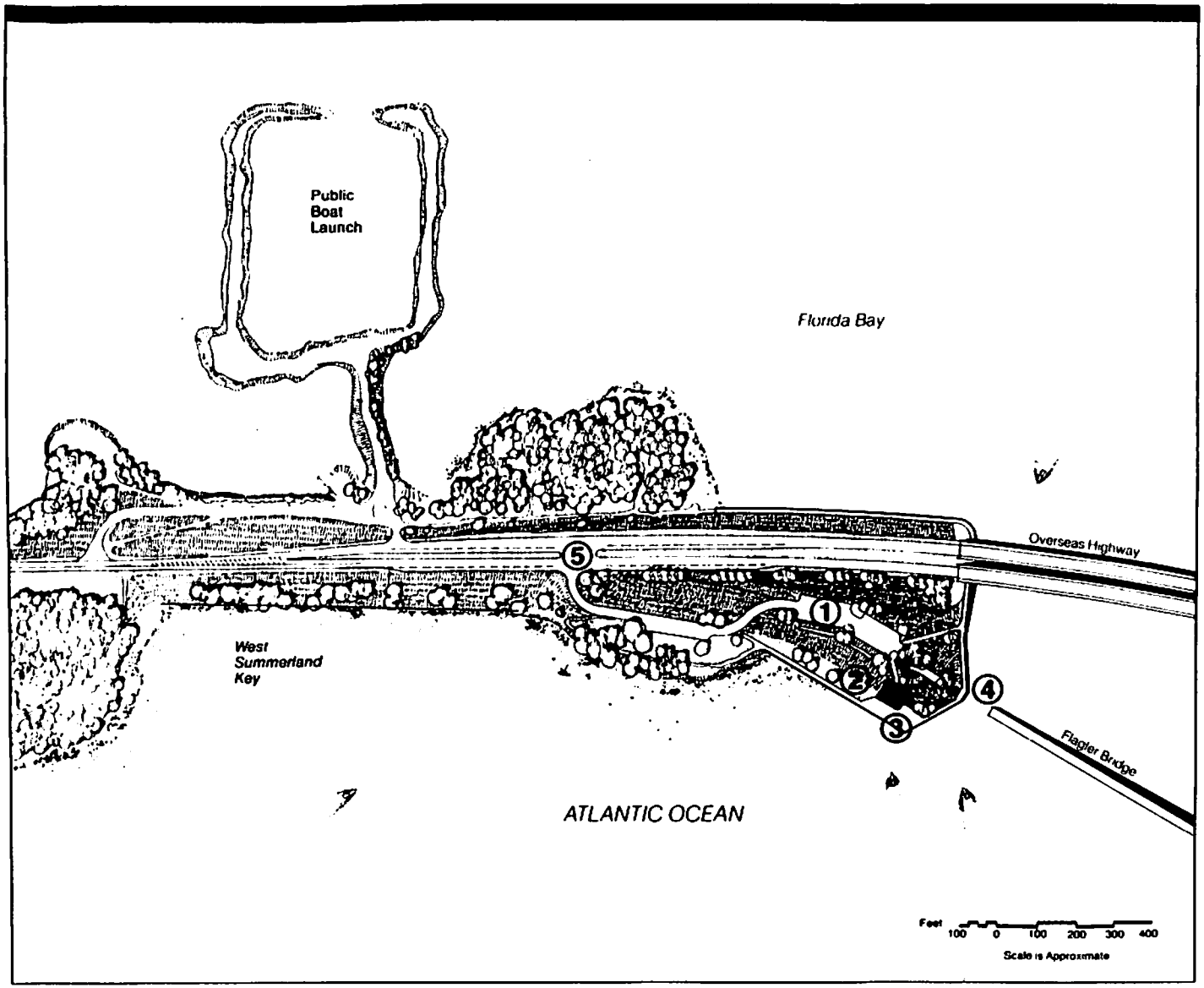


Figure 10

Phase 2: Land-base Design Concept

- Permanent Sanctuary Headquarters
- Pedestrian Access
- ① Parking
- ② Service Access
- ③ Observation Deck
- ④ Overlook
- ⑤ Highway Access

Note: West Summerland Key is one of several possible land-base sites that will be investigated in the Phase I feasibility study. It is used here for illustration purposes only.

Four

Four Key Guidelines for Continuing Program Improvement

SECTION 4

Looe Key: Guidelines for Continuing Program Management

1. OVERALL PROGRAM MANAGEMENT

The objectives and priorities for managing the Sanctuary over the short term have been addressed in the earlier sections of this plan. Section 3 provides the actions required to initiate management of the Sanctuary. It also offers a concept or image of what Looe Key could become in the future. Over the longer term, management of the Sanctuary will follow guidelines for basic, and often recurring functions. The guidelines, as presented in this section, will ensure that all actions undertaken after Phase I continue to meet Sanctuary objectives and are a step towards realizing the long term plan for Looe Key.

Coordination will be essential to the successful management of Looe Key. In addition to the Sanctuary Programs Division and the Sanctuary Manager, the Florida Department of Natural Resources and the U.S. Coast Guard will be key participants in implementing this plan. A clear definition of the duties and responsibilities of each agency is imperative in a cooperative approach to management. Frequent liaison between the Sanctuary Manager and each management agency will be necessary to ensure a smooth adjustment to program growth.

Guidelines for continuing program management are presented under five headings:

- ☐ Resource Management
- ☐ Recreational Management
- ☐ Research Management
- ☐ Interpretive Management; and
- ☐ Administration.

Phase I recommendations begin to address these subject areas. Once these are initiated and immediate issues resolved, the task will be to prepare operational plans for each subject area. The plans will articulate in greater detail the management actions, logistics, and schedules required to maintain and operate the Sanctuary on a day-to-day basis. The guidelines as presented here are intended to help prepare the operational plans. Periodic reviews must be made for each subject area to up-date both operational plans and guidelines (See Figure 11).

2. RESOURCE MANAGEMENT

(a) General Context for Management

The designation of Looe Key as a national marine sanctuary brought national recognition to the value of the coral reef resource. The first priority in managing Looe Key is to formulate and deliver a resource management program that focuses upon the protection of the reef. This was stated in the Final Environmental Impact Statement for Looe Key (Department of Commerce, 1980).

(b) Regulatory Management

Since designation, resource management has taken the form of protective regulations and their enforcement. The Sanctuary designation document, approved by the President on January 16, 1981, first promulgated these regulations, addressing existing and potential problems of resource protection. The designation document:

- ☐ Identified a list of activities that may be regulated;
- ☐ Provided for emergency regulations; and
- ☐ Defined the relationship of the Sanctuary to other regulatory programs.

Regulations that are now in effect and are directed specifically at resource management are (15 CFR Part 937):

- ☐ A prohibition on the damaging or taking of natural features, including coral, invertebrates (except for lobsters outside the Fore Reef) and tropical fish.
- ☐ A prohibition on anchoring on the coral within the Fore Reef; the requirement to use mooring buoys or anchoring areas when these are available; and a prohibition on damaging natural features with a vessel.
- ☐ A prohibition on use of wire fish traps and spearguns within the Sanctuary; lobster traps are not allowed in the Fore Reef area although currently spiny lobster can be taken elsewhere in the Sanctuary.
- ☐ A prohibition on removing or damaging any historical or cultural resource, signs or markers.
- ☐ A prohibition on discharging with the exception of fish or parts and chumming materials; and cooling water from vessels; and, effluents from marine sanitation devices.

In addition to these regulations which are specific to the Sanctuary, the Gulf of Mexico and South Atlantic Fishery Management Councils have prepared management plans for the spiny lobster and reef fishes (the snapper-grouper complex). Recreational and commercial fishing activity in the Sanctuary is carried out in accordance with these plans (Gulf of Mexico and South Atlantic Fishery Management Councils, 1981 and 1982).

The Sanctuary Programs Division is responsible for the regulatory management of the Sanctuary. In this case, management consists of:

- Assigning roles and responsibilities for surveillance and enforcement;
- Monitoring the effectiveness of surveillance and enforcement activities;
- Reviewing the effectiveness of existing regulations;
- Considering and enacting new regulations only where appropriate; and
- Identifying and providing for research and information services to support regulatory management.

The Florida Department of Natural Resources (DNR) is the main agency involved in the enforcement of regulations as outlined in a Memorandum of Understanding with the Sanctuary Programs Division (see Appendix 2). Florida Rangers stationed at Bahia Honda State Recreation Area have been assigned additional day-to-day responsibility for surveillance and enforcement within the Sanctuary. The role of the Sanctuary Manager is to maintain close liaison with all the Rangers and the United States Coast Guard (USCG). Liaison may take the form of:

- A reliable two-way radio communication between the Sanctuary Management and enforcement agencies;
- Regularly scheduled meetings to review citations and warnings; and
- Special training sessions with enforcement officers to familiarize them with the intent of the regulations, enforcement practices, public contact, and related aspects of Sanctuary management.

A record of all warnings and citations will be maintained by the Sanctuary Manager. Significant violations may require immediate consultation with the Sanctuary Programs Division. An analysis of emerging trends in violations will be undertaken periodically by the Sanctuary Manager and incorporated into his annual report to the Sanctuary Programs Division. Based on this analysis, the Sanctuary Manager may request changes in patrolling and surveillance activities. These changes may be required as a result of shifts in user behavior, increased use, seasonal variations in use, new research project locations, etc.

Changes in Sanctuary regulations will be considered primarily when research and monitoring clearly demonstrate that such changes will result in the improved protection of the reef. Updating existing regulations and/or enacting new regulations will be consistent with fair treatment of all Sanctuary users.

The most effective measures in law enforcement are preventive. It is therefore essential that visitors to the reef be provided with complete and easily understood information about regulations and the reasons for them. Communication of sensible rules and regulations will be directed primarily at access points on the mainland but will also be undertaken in the Sanctuary (see Interpretive Management).

(c) Contingency Plans for Major Environmental Accidents

The resources of Looe Key are susceptible to natural and human-related changes. Many of these changes are gradual and can be detected only through long-term monitoring of various environmental indicators. However, certain cataclysmic changes could seriously impact resources and present severe health and safety hazards. While accidental events adjacent to or on the reef cannot be predicted, there is a need for a state of readiness to avoid unacceptable losses and changes to the resource.

In Section 3, preparedness for contingencies such as accidents involving hazardous cargoes and ship groundings appears as an urgent need. The major guidelines for the Sanctuary Programs Division will be to monitor the current state of preparedness as it relates to the Sanctuary. Emergency measures for alerting response teams in the event of an accident and deploying equipment rapidly will be formulated and reviewed with all relevant agencies. There may also be procedures for closing off the reef if an accident presents a health or safety hazard for visitors.

(d) Preparation of an Operational Plan for Resource Management

The guidelines presented above offer basic directions for managing resources within the Sanctuary. The experience gained during the first few years of management and the initial coordination among the Sanctuary Programs Division and other agencies will help further define these guidelines. Once agreement has been reached, an operational plan for resources management will be prepared that describes in detail regulatory procedures, contingency plans, schedules, and cooperative and funding agreements in effect.

Looe Key National Marine Sanctuary Designation Process

Final Environmental Impact Statement

Sanctuary Programs Division, NOAA
U.S. Department of Commerce
December 1980

Presidential Approval and Designation
January 1981

Strategic Plans 1981-1983

Cooperative Agreement Planning

Florida Department of Natural Resources and Sanctuary Programs Division

Development of Looe Key National Marine Sanctuary Management Plan

Sanctuary Programs Division

Operational Plans 1983-1988

Resource Operational Plan

Recreation Operational Plan

Research Operational Plan

Interpretive Operational Plan

Administrative Operational Plan

Annual Evaluation of Progress Towards Sanctuary Goals and Management Objectives

Comprehensive Review of Sanctuary Management Plan Beginning January 1988

Figure 11

Management Plan Development and Review Process

3. RECREATIONAL MANAGEMENT

(a) General Context for Management

People who visit Looe Key almost always participate in one or several leisure time activities. In fact, recreation is the single most important activity on the reef in terms of numbers of participants. Management of recreational uses such as diving, snorkeling, and sport fishing is therefore a priority.

Recreational programs may be offered to people who cannot actually visit Looe Key. Feasibility studies undertaken during Phase I will establish the scale of facilities that could be provided at the Sanctuary Headquarters. These visitors have needs quite different from on-site visitors. They are consequently given separate attention in the plan.

(b) Visitor Orientation

Recreational visitors would benefit from an orientation to the Sanctuary prior to a visit. The information, whether given verbally or through printed materials, should identify for each visitor the facilities and programs that are available. The activity an individual decides to participate in, and whether or not various facilities and programs are used, will depend on a number of factors (e.g., time available, party or family structure, weather conditions, etc.). With the appropriate information, the visitor can plan activities in advance.

Orientation for recreational users will be available at boat launches, marinas, Bahia Honda State Recreation Area, and at landings used by commercial dive boat operators. Orientation will also take place at a permanent Sanctuary Headquarters, once a feasibility study confirms the scale and nature of the land-based development. The suggested directions for visitor orientation are discussed further under "Interpretive Management".

(c) Visitor Health and Safety

Navigation in offshore waters, boat/diver congestion, and trolling fishermen and divers represent three potential hazards in the Sanctuary. Sudden storms capable of overturning a small boat, lack of skill in recognizing marine navigational markers, and operation of boats close to snorkelers and divers can cause serious accidents.

Safety can best be assured by providing accurate and complete information to the user with respect to hazards i.e., adequate navigation charts, sea condition reports, and instructions on safe Sanctuary use. Since most recreational boats are equipped with either CB or UHF radios, Coast Guard, Rangers, and the Sanctuary Manager will be equipped to communicate severe weather warnings or receive distress calls. Aside from its other functions, a stronger management presence in the Sancturay will serve to discourage dangerous recreational practices and provide for an immediate response to emergencies.

A warning system and an emergency response plan that designate the responsibilities of various management agencies should be reviewed and updated annually. Emergency procedures for accidents that occur in the Sanctuary will be developed in cooperation with local medical and hospital staff, and with staff who operate the NOAA hyperbaric chamber on Key Biscayne. The Diving Accident Management Manual (Department of Commerce and Florida Underwater Council, 1981) will be used as a resource and training source.

Sea urchins, fire coral, and jellyfish present other less severe hazards to underwater recreationists. Sanctuary and DNR representatives present in the Sanctuary will be trained and equipped to handle minor injuries.

(d) Activity Management in the Sanctuary

The recreational activities taking place in the Fore Reef will require ongoing management for two reasons. First, it is in this area that visitors may damage the reef, and second, where uses are concentrated the visitors are liable to endanger each other or spoil recreational experiences through overcrowding. For these reasons glass-bottom boat tours are not considered safe at Looe Key.

Facilities will be provided in the Sanctuary to manage recreational activities and reduce potential conflicts. This subject is addressed in Section 3 of the plan and the initial action of installing mooring buoys is prescribed as a solution. The use of mooring buoys to prevent anchor damage to the reef has the additional benefit of enabling the Sanctuary Manager to control boat density.

In the course of undertaking the resource mapping study and other baseline studies, acceptable spacing standards for recreational vessels will be considered. Such standards will be used as a starting point to determine the number of mooring

buoys that could be installed on the reef and their placement.

Visitor satisfaction surveys and carrying capacity studies will provide a better understanding of optimum use levels. As this new information becomes available, the upper limit of boats in the vicinity of the Fore Reef may be adjusted by controlling the number of mooring buoys.

Recreational management of hook and line fishing is not anticipated over the long term since this activity takes place outside the heavy use area. However, there appears to be a problem of trolling within the Fore Reef area resulting in a safety hazard for snorkelers and divers. This may be an important use conflict to be addressed in the near future.

Monitoring use over time in the Sanctuary is an important recreational management function. The number of visitors, activities engaged in, length of stay and other important factors will be recorded in a systematic manner through surveys. This will enable the Sanctuary Programs Division to detect changes in activity patterns and preferences, and anticipate overuse problems.

Finally, since use of the Sanctuary for many will be through the services of commercial dive boats, the Sanctuary Manager will work closely with the operators to ensure that their needs are understood and taken into account in establishing recreational management measures.

(e) Recreational Management on the Land Base

Feasibility studies during Phase I will examine in detail potential programs for visitors who only visit the land base. Future recreation management may aim at providing pedestrian access around the land base, suitable services, and interpretive programs.

(f) Preparation of an Operational Plan for Recreational Management

An operational plan, similar to the one already discussed for resource management, will be prepared to present in detail the directions established above. The plan will address such topics as the placement, installation, and maintenance of the mooring buoys, the maintenance program for signage, and other orientation facilities.

4. RESEARCH MANAGEMENT

(a) General Context for Management

As a National Marine Sanctuary, Looe Key is recognized as a marine resource of national significance. The distinctive character of Looe Key, its special features, and key management issues outlined in earlier sections clearly establish it as an environmental benchmark for scientific research related to the coral reef ecosystem and sanctuary management.

The SPD has established guidelines for research in National Marine Sanctuaries. Although generic in scope, they apply to Looe Key and establish policies for research as well as instructions for permit applications and for processing and evaluating applications. The guidelines are summarized below.

(b) Policies

As first general policy, research at Looe Key will be coordinated with research in other nearby coral reef marine protected areas such as Key Largo National Marine Sanctuary, John Pennekamp Coral Reef State Park, Biscayne National Park, and Fort Jefferson National Monument. This is not to say that similar studies will not be undertaken in these areas, since there is often value in replicating research to confirm results and/or differences and similarities among reef systems. Yet there may be some research projects undertaken elsewhere that need not be repeated at Looe Key.

A second policy consists of designing research projects at Looe Key to make effective use of the most current research being undertaken on similar systems internationally.

A third general policy is that research at Looe Key will continue to focus on management issues particularly as they relate to the protection of significant resources. Studies to resolve immediate problems will have been initiated during Phase I and will continue to take priority until completed. Research projects will be developed as part of the operational plan to answer questions raised as new management practices and additional resource management issues are identified

(c) A Framework for Research

The following diagram depicts broad categories of research and highlights overall priorities for research at Looe Key. Emphasis at Looe Key will be on applied biophysical and applied social research. (Figure 12.)

Applied biophysical research is aimed at analyzing the resources of the reef in order to better understand its capacity to sustain use. In the course of undertaking this research, resources are used and sometimes subject to impact depending on the nature of the field procedures. Applied social research, on the other hand, is oriented to visitors and potential visitors. It does not usually relate to the resources directly, but it can affect the quality of the visitor experience. Guidelines for managing research are therefore required to ensure that research activity is compatible with all Sanctuary goals and objectives.

(d) Priorities for Management of Ongoing Research

Any presentation of the research program must be flexible since it will require frequent up-dating as new projects are added, others are completed, and those ongoing proceed from phase to phase.

Within the broader concept of having research relate directly to current Sanctuary management issues, three basic directions for research are suggested for Phase I.

They are:

- ☐ Compiling a baseline picture of the Sanctuary through a comprehensive resource mapping study and other related research projects;
- ☐ Starting a relatively simple monitoring program and investigating the possibility of more sophisticated programs; and,
- ☐ Conducting feasibility studies related to a land-based visitor and administrative center.

Undoubtedly these projects will extend beyond Phase I and will retain a high priority until completed.

Research projects in the future will continue to build upon the foundations set down in Phase I. The following are three groups of research projects which are being considered as high priority, because they relate to the issues and management questions identified in Section 2 of this plan.

Establishing a baseline inventory of the Sanctuary

For both applied biophysical and socio-economic research:

- ☐ Develop an easily stored and retrieved bibliographic reference system for research literature related specifically to Looe Key but also to coral reefs in general;

For applied biophysical research:

- ☐ Evaluate the baseline resource information available on Looe Key, including that made available through the mapping study. This is to determine to what extent the broad biological structure of the reef system and processes are understood and to identify basic gaps in knowledge;
- ☐ Based on the gaps identified above, initiate baseline studies on important Sanctuary resources for which more detailed information on distribution, abundance, and life history is needed for effective Sanctuary management (e.g., rare corals and fish species). This will include organisms that dominate in biomass, numbers or frequency of occurrence, harvested species; and
- ☐ Compile a detailed environmental history of Looe Key.

For applied socio-economic research:

- ☐ Conduct a baseline on-site user survey and compile available information on visitor activities. This will help establish the visitor use parameters for monitoring; and
- ☐ Conduct a baseline study on the socio-economic role and impact of the Sanctuary, determining economic and employment impacts of various activities (e.g., fishing, diving, and research).

Designing an effective monitoring program for the Sanctuary

For applied biophysical research:

- ☐ Study the ecological effects of physical damage;
- ☐ Continue to study the effects of the spearfishing ban on sanctuary resources by monitoring coral reef fish populations;
- ☐ Study the effect of hook and line fishing on community structure of reef fishes;
- ☐ Monitoring of important physical variables to determine seasonal and annual variability in major oceanographic and atmospheric factors; and
- ☐ To enable placement of water quality monitoring stations and mooring buoys, a study of circulation patterns within and around the Sanctuary is needed.

A Framework for Research at Looe Key

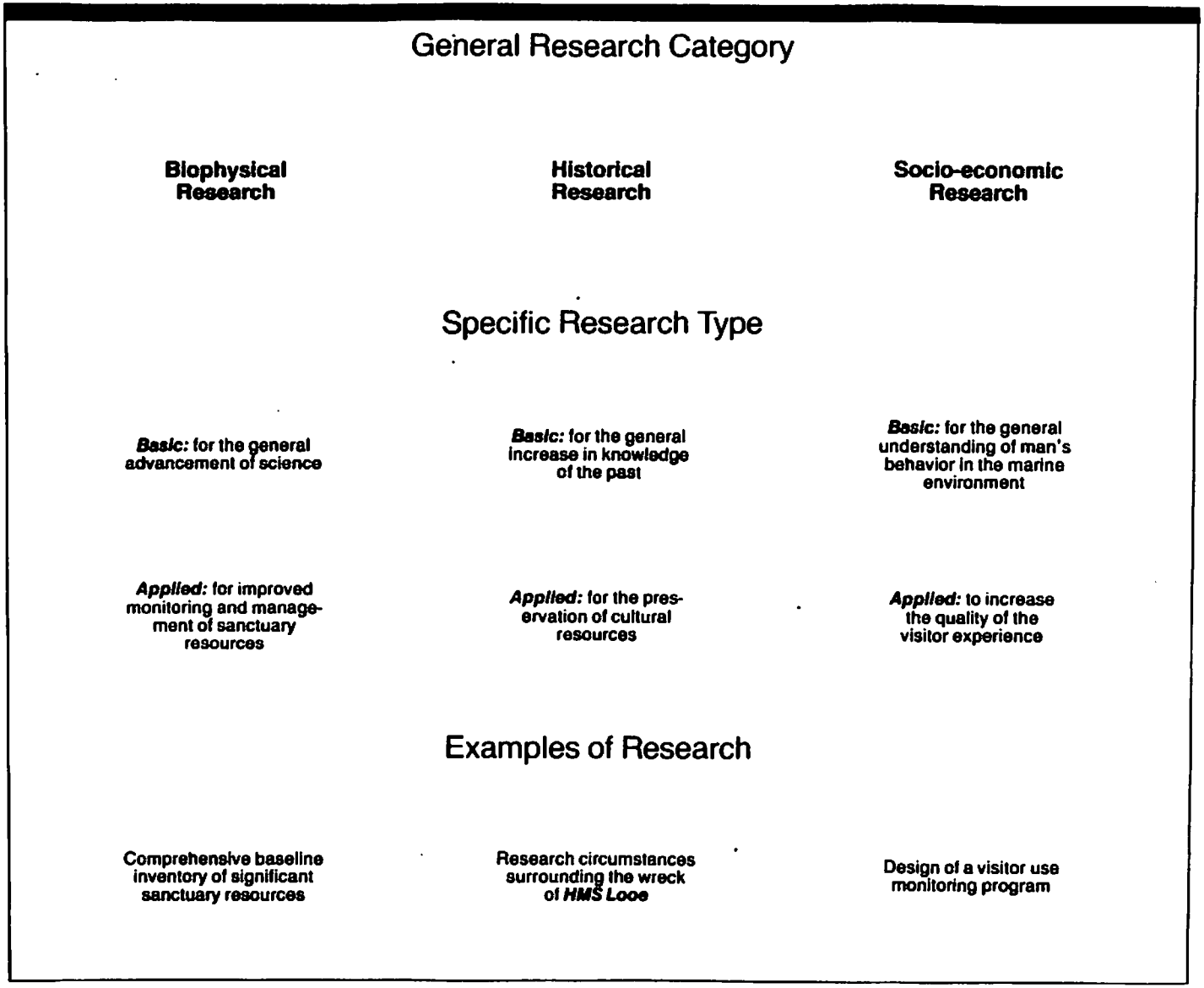


Figure 12

For applied socio-economic research:

- Design a quantitative visitor monitoring program.

Conducting feasibility studies and related research on proposed management actions and facilities

For applied socio-economic research:

- Conduct an onshore recreational tourist survey to determine information needs and interests of the different groups likely to use a Visitor Center

As for the other management functions, an operational plan for research will be prepared which presents in detail the sequence and phasing of research projects, complete terms of reference, funding, and reporting requirements.

(d) Guidelines for Management of the Research Program

The potential to carry out interesting reasearch projects at Looe Key is almost limitless. For reasons stated in earlier sections, requests for conducting research at Looe Key will increase in the future. To ensure that projects that are important, relevant, and related to the achievement of the research management objectives are placed in their proper context and given due priority, a procedure for evaluating, selecting and scheduling priority research subject areas is needed.

The Sanctuary Manager and the Sanctuary Programs Division, who hold the general management and co-ordination responsibility for Looe Key, are in the best position to manage research. The issues and questions which could benefit from research will be considered on an annual basis and taken into account throughout the process outlined below.

Annual Review of Research Program

Annual review of research needs at Looe Key will involve the Sanctuary Programs Division, the Sanctuary Manager, scientific members of the Management Advisory Group, and possibly other scientists knowledgeable of Looe Key. In the course of identifying priority research areas, the following factors will be considered:

- Immediate and evolving management issues that could benefit or be resolved through directed research;
- Achievements of research in progress or recently completed;
- Immediacy of need and environmental consequence (i.e., is Looe Key the best place to conduct the study? Will it result in user conflicts?); and
- Funding considerations.

Proposals for Research

The Sanctuary Programs Division supports research that addresses management issues. Research priorities are identified in sanctuary Management Plans. Instructions for preparing and submitting proposals are available from the SPD.

Funding for studies is normally provided through a competitive process whereby Requests for Proposals are announced in the *Commerce Business Daily* and this procedure will also be used for funding management-oriented research at Looe Key. However, unsolicited proposals of outstanding merit will also be considered. In addition, the Sanctuary Programs Division will conduct internal research with the Sanctuary Manager and his staff as well as through cooperative arrangements with other federal agencies and State government.

The Sanctuary Programs Division will also receive proposals requesting research permits. When proposals include activities that are prohibited by sanctuary regulations, it may be determined that all or part of the activity should be conducted outside of the Sanctuary.

Proposal Processing and Evaluation

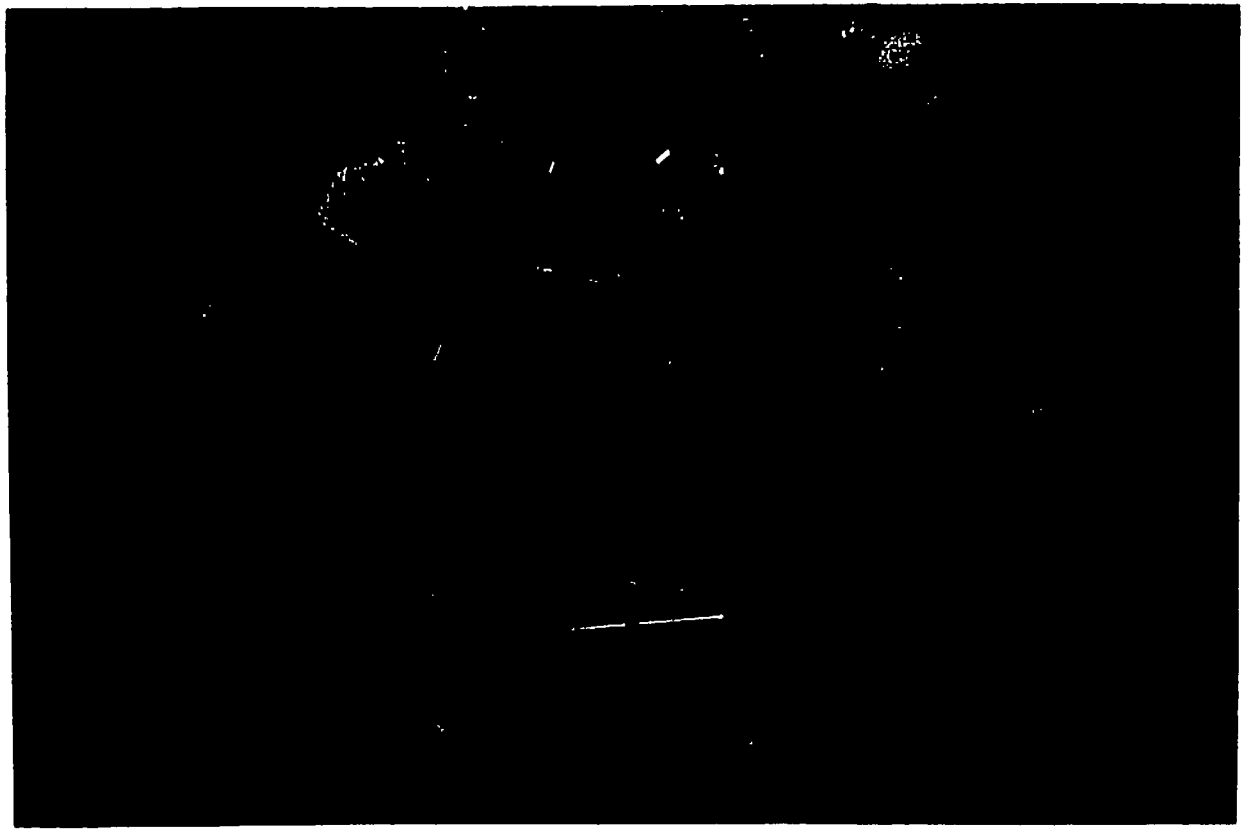
Proposals will be reviewed by recognized scientists and research managers as described above. Briefly, the criteria considered include:

- Relevance or importance of the research to Sanctuary management;
- Scientific or educational merits of the research;
- Research performance;
- Technical approach; and
- Environmental consequences.

The Sanctuary Programs Division will issue final approval of research projects. Awards will be provided through grants, contracts, and cooperative agreements.

Project Tracking and Product Evaluation

The Sanctuary Programs Division and the Sanctuary Manager will monitor performance of the contractor. Progress reports and final reports will



7. Underwater research in the Sanctuary *Sanctuary Programs Division File*

be required as well as conformance to schedules outlined under the terms of the contract. Final reports will also be reviewed by recognized scientists and resource managers. Outstanding projects may be published by the Sanctuary Programs Division in its Technical Report Series. The Sanctuary Programs Division is implementing a computerized project tracking system to facilitate management of research programs.

The Sanctuary Manager will also keep records of all research underway, sites in use, equipment being used on site, frequency of researchers visits, and progress to date. It will be helpful to summarize this information in the form of a large wall mounted airphoto upon which locations of research projects can be marked with pins, the name of the researcher, and his or her telephone number.

(f) Preparation of an Operational Plan for Research Management

An operational plan for research will be prepared early in Phase I. The plan will include detailed projects to be undertaken, their level of priority, funding and logistical requirements, and an explanation of how results will be formatted for management use.

5. INTERPRETIVE MANAGEMENT

(a) General Context for Management

If Looe Key National Marine Sanctuary is to provide a meaningful experience to a wide public, the interpretive program must offer a range of opportunities suited to the resources and interests of many potential visitors. A balanced and varied approach to interpretation can bring enhanced understanding and appreciation of the coral reef environment (James Dobbin Associates, 1980). Increased public support is essential to the achievement of resource protection goals over the long term. This area of management is therefore dealt with in some detail.

(b) Interpretive Opportunities

Opportunities for interpretive programs at Looe Key fall into three categories: those to be provided on the reef itself, those that could be offered on the mainland Keys nearby, and those disseminated within the broader region (i.e., extension services).

The abundance, diversity, and accessibility of the corals and other species at Looe Key provide a unique opportunity to interpret the coral reef environment to a large number of visitors each year. The quality of the recreational experience already draws an audience of boaters, fishermen, divers, and snorkelers who are interested in the resource and who are likely to appreciate more information about what they are observing. The fact that a variety of habitats are visible from the Fore Reef area suggests that divers and snorkelers could easily be "guided" through different sections of the Reef with well-designed brochures and guidebooks. Owing to the small size of the area and concentration of visitors, a limited number of interpretive staff are required to orient visitors and answer questions. This is a unique situation where personal services can be used cost-effectively to promote compatible recreational use of the reef.

Land-based interpretive programs can reach another large audience who, while interested in marine issues, will not actually visit the Sanctuary site because of its distance from the land, limited means of access, or lack of interest in diving or snorkeling. Access to the Sanctuary is indeed limited for this non-diving public since the shallow configuration of the Fore Reef and the management concern for not causing increases in boating activity preclude the use of glass-bottom boats. Other parts of the reef such as the Patch Reef are not suited for boat tours due to the lack of visibility and the problem in locating unmarked reefs. Even for those with some diving experience, access to the Sanctuary can be difficult because of unfavorable weather conditions during certain seasons. Most will miss the dramatic nocturnal activity on the Reef because of the dangers of diving at night. These factors suggest the need to provide a comprehensive land-based interpretive program at a point that is easily accessible from the Overseas Highway.

8. Coral area scoured by grounded vessel — *J. Halas*

Another component of the interpretive program will be reaching out to audiences throughout the Keys, the State of Florida, and elsewhere through extension services. In all aspects of the interpretive program, attention will be directed towards not increasing on-site visitor use which could impact reef resources.

(c) Interpretive Themes and Messages

The management objectives for interpretation are presented in Section I. The basic categories of information to be conveyed to the public, or interpretive themes for the Sanctuary, are as follows:

- Orientation;
- Resources;
- Sanctuary management; and
- Marine issues.

Interpretive messages are specific topics or ideas that illustrate a theme. The messages considered most important to Sanctuary visitors are answers to those obvious questions that come to mind for many visitors. Not all questions can be anticipated since they will vary considerably with the background, skills, and familiarity with the coral reef environment of the individual visitors. Yet there are some recurring questions that can be identified at this time. Messages relating to each basic theme are presented below.

Orientation Messages

- Where is Looe Key National Marine Sanctuary located and how can I get there? How will I recognize it once on the water?
- What can I expect to do and see there?
- How can I do so safely? How are diving conditions out there today?
- How can I get more information about the reef?

Resource Messages

- Why is the Fore Reef located where it is and not further out or closer to shore?
- What determines the structure and function of what I see? i.e., Why does it have a spur and groove structure?
- What are the relationships of the offshore Reef Tract and the Florida Keys?
- Why are there so many different types of fish on the reef?

Sanctuary Management Messages

- Why is Looe Key a "National" Marine Sanctuary?
- How did it become a sanctuary?
- What does sanctuary status really mean? i.e., is it really a "sanctuary" or does resource harvesting take place?
- What has sanctuary status achieved for Looe Key?
- Are there active research programs at the Sanctuary?
- How do the mooring buoys improve conditions on the Reef?

Marine Issue Messages

- Why are spearfishing, sport and commercial lobstering banned in the Fore Reef?
- How important are commercial fishing and lobstering in the local economy? How are these activities carried out? What is done to manage these fisheries?
- Are there any potential threats to the Sanctuary and what precautions have been taken to plan for such potential impacts?

Clearly, the level of detail with which these questions get answered will depend on the "media device" selected to carry the message. For example, less detail will be provided in a brochure than in a slide show or an exhibit.

In developing the interpretive materials, messages are not dealt with separately, but rather are linked together as "story lines". Good story lines, whether used to design a room, an exhibit, or a slide show, help organize the information being communicated in a logical sequence. Visitors usually find it easier to remember a story-line than specific messages.

At Looe Key National Marine Sanctuary, a visitor's understanding of the Sanctuary can be improved by presenting the Sanctuary according to the major points in its evolution. Four story lines have been identified to illustrate the Sanctuary natural history as follows:

- Growth of the coral reef, a race against rising sea levels;
- An emergent Key;
- A National Marine Sanctuary - Looe Key today; and,
- Possible tomorrows: the benefits of a Sanctuary.

The messages listed earlier can be woven into these story-lines in a meaningful yet entertaining way. The story-lines are sketched below.

Growth of the Coral Reef - A Race Against Rising Sea Levels

- The highly specific environmental conditions for coral growth (adequate sunlight, warm temperatures and clear water).
- Geological history of the Florida Reef Tract and the Keys;

- The structure of the Fore Reef: spurs and grooves - an optimal orientation for growth;
- Glacial history and changes in sea level; and
- Techniques for discovering Looe Key's past.

In Emergent Key

- Effects of storms on the Reef Tract: a mechanism for coral distribution;
- Structure of the Reef Flat: the "mini" Ice Age;
- Discovery of Looe Key: Survival at Sea!
- The cultural history of the Florida Keys;
- Navigation skills required offshore;
- Potential benefits/hazards of the Florida current; and,
- Relationship of the Reef Tract to the landward keys: mangrove colonization.

National Marine Sanctuary: Looe Key Today

- Effects of visitors on coral reefs from anchor damage, souvenir collecting, spearfishing, and sport lobstering;
- High yields of marine resources in the Keys;
- Non-consumptive use: an enjoyable alternative;
- The system of National Marine Sanctuaries; and
- Sanctuary research: a management orientation

Possible Tomorrows: The Benefits of A Sanctuary

- Improved understanding of man's effect on the coral reef environment;
- Benefits to commercial activities: protected habitats and sustained yields;
- Greater knowledge of species life cycle and habitat requirements;
- Program development: introducing people to the offshore;
- Improvements in the Sanctuary; and,
- Continual evolution of the Reef Tract: sand transport, hurricanes, and cold kills.

The above are just a few of many story-lines to be developed for interpretive documents and facilities for Looe Key. Another perhaps simpler story-line would be to use the Resource Management Units to organize much of the information to be conveyed to visitors. The habitat guidebook discussed for Phase I and other guidebooks are examples of interpretive materials that could be structured according to these units.

(d) Interpretive Programs

Interpretation related to the Sanctuary will consist of three distinct sets of programs:

- On-site programs aimed at recreational users in the Sanctuary proper;
- Land-based programs aimed at "vicarious" users - that is an interested public visiting the Sanctuary Headquarters with the intention of learning more about Looe Key but without actually going out there; and
- Land-based programs aimed at "extension audiences" - that is individuals and groups with an interest in Looe Key but not likely to visit the Sanctuary or the Headquarters to learn about the area (and which therefore require an "outreach" or extension service).

The interpretive needs of the 3 major audiences for interpretation are summarized in Tables 4-6.

Interpretive materials and facilities can be developed for use in all three programs. For example, the orientation brochure and poster to be designed and distributed during Phase I can be incorporated into both water-based and land-based interpretive programs. The descriptions below focus on the three programs separately.

On-site Programs

On-site interpretation at Looe Key will be initiated during Phase I with: (1) the development of a habitat guidebook for use on the reef; (2) training of surveillance personnel to provide some intrepretive contact; and (3) collaboration with commercial dive boat operators in developing materials and pretour talks to be provided on commercial vessels during trips out to the Reef.

Several options were considered for expanding on-site operations in future phases. Stationing an interpretive vessel on the Reef was considered as an option. It was not pursued however, because of possible duplication with facilities provided at the land-based Sanctuary Headquarters. An additional vessel also could interfere with the recreational experience of visitors in the Fore Reef area.

In fact, an important guideline for future programs is that new materials and facilities for on-site interpretation should not interfere with the quality of the visit of recreational users. As mentioned earlier, the area of prime interest (the Fore Reef) is so small and uses are so concentrated during peak periods that too many interpretive facilities would only add to the overcrowding and cause additional conflicts.

TABLE 4: Interpretive Needs and Opportunities for Recreational Users

	INFORMATION NEEDS FOR ORIENTATION:	INFORMATION NEEDS FOR UNDERSTANDING RESOURCES, ISSUES, AND PROGRAM:	*POTENTIAL CONTACT STRATEGIES:
1. Tourists (Potential Sanctuary Visitors and Vacationing Public)	- May be aware Sanctuary exists at Looe Key but will not know how to locate it, or what they might do there; - Need basic information including options for visiting Sanctuary; - Not likely to be aware of safety and navigation concerns	- Familiar with coral reefs through reading, TV etc. but have never visited first hand; - Open to presentation which captures beauty, color and complexity of Looe Key	- Pre-trip information packages - Periodicals (especially travel publications); - Destination points and stopovers e.g. State Parks, motels, service centers, etc.; - Highway-orientated information centers (e.g. Chambers of of Commerce.
2. Touring Boaters (Sail and Motorboats)	- Likely aware of Sanctuary through word of mouth or navigational charts, not as familiar with regulations; - Potential divers and snorkelers	- May not perceive Sanctuary as special or different; - Some interests in specifics on reef resources e.g., how does it relate to other sections of the reef tract	- At Sanctuary; - At supply and service stations (i.e., marinas); - Specific literature on Keys addressing recreational boaters.
3. Novice Snorkelers	- Aware of coral reef areas through literature etc. on the Florida Keys; May or may not be familiar with Looe Key NMS; - Some capable of locating reef independently; most unaware of safety navigation concerns and regulations.	- Very interested in understanding reef resources and Sanctuary program i.e., where else can I enjoy a similar marine environment? and what have I really seen?	- Similar to tourists - i.e., pre-trip, during trip at stopovers and in other activity centres. - State Parks and Key Largo NMS are ideal contact points; - While en-route to the Sanctuary
4. Proficient Snorkelers and Scuba Divers	- Highly aware of reef areas and may have visited previously; - Most are capable of navigating to reef and receptive to safety and regulatory concerns	- Likely have background in other marine areas; - Intent on underwater experience; highly receptive to and focused on specifics of sport and reef conditions.	- Pre-trip information from either special publications, organized groups or previous visitors. - In Keys, gather information from dive shops, equipment rental, other enthusiasts, and stopover points. - also receptive en-route to sanctuaries
5. Sports Fishermen	- Many are regular visitors (or Keys residents) familiar with the area. - First time visitors unaware of local conditions and of Sanctuary	- Interest in Sanctuary probably varies; - Those unfamiliar with Keys might appreciate a fish habitat correlation and background on local fishing practices.	- Pre trip information obtained from sports related periodicals. - Marinas, boat launches and other boating service centers. - Fish camps, State Parks, private campgrounds, motels and resorts

** Interpretive contacts for some recreational user groups will be undertaken through local organizations such as Chambers of Commerce rather than directly by the Sanctuary Programs Division.*

TABLE 5: Interpretive Needs and Opportunities for Commercial Users.

	RELATIONSHIP TO FLORIDE KEY NMS:	INFORMATION NEEDS:	*POTENTIAL CONTACT STRATEGIES:
1. Dive Boat Operators	☐ Have benefitted greatly from national attention directed toward the Sanctuary; ☐ Traditionally very independent business operators; ☐ Concerned with diver safety and skills.	☐ Rely on personal expertise to locate exceptional features; ☐ May or may not provide interpretive talks and material to divers and snorkelers.	☐ Provide interpretive packages initially emphasizing basic information on messages to pass on to customers.
2. Boating Service Centers	☐ Receive inquiries from customers about Sanctuary location, conditions, and recreational opportunities; ☐ Have benefitted indirectly from increased visitor use in the Sanctuary.	☐ In offering answers to customers, should be able to provide literature and accurate information on Sanctuary resources and programs.	☐ Sanctuary manager can meet, establish rapport, provide materials and information on Sanctuary.
3. Commercial Fishermen	☐ View most recreational activities as possible conflict because of competition for space.	☐ Very familiar with reef areas; ☐ Could assist in directing and informing visitors; ☐ Need to know precise location of regulated Fore Reef area.	☐ Provide buoys and nautical charts delineating Fore Reef to organized groups and suppliers.

* *Interpretive contacts for some recreational user groups will be undertaken through local organizations such as Chambers of Commerce rather than directly by the Sanctuary Programs Division.*

TABLE 6: Interpretive Needs and Opportunities for Extension Audiences

	RELATIONSHIP TO LOOE KEY NMS:	INFORMATION NEEDS:	*POTENTIAL CONTACT STRATEGIES:
1. GENERAL PUBLIC	[] Consists of potential visitors and others with interest in marine resources; [] Represents potential national support for Sanctuary program.	[] Background on special attributes of Looe Key NMS and the benefits provided by Sanctuary status.	[] Contact through general interest articles in national magazines; [] Word of mouth from friends who have vacationed in Keys
2. LOCAL COMMUNITY	[] Many are represented in various visitor groups; [] Second home and retirement communities are a large and receptive audience; [] Keys and greater Miami area in general are very marine oriented.	[] Need exists to understand scientific basis for Sanctuary regulations and relationships to local issues.	[] Presentations to community groups and schools that emphasize benefits from wise use of marine resources; [] Follow-up information can be provided through local press and radio.
3. ADVOCACY GROUPS	Organizations supporting the Sanctuary are identified in the Final Environmental Impact Statement e.g., Florida Underwater Council, the Audubon Society; [] Consists of organizations which endorse goals sympathetic to the National Marine Sanctuary Program.	[] Receptive to positive accomplishments of Sanctuary management and needs for further lobbying and conservation efforts; [] Balance between use and conservation practiced at Looe Key NMS; [] For many members, satisfied to know Sanctuary exists.	[] Organizations supporting identified in FEIS; [] Updates on Sanctuary activities can be printed in society publications; [] Interested in speakers and presentations on Looe Key NMS
4. SPECIAL INTEREST GROUPS	[] Membership acts to affect changes in public policy and attitudes around a single issue or activity; [] May be opposed or in favor of Sanctuary status; [] Examples include the Lower Keys Chapter of Organized Florida Fishermen (OFF)and the Keys Association of Dive Operators (KADO).	[] Rationale for Sanctuary management activities and positions, vis-a-vis special interest; [] Positive accomplishments of balanced program.	[] Will establish contact with SPD, DNR and Sanctuary management about special needs; [] Can be addressed by knowledgeable speakers on key aspects or by presentation on Sanctuary
5. OTHER GOVERNMENT AGENCIES	[] Most important agencies to SPD are those who will be in contact with public about marine activities in the Keys; [] Represent potential support and promotion of Sanctuary activities.	[] Activities encouraged or prohibited by Sanctuary management; [] Level of enforcement activities and results; [] Ways in which agency can assist Sanctuary management.	[] Updates on Sanctuary activities presented in newsletter, and summarized in society publications. [] Speakers and presentation on Sanctuary development welcome at conferences and meetings

** Interpretive contacts for some extension audiences will be undertaken through local and regional organizations rather than directly by the Sanctuary Programs Division.*

The major components of the on-site interpretive program after its initiation in Phase 1 will be:

- The development of guidebooks (in addition to the habitat guidebook discussed for Phase 1) for use by Sanctuary visitors to identify and learn more about the behavior of the more prominent coral reef life groups (e.g., sponges);
- Provision of limited personal services by Rangers on the enforcement vessel who would be available to answer questions. During the very low use periods (weekdays during the winter), enforcement staff with prior training could be used to provide some interpretive contact. On-site interpreters should be trained to explain to inquiring snorkelers and divers the type and reason for on-going research projects in the Sanctuary. They should also be prepared to answer a wide range of questions about the program, and the resources being protected; and
- Developing cooperative programs with commercial dive boat operators. Such programs would include: (1) working sessions to review and discuss the interpretive materials to be distributed by operators; (2) agreements to have Sanctuary Interpreters on board for special groups; and (3) meetings to discuss new interpretive materials for use by visitors.

Land Based Programs

- Bahia Honda State Recreation Area An Initial Public Information Focal Point.

Outdoor display panels in Bahia Honda will present basic information on the interpretive messages. Orientation, Sanctuary resources, the National Marine Sanctuary Program, and overview information on marine issues will be emphasized.

- The Sanctuary Headquarters: Initial Development.

In the early stages of its development, the Sanctuary Headquarters will be a relatively small facility. A large proportion of the space available will be devoted to administrative functions (e.g., Sanctuary Manager's office, staff room, meeting room, storage). There will be some space allocated to interpretation. A room could serve as a general information area. Brochures and other materials will be distributed at a counter. Permanent exhibits such as the large-scale air photo of Looe Key and a 3-dimensional model of the reef will represent the major interpretive devices in the information area, provided funding is available.

- The Sanctuary Headquarters: Full Development.

The architectural design of the Sanctuary Headquarters in Phase 2 will have inherent in it a flexibility or "open-endedness" which will allow change and expansion in an easy and comprehensive way. In time, the Sanctuary Headquarters will expand to provide more space for interpretation, and could eventually become a full-scale visitor and administrative center.

The Headquarters will provide an introduction and basic orientation to the Sanctuary, allow overall appreciation of significant resources and "guide" visitors through an experience not unlike being on the reef itself.

The story-lines described earlier could be used to design a series of interpretive display areas or rooms. An entire room or area could be devoted to each story-line and could be equipped for an audio-visual presentation on various topics. Synchronized slide shows, video films, and sound devices could be used to present to visitors specific resources, coral reef processes, and special research projects. For example, coring samples which have been used to determine changes in the structure and growth of Looe Key (schlerochronology) could be exhibited to illustrate the history of the reef (Shinn et al., 1981). One such core (known as the "Bicentennial core") provides a unique record of major weather events in the area (Hudson, 1982; pers. comm.). Hands-on devices and instruments reporting on "real time" Sanctuary conditions may also be of considerable interest to visitors.

An important concept underlying the interpretive design of the center will be to expose visitors to the features and processes of the reef. The various displays will be carefully designed around the concept of being underwater. Sounds, light, and color will be used to reproduce the outstanding recreational experience of Looe Key giving visitors a sneak preview of the range of activities and sights offered by the area.

Another important aspect to the interpretive design of the Center will be to make effective use of the panoramic nature of the site. An observation deck will be designed to offer the visitors an outstanding view of the ocean, the ships, and pleasure boats cruising by.

Extension Programs

Extension groups include organizations and individuals who may not visit the Looe Key National Marine Sanctuary and the Headquarters but who are interested and/or could benefit from knowledge of the area. Identification of extension

groups is a critical step in the development of off-site interpretation and outreach programs.

Extension groups can be broadly categorized as follows:

- A general public consisting of individuals visiting marine-related facilities outside the Sanctuary (e.g., Planet Ocean, Key West Aquarium, John Pennekamp Coral Reef State Park Visitor Center);
- The local community;
- Special interest groups such as sportsmen's groups, nature groups (Florida Audubon Society), educational organizations; concessionnaires and suppliers to recreational users; and
- Other government agencies.

In the early years of program development at Looe Key National Marine Sanctuary, it is recommended that attention be directed primarily towards on-site programs for Sanctuary visitors. Extension groups would become more important for program support if the Sanctuary Headquarters and related facilities were to assume greater visibility.

An early thrust in the extension program will be to contact directly officials in the local communities of the Keys. The aim will be to inform them of the availability of Sanctuary materials and to establish contacts with education, fishing, tourism, and industry representatives. Additional tasks will include supplying schools and colleges with interpretive materials and providing advice (upon request) as to how the Sanctuary can be incorporated into the curriculum through field trips and special projects.

Keeping extension groups informed about current events in the program will be done by:

- Developing and circulating a Sanctuary newsletter or a regional newsletter produced jointly with Key Largo;
- Providing an update on the program in local newspapers and newsletters; and
- Making presentations at major conferences and seminars in the Miami area.

There are excellent facilities in the Miami area where space could be made available for Sanctuary Programs Division temporary exhibits, and other presentations. A survey will be undertaken of the interest and advantages of making the exhibit materials available.

An opportunity which deserves special attention in the future is the possibility of developing video presentations, exhibits, slide shows, and films resulting from research conducted in the Sanctuary. These could be made available to high schools and universities with a marine studies program. Another opportunity would be to develop a high quality film interpreting both Looe Key, Key Largo and possibly Gray's Reef (Sanctuaries in the south-east Atlantic Region) which could be shown at major facilities such as Planet Ocean.

(e) Preparation of an Operational Plan for Interpretive Management

An operational plan will be prepared to present in detail the materials and other media to be developed, schedules for design and distribution, and funding requirements.

6. ADMINISTRATION

(a) General Context for Management

Management of the Looe Key National Marine Sanctuary consists of four recurring functions resources management, recreation management, research, and interpretation. A fifth function administration is an aspect that oversees all other functions since it establishes who is responsible for implementing the specific programs. The administrative framework also ensures that all management functions are coordinated.

(b) Overall Management Roles

The agency responsible for overall management of Looe Key is the Sanctuary Programs Division, NOAA. As such, it assumes the responsibility for implementing this plan. The Division has delegated a management role and specific responsibilities to the Florida Department of Natural Resources. General roles and responsibilities for each agency are as follows (see Figure 12):

Sanctuary Programs Division

The National Marine Sanctuary Program is administered through the Sanctuary Programs Division (SPD) within the Office of Ocean and Coastal Resource Management of the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce.

NOAA's Sanctuary Programs Division has overall responsibility for managing Looe Key National Marine Sanctuary, but delegates certain on-site

management and surveillance/enforcement responsibilities to state and other federal agencies. The SPD develops in collaboration with the Sanctuary Manager and the Florida Department of Natural Resources a detailed annual budget for each facility and program setting out expenditures for program development, operating costs, and staffing. Priorities for development both annually and over a 5-year period are to be established by the Sanctuary Programs Division in the operational plan.

The Sanctuary Manager represents the Sanctuary Program in the Florida Keys region. Specific responsibilities of the Sanctuary Manager are highlighted later in this section. The Sanctuary Manager's office is currently located at Bahia Honda State Recreation Area.

Florida Department of Natural Resources

NOAA's Sanctuary Programs Division has a Cooperative Agreement with the Florida Department of Natural Resources, Recreation and Parks, Bureau of Environmental Land Management (Appendix 2). This agreement provides for on-site coordination of resource protection, recreation management, research, and interpretive activities. In addition, DNR Rangers enforce all applicable federal regulations pertaining to Looe Key.

The Sanctuary Programs Division will collaborate with other agencies and enter into additional cooperative agreements as required in the course of implementing this plan. A Management Advisory Group (MAG) will also provide a mechanism for public representation and input in the management process. The general role of this group is as follows:

Management Advisory Group (MAG)

The Management Advisory Group will not perform a management role in a direct manner but will provide for effective continuing public participation and ensure communication among all users and interest groups involved with the Sanctuary. Membership in the MAG will be drawn from research and educational institutions, government agencies, and local citizen groups which express an interest in participating. Typical of the kinds of interest that might be represented on the MAG are: The Organized Fishermen of Florida (OFF), Keys Association of Dive Boat Operators (KADO), Newfound Harbor Marine Institute (NHMI), South Atlantic and Gulf of Mexico Fisheries Management Councils, Monroe County Board of Commissioners, Florida Department of Natural Resources (DNR), U.S. Coast Guard and universities which are carrying out research at Looe Key.

A method for selecting members of MAG and terms of reference for its operation will be developed early after initiation of Phase 1. The criteria for establishing the MAG should be in place within six months of the adoption of this plan. As many groups as possible which have indicated an interest in Looe Key before, during, and after designation as a Marine Sanctuary will be contacted by the Sanctuary Manager during the process of establishing the MAG. NOAA's Sanctuary Programs Division will make the final decision on membership on the MAG.

(c) Resource Management: Roles and Responsibilities

Sanctuary Programs Division

1. Reviews periodic summaries of surveillance and enforcement activities. Reviews annual reports on the effectiveness of Sanctuary regulations;
2. Provides for legal support as needed for enforcement and prosecution of violations;
3. Reviews Sanctuary policy on surveillance and enforcement of regulations with Sanctuary Manager. Jointly with the Florida Bureau of Environmental Land Management (DNR) establishes policy to be followed in surveillance and enforcement activities;
4. Provides assistance and support from federal sources in the event of a major environmental emergency threatening the Sanctuary;
5. Reviews progress towards management objectives with the Sanctuary Manager and the DNR Bureau of Environmental Land Management; and
6. Develops in collaboration with DNR an operational plan for resource management.

Sanctuary Manager's Office

1. Implements Management Plan recommendations for resource management;
2. Reviews in consultation with Bahia Honda officials surveillance and enforcement procedures for Sanctuary regulations in consultation with Sanctuary Programs Division. Implements enforcement policy;
3. Participates with the Superintendent of the Bahia Honda State Recreation Area in the selection of Department of Natural Resources

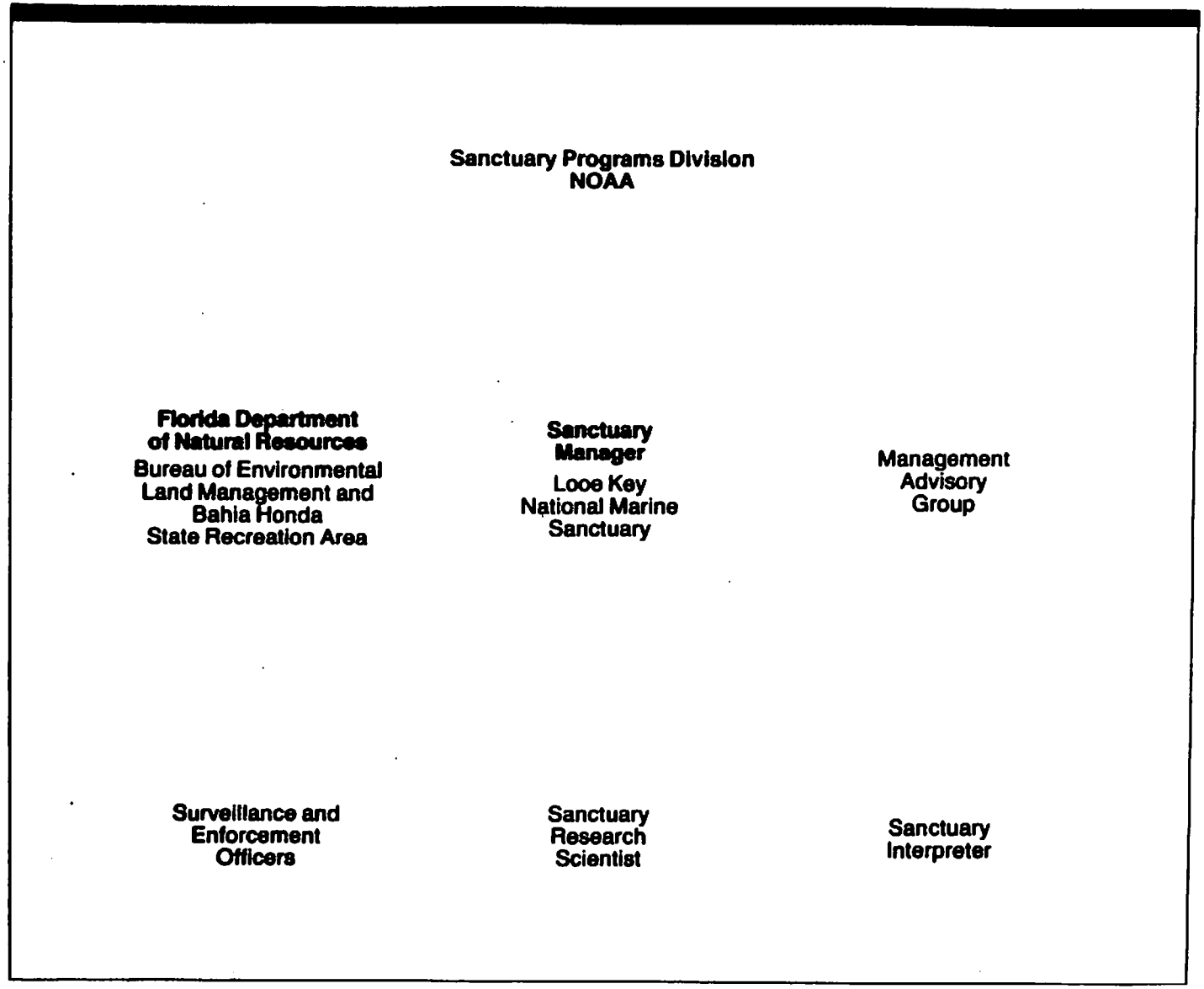

Sanctuary Programs Division
NOAA
Florida Department of Natural Resources
Bureau of Environmental Land Management and Bahia Honda State Recreation Area
Sanctuary Manager
Looe Key National Marine Sanctuary
Management Advisory Group
Surveillance and Enforcement Officers
Sanctuary Research Scientist
Sanctuary Interpreter

Figure 13

Rangers for surveillance. Establishes surveillance and enforcement training programs;
4. Oversees scheduling for surveillance and periodically reviews reports on enforcement activities;
5. Responds as needed to requests for assistance from surveillance officers;
6. Coordinates Sanctuary response in the event of an environmental emergency threatening Sanctuary resources;
7. Prepares emergency response training programs for Sanctuary staff;
8. Reports to the Sanctuary Programs Division and BLM on a regular basis (or as soon as practical in the event of environmental emergency or major violation of Sanctuary regulations) by means of quarterly reports submitted on surveillance and enforcement activities and annually on effectiveness of Sanctuary regulations; and
9. Determines annual milestones towards management objectives for resource protection, evaluates past progress on an annual basis, and assists the Sanctuary Programs Division in the development of an operational plan for resource management.

Florida Department of Natural Resources

1. Provides active enforcement presence through DNR Rangers based in Bahia Honda State Recreation Area (Cooperative Agreements). Rangers will report to the Sanctuary Manager while on active enforcement duty;
2. Assists in providing special interpretive training for marine surveillance and enforcement activities through the Florida Recreation and Parks Division; and
3. Provides assistance and support from state sources as available in the event of major environmental emergencies in the Sanctuary.

(d) Recreation Management: Roles and Responsibilities

Sanctuary Programs Division

1. Reviews and approves annual budgets for Sanctuary programs and services;
2. Reviews and approves final plans and arrangements for facilities and programs presented by the Sanctuary Manager; and
3. Reviews progress toward recreation management objectives with the Sanctuary Manager and BLM.

Sanctuary Manager's Office

1. Implements Management Plan recommendations for recreation programs, services, and facilities. Specifically, the Sanctuary Manager:
   - Oversees the location, design, and installation of recreational facilities such as the mooring buoys;
   - Oversees or carries out feasibility studies for Sanctuary Headquarters;
2. Maintains records of Sanctuary visitors and carries out studies to establish profiles, preferences, and projections of major visitor groups;
3. Provides for effective two-way communications between the other agencies and the Sanctuary Manager's Office at Bahia Honda State Recreation Area;
4. Formulates a policy and procedures for Sanctuary personnel to respond in the event of personal injuries and accidents to Sanctuary visitors;
5. Provides liaison between Sanctuary programs and local interests in Looe Key National Marine Sanctuary. For instance, establishes effective communication with private dive boat operators who frequently use the Sanctuary and inform them of Sanctuary policies on transportation, public safety, etc.; and
6. Determines annual milestones towards achieving management objectives for recreation management, reviews progress yearly, and develops the operational plan for recreation management dealing with the logistics and scheduling of major activities such as the placement of mooring buoys.

Florida Department of Natural Resources

1. Provides advice on the location of the Sanctuary display area at Bahia Honda;
2. Provides for upkeep and maintenance of the display;
3. Provides mooring space for surveillance boats;
4. Assists in the distribution of information on the Sanctuary, e.g., brochures, etc; and
5. Provides trained enforcement officers to conduct surveillance in the sanctuary.

(e) Interpretive Management: Roles and Responsibilities

Sanctuary Programs Division

Specific responsibilities for the Sanctuary Programs Division with respect to interpretation and education are as follows:

1. Reviews and gives final approval of the annual progress report for Sanctuary interpretation, monitoring progress toward management objectives;
2. Approves the annual budget and funding for interpretive programs and facilities;
3. Reviews and gives final approval of design concepts for interpretive materials, exhibits, and other media;
4. Collaborates and negotiates with federal and state agencies for the development of programs, and cost-sharing agreements; and
5. Administers major contracts for the development of interpretive materials and facilities.

Sanctuary Manager's Office

1. Prepares an operational plan for interpretation;
2. Initiates those programs listed under the interpretive strategy approved by Sanctuary Programs Division;
3. Reviews the design and oversees the development of interpretive materials and facilities in accordance with the Management Plan;
4. Prepares an annual progress report for Sanctuary intrepretation providing a summary of initial progress, proposed activities for the upcoming year, and requested staffing and funding;
5. Administers the interpretive staff keeping them informed of the scope of the programs;
6. Contacts local organizations to initiate the development of specialized documentation for their use; and
7. Determines annual milestones towards management objectives for interpretation.

Additional responsibilities which could be assigned to the Sanctuary Interpreter (should funding be available for additional staff) are as follows:

8. Assists the Sanctuary Manager in the implementation of this section of the Management Plan;
9. Designs and initiates programs, materials and exhibits and/or provides content and graphic specifications for the design of such facilities;
10. Maintains close communication with sanctuary visitors and extension audiences; and
11. Assists the Sanctuary Manager in the preparation of annual reports and budgets.

Florida Department of Natural Resources

1. Advises on interpretive approach, methods, and materials in light of experience with visitors to Bahia Honda State Recreation Area and other state parks; and
2. Assists in the distribution of a Sanctuary brochure from state facilities.

(f) Research Management: Roles and Responsibilities

Sanctuary Programs Division

1. Approves an annual budget and provides funds to support sanctuary research and monitoring programs. Encourages cost-sharing with other funding sources;
2. Approves annual research topics, priorities, and individual research projects. Approves permits for research, based on the advice of the Sanctuary Manager;
3. Maintains a registry of scientists and resource managers who have indicated a willingness to review sanctuary research proposals; and
4. Reviews annual progress in the form of the Sanctuary Manager's annually updated research operational plan.

Sanctuary Manager's Office

1. Prepares an operational plan for research;
2. Maintains a record of members of the academic and scientific communities and other parties, who have intimate knowledge of the Sanctuary, the resources, the user groups, and the resource studies needs, so that they can be called upon as required for assistance;
3. Updates annually the research operational plan;
4. Reviews permits for research and advises SPD on approval;
5. Assists in the evaluation and selection of annual research priorities and individual research projects;
6. Co-ordinates the review of ad hoc applications for research. Recommends approval or disapproval to SPD;
7. Monitors research activities in the Sanctuary;
8. Maintains a Sanctuary resource data base and bibliography and provides for access by individual scientists, educators, students, and the interested public; and,
9. Reports to NOAA's Sanctuary Programs Division and BFLM on a regular basis on activities related to fulfilling management objectives as soon as practical in the event of management problems, and annually on progress toward management objectives.

(g) Preparation of an Overall Operational Plan

Once key lines of administration have been established, an operational plan will be prepared that will consolidate into one document all cooperative agreements in force, provide a formal statement of all responsibilities including a Terms of Reference for the Management Advisory Group, and summarize detailed administrative procedures.

Appendices

APPENDIX I

LOOE KEY NATIONAL MARINE SANCTUARY REGULATIONS

REPRINTED FROM—Federal Register/Vol. 46, No. 16/Monday, January 26, 1981/Rules and Regulations

PART 937—THE LOOE KEY NATIONAL MARINE SACTUARY REGULATIONS

Sec.

§937.1 Authority.

The Sanctuary has been designated by the Secretary of Commerce pursuant to the authority of Section 302(a) of Title III of the Marine Protection, Research and Sanctuaries Act of 1972, as amended, 16 U.S.C. 1431-1434 (the Act). The following regulations are issued pursuant to the authorities of Sections 302(f), 302(g), and 303 of the Act.

§937.2 Purpose.

The purpose of designating the Sanctuary is to protect and preserve the coral reef ecosystem and other natural resources of the waters at Looe Key and to ensure the continued availability of the area for public educational purposes and as a commercial, ecological, research and recreational resource. This area supports a particularly rich and diverse marine biota. The area is easily accessible to the lower Florida Keys and is widely used by boaters, charter boat operators, dive boats, recreational divers and fishermen. Consequently, both present and potential levels of use may result in harm to Looe Key in the absence of long-term planning, research, monitoring and adequate protection.

§937.3 Boundaries.

The Sanctuary consists of an area of 5.32 square nautical miles of high sea waters off the coast of the lower Florida Keys, 6.7 nautical miles (12.5 km) southwest of Big Pine Key. The area includes the waters overlaying a section of the submerged Florida reef tract at Looe Key. The precise boundaries are:

Latitude and Longitude Are Furnished to .001 of a Second

Pt. No.	Latitude	Longitude
2-1	24°31'37"	81°26'00"
2-2	24°33'34"	81°26'00"
2-3	24°34'09"	81°23'00"
2-4	24°32'12"	81°23'00"

§937.4 Definitions.

(a) "Administrator" means the Administrator of the National Oceanic and Atmospheric Administration.

(b) "Assistant Administrator" means the Assistant Administrator for Coastal Zone Management, National Oceanic and Atmospheric Administration.

(c) "Person" means any private individual, partnership, corporation, or other entity; or any officer, employee, agent, department, agency or instrumentality of the Federal government, or any State or local unit of the government.

(d) "Tropical fish" means fish and invertebrates of minimal sport and food value, usually brightly colored, often used for aquaria purposes and which live in a close interrelationship with the coral.

(e) "The Fore Reef" means the area of the well defined "spur and groove" coral reef as delineated by Loran readings 1, 2, 3, 4 as follows:

1. NW 7980-W-13973.7, 7980-Y-43532.7
2. SW 7980-W-13975.4, 7980-Y-43543.4
3. NE 7980-W-13975.0, 7980-Y-43530.1
4. SE 7980-W-13975.4, 7980-Y-43527.7

§937.5 Allowed activities.

All activities except those specifically prohibited by Section 937.6 may be carried on in the Sanctuary subject to all prohibitions, restrictions and conditions imposed by any other authority.

§937.6 Activities prohibited without a permit.

(a) Unless permitted by the Assistant Administrator in accordance with Section 937.8, or as may be necessary for the national defense, in accordance with Article 5, Section 2 of the Designation, or to respond to an emergency threatening life, property or the environment, the following activities are prohibited within the Sanctuary. All prohibitions must be applied consistently with international law.

(1) *Removing or damaging distinctive natural features.* (A) No person shall break, cut or similarly damage or take any coral or marine invertebrate except as an incidental result of anchoring outside the Fore Reef where sand anchoring is encouraged but not required. Divers are prohibited from handling coral or standing on coral formations.

(B) No person shall take, except incidentally to allowed fishing activities, any tropical fish or marine invertebrate.

(C) There shall be a rebuttable presumption that any items listed in this paragraph found in the possession of a person within the Sanctuary have been collected or removed from within the Sanctuary.

(2) *Operation of watercraft.* All watercraft shall be operated in accordance with Federal rules and regulations that would apply if there were no sanctuary. The following constraints also shall be imposed.

(A) No person shall place any anchor on coral within the Fore Reef of the Sanctuary nor allow any chain or rope to enter the Fore Reef in a way that injures any coral. When anchoring dive boats, the first diver down shall inspect the anchor to ensure that it is placed off the corals and will not shift in such a way as to damage corals. No further diving is permitted until the anchor is placed in accordance with these requirements.

(B) Watercraft must use mooring buoys, stations or anchoring areas when such facilities and areas have been designated and are available.

(C) Watercraft shall not be operated in such a manner as to strike or otherwise cause damage to the natural features of the Sanctuary.

(D) All watercraft from which diving operations are being conducted shall fly in a conspicious manner, the red and white "divers down" flag.

(3) *Using harmful fishing methods.* (A) No person shall use or place wire fish traps within the Sanctuary.

(B) No person shall place lobster traps within the Fore Reef area of the Sanctuary.

(C) No person shall use pole spears, Hawaiian slings, rubber-powered arbalets, pneumatic and spring loaded

guns or similar devices known as spearguns within the Sanctuary.

(D) No person shall use poisons, electric charges, explosives or similar methods within the Sanctuary.

(4) *Removing or damaging distinctive historical or cultural resources.* No person shall remove, damage or tamper with any historical or cultural resources, including cargo pertaining to submerged wrecks.

(5) *Discharges.* No person shall deposit or discharge any materials or substances of any kind except:

(A) Fish or parts and chumming materials.

(B) Cooling water from vessels.

(D) Effluents from marine sanitation devises.

(6) *Markers.* (A) No person shall mark, deface or damage in any way or displace, remove or tamper with any signs, notices, or placards, whether temporary or permanent, or with any monuments, stakes, posts or other boundary markers installed by the managers or markers placed for the purpose of lobster pot fishing.

(B) All activities currently carried out by the Department of Defense within the Sanctuary are essential for the national defense and, therefore, not subject to these prohibitions. The exemption of additional activities having significant impacts shall be determined in consultation between the Assistant Administrator and the Department of Defense.

(C) The prohibitions in this Section are not based on any claim of territoriality and will be applied to foreign persons and vessels only in accordance with principles of international law, including treaties, conventions and other international agreements to which the United States is signatory.

§937.7 Penalties for commission of prohibited acts.

Section 303 of the Act authorizes the assessment of a civil penalty of not more than $50,000 against any person subject to the jurisdiction of the United States for each violation of any regulation issued pursuant to the Act, and further authorizes a proceeding *in rem* against any vessel used in violation of any such regulation. Procedures are outlined in Subpart D of Part 922 (15 CFR Part 922) of this Chapter. Subpart D is applicable to any instance of a violation of these regulations.

§937.8 Permit procedures and criteria.

(a) Any person in possession of a valid permit issued by the Assistant Administrator in accordance with this section may conduct the specific activity in the Sanctuary including any activity specifically prohibited under Section 937.6, if such activity is (1) research related to the resources of the Sanctuary, (2) to further the educational value of the Sanctuary, or (3) for salvage or recovery operations.

(b) Permit applications shall be addressed to the Assistant Administrator for Coastal Zone Management, ATTN: Sanctuary Programs Office, National Oceanic and Atmospheric Administration, 3300 Whitehaven Street, NW., Washington, D.C. 20235. An application shall include a description of all activities proposed, the equipment, methods, and personnel (particularly describing relevant experience) involved, and a timetable for completion of the proposed activity. Copies of all other required licenses or permits shall be attached.

(c) In considering whether to grant a permit the Assistant Administrator shall evaluate such matters as (1) the general profession and financial responsibility of the applicant; (2) the appropriateness of the methods envisioned to the purpose(s) of the activity; (3) the extent to which the conduct of any permitted activity may diminish or enhance the value of the Sanctuary as a source of recreational, educational or scientific information; (4) the end value of the activity; and (5) such other matters as deemed appropriate.

(d) In considering any application submitted pursuant to this Section, the Assistant Administrator shall seek the views of the Fishery Management Councils and may seek and consider the views of any person or entity, within or outside of the Federal government, and may hold a public hearing, as deemed appropriate.

(e) The Assistant Administrator may, at his or her discretion, grant a permit which has been applied for pursuant to this section, in whole or in part, and subject to such condition(s) as deemed appropriate. The Assistant Administrator or a designated representative may observe any permitted activity and/or require the submission of one or more reports of the status or progress of such activity. Any information obtained shall be made available to the public.

(f) The permit granted under paragraph (e) may not be transferred without written permission of the Assistant Administrator.

(g) The Assistant Administrator may amend, suspend or revoke a permit granted pursuant to this Section, in whole or in part, temporarily or indefinitely, if the permit holder (the Holder) has acted in violation of the terms of the permit or of the applicable regulations. Any such action shall be set forth in writing to the Holder, and shall set forth the reason(s) for the action taken. The Holder may appeal the action as provided for in §937.10.

§937.9 Other permits.

All permits, licenses and other authorizations issued pursuant to any other authority remain valid if they do not authorize any activity prohibited by Section 937.6. Any interested person may request that the Assistant Administrator offer an opinion on whether an activity is prohibited by these regulations.

§937.10 Appeals from administrative action.

(a) Any interested person (the Appellant) may appeal the granting; denial, or conditioning of any permit under §937.8 to the Administrator of NOAA. In order to be considered by the Administrator, such appeal shall be in writing, shall state the action(s) by the Assistant Administrator. The Appellant may request an informal hearing on the appeal.

(b) Upon receipt of an appeal authorized by this Section, the Administrator shall notify the permit Applicant, if other than the Appellant,

and may request such additional information and in such form as will allow action upon the appeal. Upon receipt of sufficient information, the Administrator shall decide the appeal in accordance with the criteria set in §937.8(c) as appropriate, based upon information relative to the application on file at OCZM and any additional information, the summary record kept of any hearing and the Hearing Officer's recommended decision, if any, as provided in paragraph (c) and such other considerations as deemed appropriate. The Administrator shall notify all interested persons of the decision, and the reason(s) therefor in writing, normally within 30 days of the receipt of sufficient information, unless additional time is needed for a hearing.

(c) If a hearing is requested or if the Administrator determines one is appropriate, the Administrator may grant an informal hearing before a Hearing Officer designated for that purpose after first giving notice of the time, place, and subject matter of the hearing in the Federal Register. Such hearing shall normally be held no later than 30 days following publication of the notice in the **Federal Register** unless the Hearing Officer extends the time for reasons deemed equitable. The Appellant, the Applicant (if different) and, at the discretion of the Hearing Officer, other interested persons may appear personally or by counsel at the hearing and submit material and present such arguments as determined appropriate by the Hearing Officer. Within 30 days of the last day of the hearing, the Hearing Officer shall recommend in writing a decision to the Administrator.

(d) The Administrator may adopt the Hearing Officer's recommended decision, in whole or in part, or may reject or modify it. In any event, the Administrator shall notify interested persons of the decision, and reason(s) therefor in writing within 30 days of receipt of the recommended decision of the Hearing Officer. The Administrator's action shall constitute final action for the Agency for the purposes of the Administrative Procedure Act.

(e) Any time limit prescribed in this Section may be extended for a period not to exceed 30 days by the Administrator for good cause, either upon his or her own motion or upon written request from the Appellant or Applicant stating the reason(s) therefor.

[FR Doc. 81-2481 Filed 1-23-81; 8:45 am]

BILLING CODE 3510-08-M

APPENDIX 2

Cooperative Enforcement Agreement between the United States Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management and the State of Florida Department of Natural Resources, Division of Recreation and Parks for Law Enforcement Services in the Key Largo and Looe Key National Marine Sanctuaries

This Agreement is entered in by and between the Secretary of Commerce for the United States of America (the Secretary), and the State of Florida Department of Natural Resources, Division of Recreation and Parks (the State).

WITNESSETH

Whereas, Title III of the Marine Protection, Research and Sanctuaries Act, Public law 92-532 (as amended), 16 U.S.C. 1431 *et seq*., (the Act), authorized the designation of ocean waters as marine sanctuaries to preserve or restore their conservation, recreational, ecological or esthetic values; and

Whereas, under section 302 (f) (4) (16 U.S.C. 1432 (f) (4)) of the Act, the Secretary is charged with the responsibility for enforcing the provisions of the Act and is authorized to enter into, among other things, agreements with State agencies to utilize such personnel, services, equipment, and other facilities of such State agencies as may be necessary to carry out the enforcement responsibilities of the Act; and

Whereas, such agreements with State agencies are also authorized by Section 3 (b) of the Fish and Wildlife Improvement Act of 1978 (16 U.S.C. 742l (b)) and by Section 6 (a) of the Lacey Act (16 U.S.C. 3375 (a)) both of which enhance the Secretary's ability to enforce the Act insofar as it relates to the protection of fish and wildlife; and

Whereas, on December 18, 1975 the Secretary designated the Key Largo National Marine Sanctuary adjacent to the John Pennekamp Coral Reef State Park and on January 16, 1981 the Secretary designated the Looe Key National Marine Sanctuary located five miles south-southwest of Big Pine Key (the Sanctuaries);

Whereas, the State possesses law enforcement personnel, vessels, aircraft, vehicles and other equipment and capabilities presently engaged in enforcing state conservation laws which could be utilized in assisting the Secretary in carrying out the law enforcement responsibilities mandated by the Act for the Sanctuaries;

NOW THEREFORE, it is mutually agreed:

I. DEPUTIZATION OF STATE OFFICERS AS FEDERAL ENFORCEMENT AGENTS

A. Those law enforcement officers (hereinafter referred to as Rangers) who are members of the Division of Recreation and Parks are hereby deputized and authorized as federal law enforcement agents to enforce the Act and the regulations promulgated thereunder, utilizing the powers and authorities of the Lacey Act as appropriate. Enforcement shall be under the direction of the Secretary or his or her designee and in accordance with any guidelines or limitations the Secretary or his or her designee may, from time to time, impose.

B. All Rangers, while acting as federal law enforcement agents, shall possess the powers and authorities as set forth above but shall not be held or considered as employees of the United States for the purposes of any laws administered by the United States Office of Personnel Management. Such Rangers, while acting as federal law enforcement agents, shall not be compensated, salaried or otherwise reimbursed by the United States for any services performed or expenses incurred in performance of such duties except as provided by memoranda of understanding, contracts, or cooperative agreements in accordance with this Agreement.

C. Except as provided in this Agreement, the Rangers shall not have the authority to carry out any functions or responsibilities of the U.S. Government under the Act.

D. Those Rangers who for any reason leave or are removed from service as members of the Division of Recreation and Parks will be simultaneously divested of authority herein conferred. A newly appointed member will automatically be vested with authority under this Agreement as of the date of his or her appointment.

E. All Rangers exercising authority under this Agreement shall, as soon as possible but not later than 15 days following the event, submit written documentation of any action taken pursuant to this Agreement. Such documents shall include, but not be limited to, case investigation reports, a copy of any written warning or documentation of violation issued, and any supporting exhibits, affidavits, photographs, or other evidence gathered, and shall be submitted to the Southeast Regional Counsel, National Oceanic and Atmospheric Administration, 9450 Koger Blvd., Suite 127, St. Petersburg, Florida 33702. Any arrest of persons or seizure of vessels made as a result of action taken by any Ranger under this agreement shall be reported immediately to the NOAA Regional Counsel in St. Petersburg, Florida.

F. Rangers will be made available, upon request by the appropriate Federal authority, to appear as witnesses in connection with any action brought under the Act with which they have an involvement.

G. Any vessel, fish, or cargo seized by a Ranger under the Act may be delivered to a U.S. Government official designated by the Secretary or other appropriate Federal authority. If such official is unable properly to provide for the care, handling, and preservation as evidence of such seized property, employees of the State will be expected to make reasonable arrangements for such care, handling, and preservation as evidence. Costs to third parties with whom arrangements for the care, handling, and preservation of seized property are made under this paragraph shall be considered as separate items for payment by the Secretary and will not be the responsibility of the State.

H. The State shall prepare a monthly report with respect to the activities under this Agreement and submit this report within 15 days of the close of the reporting month to the Director, Sanctuary Programs Office, National Oceanic and Atmospheric Administration. Such report shall contain, but not be limited to, a summary of the types of contacts made, the frequency of specific violations, locations and times (dates and hours) of patrols, and such other actions as may have been taken pursuant to the Act. In addition, the State shall make recommendations, as appropriate, for improving the enforcement of marine sanctuary violations.

II. CONDITIONS AND TERM OF AGREEMENT

A. This Agreement shall be effective as of the date it is signed by the parties and shall remain in effect until 30 days after either party has given the other written notice of termination. This Agreement may be amended with the mutual consent of the parties in writing.

B. In no event shall this Agreement be interpreted to conflict with any directives, specific operating policies or procedures promulgated by the Secretary or the State, without the express oral or written consent of an appropriate official of the United States or the Florida Division of Recreation and Parks respectively. If the terms of this agreement are inconsistent with any such existing directives, policies or procedures then those inconsistent terms shall be invalid, but the remaining terms and conditions shall remain in full force and effect.

C. This agreement shall be construed to be consistent with the Act, and regulations promulgated under that Act.

APPENDIX 3

RECENT AND ONGOING RESEARCH PROJECTS RELATED TO LOOE KEY NATIONAL MARINE SANCTUARY

PROJECT	*PRINCIPAL INVESTIGATOR(S)*	*OBJECTIVE*	*STATUS & REFERENCE*
Looe Key Reef Resource Inventory	A. Antonius, A. H. Weinter, J. C. Halas, E. Davidson Flordia Reef Foundation	To identify the main components of the reef ecosystem in terms of biomass, area coverage, and importance.	Completed. Report to the Sanctuary Programs Division, 1978
Photographic Quantitative Sampling of Hard Bottom Benthic Communities	J. A. Bohnsack, Ph.D. Cooperative Institute for Marine and Atmospheric Studies University of Miami 4600 Rickenbacker Causeway Miami, FL 33149	To measure the resiliency of reef fish community structure to local disturbance and to monitor colonization rates by reef fish to small model patch reefs.	Completed. Bull. Mar. Sci. 29(2): 242-252, 1979
The Ecology of Reef Fishes on Isolated Coral Heads: An Experimental Approach with Empasis on Island Biogeographic Theory	J. A. Bohnsack, Ph.D. Cooperative Institute for Marine and Atmospheric Studies University of Miami 4600 Rickenbacker Causeway Miami, FL 33149	To study aspects of the ecology of reef fish on small patch reefs.	Completed. Ph.D. Dissertation University of Miami Coral Gables, FL 270 pp. 1979
Species-Packing by Reef Fish on Australian and Caribbean Reefs: An Experimental Approach	J. A. Bohnsack, Ph.D. Cooperative Institute for Marine and Atmospheric Studies University of Miami 4600 Rickenbacker Causeway Miami, FL 33149	To compare reef fish populations on model reefs at Looe Key to populations on similar reefs at One Trec Island Reef, Great Barrier Reef, Australia.	Completed. Bull. Mar. Sci. 30(3): 710-723, 1980
Effects of Piscivorous Predator Removal on Coral Reef Fish Community Structure	J. A. Bohnsack, Ph.D. Cooperative Institute for Marine and Atmospheric Studies University of Miami 4600 Rickenbacker Causeway Miami, FL 33149	Elucidate the role of piscivorous predation in determining the community structure of coral reef fishes by comparing control reefs in Key Largo which have been protected from spearfishing with experimental reefs at Looe Key which have received heavy spearfishing pressure.	Completed. In Press 1981 Gutshop: Third Pacific Technical Workshop Fish Food Habits Studies

PROJECT	*PRINCIPAL INVESTIGATOR(S)*	*OBJECTIVE*	*STATUS & REFERENCE*
Resiliency of Reef Fish Communities to Reduced Harvest Pressure	J.A. Bohnsack, Ph.D. Cooperative Institute for Marine and Atmospheric Studies University of Miami 4600 Rickenbacker Causeway Miami, FL 33149	To determine changes in fish populations at Looe Key as a result of spearfishing prohibition.	In Progress
Spur and Grooves Revisited: Construction versus Erosion, Looe Key Reef, Florida	E.A. Shinn, J.H. Hudson D.M. Robbin, and B. Lidz U.S. Geological Survey Fisher Island Station Miami Beach, FL 33139	To describe constructionally-formed spurs at Looe Key Reef and, using data obtained by closely spaced drilling, to demonstrate that they are not controlled by underlying bedrock topography.	Completed. 4th International Coral Reef Symposium
Epizootiology of Malignant Tumors of Biocolor Damselfish *(Eupomacentrus partitus)* from Reefs Within the Key Largo and Looe Key National Marine Sanctuaries	L. Udey and M. Schmale University of Miami Department of Microbiology P.O. Box 016960 Miami, FL 33101	To document the distribution of a malignant disease tumor in the bicolor damselfish *(Eupomacentrus partitus)* among the reefs in Key Largo and Looe Key National Marine Sanctuaries and to investigate the origin, behavior and mode of disease transmission.	Completed. Final Report to the Sanctuary Programs Division under Contract NA81AAA0329, 1983.
Prevalence and Development Rates of a Disease in One Species of Reef Fish on South Florida Reefs, with an emphasis on Looe Key and Key Largo National Marine Sanctuaries	L. Udey and M. Schmale University of Miami Department of Microbiology P.O. Box 016960 Miami, FL 33101	To investigate temporal factors relative to the progress of a disease in individual bicolor damselfish *(Eupomacentrus partitus)* over a wide area of the South Florida Reef Tract.	In Progress

PROJECT	*PRINCIPAL INVESTIGATOR(S)*	*OBJECTIVE*	*STATUS & REFERENCE*
An illustrated Guidebook to the Shallow-Water Gammaridian Amphipods of the Looe Key National Marine Sanctuary	J.D. Thomas. Newfound Harbor Marine Institute Rt. 3, Box 170 Big Pine Key, FL 33043	To identify, describe and illustrate shallow water gammaridean amphipods from representative habitats in the Looe Key reef complex and to produce an illustrated guidebook for use by scientists, students and the general public.	In Progress
A Study of Three Selected Groups of Invertebrates at Looe Key Reef	R.F. Cressey, K. Fauchald and B.F. Kensley Department of Invertebrate Zoology National Museum of Natural History Smithsonian Institution Washington, D.C. 20560	To study three very different groups of organisms in detail (eunicean polychaetes, certain parasitic copepods, and isopod crustaceans) and their impact on the ecology of the reef.	In Progress
An Illustrated Guidebook to the Shallow Water Polychaetes of Looe Key National Marine Sanctuary	P. G. Johnson Barry A. Vittor and Associates, Inc. Environmental Consulting and Research 8100 Cottage Hill Road Mobile, AL 36609	To provide an illustrated guidebook to the more commonly encountered and ecologically important polychaetes of the Looe Key National Marine Sanctuary.	In Progress
A Study on the Effects of Parrotfish Grazing on Seagrasses in the Vicinity of Looe Key National Marine Sanctuary	J.C. Zieman Associate Professor Department of Environmental Science University of Virginia Charlottesville, VA. 22903	To determine seagrass distribution and abundance in the immediate area surrounding Looe Key, productivity of the seagrasses in this region, composition, abundance, and range of parrotfish schools foraging in the seagrass beds, and the amount of seagrass grazing in the vicinity of Looe Key.	In Progress

APPENDIX 4

SELECTED REFERENCES

A comprehensive bibliography accompanies the Looe Key National Marine Sanctuary Final Environmental Impact Statement (Department of Commerce, 1980). Listed below are references used in preparing this management plan.

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