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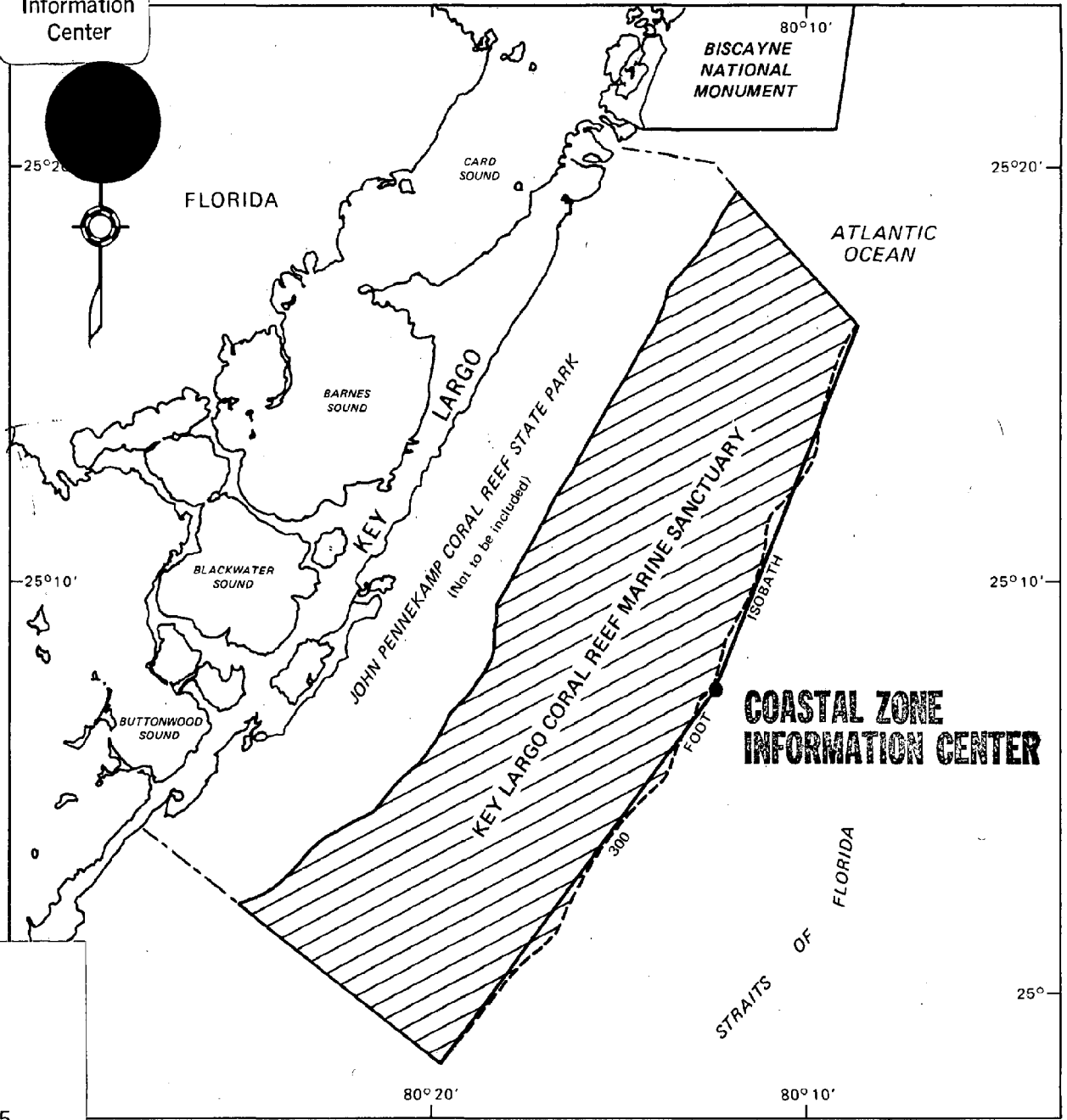
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# Final Environmental Impact Statement Key Largo Coral Reef Marine Sanctuary



U.S. DEPARTMENT OF COMMERCE  
Oceanic and Atmospheric Administration

Coastal Zone Information Center



**COASTAL ZONE INFORMATION CENTER**

KEY LARGO CORAL REEF MARINE SANCTUARY

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Key Largo Coral Reef Marine Sanctuary

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Final Environmental Impact Statement

Key Largo Coral Reef Marine Sanctuary

Summary

Responsible Office: NOAA's Office of Coastal Zone Management,  
3300 Whitehaven Street, N.W.  
Washington, D.C. 20235

1. Name of Action (X) Administrative  
Designation of a marine sanctuary pursuant to authority of Title III of the Marine Protection Research and Sanctuaries Act of 1972.
2. Description of Action  
Establishment of a marine sanctuary to protect and conserve the coral and coral reef ecosystem to regulate uses thereof to insure the health and well-being of the coral, and associated flora and fauna, and to make available the continual opportunity for the esthetic and recreational enjoyment, which healthy reefs afford. The area is directly adjacent to the John Pennekamp Coral Reef State Park.
3. Environmental Impacts  
No irretrievable commitment of resources is involved. The management program is designed to provide for continued, controlled use while retaining options for future usage.
4. Alternatives  
Alternatives considered were to enlarge the boundaries, establishing different regulations, using another legal authority or no sanctuary. Selections of either different boundaries or regulations is not precluded by this action, since procedures exist to do so. An analysis of legal authorities indicated the marine sanctuary approach was most suitable to establish the measure of protection needed to protect the reef. The rejection of the no sanctuary option was totally supported in all responses to the DEIS.

Comments

The final environmental impact statement was revised from the draft statement based on written comments received and statements made at a public hearing. A total of 34 states, agencies, organizations and individuals submitted responses. Twelve (12) presentations were made at the public hearing. All the written comments

were in favor of establishing a marine sanctuary. However, many offered suggested changes or raised clarification questions. Ten of the presentations at the public hearing were favorable and two negative.

Comments received are discussed below.

1. Many of the comments indicated the boundaries of the marine sanctuary should be expanded to include a larger area.

The nomination for a marine sanctuary in an original version encompassed an area including the State Park, Biscayne National Monument, and connecting waters. Discussions with the State of Florida, and the other Federal agencies involved, led to the decision to restrict the boundaries to those currently described. It was felt that most of the area in the early version of the nomination was sufficiently protected, and thus the complex problem of incorporating established areas was not warranted.

The outer boundary has been changed slightly to facilitate enforcement. Instead of the 300 foot isobath, lines have been drawn from the proposed outer north and south corners to a common point on the 300 foot isobath at  $25^{\circ}$  (degrees), 7.5' (minutes) north latitude and  $80^{\circ}$  (degrees), 12.5' (minutes) west longitude. This permits the use of navigational bearings rather than depth recording to mark the outer boundary. Figure 1 indicates the boundary.

2. A number of commentators requested clarification of the management system.

Overall responsibility of implementing Federal law resides with the authorized Federal agency (NOAA). However, NOAA will contract with the State of Florida for on-site management of the marine sanctuary. Federal law, however, precludes the contracting of citing authority, to the State. Therefore, the Coast Guard will be responsible for the patrol and citing aspects. Administrative decisions will be made by the State representatives in accordance with Federal guidelines elaborated in the NOAA/Florida con-

tract. Details as to arrest procedures and prosecution of violations will be presented in the rules and regulations promulgated after designation, according to provisions of the Marine Protection Research and Sanctuaries Act of 1972, and the Administrative Procedures Act.

3. Numerous suggestions were made to modify the proposed rules and regulations. The suggestions ranged from making them more strict to elimination of some. The following modifications were made:

- (a) Category 1, Removal or Destruction of Natural Features and Marine Life remains essentially unchanged. The phrase (whether temporary or permanent in character.) was deleted from (1)(c).
- (b) Category 2, Dredging, Filling, Escavating and Building Activities remains unchanged.
- (c) Category 3, Refuse and Polluting Substances was changed to reflect requirements of other Federal laws in control of ocean disposal.
- (d) Category 4, Archaeological and Historical Resources, remains unchanged.
- (e) Category 5, Markers, remains unchanged.
- (f) Citing 6, Fishing has been modified. The requirements to mark trap floats with flags has been dropped, since the floats are color coded, and numbered under the present system. The description of tropical fish and the capture thereof, is further described. Section 6 has been deleted, since provisions of other Federal statues will be employed if circumstances warrant

seizure and confiscation. The closure of portions of the marine sanctuary has been limited to 20% of the total area at any one time. Suggestions were made both to increase control of fishing, or to become less restrictive. We have elected to remain with the present situation and controls.

- (g) Category 7, Skin Diving remains unchanged.
- (h) Category 8, Operation of Watercraft was modified to incorporate recognition of all applicable Federal laws. Minor clarification language has been added.
- (i) Category 9, Photography has been modified to clarify the restriction on use of props and cast.
- (j) Category 10, Advertising or Publicity remains unchanged.
- (k) Category 11, Explosives and Dangerous Weapons, has been modified to clarify the carrying or possession of dangerous weapons. Section 11d has been deleted, as other Federal statutes will be employed if the need arises.
- (l) Category 12, Closing of the Marine Sanctuary was modified as suggested to restrict the total closed area at any given time. The level of 20% was selected.
- (m) Category 13, Report of Accidents was modified to conform to other Federal report requirements. The new damage or injury value is \$100.00.
- (n) Category 14, Disorderly Conduct has been deleted as suggested, since other Federal statutes can be employed to deal with the subject if the need arises.

#### 4. Permits.

The permits section has been changed to clarify how permits will be issued, and checked by enforcement officials. Permits are not required for allowed activities, but only when a prohibited activity is contemplated. No fees are involved.

#### 5. Enforcement.

Questions were raised as to whether sufficient funds and manpower were available to enforce the rules and regulations.

No changes were made in the impact statement in this regard. The United States Coast Guard, and the National Oceanic and Atmospheric Administration have the responsibility to insure the Federal laws are enforced.

Initial manpower and logistic capabilities have been identified, and will be employed in the marine sanctuary. Adjustments will be made if the need arises.

Administrative hearing procedures have been established to insure adequate dispensation of violations.

#### 6. Probable Impact of the Proposed Action on Environment.

It was suggested that establishment of the marine sanctuary may channel prohibited activities to adjacent areas, thereby creating a negative impact. This is not foreseen since most of the area of the marine sanctuary has previously managed under similar rules and regulations. Similarly, the reef to the north is protected by the Biscayne National Monument. It is possible, therefore, that the reefs to the south may be subject to additional pressure. Even so, this does not establish a case for no protection in the proposed area.



7. Alternatives to the Proposed Action.

Comments were made that the alternatives of different boundaries was not fully developed, i.e., this should be the alternative of choice. The information presently available indicates the **current** boundaries are the most feasible at this time.

## 1.0 Project Description

### Purpose

It is proposed to establish a recreational and esthetic area encompassing corals and associated flora and fauna under Title III of the Marine Protection, Research and Sanctuaries Act of 1972. The area will be managed to protect and conserve the coral and coral reef ecosystems, to regulate uses thereof to insure the health and well-being of the coral, and associated flora and fauna, and to make available the continual opportunity for the esthetic and recreational enjoyment which healthy reefs afford the American people.

### Area

The area nominated is adjacent to but excludes the State of Florida John Pennekamp Coral Reef State Park, beginning at the outer boundary of the Park, and extending seaward to about the 300 foot isobath (Figure 1). Included in the nominated area is the Key Largo Coral Reef Preserve (Appendix A).

Coordinates for the proposed marine sanctuary are: the point of beginning (POB) is at geographic coordinates  $25^{\circ}$  (degrees), 19.45' (minutes) north latitude,  $80^{\circ}$  (degrees), 12.0' (minutes) west longitude, said point being the northeast boundary corner of John Pennekamp Coral Reef State Park. From said POB run thence southeasterly to geographic coordinates  $25^{\circ}$  (degrees), 16.2' (minutes) north latitude  $80^{\circ}$  (degrees), 8.7' (minutes) west longitude, said point also being on the 300 foot Isobath, thence in a southwesterly direction to geographic coordinates  $25^{\circ}$  (degrees), 07.5' (minutes) north latitude  $80^{\circ}$  (degrees), 12.5' (minutes) west longitude, thence again run in a southwesterly direction to geographic coordinates  $24^{\circ}$  (degrees), 58.3' (minutes) north latitude,  $80^{\circ}$  (degrees), 19.8' (minutes) west longitude, thence leaving said 300 foot Isobath run northwesterly to geographic coordinates  $25^{\circ}$  (degrees),

2.2' (minutes) north longitude, 80° (degrees), 25.25' (minutes) west longitude, said point being the southeast boundary corner of John Pennekamp Coral Reef State Park, thence in a northeasterly direction along said easterly boundary of said state park to the POB.

#### Biology and Geology

The South Florida coral reef tract is the most extensive reef system of its type in the continental United States. The full reef complex or ecosystem includes a large array of West Indian corals, algae, sponges, shrimp, crabs, lobsters, mollusks, and a host of tropical fish species. The major plant and animal life which includes the most important sediment-producing and sediment-modifying organisms of the coral reefs is provided in Appendix B. The major ecological zones are: (1) rubble, (2) millipora, (3) acropora, (4) open sand, (5) grass beds (primarily *Thalassia testudinum*-turtle grass, (6) alcyonarian, (7) reef flat, and (8) back reef. Part of the appendicized information was developed for the Biscayne Bay National Monument. However, the area off Key Largo is very similar, therefore, the information should be applicable. The reef complex of interdependent organisms and its geological characteristics are discussed in Appendix C.

#### Uses

The nominated area is currently subjected to a number of commercial and recreational uses. Residents and tourists attracted to the area by the beauty of the reef system participate in the recreational endeavors

of boating, sailing, snorkeling, swimming, diving, and sport fishing. A recent aerial survey indicated 260 craft in the area on a single day. The number of visitors to the John Pennekamp State Park for last year was 343,484. Commercial enterprises that supply services for these forms of recreation operate adjacent to the area and within the proposed boundaries.

Other commercial enterprises also utilize the area. Lobster pot fishing occurs. Commercial transportation occurs where water depths permit. No petroleum resources have been located in the area and no evidence of sand and gravel operations has been found.

## 2.0 Proposed Management System

### Administration

NOAA's responsibilities under this legislation require that the Office of Coastal Zone Management review, comment and approve any activity that takes place pursuant to the adopted rules and regulations.

On site administration of the marine sanctuary will be by the State of Florida, Department of Natural Resources, Division of Recreation and Parks, pursuant to an agreement between the Governor of the State of Florida and the Administrator of the National Oceanic and Atmospheric Administration.

The State of Florida, Department of Natural Resources, Division of Recreation and Parks, will be assisted in administration by an advisory board consisting of representatives of the National Park Service; the U.S. Coast Guard; Department of Justice; the National Marine Fisheries Service; and the State of Florida's Division of Marine Resources, Division of

Marine Law Enforcement, Department of Environmental Regulation, Local Citizens Association, and Association of Dive Boat Captains.

#### Rules and Regulations

Present and proposed future uses of the area include recreational boating and fishing, snorkeling and scuba diving, commercial transport, fisheries activities and scientific endeavors. Those activities allowed within the marine sanctuary, however, will be subject to the following rules and regulations which are intended to provide for the maximum public use consistent with the primary purpose.

#### Key Largo Coral Reef Marine Sanctuary Rules and Regulations

##### Categories

1. Removal of or Destruction of Natural Features and Marine Life.
2. Dredging, Filling, Excavating and Building Activities.
3. Refuse and Polluting Substances.
4. Archaeological and Historical Resources.
5. Markers.
6. Fishing.
7. Skin Diving
8. Operation of Watercraft.
9. Photography.
10. Advertising or Publicity.
11. Explosives and Dangerous Weapons.
12. Closing of the Marine Sanctuary.

## 13. Report of Accidents

Rules and RegulationsProhibited Activities (except by permit or for protection of life, property, or the environment).(1) Removal or Destruction of Natural Features and Marine Life

(a) No person shall destroy, injure, harmfully disturb or remove beach sand, gravel or minerals, corals, sea feathers and fans, shells and shellfish (except lobster, crawfish and stone crab), starfishes or other marine invertebrates, seaweeds, grasses, or any soil, rock, artifact, stone or other material. Nor shall a person have possession of any of the above listed items in the boundaries of the marine sanctuary regardless of their place of extraction.

(b) No person shall cut, carve, injure, mutilate, move or displace or break off any bottom formation or growth.

(c) No rope, wire, anchor, or other contrivance shall be attached to any coral, rock or other formation.

(2) Dredging, Filling, Excavating and BuildingActivities

(a) No dredging, excavating or filling operations of any kind are to be carried out in this marine sanctuary. No materials of any sort may be deposited in or on the waters thereof.

(b) No building or structure of any kind, whether permanent or temporary, may be constructed or built.

(c) No public service facility may be constructed or extended into, upon or across this marine sanctuary, with the exception of marking and mooring buoys or stations.

(3) Refuse and Polluting Substances

No person shall dump, deposit or discharge waste material into the waters of this marine sanctuary in violation of any Federal statute or regulation. Specifically prohibited are wastes, acids, oily liquid wastes or other deleterious chemicals, bottles, broken glass, paper, boxes, dirt, rubbish, waste, garbage, refuse or other debris or substances which shall include human sewage.

(4) Archaeological and Historical Resources

No person shall willfully destroy, molest, deface, remove, displace or tamper with any archaeological or historical resources, cargo pertaining to wrecks within the marine sanctuary.

(5) Markers

No person shall willfully 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 sanctuary manager or markers for the purpose of lobster pot fishing.

Prohibited Activities(6) Fishing

Note: Sport and commercial fishing is allowed within the marine sanctuary with hook and line for the purpose of taking surface, mid-water or bottom fishes, and with nets for the taking of surface and midwater fishes, in accordance with the same provisions of the fishing laws of the State of Florida and the rules of the Department of Natural Resources. The taking of crawfish, spiny lobster and stone crab with traps is allowed for commercial purposes, in accordance with the same provision of the fishing laws of the State of Florida and the rules of the State of Florida Department of Natural Resources which requires that all trap floats shall be marked, color coded, and numbered at all times. All traps must be removed from the waters of the marine sanctuary during the closed season.

(a) Fishes normally resident in the coral formations (often categorized as tropical fishes which are of minimal sport and food value, and usually brightly colored and thus used for aquaria purposes) and live in a directly interrelationship with the corals, may not be caught except inadvertently by hook and line.

(b) The use of poisons, electric charges and similar methods for the taking or killing of fish is prohibited.

(c) Any device which is used in violation of the provisions of this subsection is hereby declared a nuisance, and may be seized and confiscated to enforce the provisions of this section.

(d) Some portions of the marine sanctuary may be set aside as control areas for research to assist in managing the sanctuary. Those



Prohibited Activities

areas designated by the sanctuary manager will be closed to fishing. No more than 20% of the sanctuary may be closed at a time for this purpose.

(7) Skin Diving

Note: Skin diving for photography and for observation is allowed and encouraged as a compatible and desired use.

(a) Skin divers will not handle corals, stand on coral formations, collect or otherwise disturb corals within the sanctuary.

(b) See 8d below.

(c) See 8e below.

(d) See 8f below.

(8) Operation of Watercraft

(a) All watercraft shall be operated in accordance with applicable Federal rules and regulations. The following additional constraints should also be imposed within the boundaries of the sanctuary.

(b) No watercraft should be operated in such a manner as to strike or otherwise cause damage to the natural features of the marine sanctuary.

(c) Except in case of emergency situation, where life and property may be endangered, no anchor should be cast or dragged in such a way as to damage any coral reef formations. Anchors shall be dropped on sand flats off the reefs and placed so as not to drift into the coral formations.

(d) No watercraft should be operated at greater than 4 miles per

Prohibited Activities

hour or in such a manner to create a wake in the vicinity of divers, sightseeing boats or fishermen, with the exception of law enforcement officials while in the performance of their duties.

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

(f) No boat under power shall approach closer than 100 yards to a boat displaying the diving flag except at a maximum speed of 4 miles per hour. Divers shall stay within 100 yards of their diving flag.

(g) Boats anchored or proceeding at slow speeds for fishing or observation shall be approached or passed at such slow speed that the wake of the approaching or passing boat does not disturb the fishing or observation boats.

(h) The operation of all watercraft within this marine sanctuary shall be in accordance with such state and Federal laws as may be applicable to the operation or navigation of watercraft.

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

(9) Photography

Note: Photography, both surface and underwater, without involving the installation of special settings or structures is encouraged.

No person shall take still or motion pictures, either commercial or private, involving the use of special settings or structures, or the performance of a cast of persons, either amateur or professional.

Prohibited Activities(10) Advertising or Publicity

No person shall erect or cause to be erected, display, or cause to be displayed within this marine sanctuary any signs, slogans or markers.

(11) Explosives and Dangerous Weapons

Note: Distress signalling devices are considered necessary for safe boat operation. Knives are frequently used by fishermen and swimmers and are not classified as weapons for purposes of these regulations.

(a) No person shall carry or possess, except while underway through the marine sanctuary or for law enforcement purposes, firearms of any description, air rifles, guns, bows and arrows, slings, spear guns, harpoons, or other kinds of weapons potentially harmful to fish or wildlife or to the reef structure and dangerous to human safety. Use of such weapons within the sanctuary is strictly prohibited except for law enforcement purposes.

(b) The firing of weapons from beyond the boundaries of this sanctuary into this sanctuary is forbidden.

(c) The use or possession of explosives within this marine sanctuary is prohibited. No person shall carry or possess explosives within the sanctuary, except while underway through the sanctuary.

## Prohibited Activities

### (12) Closing of the Marine Sanctuary

The marine sanctuary may be closed to public use in the event of emergency conditions endangering life or property. Certain areas may also be closed (but total area not to exceed 20% of the sanctuary at any one time) in order to (1) permit recovery of the living resources from overuse, or (2) provide for scientific research relating to protection and management. Public notice of closures will be made by informing the local news media.

### (13) Report of Accidents

Accidents involving personal injury or damage to property in excess of \$100 shall be reported as soon as possible by the person or persons involved to the sanctuary manager.

## Permits

Permits may be issued to conduct prohibited activities. Permits will be in letter format, and are to be presented to appropriate law enforcement personnel for inspection upon request. Issuance of permits

shall be for a limited term and a single activity subject to renewal before expiration of the permit. Permits may be extended at the discretion of the marine sanctuary manager.

A permit application may be filed with the sanctuary manager and shall indicate the purpose, the time period required, describing the proposed activity including equipment, methods and schedule of events, the financial capability of the applicant to perform the proposed activity, identifying all participants and prior experience in carrying out an analogous endeavor and evidence that all papers required by the United States Coast Guard or any other Federal agency have been obtained.

The applicant will be notified in 30 days whether the permit application has been approved or not approved, and/or whether additional information is required.

An applicant may appeal a denial to the Administrator of NOAA by letter, stating his case and requesting a review of the action of the sanctuary manager.

Permits may be cancelled by the sanctuary manager following notification to the permit holder and after a hearing, if requested by the permit holder.

#### Certification

Once the marine sanctuary has been designated by the Administrator of NOAA, no permit, license or other authorization issued by any other agency shall be valid unless the Administrator of NOAA, pursuant to the authority delegated by the Secretary of Commerce, and upon recommendation

of the State of Florida, Division of Recreation and Parks as NOAA's administrative officer, and the Advisory Committee, shall certify that the permitted activity is consistent with the purposes of this title and can be carried out within the regulations approved and adopted.

#### Research and Monitoring

Research and monitoring of the effects of particular uses of the coral reef ecosystem will be incorporated into the management procedures as needed to insure that the primary purpose for establishment of the sanctuary is carried out.

Surveillance of development activities along the coast of Key Largo will be a function of the State of Florida to insure that these activities do not adversely affect water quality, subsequent health of the coral reef ecosystem, or violate the sanctuary rules and regulations.

#### Enforcement

Implementation and administration of governing rules and regulations for the marine sanctuary will be by the State of Florida, acting in its role as NOAA's contract manager. Pursuant to 14 U.S.C. Sec. 89, the U.S. Coast Guard shall have the responsibility, according to provisions of an agreement between the Coast Guard and NOAA, for surveillance and enforcement of the rules and regulations promulgated for the marine sanctuary.

### Penalties

Any person subject to the jurisdiction of the United States who violates any of the provisions of the rules and regulations for the marine sanctuary promulgated pursuant to Title III of the Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532, 86 Stat. 1061) will be liable to a civil penalty of not more than \$50,000 for each such violation to be assessed by the Administrator. Each day of a continuing violation would constitute a separate violation. A vessel used in the violation of a regulation promulgated herein shall be liable for any civil penalty assessed for such violation and could be proceeded against in the appropriate District Court of the United States having jurisdiction thereof. Violation of any of the provisions of these regulations shall be a civil penalty punishable as provided by the Marine Protection, Research and Sanctuaries Act (16 U.S.Code 14.33).

### The Relationship of the Proposed Action to Land Use Plans, Policies and Controls for the Affected Area

This action conforms to the well-established policy of Congress to preserve unique natural resources for their continued use, recreation and esthetic enjoyment. It also conforms to the evaluation of the general area made in the State of Florida-Florida Keys Coastal Zone Management Study: "The Florida Keys represent a most unique and valuable resource to all of the people of Florida and to hundreds of thousands of tourists each year."

The study also contains the following recommendation: "Implementation of Title III of the Federal Marine Protection, Research and

Sanctuaries Act of 1972 to include John Pennekamp State Park as a 'marine sanctuary' in cooperation with the Federal government. Boundaries of the preserve should be enlarged to include the entire fringing reef system."

#### Probable Impact of the Proposed Action on the Environment

Designation of the area as a marine sanctuary and management according to the proposed regulations should control and minimize many of the stresses currently affecting this portion of the Florida reefs. Accordingly, the health and well-being of the reefs and public enjoyment of same should be enhanced.

#### Probable Adverse Environmental (User) Effects

Users of the area will be subject to regulation and some activity will be precluded. The activities to be precluded are spear fishing, damage to the coral and associated flora and fauna, salvage, and souvenir collecting.

If certain areas of coral come under stress owing to intensive use, those areas will be temporarily closed to allow the coral ecosystem to recover; this may cause minor inconvenience. When an area is closed, users will be directed to other areas which should provide a similar experience or level of enjoyment. Since most of this area was managed under similar rules and regulations prior to the U.S. vs Maine decision, it is not anticipated that reinstatement of these rules and regulations will affect the sanctuary nor adjacent areas.



The Relationship Between Local Short-Term Use of Man's Environment  
and the Maintenance of Long-Term Productivity

No irretrievable commitment of resources is involved. The management program proposed is such as to provide for continued, controlled use while retaining options for future usage.

Alternatives to the Proposed Action

Four alternatives are considered: no sanctuary, sanctuary with different boundaries, sanctuary with different regulations, and protection under another authority.

No Sanctuary

Should this occur, the current stress conditions that prompted the nomination will continue and the valuable coral resources degraded. In addition, enforcement problems currently experienced in John Pennekamp Coral Reef State Park will continue. This is due to the shallow depths at the State Park Boundary which provide easy entry by anchoring just outside the boundary and diving into the Park. An outer boundary of about 300 feet precludes this form of entry without sophisticated diving gear and expertise.

Larger Boundaries

The original nomination proposed larger boundaries. However, the area is bounded on the north by both a shallow ship channel and the Biscayne Bay National Monument. Moreover, the principal reason is the ease of marking a boundary continuous from the State Park and the converse if it is not.

Although arguments could be made for a larger area, it is not necessary in this case for the option for another nomination exists if it becomes evident a larger area is necessary to sustain the ecological balance.

#### Different Regulations

This would involve either permitting, in the judgment of the nominators, activities that would stress the coral ecosystem or preclude uses not considered injurious. Although it is felt a proper balance is made in the nomination, modifications may be appropriate. One option is to preclude all bottom fishing. This would impact on those who fish for lobster, crawfish and stone crab. As a minimum, these fishermen would need to travel a much farther distance to set their traps. It is possible that total protection of the species in part of their habitat could result in a greater total abundance in the non-protected areas. This option would preclude the possibility of damage to the corals by the pots.

Similarly, spearfishing could be allowed. Doing so could increase the possibility of injury to those who use the park and to the coral.

Net fishing could be prohibited, which would eliminate the possibility of coral damage due to net contact with the reefs. However, the reefs do considerable damage to the nets. The costly net repairs and lost fishing time usually make these fishermen very cautious in deploying their nets too close to the reef.

#### Other Authority

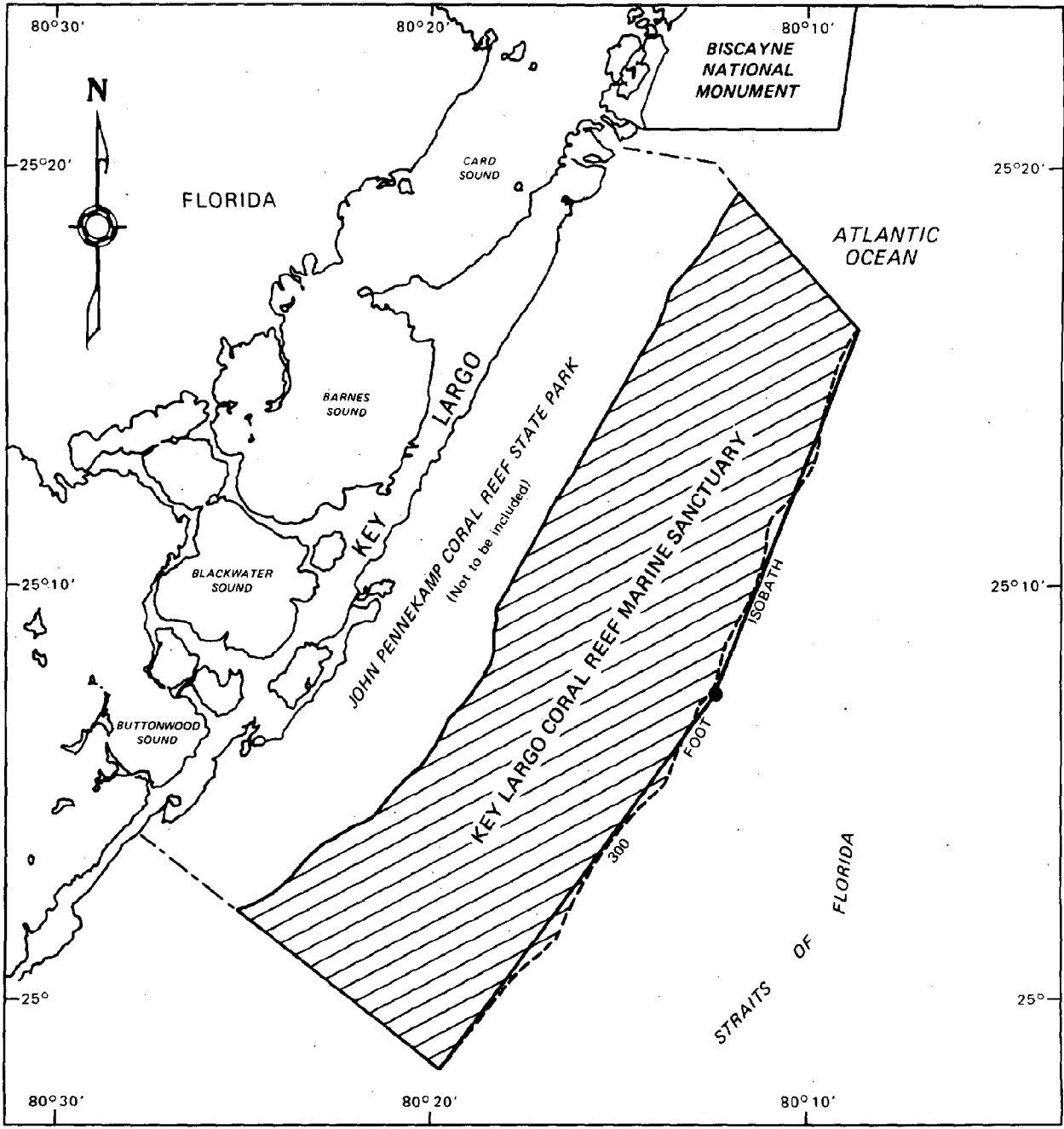
Currently, no other authority for protecting living marine resources beyond the three-mile zone exists. The Department of the Interior can set aside areas of the Continental Shelf under provisions of the Outer Continental Shelf Lands Act to conserve our marine mineral resources, but not to protect ecosystems.

Another option is a specific Act to establish the equivalent of the marine sanctuary. This option would accomplish no more than what is proposed under the existing authority of P.L. 92-532, Title III, Marine Sanctuaries.

#### Coordination

The nomination was circulated to government agencies, industrial organizations and conservation groups and individuals for their review and comment. In addition, a press release was mailed to the newspapers, radio stations and TV stations announcing the nomination. The press release was followed by phone calls to the newspapers of the area most affected to insure the nomination availability, and its content was made known to the residents and users of the area.

A public hearing was held September 30, 1975, at the Key Largo Elementary School, Key Largo, Florida. Press releases announcing the hearing were sent to all news media of the area 20 days prior to the hearing. Radio and TV news spots were made 1 to 5 days prior to the hearing, explaining the proposal and announcing the public hearing. Over 100 persons attended. Formal comments were received from 12 participants.



KEY LARGO CORAL REEF MARINE SANCTUARY

FIGURE 1

## PROCLAMATION NO. 3339

Mar. 17, 1960, 25 F.R. 2352

## ESTABLISHMENT OF KEY LARGO CORAL REEF PRESERVE

WHEREAS there is situated seaward from the coast of Key Largo, Florida, an undersea coral reef formation which is part of the only living coral reef formation along the coast of North America; and

WHEREAS this unique coral formation and its associated marine life are of great scientific interest and value to students of the sea; and

WHEREAS this coral reef is considered to be one of the most beautiful formations of its kind in the world; and

WHEREAS the reef is being subjected to commercial exploitation and is in danger of destruction; and

WHEREAS it is in the public interest to preserve this formation of great scientific and esthetic importance for the benefit and enjoyment of the people; and

WHEREAS a portion of this reef lies inside the three-mile limit in the area

relinquished to the State of Florida by the United States through the Submerged Lands Act, approved May 22, 1953 (67 Stat. 29; 43 U.S.C. 1301 et seq.) [section 1301 et seq. of Title 43, Public Lands], and the remainder lies on the sea bed of the outer Continental Shelf outside the seaward boundary of the State of Florida and appertains to the United States, as declared by the Outer Continental Shelf Lands Act, approved August 7, 1953 (67 Stat. 402; 43 U.S.C. 1331 et seq.) [section 1331 et seq. of Title 43]; and

WHEREAS the United States and the State of Florida are desirous of cooperating for the purpose of preserving the scenic and scientific values of this area unimpaired for the benefit of future generations; and

WHEREAS by the terms of the Outer Continental Shelf Lands Act the United States has jurisdiction over the lands of

Ch. 1a HISTORIC SITES, BUILDINGS, ETC. 16 § 461

the outer Continental Shelf and has the exclusive right to dispose of the natural resources of the sea bed and subsoil thereof; and

WHEREAS section 12(a) of the Outer Continental Shelf Lands Act [section 1341(a) of Title 43] authorizes the President to withdraw from disposition any of the unleased lands of the outer Continental Shelf; and

WHEREAS section 5 of the Outer Continental Shelf Lands Act [section 1334 of Title 43] authorizes the Secretary of the Interior to prescribe rules and regulations for the conservation of the natural resources of the outer Continental Shelf and to cooperate with the conservation agencies of adjacent States in the enforcement of conservation laws, rules, and regulations:

NOW, THEREFORE, I, DWIGHT D. EISENHOWER, President of the United States of America, acting under and by virtue of the authority vested in me by the Constitution and the statutes of the United States, particularly section 12(a) of the Outer Continental Shelf Lands Act [section 1341(a) of Title 43], do proclaim that, subject to valid existing rights, the following-described area is designated as the Key Largo Coral Reef Preserve, and so much thereof as lies on the outer Continental Shelf is withdrawn from disposition:

That portion of the outer Continental Shelf situated seaward of a line three geographic miles from Key Largo, Monroe County, Florida, lying and being within the following described area:

BEGINNING at a point on the 60-foot depth curve (10-fathom line) as delineated on Coast and Geodetic Survey Chart 1249 (approximate Latitude 25° 17' 38" N., Longitude 80° 10' 00" W.), 200 yards southeast of Flashing White Light—Whistle Buoy "2"; thence northwesterly approximately 7,000 yards through Whistle Buoy "2" to Can Buoy "21" (approximate Latitude 25° 20' 06" N., Longitude 80° 12' 38" W.) southeast of Old Rhodes Key; thence southwesterly about 6,900 yards to Can Buoy "25"; thence south-

westerly approximately 5,500 yards to Can Buoy "27"; thence southwesterly approximately 5,000 yards to Flashing Green Light "31BH" in Hawk Channel southeast of Point Elizabeth; thence southwesterly approximately 10,650 yards to Black Day Beacon "33" in Hawk Channel east of Point Willie; thence southwesterly approximately 9,800 yards to Flashing White Light "35" on Mosquito Bank east of Point Charles; thence southwesterly approximately 5,400 yards to Black Day Beacon "37" (approximate Latitude 25° 02' 25" N., Longitude 80° 25' 36" W.), southeast of Rodriguez Key; thence southeasterly approximately 7,100 yards (pass 600 yards southwest of Flashing Light "2" at Molasses Reef) to the 60-foot depth curve (10-fathom line) 900 yards due south of said light at Molasses Reef (approximate Latitude 25° 00' 18" N., Longitude 80° 22' 30" W.); thence northeasterly with the 60-foot depth curve and 10-fathom line (passing easterly of French Reef, Dixie Shoal, The Elbow, and Carysfort Reef) approximately 21 miles to the point of beginning.

I call upon all persons to join in the effort to protect and preserve this natural wonder for the benefit of future generations.

The Secretary of the Interior is requested to prescribe rules and regulations governing the protection and conservation of the coral and other mineral resources in this area and to cooperate with the State of Florida and its conservation agencies in the preservation of the reef.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Seal of the United States of America to be affixed.

DONE at the City of Washington this fifteenth day of March in the year of our Lord nineteen hundred and sixty and of the Independence of the United States of America the one hundred and eighty-fourth.

DWIGHT D. EISENHOWER

Library References

Armed Services ↪54.  
Woods and Forests ↪8.

C.J.S. Army and Navy § 107.  
C.J.S. Woods and Forests §§ 11, 12.

A LIST OF FISHES OF ALLIGATOR REEF, FLORIDA  
WITH COMMENTS ON  
THE NATURE OF THE FLORIDA REEF FISH FAUNA<sup>1</sup>

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Abstract

The fish fauna of Alligator Reef, Florida is enumerated and the zoogeographic nature of the Florida reef fish fauna discussed. A total of 517 species are recorded, of which 389 are coral reef forms. Forty-five species are previously unknown from Florida and an additional eight are undescribed. The Alligator Reef fish fauna is now the richest known of any single location in the new world. Only seven of the reef species are not recorded from elsewhere in the West Indian region outside Florida and this number is expected to be further reduced with additional collecting in other areas. The Florida reef fish fauna is believed to be composed of post-glacial immigrants from the West Indies and Yucatan.

INTRODUCTION

Coral reefs, though harboring what is probably the richest and certainly one of the oldest and most stable animal communities on earth, have been relatively little studied. The tremendous potential for biological research offered by coral reefs has been offset by their remoteness from most centers of higher learning and by their being underwater. In recent years development of marine research institutions in tropical regions, advances in various fields of technology, and increased availability of funds for marine biological research have resulted in a considerable increase in work on coral reefs.

The West Indian coral reef fauna in general, and that of Florida reefs in particular, are better studied than reef faunas elsewhere in the world and of reef animals fishes are among the best known. In the present list the presence of 45 species of reef fishes previously unrecorded from Florida or other U.S. waters and at least eight undescribed species is indicative of the inadequate state of our knowledge of even the best known reef organisms in the most thoroughly studied region. An additional indication of the status of our information is the fact that 36 species in the list have been described since 1955.

Even among described species many systematic problems remain and beyond the systematic level very little information is in print regarding the biology of most reef fishes. To an important extent in coral reef studies we are still dealing with an unknown fauna. This list constitutes what is apparently the first reasonably definitive enumeration of a coral reef fish fauna.

The present paper is the second of a series dealing with the structure of the fish fauna of Alligator Reef (the first is Starck and Davis, 1967). Future publications on color patterns, size and form, habitats and species associations, general behavior, and other aspects of reef fish biology are in preparation.

<sup>1</sup>Contribution No. 890 from the Institute of Marine Science, University of Miami

## STUDY AREA

Alligator Reef is a shallow knoll on the Florida reef chain located about 3.5 nautical miles offshore of the town of Islamorada Florida, in the Florida Keys. The area encompassed by the present checklist (U.S.C. & G. 1250) extends from the ocean shores of Upper and Lower Matecumbe Keys to the 100 fathom curve about nine nautical miles beyond the reef. Collections as far as the next reefs to the northeast and southwest of Alligator Reef have been included. These adjacent reefs are Crocker Reef, six nautical miles northeast and Tennessee Reef, 10 miles southeast of Alligator Reef.

Shore habitats in the study area consist mainly of beaches of mixed coral and shell rubble, calcareous sand, and finer material. The beach slope is gentle so that a distance of about one nautical mile from shore is reached before a depth of six meters is encountered. A few shore areas consist of eroded coral rock and in one location, Indian Key, the rocky shore is undercut with a water depth of one meter at shore.

The lagoon or Hawk Channel extends for a distance of about 2.5 nautical miles from shore and the bottom consists of large beds of Thalassia alternating with areas of flat rocky bottom dominated by alcyonarians, sponges, and Sargassum. Large groups of patch reefs occur in several locations in the lagoon and isolated coral heads in many areas.

The sandy back-reef begins about one mile inside the outer-reef tract. The substrate consists largely of sandy bottom mixed with increasing amounts of rubble toward the reef and with finer sediments nearer the lagoon. Many isolated patches of Thalassia dot the back-reef and a number of rocky patches covered with alcyonarians and sponges are also found.

The reef-top consists largely of eroded coral rock and rubble interspersed with small patches of sand. An eroded rocky ledge up to 2.5 meters high extends for several hundred meters along the reef-top at Alligator Reef and is an important concentration point for many species of fishes. Numerous corals and alcyonarians occur in the rocky areas but coral growth on the reef-top at Alligator Reef is not as luxuriant as at certain other reefs on either side of it along the Florida reef tract. Coral development, however, has little direct effect on the fish fauna as coral is important chiefly as shelter. Because of the shelter afforded by the rocky ledge and the presence of extensive and diverse back-reef forage areas Alligator Reef actually has a greater concentration of reef fishes than many other locations with more luxuriant coral growth. Depths on the reef-top at Alligator Reef vary from 1.5 to six meters with four to five meters over the ledge.

Seaward of the reef-top the bottom slopes over a distance of 150 to 200 meters to a depth of 22 to 24 meters and then drops more or less abruptly to a depth of 29 meters (16 fathoms). The deep-reef makes up the outer edge of this zone. It consists of heavily eroded coral rock overgrown by profuse growths of live corals, alcyonarians, and sponges. The outer face is steep and falls off onto silty sand and sandy rubble bottom at a depth of 28 to 29 meters. The deep-reef is separated from the reef-top in most areas by a band of sand 100 meters or more wide in depths of 10 to 20 meters.

Beyond the deep-reef the bottom shelves gently so that it is necessary to go about one mile beyond the outer edge of the deep-reef before a depth of 45 meters is reached and nine miles before a depth of 180 meters (100 fathoms) is reached. The bottom over most of this area consists of various mixtures of calcareous silt, sand, and rubble.



Small rocky outcrops at a depth of 45 meters occur in one location and are a focal point for concentrations of a number of deep water reef species. Other areas of low relief are found in deeper water and an extensive zone of very rugged relief occupies the outer edge of the study area in depths of 145 to 180 meters.

For the purposes of the present paper the reef community is defined as that occupying the reef-top itself and all of the reef associated habitats from the shoreward edge of the lagoon to a depth of 45 meters, about one mile beyond the outer edge of the deep-reef.

#### WORK AT ALLIGATOR REEF

The only reference to biological work at Alligator Reef prior to the present program is a paper by Breder (1927). His report on the fishes collected by the first oceanographic expedition of the "Pawnee" in 1925 includes about 15 species of reef fishes collected at Alligator Reef.

The present work at Alligator Reef was begun by the author in 1958 and has continued for varying periods during each year of the subsequent nine years. Use of rotenone-based fish toxicants and SCUBA equipment has been the single most productive collecting technique. Well over 200 such collections have been made in all major habitats from shore to 45 meters. Hundreds of additional collections have also been made by more selective methods. Spears, traps, handnets, castnets, trawls, angling, and other techniques have been used extensively. In depths greater than 45 meters bottom collections have been made by trawl and hook and line only, and even these techniques have not been used exhaustively though perhaps 50 days of hook and line fishing at these depths have been carried out.

In addition to collecting, several hundred days have been spent in observing with skin and SCUBA diving equipment. Over 100 night diving trips have also been made for observations and limited collecting.

#### PUBLICATIONS

Virtually all fishes collected at Alligator Reef have been deposited in the Ichthyological Museum of the Institute of Marine Science of the University of Miami. This material has been used by a number of investigators and a total of 34 publications and three studies in press now deal with fishes from Alligator Reef.

Anderson, Gehringer, and Berry (1966), Böhlke (1967a, 1967b), Böhlke and Robins (1960a, 1960b, 1962), Böhlke and Springer (1961), Böhlke and Thomas (1961), Courtenay (1961, 1967), Davis (1966), Eschmeyer (1965), Gilbert (1967), Hubbs (1963), Randall (1963b, 1965a, 1966), Randall and Böhlke (1965), Robins and Starck (1961), Robins and Tabb (1965), Springer (1962), and Starck and Courtenay (1962), treat material from Alligator Reef in systematic studies. These papers include 12 new Florida records and descriptions of ten new species from Alligator Reef.

Clardell (in press), Feddern (1963, 1965, in press), Gould (1965), McKenny (1959), Randall and Randall (1960), Randall (1962), Schroeder and Starck (1964), Starck (1960), Starck and Schroeder (1965), Starck (in press), Starck and Davis (1967), and Myrberg, Brahy, and Emery (1967) deal with biological aspects of fishes from Alligator Reef and include one new record of occurrence for Florida.

Numerous black and white and color photographs of reef fishes and reef habitats at Alligator Reef may also be found in Starck and Brundza (1966).

#### ACKNOWLEDGMENTS

From 1958 to 1960 collections at Alligator Reef were made by the author in co-operation with a study of the inshore fish fauna of the Florida Keys headed by C. Richard Robins under National Science Foundation grants-in-aid 3881 and 9695. Field work in the summer of 1964 was connected with investigations of the feeding habits and related morphology of selected reef fishes supported by NSF-GB-1456 of which Dr. Robins was principal investigator.

Since June 1965 work at Alligator Reef has been supported by NSF-GB-3628 of which the author is principal investigator.

The National Geographic Society has also contributed considerable support to various facets of the work since 1962.

Over the years, many individuals have participated in field work at Alligator Reef. Henry A. Feddern, Richard H. Chesher, Alan R. Emery and William P. Davis have been especially helpful and are, themselves, carrying out studies on the biology of various reef organisms. Robert E. Schroeder has also assisted in field operations at various times.

John E. Randall was involved in early collecting efforts and has been most co-operative in subsequent years with his ideas, observations, and data on reef fish biology.

C. Richard Robins has made available all possible facilities of the ichthyological museum of the Institute of Marine Science and has given invaluable aid in taxonomic problems concerning reef fishes. He has also critically reviewed this manuscript.

James E. Böhlke furnished a complete list of the known fish fauna of the Bahama Islands and solved several perplexing taxonomic problems.

Jo D. Starck, the author's wife, assisted in all phases of the work from field operations and processing of collections and data to completion of the manuscript.

#### DISCUSSION

Alligator Reef now has what is probably the most thoroughly known fish fauna of any single coral reef. The 517 species included in the present list also considerably exceeds the 440 odd fishes recorded by Longley and Hildebrand (1941) from the Tortugas; previously the richest known shore fish fauna of any single locality in the New World. This fact is indicative only of the richness of coral reef faunas in general rather than that of Alligator Reef in particular. With thorough collecting many other reefs in the West Indian Region will undoubtedly be found to have equal or even greater fish faunas.

Of the 517 species recorded some 389 are actually members of the reef community and are normally found in the area from the shore to a depth of 45 meters. The remaining species are either offshore pelagic forms, demersal species from deeper water, or stragglers from adjacent inshore areas.

In the checklist reef species have been divided into two groups to give some idea of the composition of the reef community. Primary reef species (indicated in the list by an asterisk) are those characteristically associated with coral reefs (253 species here). Secondary reef species are forms (indicated by a +) which, though normal residents of Alligator Reef and other reefs, are equally or even more characteristic of areas not associated with

reefs (136 species here). The latter includes a number of occupants of sandy bottom and grass habitats as well as wide ranging species such as sharks.

In recent years a considerable number of publications have expanded our knowledge of West Indian reef fishes. Systematic notes, descriptions of new species, and generic and familial revisions have clarified many problems. Thirty-six of the reef species in the present list have been described in the past 11 years (since 1955) and all but one of the eight known new species included here are now in the process of being described by various workers. To assist the non-systematist amid this welter of new names and changes in old ones common names follow the scientific ones. When common names were unavailable they were coined; otherwise the common names of Bailey *et al.* (1960) were generally followed. In some cases the names recommended by Bailey *et al.* were apparently taken from those listed by earlier scientific workers and are not coincident with names standardly used by aquarists, skindivers, and fishermen. In these cases the commonly used name is followed rather than the recommended one. In a few additional cases where descriptive names suggested by Bailey *et al.* were misleading for the live fish a new name is given. Wherever such changes have been made the reasons are given.

In addition to Bailey *et al.* who listed fishes of the United States and Canada Briggs (1958) also dealt comprehensively with Florida fishes in his list of Florida fishes. Both papers, though important and useful works, contribute to zoogeographic confusion by including species which were not previously recorded from Florida. Unfortunately these species were not differentiated from ones based on published record.

In a number of cases in Briggs' work and in a lesser number in Bailey *et al.*, species were anticipated on the basis of a pattern of known distribution which would probably include Florida though no specimens had been collected there. Some of these speculations have been vindicated by subsequent collections. Others have not.

Both publications also included species which had been collected but not recorded though no indication of this status is given. In the case of Bailey *et al.* a number of these were based on material collected at Alligator Reef by the author and curated by Dr. C. Richard Robins, a co-author of that work. Therefore, 16 of the species from the present list are included by Bailey *et al.* but are not previously recorded.

Whenever possible species binomens used are those recommended by recent studies. For convenience the familial order used by Bailey *et al.* has been followed and species within a family listed alphabetically. Non-reef species are designated as offshore for those pelagic species which occur from the reef-top seaward and the demersal species which live in depths greater than 45 meters. Inshore species are those which normally live in Florida Bay and stray into the reef area (for a more detailed list of Florida Bay fishes see Tabb and Manning, 1961).

To indicate the abundance of each species five qualitative categories are used. Rare species are those of which three or fewer specimens have been seen or collected among a number of collections in their habitat. Occasional ones are species collected or observed at irregular intervals. Species listed as frequent have been seen or collected on numerous occasions or are taken in a large percentage of collections from their habitat. Common species are ones that may be found during virtually every dive or collection in the proper area. Abundant indicates a common species present in large numbers.

Though the South Florida area is often thought of as subtropical it is

Important to emphasize that the marine fauna and flora of the Florida Keys is wholly tropical in nature as pointed out by Stephenson and Stephenson (1958: 393). While the Florida Keys do lie just outside of the Tropic of Cancer the Florida Current displaces tropical marine conditions northward. On rare occasions exceptionally cold weather may drop water temperatures near shore to the lower lethal limit for some organisms but the reef area from the lagoon seaward is unaffected by these short cold spells. Faunal differences between the Florida reefs and Bahamian ones, for example, are evidently connected with other factors than temperature. The unusually heavily sedimented nature (for a coral reef) of much of the sea floor in the Keys is perhaps the single most important factor.

Although ecological conditions at Alligator Reef restrict certain species many others are favored. Especially abundant and noticeable are the grunts (Pomadasyidae), snappers (Lutjanidae), and sea basses (Serranidae), and the general underwater appearance of the reef fish population density is not equalled on most other West Indian reefs.

The fishes of Alligator Reef are typical of West Indian reefs in general and constitute a fauna that can hardly be considered impoverished in reef forms. With adequate collecting many of the faunal differences between various locations in this faunal region are disappearing and those that remain are beginning to fit a pattern.

Briggs (1958: 235) listed as Florida endemics 26 nominal species that are included in or are synonyms of reef species in the present list. At the present time only one of these (Hypoplectrus gemma) is still known only from Florida. To this may be added two subsequently described species (Lythrypnus phorellus and Ophidion selenops), one undescribed species (Chromis sp.), a species previously recorded erroneously from the West Indies (Eiacatlnus oceanops), and two species which range outside Florida along the continental coast (Llopropoma eukrines and Equetus umbrosus), for a total of seven out of 389 reef inhabitants that are not recorded elsewhere in the West Indies. With further collecting it is probably that several of these seven will also be found outside Florida. Except for Ophidion all other Western Atlantic species of the genera involved are West Indian reef forms and even Ophidion has several West Indian reef representatives.

Of the seven species found, so far, only in U.S. waters, two are small gobies, two are small serranids, one a dwarf cusk eel, and one a pomacentrid. The tendency for zoogeographic differentiation within the region to be restricted to small species with limited ability to travel and little or no pelagic larval period is apparent. Rosenblatt (1963: 176) has pointed out these and additional factors which have contributed to rapid evolution in such fishes. It is also evident that most species of even these groups are not restricted to Florida and the barrier has been effective for only a relatively limited number of forms.

Differences in faunal composition between reefs in the West Indies can therefore be regarded primarily as ecological or quantitative rather than zoogeographic or qualitative. With a much larger species complement available to a reef than actually lives there the faunal composition of a given reef is a function of what can live there rather than what can get there. Though two reefs may reveal similar species lists with extensive collecting, the populations of each species are often quite dissimilar depending upon differences in geography, hydrography, and biology of the reefs.

Comparison of the fish fauna of Alligator Reef with other areas on an equitable basis is difficult because of lack of adequate collections elsewhere. Longley and Hildebrand (1941) report a total of 442 nominal species from the

Tortugas of which about 300 may be considered reef inhabitants. The species taken at Alligator but not at Tortugas largely reflect differences in techniques used. The groups showing the greatest difference are the burrowing eels and cusk eels, the small cryptic gobies, and the deeper water labrids.

In view of the nature of the differences in recorded species and collecting techniques no significant faunal differentiation between the Tortugas and Alligator Reef can be postulated and it is probable none exists.

Over recent years extensive collecting with rotenone-based ichthyocides and SCUBA gear has greatly expanded our knowledge of the fishes of the Bahama Islands. The greatest part of recent ichthyological work in the Bahamas has been carried out by James E. Böhlke and Charles C. G. Chaplin of the Academy of Natural Sciences of Philadelphia. Dr. Böhlke kindly furnished the author with a list of fishes known from the Bahamas and it is on this basis that the following comparisons are made. In this case collecting techniques are comparable between the two areas and over 50 of the Bahamian collections were made by the author using identical techniques to the ones used at Alligator Reef. However, it must still be considered that we are comparing collections made in the many reef situations of a large group of islands with those made on one reef.

Dr. Böhlke's list of Bahamian fishes includes 496 species in total, of which about 450 may be found on coral reefs. Total fauna is, therefore, slightly less than that of Alligator Reef but the reef dwelling component is fifteen percent greater.

Only one family involved is not common to both areas. The serranoid family Grammidae is not represented at Alligator Reef and is unrecorded from Florida. However, one species, Gramma loreto, is reportedly taken occasionally by aquarium fish collectors in the region from Fort Lauderdale to Palm Beach Florida. In that area the Florida current is closer to shore than at any other point along the Florida coast. This feature coupled with the absence of extensive adjacent estuarine or bay areas permits clear oceanic water to prevail over the outer reef areas there. As a result a number of other species of fishes and invertebrates characteristic of the West Indies but rare or absent elsewhere in Florida are found there. Among fishes these include, in addition to Gramma loreto, the pygmy angelfish (Centropyge argi) and the longsnout butterflyfish (Prognathodes aculeatus). This situation further illustrates that local conditions and not zoogeographic barriers are the causative agents behind much of the apparent faunal differentiation between separate reef areas in the West Indian region.

On the generic level 35 genera of reef fishes from the Bahamas have not been found at Alligator Reef but 18 of these have been taken elsewhere in Florida. Sixteen genera of reef fishes taken at Alligator Reef are unknown in the Bahamas but all have been taken elsewhere in the West Indian region.

Reef species occurring in the Bahamas but not collected at Alligator Reef total 126 but 46 of these have been taken elsewhere in Florida. Seventy-two reef species from Alligator Reef are unknown for the Bahamas; however, all but seven of these (see above) have been taken elsewhere in the West Indies. Four of these seven are normally found in depths greater than 15 meters at which depths relatively few rotenone collections, or none at all, have been made over most of the West Indian Region.

The 82 Bahamian reef species not known from Florida are scattered among 27 families but the greatest number of these (51%) occur in four families. These families, the Clinidae (including the Tripterygiidae and Chaenopsidae), Gobiidae, Apogonidae, and Gobiessocidae are all composed of small species

with short or non-existent pelagic larval periods and which as adults do not range widely.

The nature of the fish fauna of Alligator Reef and of the Florida reefs in general can be summarized as follows:

During the last glacial period tropical marine species were restricted to a much narrower latitudinal area and the Florida shore fauna was predominantly temperate in nature (Walters and Robins, 1961: 16). The present reef fish fauna consists of relatively recent immigrants that have crossed the Florida Current from the West Indies or drifted with it from the Yucatan peninsula. This barrier has apparently been effective only for forms with very limited swimming powers as adults and with reduced or absent planktonic larval periods. This category includes the speciose gobies and blennies. Certain other forms while able to cross the Straits have been unable to develop normal populations due to local conditions.

Two factors are readily apparent which might adversely affect some West Indian reef species in Florida. One is an unusually high degree of siltation for a coral reef area and the other is a surprisingly dense population of many species on the Florida reefs perhaps creating an unfavorable competitive situation for some other species.

Among the species which occur at Alligator Reef but for which local conditions are apparently unfavorable are:

Myripristis jacobus, Plectrypops retrospinis, Cephalopholis fulva, Liopropoma mowbrayi, Liopropoma rubre, Mycteroperca tigris, Inermia vittata, Lutjanus mahogani, Centropyge argi, Prognathodes aculeatus, Ballistes vetula, and Cantherhines macrocerus.

In contrast to the faunal limitations imposed by the barrier of the Florida Current and by local conditions, other factors have operated to permit a surprisingly rich reef fish fauna in Florida. The Florida Current maintains favorable temperatures over the reefs and brings an abundant supply of planktonic food. Adjacent and extensive inshore regions of high productivity furnish excellent forage areas for adults of a number of species and nursery grounds for juveniles of many. Finally a wide range of reef and reef-associated habitats are found.

The net results of these factors are that the fish fauna consists of West Indian species with the exception of seven out of nearly 400 reef species and some of these seven will probably also be found in the West Indies with further collecting. Results of the favorable factors are such that not only are a large number of species found in a single area but populations of many are unusually dense.

Outside the Western Atlantic the best known reef fish fauna is that of Hawaii. In comparison, however, it must be remembered that in Hawaii we are considering the fauna of an archipelago 1,500 miles long and not that of a single reef. Gosline and Brock (1960) report from Hawaii a total of 448 inshore species from depths less than 100 fathoms. Of these just under 400 species can be considered reef dwellers. The very similar number of reef species between Alligator Reef and the entire Hawaiian chain including Johnston Island is indicative of the surprising richness of the Florida reef fauna.

Other than at Hawaii, which is impoverished in comparison, the rich Indo-Pacific fauna is very poorly studied. Two areas have received more recent and extensive treatment than the rest. Schultz *et al.* (1951, 1960, and 1966) report about 625 reef species from the Marshall and Marianas Islands. The limited nature of the collections on which their work was based indicate an

actual fauna of at least 800 reef dwelling fishes.

Smith and Smith (1963) report approximately 740 reef species from the Seychelles. From personal observation and collecting there I would feel safe in estimating a total reef fish fauna of over 900 species.

While these figures are totals for relatively large Island groups it appears probably that the fauna of tropical Indo-Pacific reefs is approximately twice as speciose as that of West Indian reefs.

In comparing the general systematic composition of the Alligator Reef fauna or the West Indian fauna in general with that of the tropical Indo-Pacific area the most noticeable differences are the greater importance of the Clinidae and Pomadasylidae in the West Indian Region and the increased significance of the Blenniidae and Acanthuridae in the Indo-Pacific. A few specialized Indo-West Pacific families are not represented at all in the West Indian Region.

A significant portion of the Clinidae, the Chaenopsidae, has been recognized as a separate family (Stephens, 1963) and together with the Dactyloscopidae are the only families of West Indian reef fishes which are known only from the New World. The remaining families are all represented in the Indo-Pacific.

The Blenniidae of the Indo-Pacific fill, to some extent, niches occupied by the Clinidae of the West Indian Region.

The Pomadasylidae are represented in the Indo-Pacific by the closely related Gaterinidae which are also ecologically similar and the two groups probably do not rate familial separation.

The wide range of niches defined by the many species of Indo-Pacific Acanthurids are apparently exploited only by the four Western Atlantic species of Acanthurus.

Other characteristic and speciose reef fish families of the Indo-Pacific such as the Muraenidae, Ophichthidae, Holocentridae, Serranidae, Lutjanidae, Apogonidae, Carangidae, Mullidae, Chaetodontidae, Pomacentridae, Labridae, Scaridae, Gobiidae, Scorpaenidae, Blenniidae, Ballistidae, Ostraciidae and Diodontidae are all well represented at Alligator Reef. With the exception of the Mullidae (two species) and the Ostraciidae (four species) all these families have five or more species at Alligator Reef.

#### SUMMARY

The fish fauna of Alligator Reef is fully tropical West Indian in nature and surprisingly rich. The known fauna from this Reef and immediate environs now includes a greater number of species than has been previously recorded from any one location in the New World. The reef fish fauna probably consists of post-glacial immigrants and accordingly the most noticeable differentiation from the fauna of the West Indian Islands includes the absence of certain smaller demersal species with limited swimming power as adults and little or no pelagic larval period.

In comparison with the tropical Indo-Pacific reef fish fauna that of Alligator Reef is similar in composition on the familial and generic level. The total number of species involved is very close to that of the Hawaiian reef fish fauna but only about one-half that of the Marshall and Marianas Islands or the Seychelles.

#### A LIST OF FISHES OF ALLIGATOR REEF, FLORIDA

The reef habitat, primary and secondary reef species, and categories of abundance have been defined above. Comments on scientific and common names used are also made above.

Where species binomials differ from those previously used reasons are given as they are when common names differ from those suggested by Bailey et al. (1960). While stability in common names is certainly desirable the author is of the opinion that for ichthyologists to insist upon a common name in the face of uniform popular usage of another equally appropriate name contributes nothing to nomenclatural stability. In other cases a suggested common name may be misleading and require change. One example is the previously recommended whiteline goby which in life has a bright yellow line. Persons who use common names will probably never see a faded preserved specimen with a white line. Unfortunately, therefore, it appears that recommended common names like scientific ones may sometimes have to be changed. Such name changes, if reasonable and conservative in nature, should in the long run contribute to stability rather than detract from it.

Species of which specimens from Alligator Reef are in the Ichthyological museum of the Institute of Marine Science are identified by the letters UMML. The four species based on sight records only are so stated.

All new records of occurrence for Florida are identified as such and in a few cases where taxonomic status is uncertain this is also noted.

#### LAMNIDAE - MACKEREL SHARKS

Isurus oxyrinchus Rafinesque, MAKO, rare, offshore, one specimen examined but not preserved.

#### ORECTOLOBIDAE - NURSE SHARKS

+Ginglymostoma cirratum (Bonnaterre), NURSE SHARK, frequent, UMML.

#### RHINCODONTIDAE - WHALE SHARKS

Rhincodon typus Smith, WHALE SHARK, rare, one specimen seen by the author near Duck Key about 17 miles west of Alligator Reef.

#### CARCHARHINIDAE - REQUIEM SHARKS

Carcharhinus falciiformis (Valenciennes), SILKY SHARK, common, offshore.

+Carcharhinus leucas (Valenciennes), BULL SHARK, frequent to common.

Carcharhinus limbatus (Valenciennes), BLACKTIP SHARK, occasional, inshore.

Carcharhinus obscurus (Lesueur), DUSKY SHARK, frequent, offshore.

+Galeocerdo cuvieri (Peron and Lesueur), TIGER SHARK, occasional to frequent.

+Negaprion brevirostris (Poey), LEMON SHARK, common to abundant inshore, occasional reef, UMML.

Prionace glauca (Linnaeus), BLUE SHARK, rare, one specimen caught around 1940 about 10 miles SW of Alligator Reef, identified by the late Albert Pflueger, Miami taxidermist.

#### SPHYRNIDAE - HAMMERHEAD SHARKS

+Sphyrna mokarran (Rüppell), GREAT HAMMERHEAD, occasional to frequent.

+Sphyrna tiburo (Linnaeus), BONNETHEAD, occasional to frequent.

Sphyrna zygaena (Linnaeus), SMOOTH HAMMERHEAD, occasional, offshore, UMML.

#### PRISTIDAE - SAWFISHES

Pristis pectinatus Latham, SMALLTOOTH SAWFISH, occasional, inshore, UMML.

#### RHINOBATIDAE - GUITARFISHES

Rhinobatos lentiginosus (Garman), ATLANTIC GUITARFISH, rare, inshore.



## TORPEDINIDAE - ELECTRIC RAYS

+Narcine brasiliensis (Olfers), LESSER ELECTRIC RAY, frequent, UMML.

## RAJIDAE - SKATES

Raja garmani Whitley, ROSETTE SKATE, common, offshore, UMML.

## DASYATIDAE - STINGRAYS

+Dasyatis americana Hildebrand and Schroeder, SOUTHERN STINGRAY, frequent reef, common Inshore.

+Urolophus jamaicensis (Cuvier), YELLOW STINGRAY, common, UMML.

## MYLIOBATIDAE - EAGLE RAYS

+Aetobatus narinari (Euphrasen), SPOTTED EAGLE RAY, frequent.

## MOBULIDAE - MANTAS

Manta birostris (Walbaum), ATLANTIC MANTA, occasional, offshore.

## ELOPIDAE - TARPONS

Elops saurus Linnaeus, LADYFISH, frequent, Inshore.

Megalops atlantica Valenciennes, TARPON, common, Inshore, UMML.

## ALBULIDAE - BONEFISHES

Albula vulpes (Linnaeus), BONEFISH, common, Inshore.

## CLUPEIDAE - HERRINGS

+Harengula humeralis Cuvier, REDEAR SARDINE, common, UMML.

+Harengula pensacolae Goode and Bean, SCALED SARDINE, common, UMML.

+Jenkinsia lamprotaenia (Gosse), DWARF HERRING, common, UMML.

\*Jenkinsia majua Whitehead, LITTLE-EYE DWARF HERRING, common, UMML.  
First record for Florida.

William N. Eschmeyer who is presently studying the species of Jenkinsia and who identified the material from Alligator Reef informed the author that several species may be involved in what is now known as Jenkinsia majua. The identification of Alligator Reef material under this name is, therefore, provisional.

+Jenkinsia stollferi Jordan and Gilbert, NARROWSTRIPE DWARF HERRING, frequent, UMML.

Oplisthonema oglinum (Lesueur), THREAD HERRING, frequent, Inshore.

+Sardinella anchovia (Valenciennes), SPANISH SARDINE, frequent, UMML.

Hildebrand (1963) recognizes three species of Sardinella from the Western Atlantic; pinnula known only from Bermuda, anchovia ranging from Woods Hole to Florida and probably to Brazil, and brasiliensis which occurs from Florida to southern Brazil. Specimens from Alligator Reef fit descriptions of all three species with the smallest specimens generally corresponding best with brasiliensis, medium sized ones with anchovia and the largest specimens with pinnula. More than one type frequently occurs in the same school and it appears probable that only one biological species is involved. Only the oldest name, anchovia, is therefore recognized here. This name has previously been used extensively for the Florida species.

## ENGRAULIDAE - ANCHOVIES

Anchoa lyolepis (Evermann and Marsh), DUSKY ANCHOVY, common, Inshore, UMML.

Anchoa mitchilli (Valenciennes), BAY ANCHOVY, common, Inshore, UMML.

SYNODONTIDAE - LIZARDFISHES

+Saurida normani Longley, SHORTJAW LIZARDFISH, frequent to common, reef and offshore, UMML.

Synodus foetens (Linnaeus), INSHORE LIZARDFISH, frequent, UMML.

+Synodus intermedius (Splx), SAND DIVER, occasional reef, common offshore, UMML.

+Synodus poeyi Jordan, OFFSHORE LIZARDFISH, occasional reef, common offshore, UMML.

\*Synodus synodus (Linnaeus), RED LIZARDFISH, common, UMML.

+Trachinocephalus myops (Forster), SNAKEFISH, frequent, reef and offshore, UMML.

ARGENTINIDAE - ARGENTINES

Glossanodon pygmaeus Cohen, PYGMY ARGENTINE, rare, offshore, UMML.

ARIIDAE - SEA CATFISHES

Galeichthys felis (Linnaeus), SEA CATFISH, occasional, Inshore.

XENOCONGRIDAE - PENCIL EELS

+Chlorohinus suensoni Lütken, STUBBY PENCIL EEL, rare, UMML. First record for Florida.

\*Kaupichthys atlanticus Böhlke, GRAY PENCIL EEL, occasional, UMML. First record for Florida.

CONGRIDAE - CONGER EELS

+Ariosoma impressa (Poey), BANDTOOTH CONGER, rare, UMML.

\*Conger triporiceps Kanazana, MANYTOOTH CONGER, rare, UMML.

\*Nystaclichthys halli (Böhlke), GARDEN EEL, frequent, UMML. First record for Florida.

+Paraconger caudilimbatus (Poey), MARGINTAIL CONGER, rare, UMML.

MORINGUIDAE - SPAGHETTI EELS

\*Moringua edwardsi (Jordan and Bollman), SPAGHETTI EEL, frequent, UMML. First record for Florida.

Only one species of this family is presently recognized in the West Indian Region but some workers believe that further investigation may reveal more than one species is involved. The present species identification is therefore tentative.

OPHICHTHIDAE - SNAKE EELS

+Ahlla egmontis (Jordan), KEY WORM EEL, occasional, UMML.

\*Aprognathodon platyventris Böhlke, BANDED SNAKE EEL, occasional, UMML.

+Basanlichthys scuticaris (Goode and Bean), WHIP EEL, rare, UMML.

\*Carolophia toxochila Böhlke, FLANGED SNAKE EEL, rare, UMML. First record for Florida.

+Echlopsis mordax (Poey), SNAPPER EEL, rare, UMML.

\*Myrichthys acuminatus (Gronow), SHARPTAIL EEL, rare, UMML.

+Myrichthys ocellatus (Kaup), GOLDSPOTTED EEL, occasional, UMML.

Included by Bailey et al. (1960), but not previously recorded from U.S. waters.

+Myrophis punctatus Lütken, SPECKLED WORM EEL, occasional, UMML.

- +Sphagebranchus ophioneus (Evermann and Marsh), SURF EEL, frequent, UMML. Böhlke (MS) has synonymized S. conklini with S. ophioneus, leaving only one recognized species in the West Indian Region.
- +Verma sp., AUGERNOSE WORM EEL, frequent, UMML.
- +Verma sp., BLUNTNOSE WORM EEL, frequent, UMML.

Due to the present state of systematic knowledge of this genus it is not possible to give positive identifications. At least one species is new according to Dr. James E. Böhlke who is studying this material for a future report.

#### MURAENIDAE - MORAYS

- \*Echidna catenata (Bloch), CHAIN MORAY, rare, UMML.
- \*Enchelycore nigricans (Bonnaterre), VIPER MORAY, common, UMML.  
Included by Bailey et al. (1960) but not previously recorded from U.S. waters.
- \*Enchelycore sp., DWARF VIPER MORAY, common, UMML. An undescribed species of moray closely related to E. nigricans but smaller. What appears to be the same species occurs in the Bahamas and the Antilles.
- \*Gymnothorax funebris Ranzani, GREEN MORAY, frequent to common, UMML.
- \*Gymnothorax moringa (Cuvier), SPOTTED MORAY, common, UMML.
- +Gymnothorax nigromarginatus (Girard), BLACKEDGE MORAY, rare, UMML.
- \*Gymnothorax vicinus (Castelnau), PURPLEMOUTH MORAY, common, UMML.
- \*Muraena millaris (Kaup), GOLDENTAIL MORAY, frequent, UMML.  
Included by Bailey et al. (1960), but not previously recorded from U.S. waters.
- \*Uropterygius diopus Böhlke, FINLESS MORAY, occasional, UMML.

#### BELONIDAE - NEEDLEFISHES

- Ablennes hians (Valenciennes), FLAT NEEDLEFISH, occasional, offshore, UMML.
- +Platybelone argalus (Lesueur), KEELED NEEDLEFISH, common, UMML.
- Strongylura marina (Walbaum), ATLANTIC NEEDLEFISH, common, inshore.
- Strongylura notata (Poey), REDFIN NEEDLEFISH, common, inshore, UMML.
- Tylosurus acus (Lacépède), AGUJON, occasional, offshore, UMML.
- +Tylosurus crocodilus (Peron and Lesueur), HOUNDFISH, common, UMML.

#### HEMIRAMPHIDAE - HALFBEAKS

- Chriodorus atherinoides Goode and Bean, HARDHEAD HALFBEAK, occasional, inshore, UMML.
- Euleptorampus velox Poey, FLYING HALFBEAK, occasional, offshore, UMML.
- Hemiramphus balao Lesueur, BALAO, frequent, offshore, UMML.
- +Hemiramphus brasiliensis (Linnaeus), BALLYHOO, common, reef and offshore, UMML.
- Hyperhamphus unifasciatus (Ranzani), HALFBEAK, frequent, offshore (Juvenile), and inshore (Adult), UMML.

#### EXOCEOETIDAE - FLYINGFISHES

- Cypselurus exsiliens (Linnaeus), BANDWING FLYINGFISH, offshore, UMML.  
Observations and collections of most species of flyingfishes are insufficient to permit any realistic attempt at classification as to "occasional", "frequent", etc.
- Cypselurus furcatus (Mitchill), SPOTFIN FLYINGFISH, offshore, UMML.

Cypselurus heterurus (Rafinesque), ATLANTIC FLYINGFISH, common, offshore, UMML.

Exocoetus obtusirostris Günther, OCEANIC TWO-WING FLYINGFISH, offshore, UMML.

Hirundichthys affinis (Günther), FOURWING FLYINGFISH, offshore, UMML.

Hirundichthys rondeletii (Valenciennes), BLACKWING FLYINGFISH, offshore, UMML.

Parexocoetus brachypterus (Richardson), SAILFIN FLYINGFISH, common, offshore, UMML.

Prognichthys glabrifrons (Valenciennes), BLUNTNOSE FLYINGFISH, common, offshore, UMML.

#### CYPRINODONTIDAE - KILLIFISHES

Floridichthys carpio (Günther), GOLDSPOTTED KILLIFISH, common, Inshore, UMML.

Fundulus confluentus Goode and Bean, MARSH KILLIFISH, common, Inshore, UMML.

Fundulus similis (Baird and Girard), LONGNOSE KILLIFISH, common, Inshore, UMML.

#### POECILIIDAE - LIVEBEARERS

Gambusia affinis (Baird and Girard), MOSQUITOFISH, common, Inshore, UMML.

Poecilia latipinna (Lesueur), SAILFIN MOLLY, common, Inshore, UMML.

#### AULOSTOMIDAE - TRUMPETFISHES

\*Aulostomus maculatus Valenciennes, TRUMPETFISH, frequent, UMML.

#### FISTULARIIDAE - CORNETFISHES

\*Fistularia tabacaria Linnaeus, CORNETFISH, frequent, UMML.

#### CENTRISCIDAE - SNIPEFISHES

Macrorhamphosus gracilis (Lowe), SLENDER SNIPEFISH, rare, offshore, UMML.

#### SYNGNATHIDAE - PIPEFISHES AND SEAHORSES

+Corythoichthys albirostris Heckel, WHITENOSE PIPEFISH, rare, UMML.

Corythoichthys brachycephalus (Poey), CRESTED PIPEFISH, common, Inshore, UMML.

+Hippocampus erectus Perry, RIBBED SEAHORSE, frequent, UMML. This common name has been changed from that of Bailey *et al.* (1960) to avoid confusion with the following species.

+Hippocampus reidi Ginsburg, SPOTTED SEAHORSE, rare, UMML. First record for Florida.

Hippocampus zosterae Jordan and Gilbert, DWARF SEAHORSE, frequent, Inshore.

+Micrognathus crinitus (Bean and Dresel), FRINGED PIPEFISH, frequent, UMML.

+Micrognathus crinitus (Jenyns), INSULAR PIPEFISH, frequent, UMML.

+Micrognathus vittatus (Kaup), (both ensenadae and vittatus color patterns) BANDED PIPEFISH, occasional, UMML. Due to differences in ecology, and behavior, the author is of the opinion that the two forms are probably separate species.

+Syngnathus elucens Poey, SHORTFIN PIPEFISH, rare, UMML.

- +Syngnathus louisianae Günther, CHAIN PIPEFISH, rare, UMML.  
Syngnathus pelagicus Linnaeus, SARGASSUM PIPEFISH, rare, offshore, UMML.  
 +Syngnathus springeri Herald, BULL PIPEFISH, rare, UMML.

## HOLOCENTRIDAE - SQUIRRELFISHES

- \*Adloryx bullisi (Woods), DEEPWATER SQUIRRELFISH, frequent, UMML.  
 \*Adloryx coruscus (Poey), REEF SQUIRRELFISH, frequent, UMML.  
 \*Adloryx vexillarius (Poey), DUSKY SQUIRRELFISH, common, UMML.  
 \*Holocentrus ascensionis (Osbeck), SQUIRRELFISH, common, UMML.  
 \*Holocentrus rufus (Walbaum), LONGSPINE SQUIRRELFISH, frequent, UMML.  
 \*Myripristis jacobus Cuvier, SOLDIERFISH, occasional to frequent, UMML.  
 \*Plectropops retrospinis (Gulchenot), CARDINAL SOLDIERFISH, one sight record only. Bailey et al. (1960) include it, but there is no previous record from U.S. waters published or unpublished.

## CAPROIDAE - BOARFISHES

- Antigonia capros Lowe, DEEPBODY BOARFISH, rare, offshore, UMML.

## CENTROPOMIDAE - SNOOKS

- +Centropomus undecimalis (Bloch), SNOOK, common, UMML.

## SERRANIDAE - SEA BASSES

- \*Alphestes afer (Bloch), MUTTON HAMLET, rare, UMML.  
Anthias sp., (unidentified), rare, offshore, UMML.  
 \*Cephalopholis fulva (Linnaeus), CONEY, occasional, UMML.  
 \*Dermatolepis inermis (Valenciennes), MARBLED GROUPER, rare, UMML.  
 +Diplectrum bivittatum (Valenciennes), DWARF SAND PERCH, common, UMML.  
 +Diplectrum formosum (Linnaeus), SAND PERCH, frequent, UMML.  
 \*Epinephelus adscensionis (Osbeck), ROCK HIND, common, UMML.  
Epinephelus drummondhayi Goode and Bean, SPECKLED HIND, common, offshore, UMML.  
Epinephelus flavolimbatus Poey, YELLOWEDGE GROUPER, common, offshore.  
 \*Epinephelus guttatus (Linnaeus), RED HIND, common, UMML.  
 +Epinephelus itajara (Lichtenstein), JEW FISH, frequent, UMML.  
 +Epinephelus morio (Valenciennes), RED GROUPER, common, UMML.  
Epinephelus mystacinus (Poey), MISTY GROUPER, rare, offshore, UMML.  
Epinephelus nigritus (Holbrook), WARSAW GROUPER, common, offshore, UMML.  
Epinephelus niveatus (Valenciennes), SNOWY GROUPER, common, offshore, UMML.  
 \*Epinephelus striatus (Bloch), NASSAU GROUPER, common, UMML.  
 \*Hypoplectrus gemma Goode and Bean, BLUE HAMLET, common, UMML.  
 (Figure 1)  
 \*Hypoplectrus guttavarius (Poey), FOUREYE HAMLET, occasional, UMML.  
 (Figure 2) Not previously recorded from Florida.  
 \*Hypoplectrus nigricans (Poey), BLACK HAMLET, occasional, UMML.  
 (Figure 3) Not previously recorded from Florida.  
 \*Hypoplectrus puella (Cuvier), BANDED HAMLET, occasional, UMML.  
 (Figure 4)  
 \*Hypoplectrus unicolor (Walbaum), BUTTER HAMLET, common, UMML.  
 (Figure 5) In recent years most workers have relegated the many nominal species of Hypoplectrus to the synonymy of H. unicolor as a single highly variable species. Randall, Böhlke, and the author believe, on the

basils of ecology, zoogeography, and some morphometric and meristic evidence that a number of valid species are involved. The five distinct forms found at Alligator Reef have therefore been recognized as species under the earliest name clearly based on each form. Only H. gemma is, on the basis of present evidence, restricted to Florida where it is quite common.

- \*Llopropoma eukrines (Starck and Courtenay), WRASSE BASS, frequent, UMML.  
Placement in the genus Llopropoma is based on the recent capture of a specimen of L. aberrans which proved to be inseparable generically from Chorististlum. This situation will be reported upon in detail by C. Richard Robins who brought this to the author's attention. For further explanation of generic relationships in this group of serranids see Starck and Courtenay (1962: 164-165).
- \*Llopropoma mowbrayi Woods and Kanazawa, CAVE BASS, one specimen seen but not collected. Not previously recorded from Florida.
- \*Llopropoma rubre Poey, PEPPERMINT BASS, occasional, UMML.
- \*Mycteroperca bonaci (Poey), BLACK GROUPER, common, UMML.
- \*Mycteroperca interstitialis (Poey), SALMON GROUPER, common, UMML.
- +Mycteroperca microlepis (Goode and Bean), GAG, common, UMML.
- \*Mycteroperca phenax Jordan and Swain, SCAMP, common, UMML.
- \*Mycteroperca tigris (Valenciennes), TIGER GROUPER, rare, sight record only.
- \*Mycteroperca venenosa (Linnaeus), YELLOWFIN GROUPER, occasional, UMML.
- \*Paranthias furcifer (Valenciennes), CREOLE FISH, occasional, UMML.
- \*Petrometopon cruentatum (Lacépède), GRAYSBY, common, UMML.
- \*Schultzetta beta (Hildebrand), SCHOOL BASS, frequent, UMML.
- +Serraniculus pumilio Ginsburg, PYGMY SEA BASS, rare, UMML.
- \*Serranus annularis (Günther), ORANGEBACK BASS, common, UMML.  
Serranus atrobranchus (Cuvier), BLACKEAR BASS, rare, offshore, UMML.
- \*Serranus baldwini (Evermann and Marsh), LANTERN BASS, common, UMML.
- +Serranus chionarala Robins and Starck, SNOW BASS, occasional, UMML.
- +Serranus notospilus Longley, SADDLE BASS, occasional, UMML.
- +Serranus phoebe Poey, TATTLER, common, UMML.
- \*Serranus tabacarius (Cuvier), TOBACCO FISH, common, UMML.
- \*Serranus tigrinus (Bloch), HARLEQUIN BASS, common, UMML.
- +Serranus tortugarum Longley, CHALK BASS, common, UMML.

#### LOBOTIDAE - TRIPLETAILS

Lobotes surinamensis (Bloch), TRIPLETAIL, occasional both offshore and inshore, UMML.

#### GRAMMISTIDAE - SOAPFISHES

- \*Pseudogrammus gregoryi (Breder), REEF BASS, occasional, UMML.  
P. bermudensis (Kanazawa) and P. brederi (Hildebrand) are considered here to be junior synonyms.
- \*Rypticus bistrispinus (Mitchill), FRECKLED SOAPFISH, occasional, UMML.  
The name used here is that recommended by Walter R. Courtenay in his manuscript review of the genus. This species was previously known as Rypticus arenatus.
- \*Rypticus saponaceus (Bloch and Schneider), SOAPFISH, frequent, UMML.
- \*Rypticus subbifrenatus Gill, SPOTTED SOAPFISH, common, UMML.  
Included by Bailey et al. (1960) but not previously recorded from U.S. waters.

#### CIRRHITIDAE - HAWKFISHES

- \*Amblycirrhitus pinos (Mowbray), CARIBBEAN HAWKFISH, frequent, UMML.

## LUTJANIDAE - SNAPPERS

Apsilus dentatus Gulchenot, BLACK SNAPPER, rare, offshore, UMML.

Included by Balley et al. (1960) but apparently not previously recorded from U.S. waters.

- \*Lutjanus analls (Cuvier), MUTTON SNAPPER, common, UMML.
- \*Lutjanus apodus (Walbaum), SCHOOLMASTER, abundant, UMML.
- Lutjanus campechanus (Poey), RED SNAPPER, occasional, offshore, UMML.
- +Lutjanus buccanella (Cuvier), BLACKFIN SNAPPER, frequent, juveniles only, UMML.
- \*Lutjanus cyanopterus (Poey), CUBERA SNAPPER, occasional, UMML.
- +Lutjanus griseus (Linnaeus), GRAY OR MANGROVE SNAPPER, abundant, UMML.
- \*Lutjanus jocu (Bloch and Schneider), DOG SNAPPER, frequent, UMML.
- \*Lutjanus mahogoni (Cuvier), MAHOGANY SNAPPER, occasional, UMML.
- +Lutjanus synagris (Linnaeus), LANE SNAPPER, frequent, UMML.
- +Lutjanus vivanus (Cuvier), SILK SNAPPER, occasional, juveniles only, UMML.
- \*Ocyurus chrysurus (Bloch), YELLOWTAIL, abundant, UMML.

## PRIACANTHIDAE - BIGEYES

- \*Priacanthus arenatus Cuvier, BIGEYE, rare, UMML.
- \*Priacanthus cruentatus (Lacépède), GLASSEYE SNAPPER, frequent, UMML.
- +Pristigeyns alta (Gill), SHORT BIGEYE, occasional, UMML.

## APOGONIDAE - CARDINALFISHES

- \*Apogon aurolineatus (Mowbray), BRIDLE CARDINALFISH, occasional, UMML.
- \*Apogon binotatus (Poey), BARRED CARDINALFISH, frequent, UMML.
- \*Apogon conklini (Silvester), FRECKLED CARDINALFISH, common, UMML.
- \*Apogon lachneri Böhlke, WHITESTAR CARDINALFISH, frequent, UMML.  
Included by Balley et al. (1960) but not previously recorded from U.S. waters.
- \*Apogon maculatus (Poey), FLAMEFISH, abundant, UMML.
- \*Apogon pigmentarius (Poey), DUSKY CARDINALFISH, occasional, UMML.
- \*Apogon sp., SADDLETAIL CARDINALFISH, rare, UMML. A new species to be described by Böhlke and Randall under the species name plintonatus.
- \*Apogon planifrons Longley and Hildebrand, PALE CARDINALFISH, frequent, UMML.
- \*Apogon pseudomaculatus Longley, TWOSPOT CARDINALFISH, frequent, UMML.
- \*Apogon quadrisquamatus Longley, SAWCHEEK CARDINALFISH, frequent, UMML.
- \*Apogon townsendi (Breder), BELTED CARDINALFISH, occasional, UMML.  
Included by Balley et al. (1960) but apparently not previously recorded from U.S. waters.
- \*Apogon sp., SPONGE CARDINALFISH, rare, UMML. A new species to be described by Böhlke and Randall under the species name xenus.
- \*Astrapogon alutus (Jordan and Gilbert), BRONZE CARDINALFISH, occasional, UMML.
- \*Astrapogon punctulatus (Poey), BLACKFIN CARDINALFISH, frequent, UMML.
- \*Astrapogon stellatus (Cope), CONCHFISH, occasional, UMML.
- \*Chelodipterus affinis Poey, BIGTOOTH CARDINALFISH, occasional, UMML.  
First record for Florida.
- Synagrops bella (Goode and Bean), DEEPSEA CARDINALFISH, common, offshore, UMML.

## BRANCHIOSTEGIDAE - TILEFISHES

Caulolatilus cyanops Poey, BLACKLINE TILEFISH, common, offshore, UMML.

Lopholatilus chamaeleonticeps Goode and Bean, TILEFISH, rare, offshore, UMML.

\*Malacanthus plumieri (Bloch), SAND TILEFISH, common, UMML.

POMATOMIDAE - BLUEFISHES

Pomatomus saltatrix (Linnaeus), BLUEFISH, occasional in winter.

RACHYCENTRIDAE - COBIAS

Rachycentron canadum (Linnaeus), COBIA, occasional, reef and offshore.

CARANGIDAE - JACKS.

+Alectis crinitus (Mitchill), AFRICAN POMPANO, frequent, UMML.

\*Caranx bartholomaei Cuvier, YELLOW JACK, common, UMML.

+Caranx fuscus Geoffrey, BLUE RUNNER, common, UMML.

+Caranx hippos (Linnaeus), CREVALLE JACK, frequent, common inshore, UMML.

+Caranx latus Agassiz, HORSE-EYE JACK, frequent, UMML.

\*Caranx ruber (Bloch), BAR JACK, common, UMML.

Chloroscombrus chrysurus (Linnaeus), BUMPER, occasional, slight record only.

+Decapterus punctatus (Agassiz), ROUND SCAD, frequent, UMML.

\*Elagatis bipinnulatus (Quoy and Gaimard), RAINBOW RUNNER, frequent, UMML.

Oligoplites saurus (Bloch and Schneider), LEATHERJACKET, frequent, inshore.

+Selar crumenophthalmus (Bloch), BIGEYE SCAD, occasional, UMML.

Selene vomer (Linnaeus), LOOKDOWN, common, inshore, UMML.

+Seriola dumerilii (Risso), AMBERJACK, common, UMML.

Seriola rivoliana Valenciennes, ALMACO JACK, frequent, offshore, UMML.

Seriola zonata (Mitchill), BANDED RUDDERFISH, rare, offshore.

Trachinotus carolinus (Linnaeus), POMPANO, frequent, inshore, UMML.

+Trachinotus falcatus (Linnaeus), PERMIT, frequent.

+Trachurus lathami Nichols, ROUGH SCAD, occasional, UMML.

Vomer setapinnis (Mitchill), MOONFISH, rare, UMML.

CORYPHAENIDAE - DOLPHINS

Coryphaena equisetis Linnaeus, POMPANO DOLPHIN, occasional to frequent, offshore, UMML.

Coryphaena hippurus Linnaeus, DOLPHIN, common, offshore, UMML.

GERREIDAE - MOJARRAS

+Euclinostomus argenteus Baird and Girard, SLENDER MOJARRA, common, UMML.

+Euclinostomus gula (Quoy and Gaimard), SILVER JENNY, common, UMML.

+Gerres cinereus (Walbaum), YELLOWFIN MOJARRA, frequent, reef, common inshore, UMML.

POMADASYIDAE - GRUNTS

\*Anisotremus surinamensis (Bloch), BLACK MARGATE, common, UMML.

\*Anisotremus virginicus (Linnaeus), PORKFISH, common, UMML.

\*Haemulon album Cuvier, MARGATE, common, UMML.

\*Haemulon aurolineatum Cuvier, TOMTATE, abundant, UMML.

\*Haemulon carbonarium Poey, CAESAR GRUNT, common, UMML.

\*Haemulon chrysargyreum Günther, SMALLMOUTH GRUNT, abundant, UMML.

\*Haemulon flavolineatum (Desmarest), FRENCH GRUNT, abundant, UMML.

\*Haemulon macrostomum Günther, SPANISH GRUNT, common, UMML.



- \*Haemulon melanurum (Linnaeus), COTTONWICK, occasional to frequent, UMML.
- \*Haemulon parraii (Desmarest), SAILORS CHOICE, common, UMML.
- \*Haemulon plumieri (Lacépède), WHITE GRUNT, abundant, UMML.
- \*Haemulon sciurus (Shaw), BLUESTRIPED GRUNT, abundant, UMML.
- \*Haemulon striatum (Linnaeus), SMALLMOUTH TOMTATE, abundant, UMML.
- Orthopristis chrysopterus (Linnaeus), PIGFISH, rare, Inshore.

## SCIAENIDAE - DRUMS

- +Bairdiella batabana (Poey), BLUE CROAKER, occasional, UMML.
- \*Equetus acuminatus (Bloch and Schneider), HIGH-HAT, common, UMML.  
As used here acuminatus applies to the species formerly known as pulcher and the species formerly known as acuminatus is umbrosus. This change is based on the unpublished recommendation of George Miller. The common names used here and for E. punctatus differ from those suggested by Balley et al. (1960) in accordance with popular usage.
- \*Equetus lanceolatus (Linnaeus), JACKKNIFE-FISH, occasional, UMML.
- \*Equetus punctatus (Bloch and Schneider), SPOTTED HIGH-HAT, occasional, UMML. Included by Briggs (1958) and Balley et al. (1960) but not previously recorded from U.S. waters.
- +Equetus umbrosus Jordan and Eigenmann, CUBBYU, occasional, UMML.
- \*Odontoscion dentex (Cuvier), REEF CROAKER, common, UMML.
- Sciaenops ocellata (Linnaeus), RED DRUM OR CHANNEL BASS, occasional, Inshore.

## MULLIDAE - GOATFISHES

- \*Mullidichthys martinicus (Cuvier), YELLOW GOATFISH, common, UMML.
- \*Pseudupeneus maculatus (Bloch), SPOTTED GOATFISH, common, UMML.

## SPARIDAE - PORGIES

- Archosargus probatocephalus (Walbaum), SHEEPSHEAD, frequent, Inshore, UMML.
- +Archosargus rhomboidalis (Linnaeus), SEA BREEM, frequent, UMML.
- +Calamus arctifrons Goode and Bean, GRASS PORGY, occasional, UMML.
- +Calamus bajonado (Bloch and Schneider), JOLTHEAD PORGY, occasional, UMML.
- \*Calamus calamus (Valenciennes), SAUCEREYE PORGY, frequent, UMML.
- +Calamus nodosus Randall and Caldwell, KNOBBED PORGY, frequent, UMML.
- +Calamus proridens Jordan and Gilbert, LITTLEHEAD PORGY, common, UMML.
- Lagodon rhomboides (Linnaeus), PINFISH, abundant, Inshore, UMML.

## EMMELICHTHYIDAE - BOGAS

- \*Emmelichthys atlanticus Schultz, LITTLE BOGA, frequent, UMML.
- \*Inermia vittata Poey, BOGA, occasional, UMML. First record for Florida.

## PEMPHERIDAE - SWEEPERS

- \*Pempheris schomburgki Müller and Troschel, GLASSY SWEEPER, common, UMML.

## KYPHOSIDAE - SEA CHUBS

- \*Kyphosus incisor (Cuvier), YELLOW CHUB, common, UMML.
- \*Kyphosus sectatrix (Linnaeus), BERMUDA CHUB, frequent, common Inshore, UMML.

## EPHIPPIDAE - SPADEFISHES

- +Chaetodipterus faber (Broussonet), SPADEFISH, frequent to common, UMML.

## CHAETODONTIDAE - BUTTERFLYFISHES AND ANGELFISHES

- \*Centropyge argi Woods and Kanazawa, PYGMY ANGELFISH, occasional, UMML.  
Included by Briggs (1958) and Balley et al. (1960) but not recorded previously from U.S. waters. Pygmy angelfish rather than cherubfish (Balley et al.) is in wide use by aquarists.
- \*Chaetodon capistratus Linnaeus, FOUREYED BUTTERFLYFISH, common, UMML.
- \*Chaetodon ocellatus Bloch, COMMON BUTTERFLYFISH, common, UMML.  
Common butterflyfish rather than spotfin butterflyfish (Balley et al., 1960) is widely used by aquarists and skindivers. The spot is frequently absent in the day.
- \*Chaetodon sedentarius Poey, REEF BUTTERFLYFISH, common, UMML.
- \*Chaetodon striatus Linnaeus, BANDED BUTTERFLYFISH, common, UMML.
- \*Holacanthus ciliaris (Linnaeus), QUEEN ANGELFISH, common, UMML.
- \*Holacanthus isabellita (Jordan and Rutter), BLUE ANGELFISH, common, UMML.
- \*Holacanthus tricolor (Bloch), ROCK BEAUTY, common, UMML.
- \*Pomacanthus arcuatus (Linnaeus), BLACK ANGELFISH, common, UMML.  
The species name arcuatus as used here applies to the species called aureus by most previous authors. Likewise paru as used here equals arcuatus of previous authors. This nomenclature and the use of isabellita for the blue angelfish has been recommended by Henry A. Feddern (personal communication) who is reviewing the Western Atlantic angelfishes. The common name black angelfish rather than gray angelfish (Balley et al., 1960) is again a widely used name by aquarists, skindivers, and fishermen while gray angelfish is not.
- \*Pomacanthus paru (Bloch), FRENCH ANGELFISH, common, UMML.
- \*Prognathodes aculeatus (Poey), LONGSNOUT BUTTERFLYFISH, occasional, UMML. Included by Balley et al. (1960) but not previously recorded from U.S. waters. Subsequently recorded by Hubbs (1963).

## POMACENTRIDAE - DAMSELFISHES

- \*Abudefduf saxatilis (Linnaeus), SERGEANT MAJOR, abundant, UMML.
- +Abudefduf taurus (Müller and Troschel), NIGHT SERGEANT, rare, inshore, UMML.
- \*Chromis cyanea (Poey), BLUE CHROMIS, abundant, UMML. Included by Balley et al. (1960) but not previously reported. (Figures 6 and 7)
- \*Chromis enchrysurus Jordan and Gilbert, YELLOWTAIL REEF-FISH, abundant, UMML. (Figure 8)
- \*Chromis insolatus (Cuvier), SUNSHINE FISH, abundant, UMML. (Figure 9)  
The common names of this species and of Chromis multilineata, Microspathodon chrysurus, and Eupomacentrus planifrons below are in accordance with usage by aquarists and skindivers. Balley et al. (1960) offer other names.
- \*Chromis multilineata (Gulchenot), GRAY CHROMIS, abundant, UMML. (Figures 10 and 11)
- \*Chromis sp., PURPLE REEF-FISH, common, UMML. An undescribed species closely related to Chromis insolatus. (Figures 12 and 13)  
This species will be described in a forthcoming paper by Alan R. Emery under the species name scotti.
- \*Eupomacentrus fuscus (Cuvier), DUSKY DAMSELFISH, common, UMML. (Figures 14 and 15)
- \*Eupomacentrus leucostictus (Müller and Troschel), BEAUGREGORY, common, UMML. (Figure 16)

- \*Eupomacentrus sp., HONEY GREGORY, frequent, UMML. An undescribed species close to E. leucostictus. (Figure 17) This species will be described in a forthcoming paper by Alan R. Emery under the species name mellis.
- \*Eupomacentrus partitus (Poey), BICOLOR DAMSELFISH, abundant, UMML. (Figures 18, 19, and 20)
- \*Eupomacentrus planifrons (Cuvier), YELLOW DAMSELFISH, common, UMML. (Figure 21)
- \*Eupomacentrus varlablilis (Castelnau), COCOA DAMSELFISH, abundant, UMML. (Figure 22)
- \*Microspathodon chrysurus (Cuvier), JEWELFISH, common, UMML. (Figures 23 and 24)

## LABRIDAE - WRASSES

- \*Bodanus pulchellus (Poey), SPOTFIN HOGFISH, common, UMML. Included by Balley et al. (1960) but not previously recorded from U.S. waters. Subsequently recorded by Randall (1962).
- \*Bodanus rufus (Linnaeus), SPANISH HOGFISH, common, UMML.
- \*Clepticus parral (Bloch and Schneider), CREOLE WRASSE, common, UMML. Included by Balley et al. (1960) but not previously recorded from U.S. waters.
- Decodon puellaris (Poey), CUBAN HOGFISH, common, offshore, UMML.
- \*Doratonotus megalepis Günther, DWARF WRASSE, common, UMML.
- \*Hallichoeres bathyphilus (Beebe and Tee-Van), GREENBAND WRASSE, rare, UMML. Included by Balley et al. (1960) but not previously recorded from U. S. waters. Subsequently recorded by Randall and Ethlike (1965).
- \*Hallichoeres bivittatus (Bloch), SLIPPERY DICK, abundant, UMML.
- \*Hallichoeres caudalis (Poey), PAINTED WRASSE, occasional, UMML.
- \*Hallichoeres cyanocephalus (Bloch), YELLOWBACK WRASSE, frequent, UMML.
- \*Hallichoeres garnoti (Valenciennes), YELLOWHEAD WRASSE, abundant, UMML.
- \*Hallichoeres maculipinna (Müller and Troschel), CLOWN WRASSE, abundant, UMML.
- \*Hallichoeres pictus (Poey), STRIPED WRASSE, frequent, UMML. First record for Florida.
- \*Hallichoeres poeyi (Steindachner), BLACKEAR WRASSE, common, UMML.
- \*Hallichoeres radlatus (Linnaeus), PUDDINGWIFE, common, UMML.
- \*Hemipteronotus martinicensis (Valenciennes), ROSY RAZORFISH, frequent, UMML. Randall (1965b: 499) has pointed out that the Xyrichtys martinicensis of Longley and Hildebrand (1941) is Hemipteronotus splendens, thus H. martinicensis is previously unrecorded from Florida. Inclusion by Briggs (1958) and Balley et al. (1960) is apparently based on Longley and Hildebrand (1941).
- \*Hemipteronotus novacula (Linnaeus), PEARLY RAZORFISH, common, UMML.
- \*Hemipteronotus splendens (Castelnau), GREEN RAZORFISH, common, UMML.
- \*Lachnolaimus maximus (Walbaum), HOGFISH, common, UMML.
- \*Thalassoma bifasciatum (Bloch), BLUEHEAD WRASSE, abundant, UMML.

## SCARIDAE - PARROTFISHES

- \*Cryptotomus roseus Cope, BLUELIP PARROTFISH, common, UMML.
- +Nicholsina usta (Valenciennes), EMERALD PARROTFISH, frequent, UMML.
- \*Scarus coelestinus Valenciennes, INDIGO PARROTFISH, common, UMML.  
The common names used here and for Sparisoma rubripinna differ from those used by Balley et al. (1960) in order to conform to widespread usage.
- \*Scarus coeruleus (Bloch), BLUE PARROTFISH, common, UMML.

- \*Scarus croicensis Bloch, STRIPED PARROTFISH, common, UMML.
- \*Scarus guacamala Cuvier, RAINBOW PARROTFISH, common, UMML.
- \*Scarus taenlopterus Desmarest, RIBBON PARROTFISH, frequent, UMML.  
Not Included by Briggs (1958) or Bailey et al. (1960) as the name was in synonymy with Scarus croicensis at that time. Randall (1963a: 228) has pointed out the validity of this species. Breder (1948) correctly identified the male of Scarus taenlopterus and stated that it reaches Florida.
- \*Scarus vetula Bloch and Schneider, QUEEN PARROTFISH, common, UMML
- \*Sparisoma atomarium (Poey), DEEPWATER PARROTFISH, common, UMML.
- \*Sparisoma aurofrenatum (Valenciennes), WHITESPOT PARROTFISH, common, UMML. The common names suggested by Bailey et al. (1960) for this species and for S. chrysopterus and S. viride are not in wide usage and are misleading for the live fish; therefore, other names are suggested here.
- \*Sparisoma chrysopterus (Bloch and Schneider), TURQUOISE PARROTFISH, frequent, UMML.
- \*Sparisoma radians (Valenciennes), BUCKTOOTH PARROTFISH, common, UMML.
- \*Sparisoma rubripinne (Valenciennes), MUD PARROTFISH, common, UMML.
- \*Sparisoma viride (Bonnaterre), GREEN PARROTFISH, common, UMML.

## ACANTHURIDAE - SURGEONFISHES

- \*Acanthurus bahianus Castelnau, OCEAN SURGEON, common, UMML.
- \*Acanthurus chirurgus (Bloch), DOCTORFISH, common, UMML.
- \*Acanthurus coeruleus Bloch and Schneider, BLUE TANG, common, UMML.

## GEMPYLIDAE - SNAKE MACKERELS

- Gempylus serpens Cuvier, SNAKE MACKEREL, rare, offshore, UMML.

## SCOMBRIDAE - MACKERELS AND TUNAS

- Acanthocybium solanderi (Cuvier), WAHOO, occasional, offshore.
- Auxis thazard (Lacépède), FRIGATE MACKEREL, occasional, offshore, UMML.
- Euthynnus alletteratus (Rafinesque), LITTLE TUNA, common, offshore, UMML.
- Euthynnus pelamis (Linnaeus), SKIPJACK OR ARTIC BONITO, common, offshore, UMML.
- +Scomberomorus cavalla (Cuvier), KING MACKEREL, abundant in winter, UMML.
- Scomberomorus maculatus (Mitchill), SPANISH MACKEREL, frequent to abundant in winter.
- +Scomberomorus regalis (Bloch), CERO, common, UMML.
- Thunnus albacares (Bonnaterre), YELLOWFIN TUNA, frequent, offshore, UMML.
- Thunnus atlanticus (Lesson), BLACKFIN TUNA, common, offshore, UMML.
- Thunnus thynnus (Linnaeus), BLUEFIN TUNA, occasional, juveniles only, offshore, UMML.

## ISTIOPHORIDAE - BILLFISHES

- Istiophorus platypterus (Shaw and Nodder), SAILFISH, common, offshore, UMML. This name follows Whitehead's (1964) paper pointing out platypterus as the earliest available name for a sailfish (from the Indian Ocean) and James E. Morrow's unpublished study of the genus Istiophorus placing all nominal forms in one worldwide species.
- Makaira nigricans Lacépède, BLUE MARLIN, occasional, offshore, UMML.
- Tetrapturus albidus Poey, WHITE MARLIN, occasional, offshore.

Tetrapturus pfluger Robins and deSilva, LONGBILL SPEARFISH, rare, offshore.

## XIPHIIDAE - SWORDFISHES

Xiphias gladius Linnaeus, SWORDFISH, rare, offshore.

## ELEOTRIDAE - SLEEPERS

\*Loglossus callurus Bean, BLUE SLEEPER, common, UMML.

## GOBIIDAE - GOBIES

+Barbullifer ceuthoecus (Jordan and Gilbert), BEARDED GOBY, frequent, UMML.

Bathygobius mystaclum Ginsburg, TIDEPOOL GOBY, rare, Inshore, UMML.  
First record for Florida.

Bathygobius soporator (Valenciennes), FRILLFIN GOBY, common, Inshore, UMML.

\*Coryphopterus alloides Böhlke and Robins, SPLITFIN GOBY, rare, UMML.  
First record for Florida.

\*Coryphopterus dlcrus Böhlke and Robins, DOUBLESPOT GOBY, common, UMML.

\*Coryphopterus eidolon Böhlke and Robins, GHOST GOBY, common, UMML.

+Coryphopterus glaucofraenum Gill, BRIDLED GOBY, common, UMML.

\*Coryphopterus hyalinus Böhlke and Robins, GLASS GOBY, occasional, UMML.

\*Coryphopterus liperne Böhlke and Robins, BLUENOSE GOBY, frequent, UMML.

\*Coryphopterus personatus (Jordan and Thompson), MASKED GOBY, abundant, UMML.

+Coryphopterus punctipectorphorus Springer, SPOTTED GOBY, frequent, UMML.

\*Coryphopterus thrix Böhlke and Robins, BARTAIL GOBY, occasional, UMML.  
First record for Florida.

\*Elacatinus oceanops Jordan, NEON GOBY, common, UMML.

\*Garmannia grosvenori Robins, DWARF SAND GOBY, occasional, UMML.

+Garmannia macrodon (Beebe and Tee-Van), TIGER GOBY, frequent, UMML.

\*Gnatholepis thompsoni Jordan, GOLDSPOUT GOBY, common, UMML.

Goblonellus boleosoma (Jordan and Gilbert), DARTER GOBY, occasional, Inshore, UMML.

\*Goblonellus sp., DASH GOBY, frequent, UMML. An undescribed species.

To be described by Gilbert and Randall under the species name saepipallens.

+Goblonellus stigmatophilus Mead and Böhlke, SPOTGIN GOBY, frequent, UMML.

Gobiosoma robustum Ginsburg, CODE GOBY, frequent, Inshore.

\*Gobiosoma sp., YELLOWLINE GOBY, rare, UMML. This species has formerly been identified as G. horsti which does not occur in Florida.

It will be described by Böhlke and Robins under the species name xanthipora.

\*Lythrypnus neslotes Böhlke and Robins, ISLAND GOBY, rare, UMML.  
First record for Florida.

\*Lythrypnus phorellus Böhlke and Robins, PRISONER GOBY, frequent, UMML.

\*Lythrypnus spilus Böhlke and Robins, DARKSHOULDER GOBY, frequent, UMML.

\*Microgobius carri Fowler, SEMINOLE GOBY, common, UMML.

\*Nes longus (Nichols), ORANGESPOTTED GOBY, occasional, UMML. Placement of this species in the genus Nes is done on the unpublished recommendation of C. Richard Robins.

\*Quisquilius hipoliti (Metzelaar), REEF GOBY, common, UMML.

## MICRODESMIDAE - WORMFISHES

- \*Microdesmus floridanus (Longley), PUGJAW WORMFISH, occasional, UMML.

## SCORPAENIDAE - SCORPIONFISHES

- Pontinus rathbuni Goode and Bean, HIGHFIN SCORPIONFISH, occasional, offshore, UMML.  
Scorpaena agassizi Goode and Bean, LONGFIN SCORPIONFISH, frequent, offshore, UMML.  
 \*Scorpaena albifimbria Evermann and Marsh, CORAL SCORPIONFISH, rare, UMML.  
 \*Scorpaena bergi Evermann and Marsh, GOOSEHEAD SCORPIONFISH, occasional, UMML.  
 +Scorpaena calcarata Goode and Bean, SMOOTHHEAD SCORPIONFISH, frequent, UMML.  
 +Scorpaena dispar Longley and Hildebrand, HUNCHBACK SCORPIONFISH, occasional, UMML.  
 \*Scorpaena elachys Eschmeyer, DWARF SCORPIONFISH, rare, UMML.  
 +Scorpaena grandicornis Cuvier, PLUMED SCORPIONFISH, occasional, UMML.  
 This name rather than "lionfish" of Bailey *et al.* (1960) is used to avoid confusion with the Indo-Pacific lionfish (*Pterois*).  
 \*Scorpaena inermis Cuvier, MUSHROOM SCORPIONFISH, occasional, UMML.  
 \*Scorpaena plumieri Bloch, SPOTTED SCORPIONFISH, frequent, UMML.  
 \*Scorpaenodes caribbaeus Meek and Hildebrand, REEF SCORPIONFISH, frequent, UMML. (Figure 25)  
 \*Scorpaenodes tridecimspinosus (Metzelaar), DEEPREEF SCORPIONFISH, occasional, UMML. First record for Florida. (Figure 26)

## TRIGLIDAE - SEAROBINS

- Bellator brachyichir (Regan), SHORTFIN SEAROBIN, common, offshore, UMML.  
Bellator egretta (Goode and Bean), STREAMER SEAROBIN, offshore, UMML.  
Bellator militaris (Goode and Bean), HORNED SEAROBIN, abundant, offshore, UMML.  
Peristedion gracile Goode and Bean, SLENDER SEAROBIN, offshore.  
 The record of this species was kindly furnished by George Miller.  
Peristedion platycephalum (Goode and Bean), FLATHEAD SEAROBIN, offshore, UMML.  
Prionotus alatus Goode and Bean, SPINY SEAROBIN, offshore, UMML.

## DACTYLOPTERIDAE - FLYING GURNARDS

- +Dactylopterus volitans (Linnaeus), FLYING GURNARD, occasional, UMML.

## OPISTOGNATHIDAE - JAWFISHES

- +Lonchopisthus lindneri Ginsburg, SWORDTAIL JAWFISH, rare, UMML.  
 \*Opistognathus aurifrons (Jordan and Thompson), YELLOWHEAD JAWFISH, common, UMML.  
 \*Opistognathus cuiveri Valenciennes, PHANTOM JAWFISH, rare, UMML.  
 First record for Florida.  
 +Opistognathus lonchurus Jordan and Gilbert, MOUSTACHE JAWFISH, frequent, UMML. Longtail jawfish of Bailey *et al.* (1960) does not appear appropriate for this fish.  
 +Opistognathus macrognathus Poey, LONGJAW JAWFISH, occasional, UMML.  
 \*Opistognathus whitehursti (Longley), DUSKY JAWFISH, common, UMML.

## DACTYLOSCOPIDAE - SAND STARGAZERS

- +Dactyloscopus tridigitatus Gill, SAND STARGAZER, occasional, UMML.
- \*Girellus greyae Kanazawa, ARROW STARGAZER, frequent, UMML.
- \*Heteristius rubroinctus (Longley), SADDLE STARGAZER, common, UMML.

## CALLIONYMIDAE - DRAGONETS

- Callionymus agassizii Goode and Bean, LANCER DRAGONET, common, offshore, UMML.
- \*Callionymus balrudi Jordan, CORAL DRAGONET, frequent, UMML.
- +Callionymus pauciradiatus Gill, SPOTTED DRAGONET, occasional, UMML.

## CLINIDAE - CLINIDS

- \*Acanthemblemaria aspera (Longley), ROUGHHEAD BLENNY, common, UMML.
- +Chaenopsis ocellata Poey, BLUE THROAT PIKEBLENNY, rare, UMML.
- \*Chaenopsis limbaughii Robins and Randall, SAND PIKEBLENNY, occasional, UMML; First record for Florida.
- \*Emblemaria atlantica Jordan and Evermann, BANNER BLENNY, occasional, UMML.
- \*Emblemaria pandionis Evermann and Marsh, SAILFIN BLENNY, occasional, UMML.
- \*Emblemarlopsis bottomel Stephens, MIDNIGHT BLENNY, occasional, UMML. First record for Florida.
- \*Emblemarlopsis diaphana Longley, GLASS BLENNY, occasional, UMML.
- \*Enneanectes altivellii Rosenblatt, LOFTY BLENNY, common, UMML. First record for Florida.
- \*Enneanectes boehlkei Rosenblatt, BÖHLKE'S BLENNY, frequent, UMML.
- \*Enneanectes pectoralis (Fowler), REDEYE BLENNY, frequent, UMML.
- \*Hemlemblemaria stimulus Longley and Hildebrand, WRASSE BLENNY, frequent, UMML.
- \*Labrisomus bucciferus (Poey), FRECKLECHEEK BLENNY, rare, UMML. First record for Florida.
- \*Labrisomus goble (Valenciennes), PALEHEAD BLENNY, rare, UMML. First record for Florida.
- \*Labrisomus guppyi (Norman), MIMIC BLENNY, frequent, UMML.
- \*Labrisomus hatiensis Beebe and Tee-Van, HATIAN BLENNY, common, UMML. Not listed by Bailey et al. (1960) but included for Florida by Longley and Hildebrand (1941), Briggs (1958), and Springer (1958).
- \*Labrisomus kalisherae (Jordan), DOWNY BLENNY, frequent, UMML.
- \*Labrisomus nigricinctus Howell Rivero, SPOTCHEEK BLENNY, occasional, UMML.
- \*Labrisomus nuchipinnis (Quoy and Gaimard), HAIRY BLENNY, common, UMML.
- \*Malacoctenus auralineatus Smith, ORANGELINE BLENNY, occasional, UMML. Not listed by Bailey et al. (1960) but recorded from Florida by Springer (1958). Malacoctenus sp. of Briggs (1958) is possibly this species.
- \*Malacoctenus macropus (Poey), ROSY BLENNY, frequent, UMML.
- \*Malacoctenus triangulatus Springer, SADDLED BLENNY, common, UMML.
- +Paraclinus fasciatus (Steindachner), BANDED BLENNY, abundant, UMML.
- \*Paraclinus grandicomis (Rosén), HORNED BLENNY, occasional, UMML.
- \*Paraclinus infrons Böhlke, LONGNOSE BLENNY, rare, UMML. First record for Florida.
- +Paraclinus marmoratus (Steindachner), MARBLED BLENNY, occasional, UMML.
- \*Paraclinus nigripinnis (Steindachner), BLACKFIN BLENNY, abundant, UMML.
- \*Starksia ocellata (Steindachner), CHECKERED BLENNY, common, UMML.

\*Stathmonotus hemphilli Bean, CLOWN BLENNY, occasional, UMML.

#### BLENNIIDAE - COMBTOOTH BLENNIES

+Blennius cristatus Linnaeus, MULLY MILLER, abundant Inshore, occasional reef, UMML.

\*Blennius marmoratus Poey, SEAWEED BLENNY, common, UMML.

+Entomacrodus textilis (Quoy and Gaimard), PEARL BLENNY, common, UMML.

\*Hypoleurochilus bermudensis Beebe and Tee-Van, BARRED BLENNY, common, UMML.

\*Ophioblennius atlanticus (Valenciennes), REDLIP BLENNY, common, UMML.

#### BROTULIDAE - BROTULAS

+Brotula barbata (Bloch and Schneider), BEARDED BROTULA, rare, UMML.

\*Ogilbia cayorum Evermann and Kendall, KEY BROTULA, common, UMML.

It is generally accepted among systematists that a number of species are now classified under this name. The identification is, therefore, tentative and it is probable that more than one species is found at Alligator Reef.

\*Oligopus claudel (Torre), REEF BROTULA, rare, UMML. First record for Florida.

\*Petrotyx sanguineus (Meek and Hildebrand), RUDDY BROTULA, frequent, UMML. First record for Florida.

\*Stygnobrotula latebricola Böhlke, BLACK BROTULA, rare, UMML. First record for Florida.

#### OPHIIDAE - CUSK-EELS

+Lepophidium jeannae Fowler, MOTTLED CUSK-EEL, rare, UMML.

+Ophidion holbrooki (Putnam), BANK CUSK-EEL, occasional, UMML.

+Ophidion selenops Robins and Böhlke, MOONEYE CUSK-EEL, occasional, UMML.

\*Otophidium dormitator Böhlke and Robins, GHOST CUSK-EEL, occasional, UMML. First record for Florida.

\*Parophidion schmidti (Woods and Kanazawa), GRASS CUSK-EEL, frequent, UMML. First record for Florida.

#### CARAPIDAE - PEARLFISHES

\*Carapus bermudensis (Jones), PEARLFISH, frequent, UMML.

#### STROMAETEIDAE - BUTTERFISHES

Ariomma regulus (Poey), SPOTTED DRIFTFISH, rare, offshore, UMML.

Nomeus gronowii (Gmelin), MAN-O-WAR FISH, frequent, UMML.

Pallinurichthys perciformis (Mitchell), BARRELFISH, rare, offshore.

Psenes cyanophrys Cuvier, FRECKLED DRIFTFISH, occasional, offshore, UMML.

Psenes maculatus Lütken, SILVER DRIFTFISH, occasional, offshore, UMML.

#### SPHYRAENIDAE - BARRACUDAS

\*Sphyraena barracuda (Walbaum), GREAT BARRACUDA, common, UMML.

+Sphyraena borealis DeKay, NORTHERN BARRACUDA, frequent, UMML.

This common name differs from that of Bailey *et al.* (1960) in accordance with general usage.

#### MUGILIDAE - MULLET

Mugil cephalus Linnaeus, STRIPED OR BLACK MULLET, common, Inshore.

Mugil curema Valenciennes, WHITE MULLET, frequent, Inshore.



Mugil galmardiana Desmarest, REDEYE MULLET, occasional, Inshore.  
Mugil trichodon Poey, FANTAIL MULLET, abundant, Inshore, UMML.

## ATHERINIDAE - SILVERSIDES

+Allanetta harringtonensis (Goode), REEF SILVERSIDE, common, UMML.  
 +Atherinomorus stipes (Müller and Troschel), HARDHEAD SILVERSIDE, common, UMML.

## BOTHIDAE - LEFT EYE FLOUNDERS

Ancylopsetta dillecta (Goode and Bean), THREE-EYE FLOUNDER, offshore, UMML.  
 \*Bothus ocellatus (Agassiz), EYED FLOUNDER, common, UMML.  
Citharichthys arctifrons Goode, GULF STREAM FLOUNDER, abundant, offshore, UMML.  
Citharichthys cornutus (Günther), HORNED WHIFF, abundant, offshore, UMML.  
 +Citharichthys macrops Dresel, SPOTTED WHIFF, occasional, UMML.  
 +Citharichthys sp., rare, UMML. An unidentified species close to C. cornutus, possibly undescribed.  
 +Cyclopsetta flmbrata (Goode and Bean), SPOTFIN FLOUNDER, occasional, UMML.  
 +Syacium gunteri Ginsburg, CHANNEL FLOUNDER, occasional, UMML.  
 +Syacium papillosum (Linnaeus), DUSKY FLOUNDER, common, UMML.

## SOLEIDAE - SOLES

+Achirus lineatus (Linnaeus), LINED SOLE, rare, UMML.  
 +Trinectes maculatus (Bloch and Schneider), HOGCHOKER, rare, UMML.

## CYNOGLOSSIDAE - TONGUEFISHES

\*Symphurus arawak Robins and Randall, CARIBBEAN TONGUEFISH, rare, UMML. First record for Florida.  
 +Symphurus dlomedianus (Goode and Bean), SPOTTEDFIN TONGUEFISH, occasional, UMML.

## ECHENEIDAE - REMORAS

+Echenels naucrates Linnaeus, SHARKSUCKER, common, UMML.  
 +Echenels naucratoides Zuleuw, WHITEFIN SHARKSUCKER, rare, UMML.  
Phtheiroichthys lineatus (Menzies), SLENDER SUCKERFISH, rare, offshore, UMML.  
Remora brachyptera (Lowe), SPEARFISH REMORA, rare, offshore, UMML.  
Remora osteochir (Cuvier), MARLINSUCKER, frequent, offshore, UMML.

## GOBIESOCIDAE - CLINGFISHES

+Acyrtops beryllinus (Hildebrand and Ginsburg), EMERALD CLINGFISH, occasional, UMML.  
 +Goblesox strumosus Cope, SKILLET FISH, occasional, UMML.

## TRIACANTHODIDAE - SPIKEFISHES

Parahollardia lineata (Longley), JAMBEAU, rare, offshore, UMML.

## BALISTIDAE - TRIGGERFISHES AND FILEFISHES

Alutera monoceros (Linnaeus), UNICORN FILEFISH, rare, offshore, UMML.  
 \*Alutera schoepfi (Walbaum), ORANGE FILEFISH, common, UMML.  
 \*Alutera scripta (Osbeck), SCRAWLED FILEFISH, occasional, UMML.  
 +Ballistes capriscus Gmelin, GRAY TRIGGERFISH, common, UMML.

- \*Ballistes vetula Linnaeus, QUEEN TRIGGERFISH, occasional.
- \*Cantherlnes macrocerus (Hollard), HOOKTAIL FILEFISH, rare.
- \*Cantherlnes pullus (Ranzani), ORANGESPOTTED FILEFISH, frequent, UMML.
- +Canthidermis sufflamen (Mitchill), OCEAN TALLY, common, UMML. This name differs from that of Bailey et al. (1960) in accordance with common usage.
- +Monacanthus cillatus (Mitchill), FRINGED FILEFISH, common, UMML.
- +Monacanthus hispidus (Linnaeus), PLANEHEAD FILEFISH, frequent, UMML.
- +Monacanthus setifer Bennett, PYGMY FILEFISH, occasional, UMML.
- \*Monacanthus tuckeri Bean, SLENDER FILEFISH, common, UMML.

## OSTRACIIDAE - TRUNKFISHES

- +Acanthostracion quadricornis (Linnaeus), COWFISH, common, UMML.
- \*Lactophrys bicaudalis (Linnaeus), SPOTTED TRUNKFISH, frequent, UMML.
- +Lactophrys trigonus (Linnaeus), TRUNKFISH, occasional, UMML.
- \*Lactophrys triqueter (Linnaeus), SMOOTH TRUNKFISH, common, UMML.

## TETRADONTIDAE - PUFFERS

- \*Canthigaster rostrata (Bloch), SHARPNOSE PUFFER, common, UMML.
- +Sphaeroides spengleri (Bloch), BANDTAIL PUFFER, frequent, UMML.

## DIODONTIDAE - PORCUPINEFISHES

- \*Chilomycterus antennatus (Cuvier), BRIDLED BURRFISH, frequent, UMML.  
Included by Bailey et al. (1960) but not previously recorded.
- \*Chilomycterus atinga (Linnaeus), SPOTTED BURRFISH, frequent, UMML.
- +Chilomycterus schoepfi (Walbaum), SPINY BOXFISH, frequent, UMML. This common name differs from that of Bailey et al. (1960) in accordance with common usage.
- \*Diodon holacanthus Linnaeus, BALLOONFISH, frequent, UMML.
- \*Diodon hystrix Linnaeus, PORCUPINEFISH, frequent, UMML.

## MOLIDAE - MOLAS

- Mola lanceolata Linnaeus, SHARPTAIL MOLA, rare, offshore.
- Mola mola (Linnaeus), OCEAN SUNFISH, rare, offshore.

## BATRACHOIDIDAE - TOADFISHES

- Opsanus beta (Goode and Bean), GULF TOADFISH, abundant, inshore.
- Porichthys porosissimus (Valenciennes), MIDSHIPMAN, frequent, offshore, UMML.

## LOPHIIDAE - GOOSEFISHES

- Lophlus americanus Valenciennes, GOOSEFISH, occasional, offshore, UMML.  
Genus sp., an undescribed genus and species, rare, offshore, UMML.

## ANTENNARIIDAE - FROGFISHES

- +Antennarius ocellatus (Bloch and Schneider), OCCELLATED FROGFISH, occasional, UMML.
- +Antennarius pauciradiatus Schultz, DWARF FROGFISH, occasional, UMML.  
Not included by Bailey et al. (1960) but described by Schultz (1957) from Florida.
- \*Antennarius scaber (Cuvier), SPLITLURE FROGFISH, rare, UMML.
- Histrice histrice (Linnaeus), SARAGASSUMFISH, frequent, offshore.

## OGCCEPHALIDAE - BATFISHES

- +Halleutichthys aculeatus (Mitchill), PANCAKE BATFISH, abundant, offshore, occasional reef, UMML. The common name spiny batfish of Bailey et al. (1960) is inappropriate as this species is one of the least spiny of the family.
- +Ogcocephalus cubifrons (Richardson), POLKA-DOT BATFISH, occasional, UMML.
- Ogcocephalus nasutus (Valenciennes), SHORTNOSE BATFISH, rare, offshore, UMML.
- +Ogcocephalus parvus Longley and Hildebrand, ROUGHBACK BATFISH, common offshore, occasional reef, UMML.
- +Ogcocephalus vespertilio (Linnaeus), LONGNOSE BATFISH, frequent offshore, rare reef, UMML.
- Zalleutes mcgintyi (Fowler), TRICORN BATFISH, frequent offshore, UMML.

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## Basic Plant and Animal Communities

The plant and animal communities of the Biscayne National Monument area are extremely rich and varied. The following discussion is limited to the dominant communities of the area. To list the species of plants and animals found in each community would be superfluous in view of the extended list of animals and plants found in the last section of this report. To use the list of animals and plants for community or ecological purposes, one should refer to the key to the zonations and ecological habitats given at the first of the list. In the following discussions, the general code number from the extended list has been put in parentheses after the headings in order that the interested reader may refer easily to these lists.

The plant and animal communities of the marine environment within the monument waters have been described in part by Stephenson and Stephenson (1950) and Voss and Voss (1955), and for details of many of these communities, these papers should be consulted. Stephenson and Stephenson worked partly within the monument area and there are many direct references to Elliott Key and Old Rhodes Key. Voss and Voss did their report upon the nearby Soldier Key, separated from the Biscayne Monument waters by a few miles of flats and coral areas. These papers deal with the intertidal area, the reef flat and the reef tract itself. For a comprehensive review of the infauna bottom communities of the mid-portion of the bay, the papers by H. Moore and his colleagues should be consulted (McNulty, J. Kneeland, Robert C. Work, and Hilary B. Moore, 1962). These community assemblages should be found in the level bottom on the bay side of the monument.

### 1. Thalassia community (Code 3).

Within the bay, the most important community is that of the turtle grass. The turtle grass community is composed of turtle grass (Thalassia testudinum), the manatee grass (Syringodium filiforme) and Diplanthera wrightii. These grasses form dense mats on the bottom, their rhizomes forming a thick mass penetrating the bottom for eighteen inches or more. Their leaves greatly increase the available surface for the attachment of various species of filamentous algae (Humm, 1964) diatoms, foraminifera, and various bivalve mollusks. The long leaves also function as a sediment trap and assist thus in maintaining water clarity. D. Moore and Work (unpublished) made a detailed study of the Thalassia community over a three year period and concluded that it supported the richest assemblage in species and number of individuals, of any known marine community. The productivity of this community is very high (see Jones, 1968) and it is the known nursery ground for the early stages of the commercial shrimps of the genus Penaeus, and the crawfish, Panulirus, as well as many species of shore fishes. The main predator is the sea urchin, Lytechinus variegatus, and certain of the parrot fishes in the vicinity of lagoon patch reefs. On the borders of the Thalassia community, several algae make inroads: Penicillus, Halimeda and Laurencia.

2. Bay hard bottom community (Code 9d).

Much of the deeper portion of the bay and the eastern shore against the keys is composed of a soft, calcium carbonate sediment overlaying the rock substrate. This calcium sand is in places very shallow and the whole region must be classed as hard bottom.

The most conspicuous growth forms in this region are the various sponges, especially Hippiospongia gossypina, H. lachne, Spongia barbara, S. cheiris, and S. graminia, (all commercial sponges), the loggerhead sponge, Spheciospongia vesparia, and the vase sponge Ircinia campana; the corals, Porites porites, Siderastrea siderea, S. radians and Solenastrea hyades, and the sea feathers of the genus Plexaurella and Pterogorgia anceps. This is not an area of high productivity and most of the enrichment is gained from the adjacent Thalassia beds and mangrove fringe. A considerable number of organisms live within the canals of the sponges varying in size from the large worm Eunice spongicola to thousands of snapping shrimp. The nature of these relationships has not as yet been studied. This area is important in the life histories of the crawfish Panulirus and is one of the major habitats for the stone crab, Menippe mercenaria.

3. Mangrove community (Code 8).

Next to the Thalassia community, this is one of the most important areas in tropical waters due to 1) its stabilization of the shore line, 2) filtering of land runoff and 3) the contribution to the organic nutrients through its leaf fall and associated organisms. This community is characterized by the three mangroves: red mangrove (Rhizophora mangle), black mangrove (Avicennia nitida) and the white mangrove (Laguncularia racemosa). Associated with these but more landward is the buttonwood (Conocarpus erectus). The plant communities of this area have been described by J. H. Davis (1940, 1942) and Craighead (1964) has discussed their relationship to land building and the effect on them of hurricanes.

On the bay side of the keys, the mangroves attain their maximum development in the monument. The most conspicuous organisms related to the mangrove community are those attached to the mangrove root props, trunks and pneumatophores. These often double the diameter of the root props themselves. These consist of the alga Bostrychia, numerous hydroids, such as Lytocarpus philippinus, encrusting sponges, coon or mangrove oysters Crassostrea rhizophorae, the pearl oyster Pinctada radiata, several species of barnacles, the snails Littorina angulifera and Tectarius muricatus, several species of small climbing crabs of the genus Pachygrapsus, the sea roach Ligia baudiniana and occasional sea urchins. Beneath the mangroves in the intertidal zone or just above can be found the gastropods Melampus, Detracia, and Truncatella and hunting in this area but living above the high tide mark, the large land crabs Ucides, Cardisoma and Gecarcinus.



#### 4. The supralittoral and intertidal.

The east side of the keys is mainly rocky in the intertidal and has been well studied in regards to its ecological zonation by Stephenson and Stephenson (1950) and Voss and Voss (1955). The Stephensons divided this region into the upper platform (from the line of land vegetation to the sea edge(?)), and the lower platform which extended from this out to the reef flat. These areas were further subdivided into color zones based upon exposure, weathering, algal mats and other factors. From the land out, these were -- upper platform (white, grey, black and yellow); lower platform (no color zones given). Voss and Voss in their study of Soldier Key did not use this color zonation but divided the intertidal into upper platform, platform face, and lower platform, features that can be seen easily in most seaward areas in the monument.

##### Upper platform.

White zone. -- This is the actual meetingplace of land and sea. It is bleached white by salt spray and no fully marine animals or marine plants live in it. Animals present are: the hermit Coenobita, the isopod Ligia, two crabs Sesarma and Cyclograpsus, and the snails Tectarius, Truncatella and Detracia.

Grey zone. -- This lies between the white and the black zones. Plants are: Sesuvium, Batis, Salicornia and others. The animals are: Littorina ziczac, Tectarius muricatus and tuberculosis, Echininus nodulosus, Nerita peleronta and N. versicolor (all gastropods), and the aforementioned crabs as well as the other organisms mentioned above.

Black zone. -- This zone is wetted at high water spring. Its black color is derived from the coloring effects of certain blue-green algae Entophysalis and Brachytrichia, and the dry mats of the alga Bostrychia. Animals in this zone are most of those mentioned above with the addition of Planaxis lineatus, a snail and the common snail Batillaria minima which may occur in vast mats.

##### Platform face (yellow zone) (Code 2).

The platform face is occupied by the yellow zone which is the true intertidal zone of the inshore. The characteristic color is given by the wet mats of algae, primarily such forms as Anadyomene stellata, Cladophoropsis membranacea, Catanela repens, Centroceras clavulatum, Ceramium fastigiatum, Polysiphonia howei. Higher up, Bostrychia and Valonia are dominant. All of these algae form dense mats that offer refuge to numerous small animals.

The animals within the yellow zone are too numerous to list here but include numerous specimens of the barnacles Chthamalus stellatus and Tetraclita squamosa, the vermetid mollusk Spiroglyphus, the false limpet Siphonaria pectinata and alternata, various fissurellids, especially Diadora listeri, the snails Batillaria minima, Thais rustica, Cantharus tinctus, the true limpet Acmaea and the slug Onchidium floridanum. The

large chiton, Acanthopleura granulata, is common along with the mussel Mytilus exustus and the oysters Isognomon alata and I. chemitziana. Numerous other animals are found in this zone. They are listed in the species lists.

#### 5. Shallow water.

##### Lower platform (Code 2)

The lower platform is difficult to separate from the so-called reef flat. It begins at the bottom of the platform face. It is often distinguished by the somewhat steeper slope, very rough eroded stone floor, and the presence of most of the area of the yellowish-green carpet of Laurencia papillosa and associated green and red algae. Dominant in many places in holes in the rock is the sea urchin Echinometra lucunter, the mussels Arca barbata and A. umbonata. Several anemones are found here, Phymanthus crucifer, Aiptasia annulata and Condylactis gigantea. Many species of crabs are found under rocks in this area. For a more complete listing, see the species list.

##### Reef flat (Code 5, 9, 10)

This is a general term that takes in the entire area east of the keys except the reef itself. Distinct communities have not been recognized in that area except for the extensive Thalassia community already mentioned, and the lagoon patch reefs and the outer reef. These will be treated separately.

#### 6. Lagoon patch reef (Code 7).

One of the most prominent features found within the Hawk Channel is the lagoon patch reef. These are found around Bache Shoal, Margot Fish Shoal, and back of Triumph Reef, Long Reef and Ajax Reef. These reefs have been studied in detail by Voss and Bayer (1968), Jones (1963), and Ebbs (1966).

Commonly, the patch reef is a structure formed of living masses of coral heads rising directly from the bottom in 10-20 feet of water. They have nearly perpendicular sides and rise to within two or three feet of the surface. The bottom around them is usually flat and covered with Thalassia except for a ring, several yards wide, of clear sand caused by the grazing of parrot fishes. The patch reefs in the monument area range in size from individual coral heads to masses several hundred feet across.

The mass of the reef is made up of corals, primarily Diploria, Eusmilia, Isophyllia, Montastrea, Porites and Siderastrea, with associated Acropora cervicornis, Agaricia, Dichocenia, and others. These corals are usually compacted and often filled in between with coral rubble forming a reef top on which grow a profusion of sea feathers, whips and fans, of which the genera Eunicea, Muricea, Plexaura,

Pseudopterogorgia, and Gorgonia are the most common. In these patch reefs mollusks are not common except for the stubby coral shell Coralliophila abbreviata and its relatives, and a few cowries (Cypraea) and smaller forms. The crawfish or spiny lobster, Panul rus, is common.

The main body of these patch reefs is often soluted away by the waves' action and sea water to form caverns and chambers which are filled with a large number and variety of reef fishes. These are not obvious on first examination for during the day most of them will be within the reef. In fact, these reefs support a dual population of fishes, day feeders and night feeders. These are reported upon by Starck (1968), Randall (1968) and Voss and Bayer (1968).

7. Outer reef. (Code 6).

The outer reefs consist of those coral reefs or dead coral reef jumble lying on the outer edge of the reef platform immediately adjacent to the drop-off into deep water and the Florida Current. These reefs have been well described by Ginsburg and Goreau (the latter not listed as the work was done in Jamaica) and the various reef types are well known.

Two main outer reef types occur in the monument waters, Long Reef and Ajax Reef. Long Reef is a low, long, shallow structure formed by loose, coral rock and sheets of dead Acropora. Within this reef structure and beneath the rock slab exists a wealth of marine life far too numerous to list here. A comprehensive listing of these species is found in the species list. Ajax Reef is a live coral reef largely made up of living Millepora colonies. The invertebrate life is not rich but numerous fish species are found. For a good description of this type of reef, see Starck (1968) who reported upon a similar structure at Alligator Reef.

## Bottom Community Chart.

Past workers (e.g., Kumpf and Randall, 1961; MacIntyre, 1968) have had moderate success making simple bottom community charts of the major faunal elements in limited geographical areas. We have attempted to make a similar chart covering the entire area of the proposed Biscayne National Monument. Of necessity, the resultant chart is to a very large extent a simplified generalization. In those areas where sharp boundaries occur between major bottom types, such as along the eastward side of the monument, the chart rather accurately portrays the natural situation. But in many areas, such as Biscayne Bay itself, the bottom types gradually grade from one into another, or two or more types may occur intermixed over large regions. In such cases, the limits portrayed are largely arbitrary. In reality, the environment is much more complex than can be shown on any chart or map. In particular, the increased complexity resulting from (1) the much larger area considered, (2) the involved interactions between the sea-land areas, and (3) the semi-closed system of Biscayne Bay itself, has created conditions that do not permit the precise delimitation of faunal boundaries commonly expected of a community chart.

Southern Biscayne Bay, the portion of the bay incorporated into Biscayne National Monument, is a large shallow estuary bounded on the north by the shallow Featherbed Banks, to the south by Cutter Bank, to the east by the chain of islands from the Ragged Keys to Old Rhodes Key and to the west and southwest by the mainland coast. Water circulation is somewhat restricted by the land masses. Flushing occurs through a number of deep channels or cuts directly to the ocean (eastward), to north Biscayne Bay and to Card Sound on the south; the primary cause of the water exchange is tidal flushing.

In conjunction with the restricted circulation, the southern part of Biscayne Bay is subject to a variable input of fresh water from many drainage canals along the mainland and subsurface fresh water percolation (Kohout and Kolipinsky, 1964, and personal observations).

These conditions cause extremes of temperature and salinity -- both high and low -- not found in the oceanic environment. They also contribute to the complexity of the bottom communities within the Bay. In addition, the bottom of the Bay itself is of primary importance in determining the faunal make-up. The Bay is underlain by a limestone rock bottom that is generally covered by small but varying depths of sand or silt. Even small changes in thickness of sediment influence the bottom communities immensely, with the marine grasses (primarily Thalassia testudinum) and certain algae (e.g., Penicillus) dominating regions of thick sediment (e.g. 10 cm. or greater), and sponges, alcyonarians, and other algae dominating regions of thin or no sediment.

Because of the diversity of conditions in Biscayne Bay, the bottom communities are diverse and their interrelationships complex. Eight different environmental types are distinguished on the chart: (1) marine

grasses; (2) algae; (3) sand; (4) sponges and alcyonarians; (5) bare rock; (6) corals; (7) coral rubble; and (8) mangrove.

The dominant bottom community throughout the monument is that characterized by the marine grasses. Thalassia testudinum is the most common component, but it is replaced by or found mixed with Syringodium filiforme in the deeper waters and Diplanthera wrightii in shallower regions. The Thalassia community actually can be further divided into separate sub-communities. In some regions, especially the area east of the chain of islands, dense beds of almost pure grasses dominate. In other regions the grasses grow less thickly, and the bottom is greatly worked over by burrowing polychaetes. Algae can invade the grass beds to a varying extent: Penicillus and Halimeda are two common forms, and Laurencia first mixes with, then replaces the grasses along the western shore of the Bay. The chart makes no attempt to separate the different species of marine grass, nor does it indicate the concentration of the grasses.

Although some algae (Penicillus and Halimeda) are found in deeper (10 m) waters mixed in with the grasses, the algae as a dominant bottom community are restricted to shallow waters. They occur primarily in belts immediately surrounding the shore of the mainland and the islands, although Laurencia is the dominant cover over a large segment of the southwest section of Biscayne Bay.

The regions indicated by sand likewise include more than a single type of bottom community. In the area to the east of the islands, between the thick Thalassia beds and the outer coral reefs, a region of isolated sand patches occurs. These range in size from quite small (a few meters) to several kilometers in length. They are quite clearly defined by a sharp, usually undercut border between the sand and the grasses. Generally no vegetation occurs in these sand patches. The sand is a fairly coarse, calcareous sand. In contrast, regions within the Bay that are similarly designated on the chart are not so clearly defined; their delimitation has necessarily been arbitrary, because of their indistinct boundaries. Actually Thalassia is found in varying densities, over almost the entire bay floor. It is concentrated in discrete dense patches, which are often distributed in irregular lines, and is found in sparse growth over the remainder of the bottom. There is an even continuum from dense Thalassia growths to the sparsest regions, and the line delimiting a predominantly sandy area from a predominantly grassy one is indeed arbitrary, although the authors believe, in view of the great differences between the types of bottom, that the distinction should be made. In addition to grass, the sandy areas of the Bay also contain many sparse patches of sponges and alcyonarians; again the delimitation is an arbitrary one.

A third type of sandy area, not shown on the chart, is a sandy halo surrounding the many coral patches in the zone to the east of the islands. This halo is a narrow belt of sand that surrounds virtually every patch reef and is considered to be the result of grazing by reef fauna.

Sponges and alcyonarians are found widespread over much of the monument area. Dense stands occur in the cuts between the islands, where swift currents flow. Sparse growths are found around the islands themselves and throughout the Bay as well. Sponges and alcyonarians, especially the latter, are also important components of the coral patches in the zone to the east of the islands; in this community they are included in the symbol for corals, and are not marked separately.

Patches of the limestone base emerge as bare rocks in some regions, primarily in the surf zone around the islands. In addition to supporting a distinct community, these regions are noteworthy because the rock is greatly eroded and pitted by solution, forming a very sharp, hard substrate that should be avoided by waders and boaters.

Although some corals (e.g., Porites, Manicina, and Siderastrea are scattered throughout the monument area, large coral patches are found in only in two zones. Seaward of the dense Thalassia zone to the east of the islands is an area of dense but discrete coral patch reefs. In addition to large coral heads, these patch reefs also include dense growths of alcyonarians and sponges. Some of the patches, especially in the Margot Fish Shoals, contain large patches of Acropora cervicornis, but this is not really widespread. The patch reefs are scattered throughout a matrix of rather dense Thalassia; they do not form a solid bottom cover.

A zone of outer reefs is located still farther to the east. This is largely an area of dead reefs (indicated by coral rubble) although there is some living coral in this region. Only in the southern end of the outer reef -- around Pacific Light -- do large, luxuriant growths of corals, primarily Acropora palmata, occur.

Finally, in many regions around the islands and along the mainland, mangroves extend for varying distances into the water. This is a distinctive community subject to rather sharp delineation and therefore portrayed accurately on the chart.

Considering all of the zones, the following can be summarized: generally, proceeding from the shore (either mainland or islands) seaward, one passes from either mangroves or bare rocky coast successively through an algal zone, a sparse alcyonarian-sponge zone, and a marine grass zone. The relative extents of these zones are influenced at least partially by depth, bottom type, and salinity. Finally, east of the islands, a coral patch reef zone, a sand patch zone, and a barrier reef coral rubble zone are encountered. The dominant feature of the Bay itself is the large central sand zone with scattered Thalassia, alcyonarians, and sponges. The most prominent features outside the Bay are the dense beds of Thalassia and secondarily the coral patch zone.

## Seasonal Abundance and Migratory Patterns of Marine Life.

Tropical waters do not have a great seasonal range of temperature and as a result there are few evident seasonal migrations or movements of the fauna. Those migrations that do take place are usually feeding migrations involved in the life history of the species. A few of the larger, more active long-ranging swimmers do show seasonal changes. These will be mentioned below. In general among many of the tropical fishes and invertebrates, spawning is not restricted to a few days or a week or two as in temperate regions but may take place over a period of several months or even throughout the year. As a result, great increases in seasonal abundance are not generally seen. Long-term spawning periods also are important for management practices, in that distinct year classes are not common in tropical forms, and adverse weather conditions do not noticeably affect the year's production of young.

Plants. The life histories of few of the marine plants of the region are known. Because of the rather small seasonal variation in water temperature, and especially the lack of any period of extreme low temperature, there is typically no period in the year when the majority of adult marine plants disappear. However, some types of algae, for example, the various species of Caulerpa, may show periods of flourishing vegetative growth as well as periods of inactivity when outward signs of the vegetative plants regress or even vanish. Such individual seasonal responses, however, have little effect upon the appearance of the marine flora.

The most prominent seasonal change in the plants is seen in Thalassia, which may suffer heavy loss of leaves during the brief periods of winter low and summer high temperatures. This marine grass and the larger green, red and brown algae may be covered over by a mat-like growth of blue green algae during the summer in semi-stagnant areas.

Invertebrates. There is little change in seasonal abundance of most invertebrates and these are minor. Only a few cases of seasonal migration are known.

1. There is some change in the abundance of Octopus. In general, adult octopus move offshore during the summer into waters of 15-30 ft. depths, but in winter and spring they come inshore to spawn and to find warm water. Most species are common in depths of less than 10 ft. during the period from March to May when they are caring for their eggs under old coral heads and rock slabs.

2. Lower Biscayne Bay and Card Sound are important nursery grounds for the pink shrimp, Penaeus duorarum Burkenroad. Spawning takes place in deep water offshore. The larval shrimp begin to appear in the Bay in quantity in March where they live in shallow water of 2 ft. depth or less. They grow rapidly in this nursery ground and by September they have reached a fairly large size and have moved out into the Bay into waters

deeper than 3 ft. where they are fished for in the bait shrimp fishery. These shrimp remain in the Bay as juveniles where they attain a considerable size. However, no adult gravid shrimp have been taken in the Bay. About the end of December, depending upon weather conditions and moon phase, the juvenile shrimp move out of the Bay into the ocean. According to recent studies, this movement in the main is northward in the Bay and the majority of the shrimp pass out through Cape Florida Channel, Bear Cut and Government Cut. Despite these migrations, there are always juvenile shrimp in the Bay, to the extent that the bait shrimp fishery flourishes. For some reason not now understood, there is a migration into the Bay of the Caribbean Brown shrimp (Penaeus brasiliensis) in the summer when, for several months, it accounts for up to 40 per cent of the bait catch. It is not found in the Bay during the rest of the year.

3. The spiny lobster, mainly Panulirus argus Latreille, also performs a general growth movement. The larvae hatch out as phyllosomas and remain drifting passively in the plankton for up to 5-6 months. After metamorphosis, the very young juvenile spiny lobsters are found in the grass beds in shallow water in the Bay, especially on the western side and on the east side of the Keys. With about 1/3-1/2 growth they are found in deeper water in the Bay living under sponges, particularly the loggerhead sponge Spherospongia vesparia. As adults they are found in water of four feet or greater depth, living in rocky holes, under rocky or coral ledges, and various other sheltered situations. At certain times and places, particularly along the open ocean beach, spiny lobsters perform long mass migrations. Neither the cause, time nor duration are known. No such mass migrations have so far been reported from the monument region.

Fishes. There is extensive movement of fishes within the Park area, much of which can be termed migration. Migrations are of three main types: 1) daily, 2) seasonal, 3) ontogenetic. Daily migrations are practiced by many of the so-called reef fishes and are usually associated with nocturnal feeding activities in the grass beds and open sand areas. Most grunts (Pomadasyidae) and snappers (Lutjanidae) which account for much of the mass of fishes to be found on the reefs by day undergo such migrations.

Seasonal migrations are of two types. One is associated with spawning and mostly consists of estuarine, bay and reef species that move offshore to spawn. The time and length of the spawning season varies with the species. The American eel moves on particular moon phases especially in the December and March season. Worm eels move again during particular moon phases most every month. Other notable migrants of this type within the park are the mullets (especially in November and December), the jack-knife fish, the black grouper (probably all groupers).

The second group of seasonal migrants are fall and winter visitors from the north. Most important here are the smooth hammerhead, the black-tip shark, certain rays and the bluefish.

Ontogenetic migrants are those that spend their juvenile life within the area, moving with growth into offshore waters or at least to a differ-



ent habitat within the Park.

Jackknife fish -- Young on the deep reef, adults in the Bay and mangroves.

King mackerel -- Young in the Bay and grassy areas, adults oceanic.

Grey snapper -- Young in grass beds, adults on outer reefs and in passes.

Striped mojarra -- Larvae oceanic, juveniles along the shore, adult estuarine.

The larvae of many but not all shore and reef fishes are oceanic. Life histories of only a few are known in detail. In some, spawning takes place in shore waters with the eggs being swept out to sea. In others, hatching also occurs in inshore waters with the early larvae going to sea while in others the adults move offshore to spawn.

Of the many fish species known within the monument, only certain reef species spend their entire life in a single environment. Of all phases of study needed on monument fishes, none is more deserving from a resource management standpoint than basic life history studies.

The Florida Keys form a crescentic chain of small limestone islands which extend from near Miami in the north to, and including, Key West on the south and west, a total of about 150 miles. They form an arc bounded on the convex side by the Florida Current and on the concave side by Biscayne Bay, Florida Bay and adjoining waters. Basically they are made up of two main formations of Pleistocene age -- the Key Largo Limestone and the Miami Limestone. The former is an elevated coral reef rock and the latter an oblitic limestone. The Key Largo Limestone is the surface rock of the upper Keys, and the Miami Limestone covers the Lower Keys. Actually, the Key Largo Limestone covers the entire 150 miles of the Florida Keys but in the Lower Keys is overlain by the Miami Limestone beginning near the east end of Big Pine Key.

The Key Largo Limestone first appears at the surface near its northern boundary at Soldier Key just north of the Ragged Keys and forms the basis of the main keys contained within the monument. It is especially conspicuous as eroded ragged rock along the ocean side of the keys with major outcrops at Caesar's Creek and Old Rhodes Channel. It also forms the hard, smooth floor of several of the passes where the tidal current keeps sediments scoured away.

According to drillings investigated and/or made by Hoffmeister and Multer, this limestone rests upon a quartzose calcareous sand base. The limestone is of varying thickness; near the northern end of Key Largo it was 145 feet thick, 10 miles further south 75 feet. In the lower Florida Keys it attains a thickness of nearly 200 feet. It is typical organic reef composed of in situ, wave resistant elements, the important of which are hermatypic corals. These form the framework of the structure and are responsible for the trapping of large amounts of calcarenite in which

they are now embedded. The formation is made up of these lithologic types (in order of decreasing abundance): calcarenite, coralline limestone, and calcilutite.

1. Calcarenite. This rock consists of varying amounts of molluscan debris, Halimeda, coralline algae, foraminifera, bryozoans, coral and rock fragments bounded by microcrystalline and sparry calcite. Minor constituents include pellets, echinoid spines, sponge spicules, ooliths and worm tubes.
2. Coralline limestone. Large masses of coral, either in growth position or as detached fragments, recrystallized to calcite occur. The principal corals are Montastrea annularis, Diploria strigosa, D. clivosa, D. labyrinthiformis, and several species of Porites, principally P. astreoides. This limestone can be porous or dense, commonly with burrows of boring mollusks, the cavities often lined with drusy calcite or filled with varying amounts of sand-size debris. About 30 per cent of the Key Largo Limestone is made up of this coral rock of which Montastrea makes up about half. Acropora cervicornis, Montastrea cavernosa and Siderastrea radians are also found in lesser amounts. All of these corals are found living today within the monument boundaries.
3. Calcilutite. This dense rock made up of well-cemented silt-clay carbonate commonly displays pinpoint-to finger-size holes. Limited amounts of skeletal hash are often present.

The coral rock where exposed has a thin cap of very hard rock overlying it, formed either by aerial exposure or microbial activity. It is extensively quarried for use in decorative walls and in floors and patios in south Florida. In situ, below the hard cap, it is soft, and well points pierce it easily. Upon lengthy exposure it becomes very hard and durable. Quarries are found throughout the Keys.

The method of formation of the Keys themselves has been a matter of controversy, some claiming that the present keys represent the limits of a former outer coral reef of Pleistocene times, others claiming that they were formed from lagoon patch reefs in the back-reef area when the outer reef was located some distance inshore of its present position. Studies by Hoffmeister and Multer (loc. cit.) point to the latter hypothesis. They say:

"During the last interglacial period, about 95,000 years ago (Broecker and Thurber, 1965, pp. 58-60), the coral reefs which today make up the Key Largo Limestone of the Florida Keys were flourishing as a line of patch reefs in the back-reef area of a broad-reef platform similar to the Florida reef tract of today. Seaward of them the platform was occupied by parallel lines of other patch reefs and edged by an outer reef (Fig. 2).

"Subsequent marine and subaerial erosion following the withdrawal of the sea during the Wisconsin, possibly accompanied by a structural downward tilting or faulting of the area, or both, resulted in the lowering of the

platform to a depth of about 75 feet at its seaward edge and progressively less farther inland. With the return of the sea, new reef growth began on the eroded platform and continued to the present (Fig. 3).

"Some of the main observations upon which it is concluded that the Key Largo Limestone of the Keys originated as a line of patch reef in a back reef environment are the following. (1) The species of corals and other organisms found fossil in the old reef are identical with those of the living patch reefs. (2) There is an absence of Acropora palmata, a coral species found commonly in the turbulent waters of living outer reefs. (3) There is a favorable proportion of other species common in all zones. (4) Since the community of coral species found in the Key Largo requires an environment of low-level energy and since it was determined that the water in which the corals grew was shallow, it becomes clear that they must have developed in the protected area of a back reef zone. (5) The discovery of Acropora palmata in the Key Largo Limestone, underlying the more recent material of the outer reef, demonstrates its presence at the time the Keys were being formed and indicates that its absence in the rocks of the Keys is due to the unfavorable environment of a back reef. Its presence also indicates the existence of an outer reef at the edge of the platform during Key Largo time. (6) The elongated crescentic shape of the Keys, running approximately parallel to the outer edge of the platform, is similar to the alignment of present day patch reefs."

The soil of the Keys, overlying the Key Largo Limestone, is of organic origin, originally from materials trapped in the outcroppings but now mainly muck or humus from the hardwood hammocks and mangrove peat.

Offshore of the Keys, the bottom is underlain by Key Largo Limestone with a layer of post-Pleistocene Key Largo Limestone overlying the older rock and increasing in thickness seaward. Upon this is a layer of calcium carbonate sediments made up of mechanically precipitated fine calcium carbonate, and fine particles of calcium carbonate shells of a host of marine organisms such as Halimeda segments, sea-urchin spines and ancyonarian spicules, and the shells of Foraminifera. The outer reef base is of post-Key Largo Limestone formation overgrown in large areas by stands of living coral. The lagoon and back-reef area is thickly interspersed with patch reefs such as those forming Bache Shoal, Margot Fish Shoal, and the lagoon reefs behind Long Reef.

Shoreward of the reef, the bottom is formed basally of Key Largo Limestone overlaid by soft calcium carbonate mud or ooze, thick in the western half of Biscayne Bay, but thin the eastern half.

A short but pertinent bibliography of sources concerning the geology pertaining to the monument area is given at the end of the report.

A more detailed geological description of the coral reefs is given in the following references:

- 1967- Miami Limestone of Florida and its Bahamian Counterpart. Geol. Soc. Amer. Bull., 78:175-190. K. W. Stockman and H. G. Multer  
1968-Geology and Origin of the Florida Keys. Geol. Soc. Amer. Bull. 79:1487-1502. H. G. Multer.

## APPENDIX D

Following is a list of Federal, State, and local agencies, as well as private individuals, businesses, and organizations who have received copies of the DEIS or FEIS.

### FEDERAL AGENCIES

Sea Grant  
Department of the Navy  
Department of Justice  
Coast Guard, Marine Protection Branch  
Energy Research and Development Administration  
National Ocean Survey  
Coast Guard, Office of Marine Environmental and Systems  
Department of State, Office of Environmental Affairs  
Environmental Protection Agency  
Department of Interior  
Department of Defense (Health and Environment)  
National Marine Fisheries Service  
Department of Housing and Urban Development  
National Aeronautics and Space Agency  
Executive Director of Civil Works-Army Corp of Engineers  
Office of Environmental Quality  
Soil Conservation Service  
Coast Guard, Department of Transportation  
Water Resources Council

### STATE AGENCIES

Governor Reubin Askew  
Florida Department of Natural Resources  
Florida Division of State Planning  
John Pennekamp Coral Reef State Park Director  
Florida Game and Fresh Water Fish Commission  
Florida Division of Recreation and Parks

### LOCAL AGENCIES

Environmental Information Center  
South Florida Reg. Planning Council

## PRIVATE BUSINESS AND ORGANIZATIONS

Environmental Policy Center  
National Parks and Conservation Association  
Florida Keys Citizens Coalition  
Belcher Oil Co.  
Underwater Society of America  
Sport Fishing Institute  
Tropical Audubon Society, Inc.  
National Audubon Society  
Organized Fishermen of Florida  
Environmental Confederation of Southwest Florida  
Izaak Walton League of America, Florida Chapter  
Florida Power and Light Co.  
Florida Audubon Society  
Bailey and Post  
Jack McCormick & Associates, Inc.  
Florida Skin Divers Association  
Sea Farms Inc.  
Organized Fisheries of Florida  
Greenleaf Telesca, Inc.  
Florida Sierra Club  
Florida Wildlife Federation  
Southeastern Fisheries Association  
Natural Resources Defense Council, Inc.  
Natural Resources Council of America  
The Nature Conservancy  
American Littoral Society  
The Conservation Foundation  
Environmental Defense Foundation  
Florida Defenders of the Environment, Inc.  
Monroe County Audubon  
Rookery Bay Marine Laboratory  
Salt Water Fisheries Advisory Council

## INDIVIDUALS

Marc J. Hershman  
Leonard J. Greenfield  
Walter M. Goldberg, Ph.D.  
Walter P. Stepien, Jr.  
Dorian Cowan  
Isadore Weintraub  
William and Gay Loring  
Gilbert L. Voss  
Jon C. Staiger  
Dr. Walter R. Courtenay, Jr.  
Alan Sirkin  
Meredith Ingham  
Iver M. Brook  
Robert C. Work  
Eva and George Wielander

INDIVIDUALS

Dennis O'Connor  
Dr. Rezneat M. Darnell  
T. N. Anderson  
David Anthony  
Mike Stewart  
Jim Redford  
Dr. Robert Livingston  
Dr. C. R. Robins  
Dr. T. Alexander  
Jim Higgins  
Gary A. Soucie  
Nancy Hunt

CONGRESSIONAL

Hon. Richard Stone  
Hon. Lawton Chiles  
Hon. Dante Fascell  
Hon. Claude Pepper  
Hon. William Lehman  
House Merchant Marine Committee  
Senate Commerce Committee



**UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration**

~~NOAA XXX 20862~~  
NATIONAL SEA GRANT PROGRAM  
3300 WHITEHAVEN STREET, N. W.  
WASHINGTON, D. C. 20235

September 11, 1975

Dr. Sidney R. Galler  
Deputy Assistant Secretary for  
Environmental Affairs  
Office of the Assistant Secretary  
for Science and Technology  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Dr. Galler:

With reference to your letter of August 18, the Office of Sea Grant does not have information pertaining to the Key Largo area which would permit us to critique the environmental impact statement. As far as I can determine, this statement is adequate.

Sincerely,

Richard C. Kelf  
Associate Program Director  
Grants Management  
National Sea Grant Program







UNITED STATES DEPARTMENT OF JUSTICE

WASHINGTON, D.C. 20530

September 22, 1975

Address Reply to the  
Division Indicated  
and Refer to Initials and Number

MWR  
90-4-03

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
United States Department of Commerce  
Washington, D.C. 20230

Dear Mr. Galler:

This is in response to your request of Mr. Rashkow for comments on an environmental impact statement entitled "Key Largo Coral Reef Marine Sanctuary."

Creation of the Key Largo Sanctuary is a Federal action specifically designed to improve the human environment by protecting the natural resources of the Florida reef. Your environmental impact statement indicates that various alternatives were considered in determining how best to protect these resources. It appears from the statement that the proposed sanctuary permits the maximum public utilization of the area while providing the necessary protection for the reef.

I would make one comment regarding section 2.0 of the statement. Under the heading "Administration," there follows a statement that: "NOAA's responsibilities under this legislation require that the Office of Coastal Zone Management review, comment and approve any activity that takes place pursuant to rules and regulations." The meaning of this statement is unclear. The proposed regulations permit numerous activities within the sanctuary. I am sure that NOAA does not intend to approve each entry into the sanctuary; and, yet, no other interpretation seems possible from the language.



I note that your statement includes proposed regulations to govern administration and use of the sanctuary. These regulations raise a number of questions upon which I will take this opportunity to comment.

Section (1)(c) concludes with the phrase, "whether temporary or permanent in character." I cannot tell from the language what that phrase is intended to modify; but, in any case, it would appear to be unnecessary, and I would recommend that it be deleted.

Section (3)(a) - I would recommend amending the final line to read "substances, including human sewage."

Section (6) - I would recommend amending the second sentence of the Note to read, "The commercial trapping of crawfish, spiny lobster and stone crab, in accordance with the laws of the State of Florida and the rules and regulations of the State of Florida Department of Natural Resources, is allowed."

Section (8) - I would recommend amending subsection (d) to read, "No watercraft shall be operated at speeds greater than 4 miles per hour within 100 yards of a diver, a boat displaying the "divers down" flag, sightseeing boats or fishing boats. The foregoing shall not apply to law enforcement officers while in the performance of their duties."; subsection (e) to read, "All watercraft from which diving operations are being conducted shall conspicuously fly the red and white "divers down" flag. Divers shall stay within 100 yards of their diving flag."; and deleting subsection (f). Subsection (i) should be in the negative. It might read as follows: "Watercraft may not moor or anchor in areas where mooring buoys, stations or anchoring areas are provided and available except through the use of such buoys, stations or areas."

The Certification provision on page 11 appears to be broader than intended. As written, it would void such things as Coast Guard permits, Federal Communications permits and untold other authorizations held by people navigating through the sanctuary but having no real bearing on it. It should also be made clear that the provision applies only within the sanctuary.

The Research and Monitoring provision might be clarified by amending the first line to read, "Provisions for research and monitoring the effects of particular uses of the coral". The second sentence might read, "The State of Florida and the South Florida Regional Planning Counsel will monitor the coast of Key Largo to insure that these activities do not adversely affect water quality, subsequent health of the coral reef ecosystem, or violate the sanctuary rules and regulations."

The Enforcement provision is unclear. What exactly will Florida do? It would appear that the rules already exist and are to be enforced by the Coast Guard.

I would recommend changing lines 6, 7 and 8 of the Penalties section to read: "a continuing violation constitutes a separate violation. A vessel used in a violation of a regulation is liable for any civil penalty assessed for such violation and may be proceeded...."

If you would like clarification of any of these comments, please feel free to call me on 739-2750.

Sincerely,

Assistant Attorney General  
Land and Natural Resources Division

By:



Michael W. Reed  
Attorney, Marine Resources Section



UNITED STATES  
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
WASHINGTON, D.C. 20545

September 26, 1975

Dr. Robert R. Kifer  
Marine Sanctuary Coordinator  
Office of Environmental Affairs  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Dr. Kifer:

I have reviewed the draft environmental impact statement for the proposed "Key Largo Coral Reef Marine Sanctuary" recently transmitted to us. As previously stated we believe a sound basis exists for the establishment of a sanctuary and that the addition of the proposed sanctuary to John Pennekamp Coral Reef State Park represents a beneficial and appropriate action under the terms of the enabling legislation.

We appreciate the opportunity to comment.

Sincerely yours,

D. Heyward Hamilton  
Aquatic Ecologist  
Environmental Programs  
Division of Biomedical and  
Environmental Research





**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL OCEAN SURVEY  
Rockville, Md. 20852

C52/JLR

SEP 26 1975

TO: Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs

FROM: *Gordon Lill*  
Dr. Gordon Lill  
Deputy Director  
National Ocean Survey

SUBJECT: Key Largo Coral Reef Marine Sanctuary

The subject statement has been reviewed within the areas of NOS responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

As there are no NOS facilities or reference marks involved in this statement, and the proposed action is outside the program fields of NOS, no comment is required.





**DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD**

MAILING ADDRESS:  
U.S. COAST GUARD (G-WS/73)  
400 SEVENTH STREET SW.  
WASHINGTON, D.C. 20590  
PHONE: (202) 426-2262

• 1 OCT 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary for  
Environmental Affairs  
Department of Commerce  
Washington, D. C. 20230

Dear Mr. Galler:

This is in response to your letter of 25 August 1975 addressed to this Office concerning an environmental impact statement for the Key Largo Coral Reef Marine Sanctuary, Collier County, Florida.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

**D. J. RILEY**  
Captain, U. S. Coast Guard  
Deputy Chief, Office of Marine



DEPARTMENT OF STATE

Washington, D.C. 20520

BUREAU OF OCEANS AND INTERNATIONAL  
ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

October 14, 1975

Dr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U.S. Department of Commerce  
14th and Constitution Avenue, N.W.  
Washington, D.C. 20230

Dear Sid:

I refer to your letter of August 18 in which you requested the Department of State's opinion on the revised Environmental Impact Statement entitled "Key Largo Coral Reef Marine Sanctuary." We have no substantive comments on the draft EIS, although we appreciate the opportunity to review it.

The proposed regulations described in the EIS substantially meet the objections we outlined in Lindsey Grant's March 18 letter to Dr. Kifer. However, we look forward to the opportunity to review any Notice of Proposed Rulemaking prior to the promulgation of the Sanctuary regulations.

Sincerely yours,

A handwritten signature in cursive script that reads "Grant".

J. Grant Burke  
Office of Environmental Affairs



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

1421 PEACHTREE ST., N. E.  
ATLANTA, GEORGIA 30309

October 24, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U. S. Department of Commerce  
Office of the Assistant Secretary  
for Science and Technology  
Washington, D. C. 20230

Dear Mr. Galler:

We have reviewed the Draft Environmental Impact Statement on Key Largo Coral Reef Marine Sanctuary in Florida, and in general, we have no objection to establishing the Key Largo Marine Sanctuary.

In fact, it is probably the best method of protecting the area from sand dredging and canal mining which could in turn affect the coral reefs in John Pennkamp Coral Reef State Park. However, there are several points that should be clarified.

1. It is stated (Page 11) that "Research and monitoring of the effects of particular uses of the coral reef ecosystem will be incorporated into the management procedures as needed to insure that the primary purpose for establishment of the sanctuary is carried out." Just what agency or agencies will perform this activity should be specified and an indication of the research program planned would also be in order.
2. The EIS would be improved by a more ample and accurate introduction than that given under the heading of "Environmental Setting" (Page 2). The "current stress conditions that prompted the nomination...and valuable coral resources degraded" (mentioned in discussion of "Alternates to the Proposed Action", Page 14) should be fully described from evidence gained by direct observations made by personnel of Florida State agencies, NOAA, and the U. S. Coast Guard.



3. Since information on the flora and fauna of Biscayne Bay National Monument is used in lieu of primary data pertaining to the nominated area, a location map showing the proximity of the two areas should be provided.

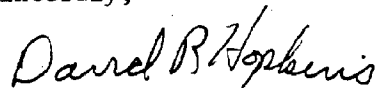
4. An explanation of the relationship of Key Largo Coral Reef Preserve to the nominated sanctuary area should be given.

5. The treatment of "Uses" (Page 3) should include statistics on visitor days to the area, economic value of recreational activities, and especially that of boating and fishing.

In view of the foregoing, we have rated the impact of the action LO (lack of objection) and 2 (insufficient information) to the Impact Statement.

We would appreciate receiving five copies of the final environmental impact statement when it is available, and if we can be of further assistance, please let us know.

Sincerely,



David R. Hopkins  
Chief, EIS Branch



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
WASHINGTON, D.C. 20546



REPLY TO  
ATTN OF:

ADA-1

September 23, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
United States Department of Commerce  
Washington, D.C. 20230

Dear Mr. Galler:

This responds to your letter of August 18, 1975, addressed to the NASA Comptroller, requesting that NASA comment on the Draft Environmental Statement, "Key Largo Coral Reef Marine Sanctuary." NASA personnel have reviewed the draft environmental statement and have no comments to offer.

We appreciate the opportunity to comment on this draft environmental statement.

Sincerely yours,

Nathaniel B. Cohen, Director  
Office of Policy Analysis



DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD

MAILING ADDRESS:  
U.S. COAST GUARD (G-WEP-5/73)  
WASHINGTON, D.C. 20590  
PHONE: 202-755-7938

U. S. Department of Commerce  
Office of Environmental Affairs  
Washington, DC 20230

Dear Sir:

The draft environmental impact statement for the Key Largo Coral Reef Marine Sanctuary has been reviewed by the concerned offices within the Coast Guard. The following comments apply:

a. Format of the EIS - The EIS format does not follow that of the typical EIS. The majority of the EIS is contained in two basic categories, Project Description and Proposed Management System, the latter containing such unrelated topics as probable adverse effects and alternatives.

b. Project Description - The area is described as adjacent to, but excluding, the John Pennekamp Coral Reef State Park, beginning at the three mile territorial limit and extending seaward. The two geographical coordinates which supposedly mark the seaward boundary of the John Pennekamp Coral Reef State Park are located as much as 2.3 nautical miles inside the legal three mile limit as prepared by the Interdepartmental Baseline Committee. A copy of the chart is enclosed. The geographical extent of the existing state park and Federal preserve need to be reviewed and addressed in the EIS.

c. Project Description - The 300 foot isobath should not be used as the seaward boundary. When the 300 foot isobath is plotted on a chart it is obvious that two straight lines can be drawn which will approximate it very closely. It is recommended that the seaward boundary be defined as the two existing points marking its ends and the geographical coordinate 25° 07.5' N, 80° 12.5' W. This will facilitate enforcement, allow for possible future marking if desired, and closely approximates the 300 foot isobath.

d. Administration - The authority by which NOAA can delegate the State of Florida to administer the sanctuary should be cited. It does not appear to be a provision of the Act. The authority of the state to administer non-state waters is questionable.

e. Regulation (1)(a) - This regulation is far too broad. Read literally, the sanctuary could not be used for fear that a few grains of sand might be disturbed or removed or a piece of seaweed might be dislodged thereby subjecting the violator to a \$50,000 penalty. As in enclosure (1), it is suggested that this regulation be changed to read as follows: "No person shall intentionally or negligently destroy, injure,....".

f. Regulation (1)(b) - Delete - The prohibition of regulation (1)(a) adequately covers these activities also.

g. Regulation (2)(a) - Delete the last sentence. "No materials" is too vague. Every vessel puts some material into the water during normal operations, such as oil from a shaft packing gland or a thin sheen from an outboard motor's exhaust.

h. Regulation (2)(c) - "Public service facility" needs to be defined.

i. Regulation (3)(a) - Recommend change to read: "No person shall dump, deposit, or discharge waste material into the water of this sanctuary in violation of any Federal statute or regulation". Similar wording was used in the regulations for the MONITOR sanctuary. The Coast Guard is especially opposed to the reference to vessel sewage. Section 312 of the Federal Water Pollution Control Act adequately addresses this source of pollution and provides a mechanism for designating no-discharge areas. It would not seem logical to prohibit such discharge in the sanctuary while discharges are permitted in the three mile area between the sanctuary and the shore line.

j. Regulation (6)(b) - Substitute the following: "No person shall carry or possess such poisons or devices, except while underway through the marine sanctuary." Seizure and confiscations are not remedies sanctioned by the Act. Only civil penalties are authorized remedies and then only after proper notice and opportunity to be heard. (Note: The fishing laws of the State of Florida do not apply outside the 3 mile limit, except as to its own citizens).

k. Regulation (6)(c) - There is no definition as to who the "sanctuary manager" is, or how he is chosen.

l. Regulation (7)(a) - Delete - It will be impossible for the Coast Guard to enforce a regulation prohibiting a person from touching coral, an activity which presumably will occur under water and out of sight. The remainder of this regulation addressing collection of or disturbing coral is adequately addressed in regulation (1)(a).

m. Regulations (7)(b) through (d) - Delete

n. Regulation (8)(a) - Change to read: " in accordance with applicable Federal rules and regulations."

o. Regulations (8)(b) through (g) - Recommend delete. The second sentence of regulation (8)(a) infers that these are recommended procedures and not binding regulations. If it is desired to retain them as recommended procedures, then the word "shall" should be changed to "should" throughout. As stated in enclosure (1), these appear to be personnel safety matters and not necessary for the preservation or restoration of the area.

p. Regulation (8)(h) - Delete - Adequately addressed in regulation (8)(a) as corrected in (n.) above. Also, there is no "salt water" demarcation that governs the operation of watercraft.

q. Regulation (9) Note - Delete "or cast". Cast is not defined. Literally interpreted, this could mean that one person could not take the picture of another person, even on a boat when in the sanctuary.

r. Regulation (9)(a) - Change to read: "...involving the installation of special settings or structures."

s. Regulation (11) Note - add a sentence reading: "Knives are frequently used by fishermen and swimmers and are not classified as weapons for purposes of this regulation".

t. Regulation (11)(a) - Add the following to the end of the last sentence: "except for law enforcement purposes".

u. Regulation (11)(b) - Change to read: "The firing of weapons into the sanctuary from outside its boundaries is forbidden". The mere aiming of a weapon toward the sanctuary could be done from hundreds of miles away.

v. Regulation (11)(c) - Delete "or possession" and add a second sentence as follows: "No person shall carry or possess explosives within the sanctuary except while underway through the sanctuary."

w. Regulation (11)(d) - Delete. See (j) above regarding seizure and confiscation.

x. Regulation (12) - This regulation on closing of the sanctuary needs to be expanded to designate who has the authority to close the sanctuary and the mechanism by which it will be accomplished. Is it contemplated that closure will prevent all access to the area or will it simply restrict activities such as fishing or diving?

y. Regulation (13) - Delete - CG regulations presently require reports of personal injury or property damage in excess of \$100. See (k) above for comments concerning the definition of "sanctuary manager".

z. Regulation (14)(a) - Delete. Summary removal is not a remedy sanctioned by the Act. Additionally, all persons using this sanctuary are subject to the penalty provisions of the Act.

aa. Regulation (14)(b) - Delete. Adequately and more appropriately addressed under "Penalties".

bb. Permits - Delete: "educational endeavors, scientific and industrial research". Permits are not required unless a prohibited activity is contemplated. Insert the following after the first sentence: "Permits will be in letter format and are to be presented to appropriate law enforcement personnel for inspection on request". See (k) above regarding definition of "sanctuary manager".

cc. Certification - Authority for NOAA to name the State of Florida as NOAA's administrative officer should be stated, as that authority is questionable. Also, the regulations do not actually name Florida's administrative

officer.

dd. Enforcement - It is questionable whether the State of Florida can be designated to administer and implement the rules and regulations. "Governing" should be deleted. "Contract manager" is another undefined term. Also, the Coast Guard's enforcement responsibilities should be more clearly stated. For example, will the Coast Guard be enforcing in conjunction with NOAA police?

ee. Penalties - Change first sentence to read "... Provisions of the rules and regulations for the marine sanctuary promulgated pursuant to Title III... to be assessed by the Administrator of the National Oceanic and Atmospheric Administration". Change the word "would" to "shall" in the last sentence.

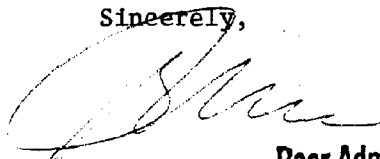
ff. Page 13 - If John Pennekamp State Park was recommended for inclusion in the marine sanctuary, the reason for its being so included should be stated.

gg. Alternatives to the proposed action - Under "No sanctuary" change the last sentence to read "An outer boundary located at the 300 foot isobath precludes...".

The Coast Guard feels that many of the proposed regulations are not "necessary and reasonable" as specified in the Act. The purpose against which these regulations must be measured for reasonableness are presumably the same purposes for which the Act was established, viz., "preservation or restoring such areas...". We therefore feel that regulations which are not directed specifically toward preserving or restoring the area are not necessary and reasonable regulations.

The Coast Guard has no further comments to offer, and appreciates the opportunity to review this impact statement.

Sincerely,



R. I. PRICE  
Rear Admiral, U. S. Coast Guard  
Chief, Office of Marine Enforcement  
and Systems

Encl:

- (1) Copy of COMDT(G-WEP-5/73) ltr of 5 May 75
- (2) Charts



DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD

MAILING ADDRESS:  
U.S. COAST GUARD (G-WEP-5/73)  
400 SEVENTH STREET, N.W.  
WASHINGTON, D. C. 20540  
PHONE: 202-426-9578

• 5 MAY 1975

Administrator  
National Oceanic and  
Atmospheric Administration  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Sir:

The nomination by the State of Florida of the area to be known as the Florida Keys Coral Reef Sanctuary has been reviewed by the concerned offices within the Coast Guard. The Coast Guard supports the efforts to preserve the coral reef as a habitat preserve but is opposed to the establishment of the sanctuary as proposed by the State of Florida. The Marine Protection, Research, and Sanctuaries Act calls for issuance of regulations which are both "necessary and reasonable." It is felt that the majority of the proposed regulations are not "necessary and reasonable" to carry out the purpose for which sanctuaries are established as stipulated in Section 302(a) of the Act, to preserve or restore this area. Specific comments are as follows:

a. Section VII.c - Neither the MPRSA nor any other known mechanism provides for the deputizing of state law enforcement officers to allow them to enforce Federal law on the high seas.

b. Section VIII(2)(a) - This section should be changed as follows: "No person shall intentionally or negligently destroy, injure ... except in accordance with a permit or as necessary for the protection of life, property, or the environment."

c. Section VIII(2)(b) and (c) - Delete as unnecessary. Adequately addressed in Section VIII(2)(a).

d. Section VIII(2)(d) - Change to read "...except in accordance with a permit."

e. Section VIII(3)(a) - Change first sentence to read "...sanctuary except in accordance with a permit." Delete last sentence as unnecessary. Existing authority in FWPCA and Title I of the MPRSA is adequate to protect the reef and marine life from potentially harmful discharges. This portion should be changed to prohibit the discharging of waste material into the water in violation of any Federal statute or regulation.

**ENCLOSURE(1)**

Subj: Review of Florida Keys Coral Reef Sanctuary

- f. Section VIII(3)(b) - Change to read "...built without a permit."
- g. Section VIII(3)(c) - Change to read "...with the exception of navigational aids or mooring buoys or stations or in accordance with a permit."
- h. Section VIII(4)(a) - Delete as unnecessary for same reasons given in (E) above for Section VIII(3)(a). The Coast Guard is especially opposed to the reference to vessel sewage; Section 312 of the FWPCA adequately addresses this source of pollution and provides for no-discharge areas.
- i. Section VIII(7)(d) - Delete. Seizure and confiscation are not remedies sanctioned by the Act.
- j. Section VIII(8)(b) - Delete as unnecessary. It is interesting to note that indecent exposure appears to be of concern only if the person enters the water.
- k. Section VIII(8)(c) - Delete as unnecessary. Adequate safeguards contained in Section VIII(2)(a).
- l. Section VIII(10)(a) and (b) - Delete as unnecessary. Adequate safeguards contained in Section VIII(2)(a) as amended in (B) above to protect the coral reef.
- m. Section (10)(c) through (i) - Delete as unnecessary. These appear to be personnel safety matters and are not necessary for the preservation or restoration of the area. Issues of vessel and personnel safety are not unique to this area and are subject to the jurisdiction of the Coast Guard on the high seas.
- n. Section VIII(11) and (12) - Delete as unnecessary. Adequate safeguards contained in Section VIII(2)(a) as amended in (B) above to protect the coral reef.
- o. Section VIII(13)(a), (b), and (c) - Delete as unnecessary. Preceding sections provide adequate protection. These sections would prevent the arming of law enforcement personnel, prevent divers from carrying anti-shark weapons and prevent the carrying of certain types of distress signaling devices on board vessels.
- p. Section VIII(13)(d) - Delete. Seizure and confiscation are not remedies sanctioned by the Act.
- q. Section VIII(15)(a) - Delete as unnecessary to the purpose of preserving or restoring the area.
- r. Section VIII(16) - Delete. Removal of persons is not a remedy sanctioned by the Act.



Subj: Review of Florida Keys Coral Reef Sanctuary

s. Section VIII(17)(a) - Delete. This would more appropriately be the subject of a State law, not a Federal regulation.


t. Section VIII(17)(b) - Delete. Preceding sections provide adequate protection.

The Coast Guard feels that the proposed regulations must be necessary and reasonable and must be directed specifically toward preserving or restoring the area. As the Federal agency responsible for enforcement on the high seas, this is of vital concern to us. Many of these proposed regulations are redundant in that they address in a variety of ways the basic prohibition against destroying the coral reef as addressed in Section VIII(2)(a). Others either duplicate existing authority or call for procedures which are not sanctioned by the Act.

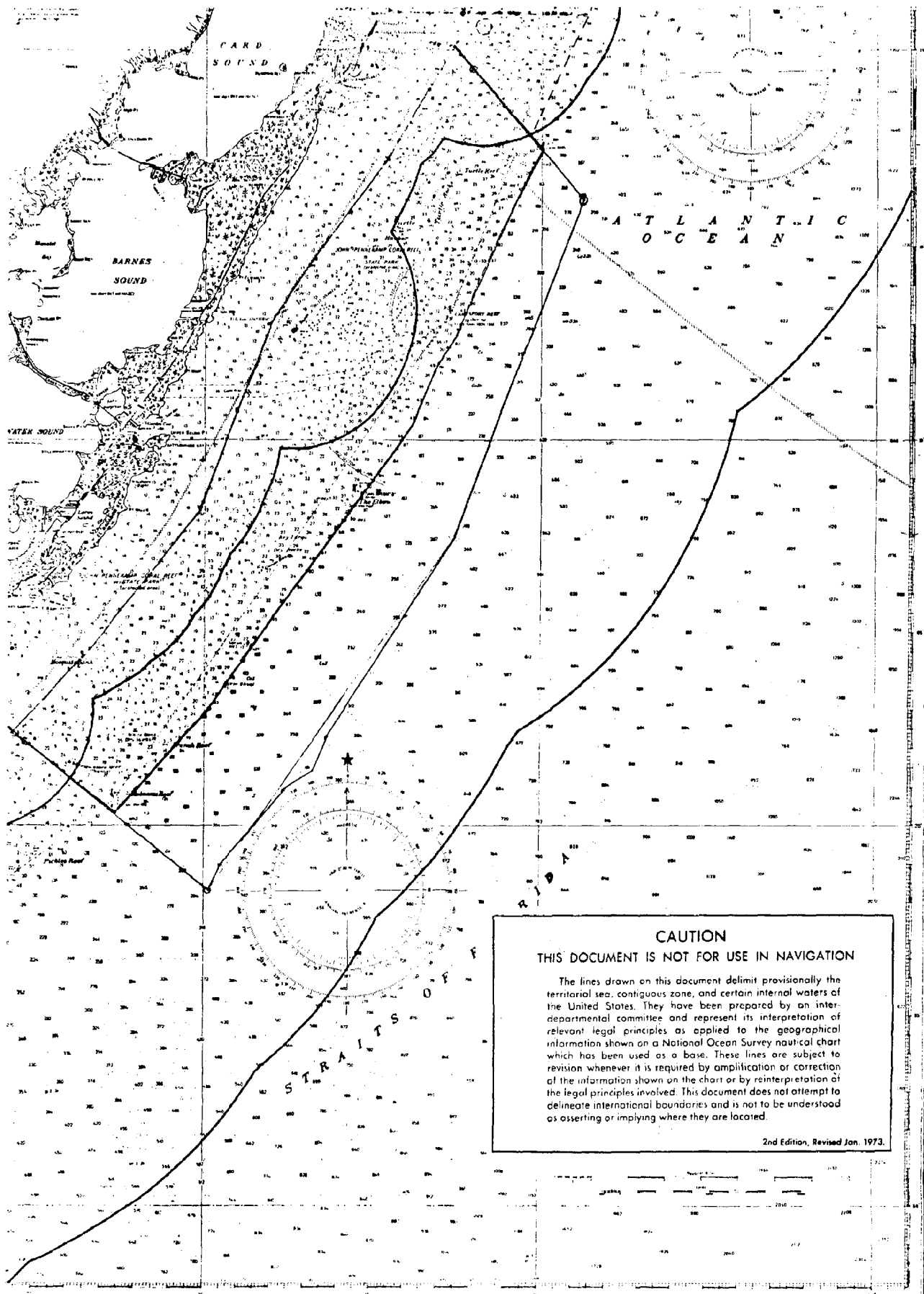
In evaluating the necessity to establish the proposed sanctuary, you should be aware of related statutory and regulatory authorities. The Outer Continental Shelf Lands Act, 43 U.S.C. 1331 et seq., administered generally by the Department of the Interior, authorizes withdrawing from disposal of any OCS lands, 1341(a); provides authority for the promulgation of regulations, 1334; and establishes a criminal penalty, 1334(a)(2). The Key Largo Coral Reef Reserve was established by Proclamation No. 3339, March 17, 1960, 25 F.R. 2352. See note under 16 U.S.C. 461. Regulations promulgated by the Department of the Interior can be found at 43 C.F.R. 15. Another enforcement vehicle is the Bartlett Act, 16 U.S.C. 1081, which relates to coral as a creature of the continental shelf.

The Coast Guard has no further comments to offer and appreciates the opportunity to review the proposal.

Sincerely,



W. E. CALDWELL  
Captain, U. S. Coast Guard  
Acting Chief, Office of Marine  
Environment and Systems

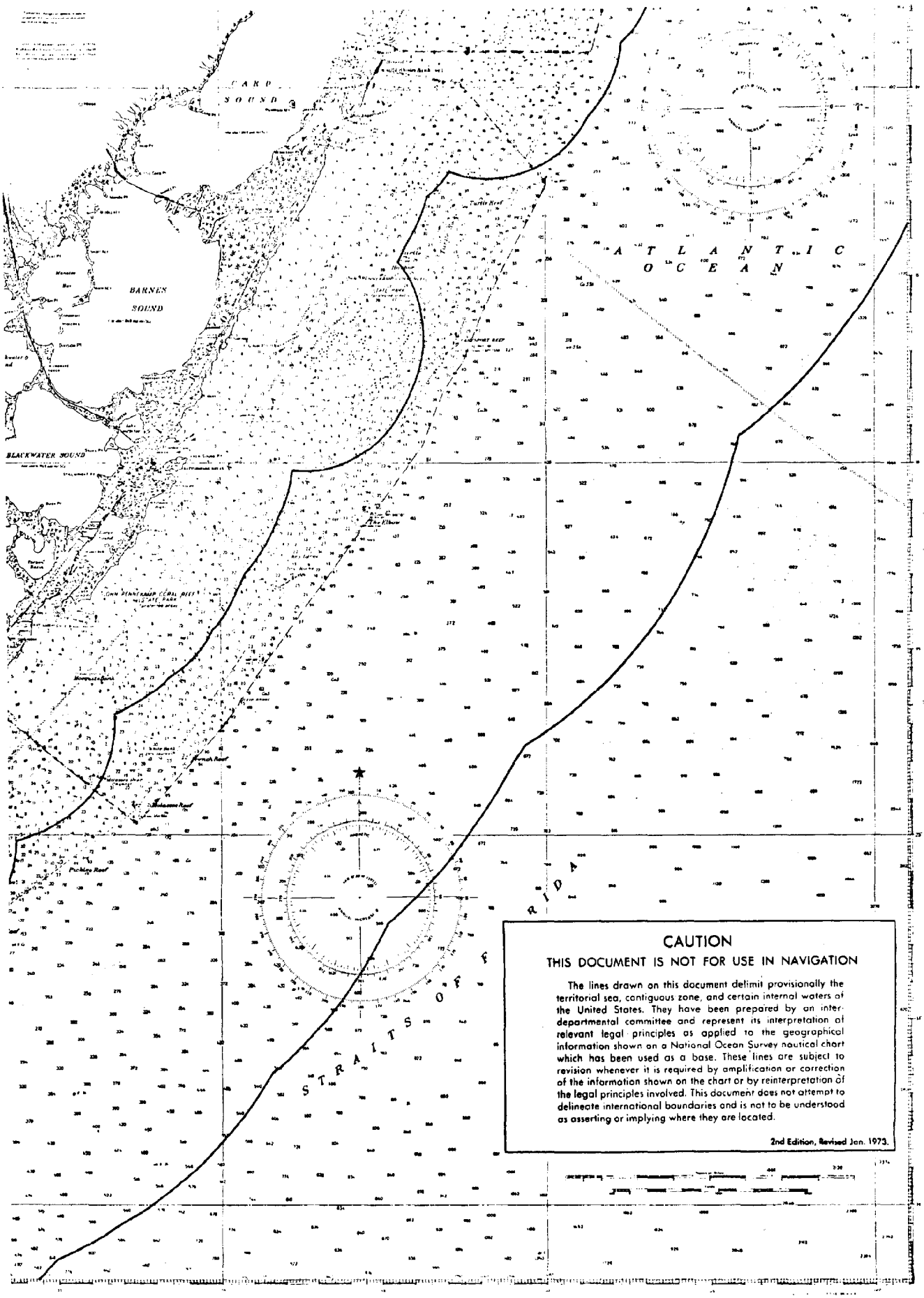


**CAUTION**

**THIS DOCUMENT IS NOT FOR USE IN NAVIGATION**

The lines drawn on this document delimit provisionally the territorial sea, contiguous zone, and certain internal waters of the United States. They have been prepared by an inter-departmental committee and represent its interpretation of relevant legal principles as applied to the geographical information shown on a National Ocean Survey nautical chart which has been used as a base. These lines are subject to revision whenever it is required by amplification or correction of the information shown on the chart or by reinterpretation of the legal principles involved. This document does not attempt to delineate international boundaries and is not to be understood as asserting or implying where they are located.

2nd Edition, Revised Jan. 1973.

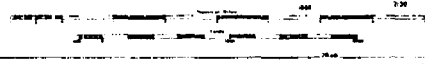


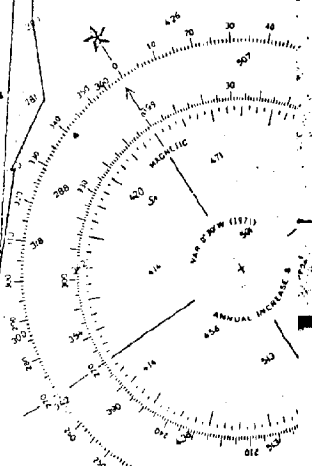
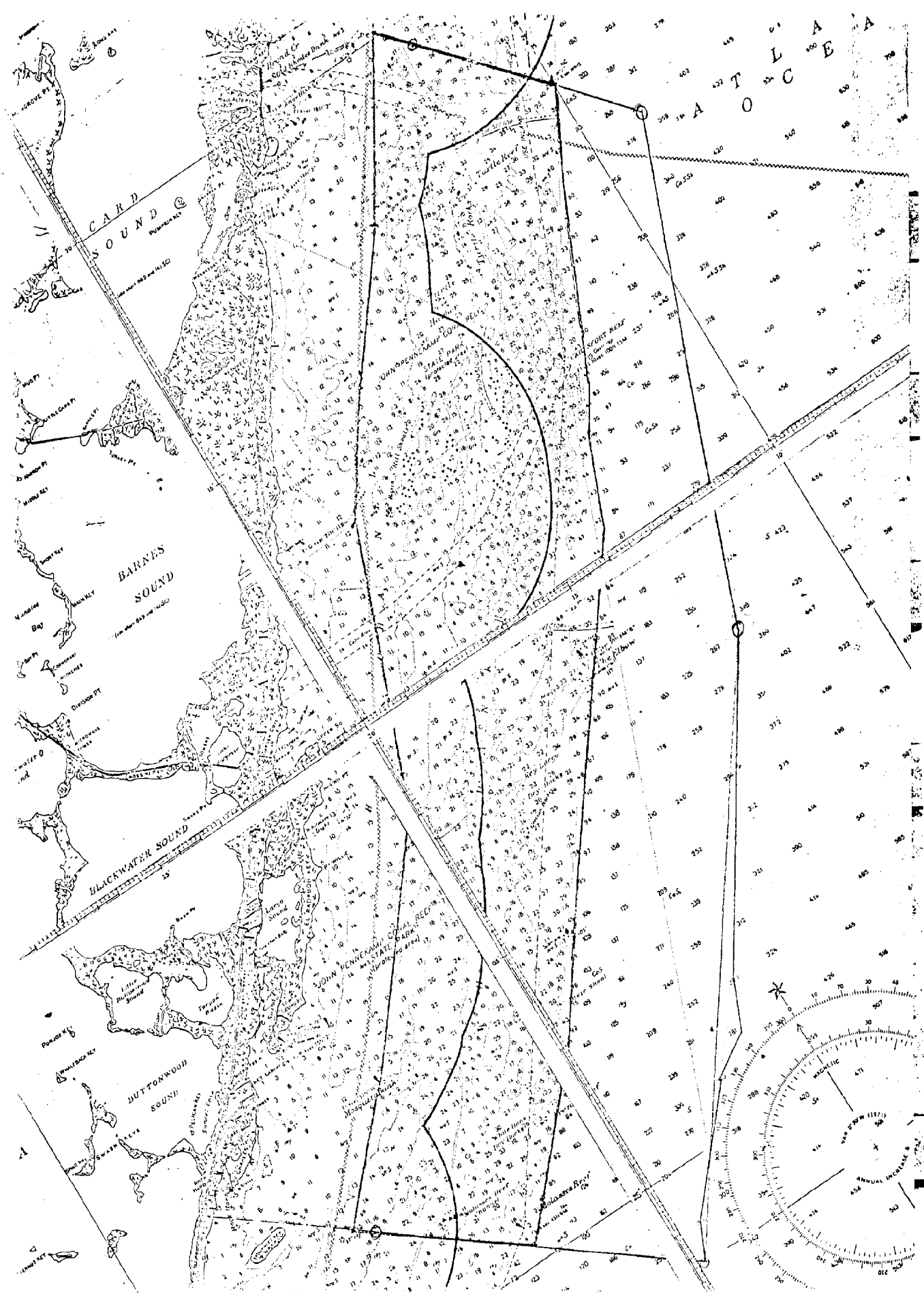
**CAUTION**

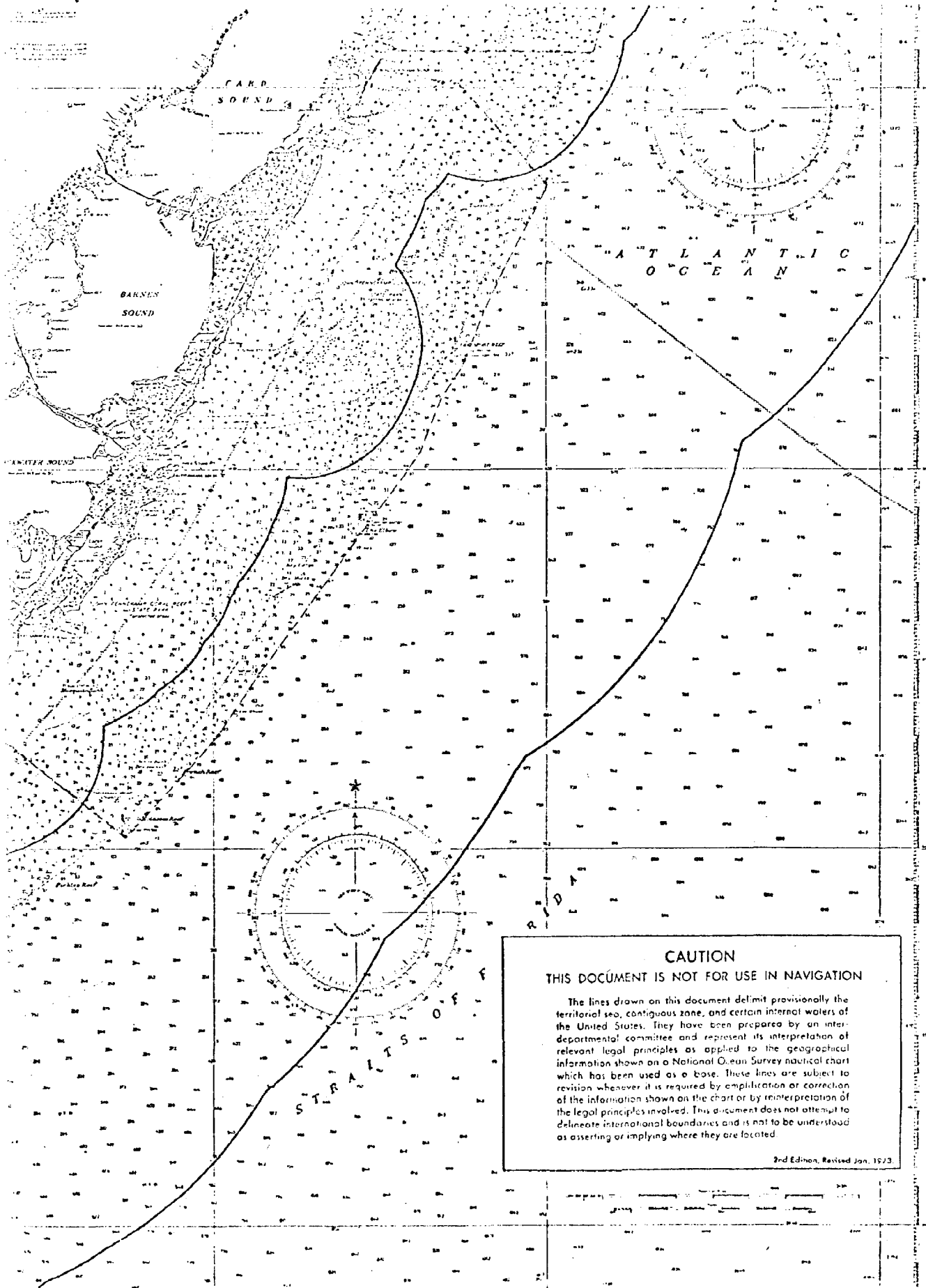
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2nd Edition, Revised Jan. 1973.

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

---

State Office, P. O. Box 1208, Gainesville, FL 32602

September 12, 1975

Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Mr. Galler:

RE: Draft Environmental Impact Statement for Key Largo Coral Reef  
Marine Sanctuary

We concur in your draft environmental impact statement and have no  
further comments to offer.

We appreciate the opportunity to review this proposal.

Sincerely,

*W. E. Austin, acting*  
William E. Austin  
State Conservationist

cc: R. M. Davis  
F. G. Maxwell



State of Florida



REUBIN O'D. ASKEW  
Governor  
BRUCE A. SMATHERS  
Secretary of State  
ROBERT L. SHEVIN  
Attorney General  
GERALD A. LEWIS  
Comptroller  
PHILIP F. ASHLER  
Treasurer  
DOYLE CONNER  
Commissioner of Agriculture  
RALPH D. TURLINGTON  
Commissioner of Education

DEPARTMENT OF NATURAL RESOURCES

HARMON W. SHIELDS  
Executive Director

CROWN BUILDING / 202 BLOUNT STREET / TALLAHASSEE 32304

September 8, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U. S. Department of Commerce  
The Assistant Secretary for  
Science and Technology  
Washington, D. C. 20230

Dear Mr. Galler:

Thank you for the copies of the environmental impact statement and proposed regulations for the Key Largo Coral Reef Marine Sanctuary.

The only area of concern that I see at the moment is in Section (6) of the regulations in which it requires all trap floats to be marked with flags. This might prove to be burdensome and expensive and will be a controversial issue with the fishermen. If the Florida State regulations are adhered to, as called for in the proposals, the trap buoys will have to be color coded and numbered and these criteria should be sufficient for recognition and identification of the trap locations.

Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in dark ink, appearing to read "C. A. Willis".

Col. C. A. Willis, Director  
Division of Law Enforcement

CAW/nd

cc: Mr. Harmon W. Shields  
Mr. Edwin A. Joyce  
Lt. Col. John J. Brown  
Mr. Bob Jones  
Mr. Thomas Fulford



STATE OF FLORIDA

## Department of Administration

### Division of State Planning

660 Apalachee Parkway - IBM Building

Reubin O'D. Askew  
GOVERNOR

TALLAHASSEE

32304

Lt. Gov. J. H. "Jim" Williams  
SECRETARY OF ADMINISTRATION

R.G. Whittle, Jr.  
STATE PLANNING DIRECTOR  
(ACTING)

(904) 488-1115

September 16, 1975

Dr. Robert R. Kifer  
Marine Sanctuary Coordinator  
Office of Environmental Affairs  
Assistant Secretary for Science  
and Technology  
United States Department of Commerce  
Washington, D. C. 20230

Dear Dr. Kifer:

I am pleased to respond to your recent request for comments on the Draft Environmental Impact Statement, "Key Largo Coral Reef Marine Sanctuary." This proposed action is one which is highly desirable and of major importance to the State of Florida, as well as to the nation. The protection of the fragile and irreplaceable coral ecosystems which this action will implement is long overdue. I enthusiastically endorse this action except for the minor exceptions noted below.

It is my strong feeling that regulations for operating the Sanctuary should preclude all bottom fishing. I find it inconsistent within the stated objectives of the DEIS: "to protect and conserve the coral and coral reef ecosystems, to regulate uses thereof to insure the health and well-being of the coral, and associated flora and fauna, and to make available the continual opportunity for the esthetic and recreational enjoyment which healthy reefs afford the American people," to allow activities such as bottom fishing and lobster and crab trapping which are known to be detrimental and alterative to the coral ecosystem. If the goal of the sanctuary is to provide maximum protection to this ecosystem as well as to provide for

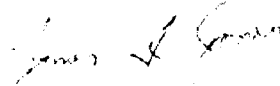


Dr. Robert R. Kifer  
September 16, 1975  
Page Two

esthetic and recreational opportunities, I do not feel that the economic benefits to be derived by a relatively few persons within the area should take precedence over the potential for maximum protection which may be provided the ecosystem. Additionally, I feel that all net fishing within the proposed Sanctuary should be banned for the same reasons. I would also note that in the DEIS it is not stated that a proposed goal of the Sanctuary is to provide economic opportunities, destructive and alterative to the ecosystem, for the benefit of local commercial fishermen.

Thank you for providing me the opportunity to comment on this highly significant action. If you should desire further elaboration on any of my statements or views, or to participate in any of the public formal activities involved in the implementation of this proposed action, I am at your service.

Sincerely,



James I. Jones, Ph.D.  
Special Projects Officer  
Division of State Planning  
and  
Marine Science Advisor to  
the Governor

JIJ/bj

State of Florida



DEPARTMENT OF NATURAL RESOURCES

RANDOLPH HODGES  
Executive Director

LARSON BUILDING / TALLAHASSEE 32304 / TELEPHONE 224-7141

REUBIN O'D. ASKEW  
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RICHARD (DICK) STONE  
Secretary of State  
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Attorney General  
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Comptroller  
THOMAS D. O'MALLEY  
Treasurer  
DOYLE CONNER  
Commissioner of Agriculture  
FLOYD T. CHRISTIAN  
Commissioner of Education

PLEASE ADDRESS REPLY TO:

John Pennekamp Coral Reef State Park  
P. O. Box 487  
Key Largo, Florida 33037  
September 22, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
For Environmental Affairs  
Department of Commerce  
Coastal Zone Management  
3300 Whitehaven Street, N.W.  
Washington, D.C. 20235

Dear Mr. Galler:

Dr. Kifer has already provided me with a similar proposal, which I commented on and returned to him. I have no recommendations or changes, other than the ones I have already provided him with. I think it is very good and will be hard to improve on.

Sincerely yours

Jack Gillen  
Superintendent  
John Pennekamp Coral Reef State Park

CC: Park File

# FLORIDA GAME AND FRESH WATER FISH COMMISSION

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H.E. WALLACE, Assistant Director



Farris Bryant Building  
Tallahassee, Florida 32304

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
United States Department of Commerce  
Washington, D. C. 20230

Re: Draft Environmental Impact  
Statement, Key Largo Coral Reef  
Marine Sanctuary, Monroe County

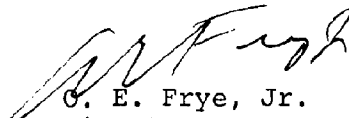
Dear Mr. Galler:

The Environmental Protection Bureau of the Florida Game and Fresh Water Fish Commission has reviewed the above referenced impact statement and offers the following comments.

Due to the unrestricted development that has occurred in recent years throughout the Florida Keys and the concomitant increase in permanent residents and seasonal visitors, the Florida Reef Tract has suffered considerably from such human activities as dredge and fill projects, commercial exploitation of corals, and abusive boating and diving practices. The establishment of the Key Largo Coral Reef Marine Sanctuary would serve to preserve an important portion of this reef tract through the control or elimination of present stresses, and would further buffer the existing natural features of the John Pennekamp Coral Reef State Park. Therefore the Florida Game and Fresh Water Fish Commission supports the proposed action.

If we may be of further assistance, please do not hesitate to contact our office.

Very truly yours,

  
C. E. Frye, Jr.  
Director

OEF/DB/rs

# Florida Keys Citizens Coalition

Rt. 2 - Box 310

Summerland Key, Fla. 33042

50



Sidney R. Galler  
Deputy Assistant Secretary for Environmental Affairs  
U.S. Department of Commerce  
Washington, D.C. 20230

Dear Mr. Galler:

This letter contains comments on the environmental impact statement prepared by the Department of Commerce for the National Oceanic and Atmospheric Administration, Office of Coastal Zone Management entitled "Key Largo Coral Reef Marine Sanctuary." These comments represent the aggregate viewpoint of the nineteen Monroe County citizens' organizations included in the Florida Keys Citizens Coalition.

The FKCC strongly supports implementation of the proposal based upon needs assessment and long term direct experience with the area under study. We believe that the proposed action is in accordance with developing land use plans and policies in the Florida Keys and that the proposed resource management systems would help to reduce the increasing negative impact on this area by the large and diverse user groups.

We would recommend however that all of the proposed management systems, including rules, regulations and prohibitions also be applied to the adjacent John Pennekamp Coral Reef State Park. We believe that an area larger than the boundaries of the proposed marine sanctuary must be carefully managed in order to maintain the integrity of the Florida Keys Coral reef ecosystem both structurally and functionally. Maintenance of "whole systems" ecologically balanced requires whole system management. Ideally the entire reef tract should be managed according to national guidelines and by an agency of government which supports this philosophy.

We realize that at present, circumstances have mitigated against larger boundaries for the proposed marine sanctuary. We do believe however, that the present need for strict management controls in John Pennekamp State Park outweigh the considerations which have led to the proposed boundaries. Moreover, the current stress conditions which exist throughout the reef tract make it evident that a larger area should be carefully protected. We therefore recommend that your agency collaborate with the State of Florida with the expressed purpose of extending the proposed management system to include John Pennekamp Coral Reef State Park

Yours truly,

*Art Weiner*

Arthur H. Weiner Phd.  
Chairman

cf:AW  
cc: Fla. Dept. Nat. Res.

# BELCHER OIL COMPANY



P. O. BOX 011751  
MIAMI, FLORIDA 33101

September 25, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary for Environmental Affairs  
UNITED STATES DEPARTMENT OF COMMERCE  
The Assistant Secretary for Science and Technology  
Washington, D.C. 20230

Dear Sir:

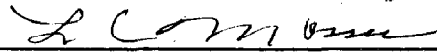
The Draft Impact Statement for the Key Largo Coral Reef Marine Sanctuary has been reviewed.

As explained to Dr. Robert R. Kifer, Marine Sanctuary Coordinator, after review of the original nomination, Belcher Oil Company has no objections to the establishment of this sanctuary as long as it does not limit the use of the navigable water way known as Hawk Channel. The presently proposed boundaries do not include Hawk Channel.

We offer the observation that commercial shipping, much of it under foreign flags, habitually stays close in to the reef markers when south bound to escape the north flowing current. Swimmers and sightseers should not be encouraged to feel safe from ship traffic in water depths of 50 feet or greater.

Subject to these comments, we are glad to see this effort to preserve the reefs.

Sincerely,

  
L. C. MORRIS  
Asst. Vice President

LCM/lpf



UNDERWATER SOCIETY OF AMERICA  
AMBLER, PENNSYLVANIA 19002  
Route 2, Box 368-A, Kissimmee, Fla. 32741

September 22, 1975

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2616 Forrest Hill Drive  
San Jose, Calif. 95130

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Vice President  
4858 Battery Lane No. 115  
Bethesda, Md. 20014

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7416 Glendora Dr.  
Washington, D.C. 20028

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President  
Diving Equipment Mfrs Assn

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
Environmental Affairs  
U.S. Department of Commerce  
Washington, D.C. 20230

Re: Comments on Draft Environmental Impact Statement  
Key Large Coral Reef Marine Sanctuary

The proposed Marine Sanctuary is a badly needed addition to the John Pennekamp Coral Reef State Park and the draft environmental impact statement appears adequate -- except for the following objections to the proposed regulations.

Page 7, item 6 of Prohibited Activities states, "The taking of crawfish, spiny lobster and stone crab with traps for commercial purposes ... is allowed." The item also states that sport and commercial fishing with hook and line ... and with nets ... is allowed within the marine sanctuary."

In our opinion the above provisions make a mockery of the avowed purpose of the sanctuary which is stated as, "The area will be managed to protect and conserve the coral and coral reef ecosystems, to regulate uses thereof to insure the health and well-being of the coral, and associated flora and fauna, and to make available the continual opportunity for esthetic and recreational enjoyment which healthy reefs afford the American people." (emphasis added)

There is ample evidence that lobster trapping and commercial fishing with nets (and with powered reels and wire lines) significantly damages corals and associated reef ecosystems. Allowing these activities in a marine sanctuary is, in our opinion, equivalent to allowing commercial trapping and hunting in a forest sanctuary such as Yellowstone or Yosemite.

We are in favor of the prohibition of spearfishing in the sanctuary, but there is no evidence that this activity poses a greater threat to corals than lobster trapping or commercial fishing -- and we believe the preferential treatment proposed for commercial activities is rank discrimination. If conservation is necessary, everybody should be required to conserve.

Respectfully,

*William Barada*  
William R. Barada  
Environmental Advisor

*An Organized Diver Is A Safe Diver*



608 THIRTEENTH STREET, N.W. (SUITE 801) WASHINGTON, D. C. 20005 (202) 737-0668

August 29, 1975

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Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U.S. Department of Commerce  
Washington, DC 20230

Dear Mr. Galler:

Thank you for furnishing a copy of the Draft EIS for the Key Largo Coral Reef Marine Sanctuary and providing an opportunity for us to comment on that document.

The Sport Fishing Institute endorses the proposed Key Largo Coral Reef Marine Sanctuary and commends the efforts of all those responsible. The protection of such valuable coral reef ecosystems is a major purpose of the Marine Sanctuaries Act, reflecting a concept this Institute has long supported.

The Draft EIS appears to be particularly well-organized, and we especially appreciate its conciseness. The uses of the Sanctuary which are to be prohibited will provide all the protection that will be needed, while still allowing for appropriate compatible public utilization. We concur in and commend the decision to assign administrative responsibility to the Florida Department of Natural Resources.

Regarding Page 7 of the Draft EIS, we have two specific comments concerning Prohibited Activities (6) Fishing, viz:

Subdivision (a) now reads, "The use of poisons, electric charges, and similar methods for the taking or killing of fish is prohibited." We suggest that an additional clause, "except for purposes of scientific investigation with written approval and supervision by the sanctuary's administrative agency", be added at the end of that sentence.

Subdivision (c) provides for setting aside some portions of the marine sanctuary as control areas for research to assist in managing the sanctuary and that such areas will be closed to fishing. We see merit in such provisions, but we are concerned that they be judiciously limited. In this regard, we

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs

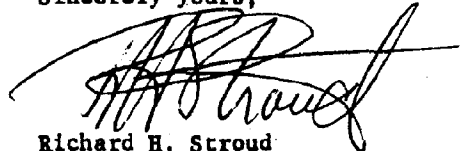
Page 2

August 28, 1975

suggest that appropriate language be added to provide that such inviolate areas shall in no case exceed 10 percent of the total sanctuary area.

We appreciate the opportunity to comment.

Sincerely yours,



Richard H. Stroud  
Executive Vice President

RHS:mjw

CC to: Mr. Russell Peterson - CEQ  
Mr. Harmon Shields - Florida DNR



*Tropical Audubon Society, Inc.*  
7615 S.W. 62nd Avenue  
MIAMI, FLORIDA 33143

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JERRY C. COUTURE

9 September 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary for Environmental  
Affairs

U.S. Department of Commerce  
Washington, D.C. 20230

RE: Key Largo Coral Reef Marine Sanctuary

Dear Mr. Galler:

I greatly appreciate the opportunity to review the environmental impact statement for the Coral Reef Marine Sanctuary.

I am completely in favor of such a sanctuary being established in the Keys. The proposed rules and regulations, particularly those regarding the removal or destruction of marine life are long overdue.

The enforcement of these rules and regulations will be the responsibility of the U. S. Coast Guard, as proposed on page 12. Does or perhaps, will the Coast Guard receive the additional man-power, funds and surface craft to adequately carry out these added duties? This is absolutely necessary if the sanctuary is to be a reality. With a reported 260 surface craft using the area on a single day, enforcement will require constant vigilance.

The Tropical Audubon Society is completely supportive of these proposals and the sanctuary, but question the enforceability of these rules.

If I can be of further assistance please feel free to contact me at any time.

Sincerely,

*Peter A. Quincy*  
Peter A. Quincy  
President

PQ/mr



## NATIONAL AUDUBON SOCIETY

RESEARCH DEPARTMENT • 115 INDIAN MOUND TRAIL, TAVERNIER, FLA. 33070 — (305) 852-5092

September 12, 1975

MR. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
United States Department of Commerce  
Washington, D. C. 20230

Dear Mr. Galler:

Thanks very much for sending the draft environmental impact statement for the proposed Key Largo Coral Reef Marine Sanctuary for my comments and review.

The proposal is certainly a very timely one. Additional control over human activities in the coral reef tract off the Florida Keys is badly needed, and this proposed marine sanctuary will provide the mechanism for more adequate protection, at least in one of the more heavily used sections of the reef tract. I certainly concur with most of the comments and proposals contained in the draft.

I do have some questions and comments on one point on page five under the section headed Proposed Rules and Regulations, subsection 1-C, which states that "No rope, wire, anchor, or other contrivance shall be attached to any coral, rock or other formation, whether temporary or permanent in character." I believe this to be somewhat ambiguous and in need of clarification. If taken in it's literal sense it would preclude any anchoring within the reef tract proper almost entirely. Within the reef tract there are a number of areas of sand where an anchor can be placed safely and not touch or otherwise impinge on the coral surrounding these patches, but in many of these there are rocks which in some cases are necessary for the security of an anchor, and under the rules and regulations so stated here it would seem to be illegal to anchor anywhere in the reef tract where the anchor might be in contact with a rock. Perhaps this is nitpicking, but I really think that it should be clarified. Certain areas could be designated as no anchoring zones and marked by buoys, or, as is mentioned in another section, mooring buoys should be provided within certain heavy-use areas and their use required exclusively.

This last might be a method of not only preventing the damage of corals by anchors but also a method of limiting the number of boats using any given area at a given time. If "X" numbers of buoys were provided and boats were required to use them this might cut down some of the congestion that presently occurs over the most scenic and popular areas of the reef.

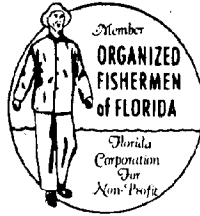
Here in the Florida Keys in the total reef tract running from the Biscayne National Monument to the Dry Tortugas, there are a number of serious resource-use problems which can only be attacked and regulated through some form of Federal action. The fact that the state can only legally control operations inside the three mile limit and the further fact that at least half of the reef tract lies outside of the three mile limit create a great many problems in the regulating of such things as lobster fishing, spear fishing, collection of tropical fish by aquarists, collection of coral and a host of other things. I believe that it is incumbent on the U. S. Department of Commerce, through the National Oceanic and Atmospheric Administration and/or the Bureau of Commercial Fisheries, to seek methods of alleviating some of the serious problems which this situation creates. The present proposal is a start but much more needs to be done.

Sincerely yours,



Alexander Sprunt, IV  
Director of Research

AS/jcg



September 20, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U. S. Department of Commerce  
The Assistant Secretary for  
Science and Technology  
Washington, D. C. 20230

Dear Mr. Galler:

Thank you for the copies of the environmental impact statement and proposed regulations for the Key Largo Coral Reef Marine Sanctuary.

There is a definite area of concern in Section (6) of the regulations which requires all trap floats to be marked with flags. This will prove to be burdensome, expensive, and will be impossible to comply with. If the Florida State regulations are followed as called for in the proposals, the trap buoys alone will be sufficient for recognition and identification of the trap locations and owners.

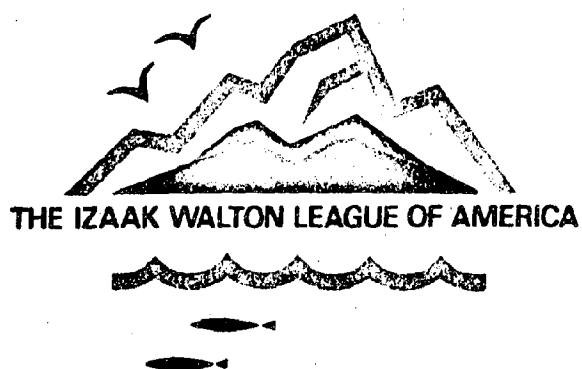
Thank you for the opportunity to comment.

Sincerely,

*Blue*

Thomas "Blue" Fulford  
Exec. Director, OFF  
4507 99th St. W.  
Bradenton, FL 33507

FLORIDA DIVISION



Box 1093  
Jupiter, Florida 33458

RESOLUTION

The United States Supreme Court has recently ruled that the State has no jurisdiction to enforce its laws beyond the three-mile limit.

As a result, live coral is being collected in the deeper reefs outside the John Pennekamp Coral Reef State Park, thus hastening their destruction.

The National Oceanic and Atmospheric Administration has announced that it is considering the creation of a federal marine sanctuary in an area up to five miles seaward of the John Pennekamp Park's outer boundary.

Therefore, be it resolved that the Florida Division, Izaak Walton League of America, urges that the National Oceanic and Atmospheric Agency proceed with all possible speed to establish the proposed sanctuary under the Federal Marine Sanctuary Act.

Passed by the Directors of the  
Florida Division, Izaak Walton  
League of America at Palm Beach  
Gardens, Florida 23 March 1975

*Mary Ann Peters*

Mary Ann Peters, Secretary

FLORIDA DIVISION



THE IZAAK WALTON LEAGUE OF AMERICA

P. O. Box 1093  
Jupiter, Florida 33458

5 September 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary for Environmental Affairs  
U. S. Department of Commerce  
Washington, D. C. 20230

Subject: Key Largo Coral Reef Marine Sanctuary

Dear Mr. Galler:

This is in response to your request for comments on the Draft Environmental Impact Statement on the subject.

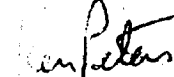
The Florida Division, Izaak Walton League of America is in support of the creation of this Sanctuary, witness our resolution enclosed.

I request that consideration be given these comments on Proposed Rules and Regulations, Prohibited Activities, paragraph 11 (a) page 9.

It is conceivable that a vessel vacationing in the Keys, dive in the Sanctuary, yet have aboard a spear gun for use where not prohibited.  
This should not be a violation.

Admittedly, enforcement is made more difficult, yet enforcement problems should not be eased with further abridgement of other rights.

Sincerely,



Ken Peters  
President



THE IZAAK WALTON LEAGUE OF AMERICA  
Florida Keys Chapter INCORPORATED  
P.O. Box 400  
Islamorada, FL 33036

September 20, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary for Environmental Affairs  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Mr. Galler:

The Florida Keys Chapter of the Izaak Walton League of America strongly urges that the Key Largo Coral Reef Marine Sanctuary designation be made a reality as expeditiously as possible.

We also feel very strongly that the marine area of John Pennekamp Park be included in this designation.

We strongly urge placing mooring buoys of sufficient numbers in strategic areas, and no anchoring be allowed.

Sincerely,

Ron Bell  
President



September 17, 1975

Mr. Sidney R. Galler  
Deputy Assistant Secretary for  
Environmental Affairs  
United States Department of Commerce  
Washington, D.C. 20230

Dear Mr. Galler:

The draft environmental impact statement on "Key Largo Coral Reef Marine Sanctuary" was passed on to me for review and comment by Dr. Donald Dunlop. I find no problems with the DEIS.

I would like to congratulate your Department of the idea of the proposed marine sanctuary. I have visited John Pennekamp Coral Reef State Park many times and always wished that the boundaries could be extended. I was pleased to see your proposal and wish you every success.

Sincerely,

A handwritten signature in cursive script that reads "J. Ross Wilcox".

J. Ross Wilcox, Ph. D  
Ecologist

JRW:mg



SINCE NINETEEN-HUNDRED



"THE VOICE OF CONSERVATION"

Office of Coastal Zone Management  
National Oceanic and Atmospheric Administration  
3300 Whitehaven Street, N.W.  
Washington, D.C. 20235

29 September, 1975

re: Draft Environmental Impact Statement  
Key Largo Coral Reef Marine Sanctuary

Dear Sirs:

We have reviewed the Draft Environmental Impact Statement for the proposed Key Largo Coral Reef Marine Sanctuary, and most strongly support the proposal.

In our review, we found two areas of concern:

- A. Recognizing that regulations are only effective if they are enforced, we recommend that adequate patrol boats and personnel be assigned to the sanctuary.
- B. We believe that there is inadequate protection offered for the spiny lobster and would support research to determine their status as well as research on the impact of authorized uses on all of the marine life in the sanctuary.

We very much appreciate the opportunity to review this document and continue our support for your program.

Sincerely yours,

Alexander J. Friedman  
Vice President

AJF/



**SIERRA CLUB**

Miami Group

P. O. BOX 011776 • Miami, Florida 33101

30 September 1975

Dr. Robert R. Kifer  
Marine Sanctuary Coordinator  
U.S. Dept. of Commerce  
The Assistant Secretary for Science and Technology  
Washington, D.C. 20230

RE: Draft EIS Key Largo Coral Reef Marine Sanctuary

Dear Dr. Kifer:

We applaud the federal government's move to establish the Key Largo coral reef as a marine sanctuary. This is something that should have been done years ago when the Everglades National Park was created, but it is never too late!

As residents of this area and explorers of the coral reefs, we do not see how the creation of this marine sanctuary can be anything but a positive environmental impact.

This is a good start toward protection of one of the nation's treasured resources. In the long run, however, it will have to be followed up by more rigid rules and more effective enforcement. We would like to see the entire chain of Florida coral reefs protected and manpower assigned to prohibit the possession of the coral.

Our thanks to you for a fine report and we hope to soon have an established marine sanctuary off Key Largo.

Very truly yours,

Alan Sirkin  
Chairman

/as

# Natural Resources Defense Council, Inc.

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NEW YORK, N.Y. 10036

212 869-0150

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WASHINGTON, D.C. 20005  
202 737-5000

*Western Office*  
664 HAMILTON AVENUE  
PALO ALTO, CALIF. 94301  
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September 24, 1975

Sidney R. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
Department of Commerce  
Washington, DC 20230

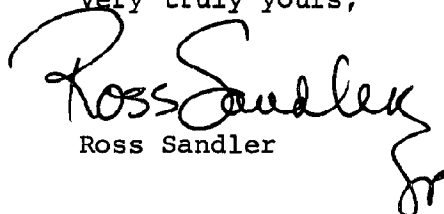
Dear Mr. Galler:

The proposal to establish a recreational and esthetic area off Key Largo pursuant to Title III of the Marine Protection, Research and Sanctuaries Act of 1972 is a worthy proposal and one that should be adopted.

With respect to the draft environmental impact statement, the agency does not appear to discuss the stress and concentration of activities on non-protected coral reefs caused by the establishment of the coral reef preserve. It should be possible to make some evaluation as to whether coral reefs existing outside of the protected boundaries will be harmed by overuse in a concentrated area.

As a second consideration, the reasons for restricting the boundaries appear to be weak. The manner in which the proposed boundaries have been established overlooks the basic purpose of designation of these valuable resources - to protect them from current stress conditions. This is particularly so since the boundaries selected appear to be wholly arbitrary and do not appear to have been selected with respect to actual coral reef configuration.

Very truly yours,

  
Ross Sandler

RS/p

UNIVERSITY OF MIAMI  
CORAL GABLES, FLORIDA 33124

DEPARTMENT OF BIOLOGY  
P. O. BOX 249118

September 16, 1975

Dr. Sidney R. Galler  
Deputy Asst. Secretary for Environmental Affairs  
U. S. Dept. of Commerce  
Coastal Zone Management  
NOAA  
Rockville, Md. 20852

Dear Dr. Galler:

I am returning the draft on the Key Largo Sanctuary, and the following comments apply.

P. 5, para. (2)(a). Unless you allow for a "holiday" area around the sanctuary, especially to the north and south, any dredging operations within a mile of the borders will be as effective in silting the sanctuary as if it occurred within its borders. I am not saying that silting is the problem in the area since the banks silt the area in rough seas all the time, however, you will not be able to differentiate the silt type or quality unless the borders are "protected".

P. 6, para. 3 and P. 8, para. 8 I would suggest that unless you are dealing with sailboats or protein-operated skiffs, most of the operating craft are polluters in that oil, fuel, and other hydrocarbons from the engine exhaust go right into the water. If, as a result of the sanctuary, boat traffic increases, you may want to control the density under given conditions or else have the consequence of sufficient exhaust waste to cause as much pollution as a few boats pumping their bilges.

I hope that in your monitoring/research plans that you are going to maintain checks on hydrocarbons on the surface, dispersed, and in the upper sediments. They (the hydrocarbons) can be cumulative. Also, I hope that you institute a study on the quality and quantity of sediment transport. The nature of the bottom and its continuance is one of the prime physical factors in this area. Also sediment deposition on live organisms and its ultimate disposal is extremely valuable information.

Sincerely,



Leonard J. Greenfield  
Chairman, Department  
of Biology

LJG:lg



FLORIDA INTERNATIONAL UNIVERSITY

TAMIAMI TRAIL • MIAMI, FLORIDA 33144 • (305) 223-2300

Biological Sciences

September 15, 1975

Dr. Robert Kifer  
Marine Sanctuary Coordinator  
Office of Coastal Zone Management  
11400 Rockville Pike  
Rockville, Md. 20852

Dear Sir:

I have read the draft E.I.S. and nominations concerning the proposed Key Largo Coral Reef Marine Sanctuary. I am in agreement with the statements and proposals made by O'Connor and Darnell in their original nomination and feel that their sanctuary boundaries form a more realistic framework for the protection of Florida's coral reef resources.

My only comment on the proposed rules and regulations concerns (1) the removal or destruction of natural features and marine life. I would like to add a clause that would allow limited removal of specimens by scientific personnel from authorized state or local agencies. This might eliminate some of the problems concerned with issuance of permits to individuals from authorized institutions such as university faculty. An alternative to this could be language under the heading "Permits" (Page 10, E.I.S.) which includes issuance of permits to authorized institutions to cover a variety of otherwise prohibited activities. The present language does not distinguish institutional (or permanent) from individual (or temporary) permits, since all seem to fall into the latter category.

On page 14 of the E.I.S., alternatives to the proposed action are given. The first of these includes no sanctuary and proposes an outer boundary to Pennekamp State Park of 300 feet. In my judgement this is insufficient to preclude illegal park activities. Such a boundary should extend a minimum of 1000 feet.

Thank you for your kind attention to these comments.

Yours sincerely,

Walter M. Goldberg, Ph.D.  
Assistant Professor

1252 Walsh Ave. Apt. 28K  
Coral Gables, Florida 33146  
September 11, 1975

Dr. Robert Kifer  
Marine Sanctuary Coordinator  
Office of Coastal Management, NOAA  
11400 Rockville Pike  
Rockville, Maryland 20852

Dear Dr. Kifer:

I am pleased to learn of the proposed Key Largo Coral Reef Marine Sanctuary. This is an important step forward in the preservation of the South Florida coral reef tract.

The extension of the protected reef area offshore from the seaward edge of Pennekamp Park to the 300 foot isobath is an excellent idea. This will prevent the current practice of divers anchoring outside the boundary and entering from the east. The prohibition against spearfishing will aid greatly in preserving the natural fish population of the sanctuary. In general the regulations prohibit most activities within the sanctuary which might be detrimental to the reef ecosystem. I wish to take issue with some of them, however.

6. Fishing. The present regulations allow commercial fishing of spiny lobster and stone crab within the sanctuary.

The Draft EIS speaks of management to avoid "excessive stress" on the ecosystem and to achieve a proper balance of uses. This is a commendable attitude but I feel is not the best philosophy of management for the proposed sanctuary. The Draft EIS is proceeding on the "multiple use" philosophy much like the management of the U.S. National Forests. A more desirable approach is

the "wilderness" approach, that is attempt to keep the area in its natural state.  
In terms of fishing this would entail a prohibition of all bottom fishing, which is one of the options discussed on p. 15 of the Draft EIS. The species involved are valuable commercial species- spiny lobster, stone crab, snapper and grouper- but the extension of the protected region to the 300 foot isobath offers a unique opportunity to protect a sample of the deeper organisms. The general concept of wilderness areas is discussed further below.

A second option would be to determine the effect of commercial pot fishing on the reef ecosystem. This has some potential for damage to the reefs. Spiny lobster pots are ballasted with concrete and weigh about 40 lbs. Lobstermen try to place them on the reef flats because lobster move from the reefs to the reef flats at night to feed. Some pots may inadvertently be dropped on the reef, especially with the increased fishing effort applied this year subsequent to the closing of the Bahamian shelf. A 40 lb lobster pot can be expected to do damage to a reef and weighs more than many anchors, which are properly treated in the proposed regulations. If the increased fishing effort proves detrimental to the reefs corrective measures must be taken.

8d. Operation of Watercraft. My preference is to have a "no wake" prohibition, expressed as in 8g. A speed limit is difficult to enforce and most boat operators have no way of judging their speed. Also, a displacement hull moving at 4 mph can leave a large wake.

p.12-16. There is evidence of an ostrich philosophy in this discussion of future action or another nomination "... if it becomes evident a larger area is necessary to sustain the ecological balance..."<sub>1</sub>

It is evident now that the major threats to the reef ecosystem of both Pennekamp Park and the proposed Sanctuary are from activities outside the preserved area. "The John Pennekamp Coral Reef State Park, off Key Largo, Florida, was established in 1960, the first and one of the most beautiful underwater reserves in the world. Yet within only 12 years, substantial sections of coral reef were dying from excessive sewage and industrial wastes, as well as from turbidity caused by dredging..."<sup>2</sup> Strict control over dredging and other activities is needed now in a buffer zone upstream of the proposed Sanctuary to control the quality of water going into the park. The reef is not only the most visible part of a biotic and physiochemical continuum. All parts must be healthy or the reef will die.

#### Recommendations

1. An effective enforcement system must be developed, with adequate funding and heavy fines. Many persons in the area make their living from activities which will be prohibited in the sanctuary and small fines will not deter them.
2. An active research program should be funded to monitor the sanctuary and to further document the need for expansion of the controlled area.
3. A strong advisory group with advise and consent power over sanctuary regulations. Representation should be included from all groups concerned with the coral reef ecosystem. Groups which come to mind are coral reef biologists, commercial and sport fishermen, local dive boat operators, and enforcement officials.

2. Allen, R., 1975. Marine parks: the Cinderella of conservation. New Scientist, 14 August. p.366-369.



4. The proposed sanctuary should be managed as a "Wilderness" area, not as a "Multiple-use" area. The South Florida coral reef tract is an unusual and delicate ecosystem. The sanctuary should try to preserve a section of it in as natural a state as possible. Such areas are needed as reservoirs of genetic diversity and as control areas against which to measure man's impact on the environment. Today extracts of Caribbean reef coral show great promise in developing a "morning after" contraceptive and a Red Sea reef fish is yielding a 100% effective shark repellent.

If representative samples of all ecosystems are not preserved in their natural state they and their benefits to mankind will be lost forever.

Sincerely,

*Walter P. Stepien, Jr.*

Walter P. Stepien, Jr.

M.S. Fisheries- University of Miami

Associate Member- American Institute of  
Fishery Research Biologists

J.D. student- Ocean and Coastal Law Program,  
University of Miami School of Law

UNIVERSITY OF MIAMI  
CORAL GABLES, FLORIDA 33124

SCHOOL OF LAW  
P. O. BOX 248087

September 16, 1975

Dr. Robert Kifer  
Marine Sanctuary Coordinator  
Office of Coastal Zone Management NOAA  
11400 Rockville Pike  
Rockville, Maryland 20852

Dear Dr. Kifer:

In reviewing your Environmental Impact Statement for the Key Largo Coral Reef Marine Sanctuary I was deeply impressed not only by its thoroughness but by its detailed description of unique coral formations and related fauna and flora located therein.

I. Salient Features of Environmental Impact Statement

A. Project Description

The area nominated as a recreational and esthetic marine sanctuary specifically excludes the State of Florida John Pennekamp Coral Reef Park, but embraces a marine area adjacent thereto beginning at the three-mile territorial limit and extending seaward to the 300 foot isobath.

Included in the nominated area, however, is the Key Largo Coral Reef Preserve established March 17, 1960, by President Dwight D. Eisenhower under provisions contained in the Federal Outer Continental Shelf Lands Act.

B. Proposed Management of Nominated Area

Administration of the marine sanctuary is reposed in the State of Florida, Department of Natural Resources, Division of Recreation and Parks pursuant to an agreement between the Governor of the State of Florida and Administrator of the National Oceanic and Atmospheric Administration (NOAA).

C. Proposed Rules and Regulations

These include 14 individual categories that deal with such prohibited activities as (1) Removal and Destruction of Natural

Features; (2) Dredging, Filling, Excavation and Building Activities; and (3) Refuse and Polluting Substances, but limited exercise of such recreational pursuits as (6) Fishing, (7) Skin Diving, (8) Operation of Water Craft and (9) Photography. Others pertain to (11) Explosives and Dangerous Weapons, (12) Closing of the Marine Sanctuary, (13) Report of Accidents and (14) Disorderly Conduct. (See pp 4 and 5 of Statement.)

#### D. Implementation of Rules and Regulations

The Statement declares that "implementation and administration of governing rules and regulations for the marine sanctuary will be by the State of Florida, acting in its role as NOAA's contract manager; and that pursuant to 14 U.S.C., Sec. 89 the U.S. Coast Guard shall have the responsibility for surveillance and enforcement." (See p 12 of Statement.)

### II. Suggested Policies with Respect to Administration and Enforcement

A. The Statement further declares that "any person subject to the jurisdiction of the United States who violates any of the provisions of the governing regulations pursuant to Title III of the Marine Protection Research and Sanctuaries Act of 1972 (P.L. 92-532) will be liable to a civil penalty of not more than \$50,000 for each such violation to be assessed by the Administrator. Each day of a continuing violation would constitute a separate violation." Also, "A vessel used in violation of a regulation promulgated herein would be liable for any civil penalty assessed for such violation and could be proceeded in the appropriate District Court of the United States having jurisdiction thereof." (See p 12 of Statement.)

Since these violations and prohibitions are so broad in scope, many instances of which may be factually insignificant, it is evident that enforcement policies and procedures be established that will allow the Administrator of the sanctuary to properly assess civil penalties commensurate with the character and extent of the infraction.

#### B. Enforcement Recommendations.

1. While implementation of governing rules and regulations of the marine sanctuary is by agreement reposed in the State of Florida "acting in its role as contract manager" responsibility for

surveillance and enforcement is assigned to the U.S. Coast Guard.

2. This assignment is evidently made necessary by a provision in the Outer Continental Shelf Lands Act (14 U.S.C., Sec. 89), which statute vests sole jurisdiction over these lands in the U.S. Government.
3. To facilitate enforcement of governing rules and regulations it is urged that a hearing officer be appointed by the Sanctuary Coordinator who will have the responsibility of determining the nature and extent of the infraction and assess such penalty deemed appropriate under the circumstances.
4. Such hearing officer need not be a member of the legal profession. For the protection and betterment of the Sanctuary it is preferable that he be generally versed in scientific and marine matters.
5. All infractions of governing rules and regulations brought to the attention of the hearing officer are subject to review of the Coordinator; provided that written application for such review is made in 30 (thirty) days.
6. Where major violations are involved, however, such as taking of fish by commercial vessels; extensive removal or debasement of coral formations and other natural features; introduction of poisons and other prohibited substances; etc., for which a penalty of \$5,000 (five thousand dollars) or more has been assessed, such infraction would be subject to judicial review by a U.S. District Court of competent jurisdiction.

Trusting that these recommendations will be given due consideration, I remain

Sincerely yours,



Dorian Cowan  
Research Associate  
Ocean and Coastal Law Program

DC:by

UNIVERSITY OF MIAMI  
CORAL GABLES, FLORIDA 33124

SCHOOL OF LAW  
P. O. BOX 248087

September 24, 1975

Dr. Robert Kifer  
Marine Sanctuary Coordinator

Should All Bottom Fishing in Nominated Area be Prohibited?

1. Though not identical in all respects the proposed rules and regulations set forth in the Environment Impact Statement of August, 1975, generally adhere to those recommended by Harmon W. Shields, Executive Director Department of Natural Resources of the State of Florida. (See communication of Jan. 23, 1975, addressed to you as Marine Sanctuary Coordinator.)
2. Rule #6 of the proposed regulations, which pertains exclusively to fishing, (see p. 7 of Impact Statement) is a particularly interesting example of following Florida's recommendations. Though sport and commercial fishing are specifically prohibited, it further states:

"The taking of crawfish, spiny lobster and stone crab with traps for commercial purposes in accordance with the fishing laws of the State of Florida Department of Natural Resources is allowed. All trap floats shall be marked with flags at all times. All traps must be removed from the waters of the marine Sanctuary during the closed season . . ."

3. It should be mentioned, however, that the Impact Statement recognizes the possible need for adoption of different regulations.


"This would involve either permitting, in the judgment of the nominators, activities that would stress the coral ecosystems or preclude uses not considered injurious." (p. 14 of Statement)

4. One such option, of course, is to preclude all bottom fishing. This, as explained on p. 15, would have a direct impact on those who fish for lobster, crawfish and stone crab.

"Such fishermen would need to travel a much farther distance to set their traps. It is possible that total protection of the species is part of their habitat and would result in a greater abundance in the unprotected areas. This option would preclude the possibility of damage to the corals by the pots."

5. We are in full agreement with the substance of these observations and hold the opinion that the governing rules and regulations be revised to prohibit all bottom fishing in the nominated area. There is little question that lobster, crawfish and stone crab are in diminishing supply in adjacent unprotected waters and such measure would aid materially in the replenishment of these species.

Needless to say it would also preclude the possibility of damage to corals and other natural features from submergence of traps and related equipment.

  
Dorian Cowan  
Research Associate, Ocean and  
Coastal Law Program

September 12, 1975

Senator Richard Stone  
Suite 200 B  
2639 North Monroe Street  
Tallahassee, FL 32303

Dear Senator Stone:

This is in reply to your correspondence of September 9, 1975, concerning the "Key Largo Coral Reef Marine Sanctuary". After reading the proposal and giving it some afterthought, I feel such would be of benefit to the vast proportion of the electorate and citizenry. I fully realize some, particularly those in the land fill industry or those in the collection and sale of shells or coral, might feel it is an infringement on their right to free enterprise, however, ultimately it would benefit all in assuring the non-depletion of our natural resources. While the proposal allows for bottom fishing and crawfish pots these might later be restricted and such would allow for a breeding and maturity of those species which could then swim to non-restricted waters where they could be taken by sportsmen and commercial fishermen alike.

It is the quality of life which must be preserved and such is best found in a rational control of one's environment between the extremes of free enterprise and conservation.

Thank you for the confidence you have placed in my opinion and if I can be of further help, please feel free to contact me.

Sincerely,



Isadore Weintraub

William J. LORING

530 Grinnell St.

Key West, FL 33040

September 26, 1975

Director

Office of Coastal Zone Management

NOAA 3300 Whitehaven St. N.W.

Washington, D.C. 20235

Dear Sir

As a property owner in Monroe County, both Key West and Upper Keys, I request that you favorably consider the proposal to set aside the land and water adjacent to Pennekamp State Park for use as a Natural Marine Sanctuary.

There is little ~~enough~~ enough space left to natural beauty and estuarine productivity to warrant the risk of more dredge and fill operations.

Please help save what is left of the Florida Keys.

Sincerely

WJL



Sept 26, 1975

Director  
Office of Coastal  
Zone Management  
NOAA 3300 Whitehaven St. N.W.  
Washington, D.C. 20235

Dear Sir:

As a landowner in Monroe  
County, Florida, I want to urge  
you to support the proposed sanctuary  
adjacent to Pennkamp State Park.  
Much of our beautiful land and  
water in the Keys have been  
ruined by dredging and filling  
operations - let us keep what  
little natural beauty that is left.  
Sincerely,  
Gay Loring (over)

Sept 26, 1975

Director  
Office of Coastal  
Zone Management  
NOAA 3300 Whitehaven St. N.W.  
Washington, D.C. 20235

Dear Sir:

As a landowner in Monroe  
County, Florida, I want to urge  
you to support the proposed sanctuary  
adjacent to Pennkamp State Park.  
Much of our beautiful land and  
water in the Keys have been  
ruined by dredging and filling  
operations. Let us keep what  
little natural beauty that is left.  
Sincerely,  
Ray Foring (over)

# UNIVERSITY OF MIAMI

Dorothy H. and Lewis Rosenstiel  
SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE

10 RICKENBACKER CAUSEWAY  
MIAMI, FLORIDA 33149  
(305) 350-7211  
Cable: UOFMIAMI

15 September 1975

Dr. Sidney R. Galler  
Deputy Assistant Secretary  
Office of Environmental Affairs  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Sid,

Thanks for the opportunity to comment upon the draft statement on the Key Largo Coral Reef Marine Sanctuary. As you may know, I first proposed the Key Largo Coral Reef Preserve, worked hard to make it a reality, and wrote in draft form the original regulations for its policing. At the time we established the boundaries we did not foresee that coral collectors and spear fishermen could violate the regulations by anchoring offshore of the 10 fathom contour and swimming into park waters.

I have read the proposed legislation and am in full accord with it. I regret, however, that the wider coverage was not accepted. The Biscayne National Monument to the northward is plagued by the same troubles as the Key Largo Coral Reef Preserve. The inclusion of the Monument would have harmed no legitimate interests and would have helped in the safeguarding of its resources.

In the original proposal drafted by Mr. Dennis O'Connor I had specifically requested that the hiatus between the Key Largo Coral Reef Preserve and the Monument be included as its omission endangers both areas at their respective ends. On page 14 of the statement it says that the reason for leaving this hiatus out is because it contains a ship channel and also makes for easier boundary marking. Neither of these statements is true. The hiatus contains a small boat channel but I can assure you that no ship, in any sense of the word, can pass through this channel. The continuation of the boundary line northeastward along the Monument would leave no doubt that the waters of the hiatus were included and would not leave doubts as to limits. I believe the omission of these northward areas will prove to be a serious error of judgement.

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*A private, independent, international university*

The following are a few specific comments:

1. p. 6-3,a. The last wording of the final sentence can be interpreted that all of the above specifically stated substances are prohibited only if they include the discharge of human sewage. This could be corrected by deleting the words "which shall include" and inserting a comma after substances and the word "including".
2. p. 7-7,a. Skin divers cannot cross over the higher part of Largo Dry Rocks, especially at low water, without touching or standing on coral formations. However, the top of the Dry Rocks is not living coral and would not be harmed by contact. I suggest changing the wording from "stand on coral formations" to "stand on living coral".
3. p. 8-8,c. The problem concerning anchor damage has long been of deep concern. Few small boat operators are familiar with proper anchoring techniques. The last sentence should be changed to "and placed so as not to drag into the coral formations". Anchors do not drift at least in my experience. Frankly, I would permit no private anchoring around major coral areas but have planted moorings which the boats would be forced to use. This would both prevent coral damage and, within limits, control the numbers of persons on a given locality at a given time.
4. p. 15-1st paragraph. I strongly object to the possibility of excluding bottom fishing when and where it does not harm the reefs. It was the promise of permitting this type of fishing that saved us from public opposition when the park areas were originally proposed. I can see no valid biological reason for prohibiting it now.
5. p. 15-2nd paragraph. The option on permitting spearfishing should not even remotely be considered.
6. p. 15-3rd paragraph. I had hoped that the possibility of excluding net fishing would not arise. The controversy between sport and commercial net fishing is psychological and sociological, not biological. No net fisherman would dream of endangering several thousands of dollars worth of webbing by setting where the nets might come in contact with razor sharp coral formations. I urge that this option be expunged.

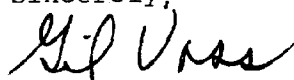
I think that you and your staff have done an excellent job in preparing this draft statement. My only regret is that it does not cover the larger area originally proposed. Is it too late to do so?

I hope to be at the hearing in the keys on September 30.

Its been a long time since we last met. I still have fond memories of the Compleat Angler in Bimini!

With best wishes

Sincerely,



Gilbert L. Voss

UNIVERSITY OF MIAMI

Dorothy H. and Lewis Rosenstiel  
SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE

4600 RICKENBACKER CAUSEWAY  
MIAMI, FLORIDA 33149  
(305) 350-7211  
Cable: UOFMIAMI

11 September 1975

Dr. Sidney R. Galler  
Deputy Assistant Secretary for  
Environmental Affairs  
Office of Environmental Affairs  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Dr. Galler:

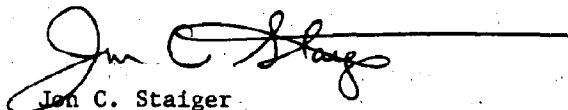
I appreciate the opportunity to review the draft environmental impact statement for the Key Largo Coral Reef Marine Sanctuary. I feel very strongly that the establishment of such a sanctuary is long overdue.

I have two comments on the draft impact statement.

The use of the term "ship channel" on page 14, in the paragraph headed Larger Boundaries, is misleading. The channel in question is not, in fact, a ship channel, but rather a shallow channel navigable by small craft only.

The second comment pertains to the proposed boundaries of the sanctuary. I feel that the northern boundary of the sanctuary should at least coincide with the southern boundary of the Biscayne National Monument. This northern extension would merge the Biscayne National Monument, the Key Largo Coral Reef Marine Sanctuary, and the John Pennecamp Coral Reef State Park into one large preserve. To perpetuate an uncontrolled corridor between these conservation areas is to invite continuing attempts to dredge a deep channel into south Biscayne Bay. Such development, I feel, would be disastrous to the ecology of both the Bay and the Florida reef tract.

Yours sincerely,



Jon C. Staiger  
Research Associate Professor  
Division of Biology and  
Living Resources

JCS:jms

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*A private, independent, international university*

American Society of Ichthyologists

and Herpetologists



24 September 1975

Dr. Robert Kifer  
Office of Coastal Zone Management  
National Oceanic and Atmospheric  
Administration  
U.S. Department of Commerce  
3300 Whitehaven Street, N.W.  
Washington, D.C. 20235

Dear Dr. Kifer:

I am writing in regard to the proposed Key Largo Coral Reef Marine Sanctuary on behalf of the Committee on Environmental Quality of the American Society of Ichthyologists and Herpetologists. This is a very fine and, perhaps, long overdue proposal which we hope will become reality in the near future. The impact that this sanctuary would have on the environment is obviously beneficial.

Three questions have arisen with regard to the draft environmental impact statement on this proposed marine sanctuary. On page 7, the term "tropical fishes" is used. This should definitely be clarified as to what is meant. I would assume that tropical fishes as used here refers to fishes within the proposed sanctuary area that are of no sport or food value and would include brightly-colored reef fishes that would be suitable for use as aquarium fishes.

Again on page 7, first paragraph, third line down, reference is made to allowing the use of "nets for the taking of surface and midwater fishes..." We question the adviseability of this as (1) nets are far more effective in removing large numbers of fishes than are both hook and line fishing and spearfishing, and (2) the use of nets, particularly nets operated in midwaters, around stands of coral does provide the potential for direct damage to corals as well as to the nets. Furthermore, what kinds of nets might be allowed? For example, would hand nets for collecting reef fishes be included?

Dr. Robert Kifer  
24 September 1975  
Page 2

On pages 14 and 15, caution is urged with regard to "modifications". Perhaps the statement on Different Regulations needs strengthening and/or greater clarification. For example, if this is to be truly a sanctuary, one would not permit the removal of plankton-picking fishes (which are reef dwellers) by nets but one could permit the taking of sport or food fishes by hook and line.

Finally, I personally regret that I will not be able to attend the public hearing on 30 September in Key Largo, but my teaching duties will prevent this. Please be assured, however, that this proposal has the support of this Committee and, I suspect, the entire membership of the American Society of Ichthyologists and Herpetologists.

Sincerely,

*Walter R. Courtenay, Jr.*

Walter R. Courtenay, Jr., Ph.D.  
Chairman

Committee on Environmental Quality

cc: Dr. James W. Atz  
Dr. Bruce B. Collette

WRC:bjr

DR. WALTER R. COURTENAY, JR.  
DEPARTMENT OF BIOLOGICAL SCIENCES  
FLORIDA STATE UNIVERSITY  
TALLAHASSEE, FLORIDA 32306



UNIVERSITY OF MIAMI

Dorothy H. and Lewis Rosenstiel

SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE

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MIAMI, FLORIDA 33149  
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Cable: UOFMIAMI

September 24, 1975

Dr. Robert R. Kifer  
Marine Sanctuary Coordinator  
Office of Environmental Affairs  
U. S. Department of Commerce  
Washington, D. C. 20230

Dear Dr. Kifer:

The delay in returning my comments on the Draft E.I.S. for the Key Largo Coral Reef Marine Sanctuary is due to my return from vacation this past week, not a lack of interest in the proposal. Northern Card Sound is the area in which I did my dissertation research, and at present I am a Co-Principal Investigator on a project entitled "Determination of the primary food sources utilized by the benthic, epibenthic and cryptic fauna in a coastal lagoon in southeast Florida" funded by ERDA.

The recent Supreme Court decision limiting the coastal waters of Florida to three miles caused concern about the future of the fringing reefs of Pennekamp State Park. Placing of the reefs under the aegis of this Federal Government is a necessity if these areas are to be maintained in their present condition.

From my observations, Carysfort Reef is one of the finest shallow reefs to be found in western Atlantic. It compares favorably with those found in the Bahamas and Grand Cayman. New growth of Acropora cervicornis and A. palmata is spreading and the fish population is high. Molasses Reef is not as attractive based on its coral growth, but it is known for its diverse, abundant and unusual fish fauna. Unusual because it is possible to observe many shy inshore game fishes in a habitat with which they are not associated. Large snook, permit and tarpon were observed by me on a recent trip.

Since most of the recreational and commercial uses occur in waters less than 100 feet I am curious about the reasons for the selection of the 300 foot isobath as the seaward boundary. Another question is raised by use of the term lobster and crawfish. I assume that "lobsters" refer to the slipper lobsters of the family Scyllaridae while crawfish are spiny lobsters, members of the family Palinuridae. Under Florida law only Panulirus argus, the spiny lobster is protected while the two other species of the genus Panulirus, P. guttatus and P. faevicauda are not.

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Page Two

The recent events in this lobster fishery and the lack of agreement between the Bahamas and the U.S. have, in my opinion, changed the management goals of this fishery. The inability of the lobstermen to fish Bahamian waters has resulted in a proliferation of the traps along the Florida coast. We do not have sufficient data to state that the resource is overfished, but certainly the effort has increased this year. Our knowledge of the resource is also limited. Life history, age and growth, the area from which the local stocks are recruited require extensive study. These factors are mentioned to give some background for the recommendation that commercial trapping be excluded from the sanctuary and that only a limited sports fishery be permitted.


A closer control over anchorage areas would prevent the destruction of coral formations by careless boaters. Anchorage areas should be marked by buoys particularly in heavily used areas such as Molasses Reef, Carysfort Reef and the "Christ of the Deep" statue.

Many local scientists have a personal interest in the management of this system, unique in continental U. S. waters. It is my suggestion that provision for participation by the scientific community be included in management of the sanctuary. In addition, funding should be provided for research on the fishery resources, the understanding of coral reef ecosystems and the socio-economic impact of the proposed sanctuary and the Biscayne National Monument on the Southeast Florida community.

I strongly support the plan for the Key Largo Coral Reef Marine Sanctuary, but adequate provisions must be made for cooperation with the State of Florida on policing of the inshore areas. Expansion of Coast Guard facilities to monitor the use of the sanctuary and enforce the recent directive prohibiting the taking of coral must also be provided.

Thank you for the chance to air my views.

Most sincerely,



Iver M. Brook  
Division of Biology and  
Living Resources

IMB/sm

UNIVERSITY OF MIAMI

Dorothy H. and Lewis Rosenstiel

SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE

Sept. 12, 1975

4600 RICKENBACKER CAUSEWAY  
MIAMI, FLORIDA 33149  
(305) 350-7211  
Cable: UOFMIAMI

Dr. Sidney K. Galler  
Deputy Assistant Secretary  
for Environmental Affairs  
U.S. Department of Commerce  
Washington, D.C. 20230

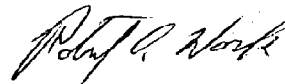
Dear Dr. Galler:

The draft environmental impact statement concerning the Key Largo Coral Reef Marine Sanctuary appears to be adequately comprehensive and carefully assembled. It is, however, unfortunate that all corals, gorgonians, non-commercial sponges, and other attached organisms cannot be fully protected throughout all of our coastal waters. This would, perhaps, preclude the need and expense for so many underwater parks, sanctuaries, monuments, etc.

I am enclosing copies of pages 11 - 14, and 18 of Appendix B in the draft. There are corrections on these pages, some of which are just corrections or updatings of scientific names. I am particularly disturbed by the statement on page 11 concerning "my conclusions" on Thalassia productivity.

It also seems incredible that a sponge, extinct since 1938, could be considered among the common sponges of the monument area (p.12); and, contrary to the statement on page 18, there are no luxuriant growths of coral and no Acropora palmata at Pacific Light.

Sincerely yours,



Robert C. Work  
Research Associate, BLM

## Basic Plant and Animal Communities

The plant and animal communities of the Biscayne National Monument area are extremely rich and varied. The following discussion is limited to the dominant communities of the area. To list the species of plants and animals found in each community would be superfluous in view of the extended list of animals and plants found in the last section of this report. To use the list of animals and plants for community or ecological purposes, one should refer to the key to the zonation and ecological habitats given at the first of the list. In the following discussions, the general code number from the extended list has been put in parentheses after the headings in order that the interested reader may refer easily to these lists.

The plant and animal communities of the marine environment within the monument waters have been described in part by Stephenson and Stephenson (1950) and Voss and Voss (1955), and for details of many of these communities, these papers should be consulted. Stephenson and Stephenson worked partly within the monument area and there are many direct references to Elliott Key and Old Rhodes Key. Voss and Voss did their report upon the nearby Soldier Key, separated from the Biscayne Monument waters by a few miles of flats and coral areas. These papers deal with the intertidal area, the reef flat and the reef tract itself. For a comprehensive review of the infauna bottom communities of the mid-portion of the bay, the papers by H. Moore and his colleagues should be consulted (McNulty, J. Kneeland, Robert C. Work, and Hilary B. Moore, 1962). These community assemblages should be found in the level bottom on the bay side of the monument.

### 1. Thalassia community (Code 3).

Within the bay, the most important community is that of the turtle grass. The turtle grass community is composed of turtle grass (Thalassia testudinum), the manatee grass (Syringodium filiforme) and Diplanthera wrightii. These grasses form dense mats on the bottom, their rhizomes forming a thick mass penetrating the bottom for eighteen inches or more. Their leaves greatly increase the available surface for the attachment of various species of filamentous algae (Humm, 1964) diatoms, foraminifera, and various bivalve mollusks. The long leaves also function as a sediment trap and assist thus in maintaining water clarity. D. Moore and Work (unpublished) made a detailed study of the Thalassia community over a three year period and concluded that it supported (the richest assemblage in species and number of individuals, of any known marine community.) The productivity of this community is very high (see Jones, 1968) and it is the known nursery ground for the early stages of the commercial shrimps of the genus Penaeus, and the crawfish, Panulirus, as well as many species of shore fishes. The main predator is the sea urchin, Lytechinus variegatus, and certain of the parrot fishes in the vicinity of lagoon patch reefs. On the borders of the Thalassia community, several algae make inroads: Penicillus, Halimeda and Laurencia.

not my  
conclusion  
certainly not  
me.

Much of the deeper portion of the bay and the eastern shore against the keys is composed of a soft, calcium carbonate sediment overlaying the rock substrate. This calcium sand is in places very shallow and the whole region must be classed as hard bottom.

extinct  
since 1938  
disease

The most conspicuous growth forms in this region are the various sponges, especially Hippiospongia gossypina ~~H. lachne~~, Spongia barbara, S. cheiris, and S. graminia, (all commercial sponges), the loggerhead sponge, Sphaciospongia vesparia, and the vase sponge Ircinia campana; the corals, Porites porites, Siderastrea siderea, S. radians and Solenastrea hyades, and the sea feathers of the genus Plexaurella and Pterogorgia anceps. This is not an area of high productivity and most of the enrichment is gained from the adjacent Thalassia beds and mangrove fringe. A considerable number of organisms live within the canals of the sponges varying in size from the large worm Eunice spongicola to thousands of snapping shrimp. The nature of these relationships has not as yet been studied. This area is important in the life histories of the crawfish Panulirus and is one of the major habitats for the stone crab, Menippe mercenaria.

### 3. Mangrove community (Code 8).

Next to the Thalassia community, this is one of the most important areas in tropical waters due to 1) its stabilization of the shore line, 2) filtering of land runoff and 3) the contribution to the organic nutrients through its leaf fall and associated organisms. This community is characterized by the three mangroves: red mangrove (Rhizophora mangle), black mangrove (Avicennia nitida) and the white mangrove (Laguncularia racemosa). Associated with these but more landward is the buttonwood (Conocarpus erectus). The plant communities of this area have been described by J. H. Davis (1940, 1942) and Craighead (1964) has discussed their relationship to land building and the effect on them of hurricanes.

On the bay side of the keys, the mangroves attain their maximum development in the monument. The most conspicuous organisms related to the mangrove community are those attached to the mangrove root props, trunks and pneumatophores. These often double the diameter of the root props themselves. These consist of the alga Bostrychia, numerous hydroids, such as Lytocarpus philippinus, encrusting sponges, con or mangrove oysters Crassostrea ~~viridis~~, the pearl oyster Pinctada ~~retusa~~, several species of barnacles, the snails Littorina argulifera and Tectarius ~~viridis~~ viridis, several species of small climbing crabs of the genus Pachygrapsus, the sea roach Ligia baudiniana and occasional sea urchins. Beneath the mangroves in the intertidal zone or just above can be found the gastropods Melampus, Detracia, and Truncatella and hunting in this area but living above the high tide mark, the large land crabs Ucides, Cardisoma and Gecarcinus.

#### 4. The supralittoral and intertidal.

The east side of the keys is mainly rocky in the intertidal and has been well studied in regards to its ecological zonation by Stephenson and Stephenson (1950) and Voss and Voss (1955). The Stephensons divided this region into the upper platform (from the line of land vegetation to the sea edge(?)), and the lower platform which extended from this out to the reef flat. These areas were further subdivided into color zones based upon exposure, weathering, algal mats and other factors. From the land out, these were -- upper platform (white, grey, black and yellow); lower platform (no color zones given). Voss and Voss in their study of Soldier Key did not use this color zonation but divided the intertidal into upper platform, platform face, and lower platform, features that can be seen easily in most seaward areas in the monument.

##### Upper platform.

White zone. -- This is the actual meeting place of land and sea and is bleached white by salt spray and no fully marine animals or marine plants live in it. Animals present are: the hermit Coenobita, the isopod Ligia, two crabs Sesarma and Cyclograpsus, and the snails Tectarius, Truncatella and Detracia.

Grey zone. -- This lies between the white and the black zones. Plants are: Sesuvium, Batis, Salicornia and others. The animals are: Littoriziczac, Tectarius muricatus and tuberculosus, Echinus nodulosus, Nerit peltifrons and N. versicolor (all gastropods), and the aforementioned crabs as well as the other organisms mentioned above.

Black zone. -- This zone is wetted at high water spring. Its black color is derived from the coloring effects of certain blue-green algae Entophysalis and Brachytrichia, and the dry mats of the alga Bostrychia. Animals in this zone are most of those mentioned above with the addition of Planaxis lineatus, a snail and the common snail Batillaria minima which may occur in vast mats.

##### Platform face (yellow zone) (Code 2).

The platform face is occupied by the yellow zone which is the true intertidal zone of the inshore. The characteristic color is given by the wet mats of algae, primarily such forms as Anadyomene stellata, Cladophoropsis membranacea, Catanela repens, Centroceras clavulatum, Ceramium fastigiatum, Polysiphonia howei. Higher up, Bostrychia and Valonia are dominant. All of these algae form dense mats that offer refuge to numerous small animals.

The animals within the yellow zone are too numerous to list here but include numerous specimens of the barnacles Chthamalus stellatus and Tetraclita squamosa, the vermetid mollusk Spiroglyphus, the false limpet Siphonaria pectinata and alternata, various fissurellids, especially Diadora listeri, the snails Batillaria minima, Thais rustica, Gantheus tinctus, the true limpet Acmaea and the slug Cathidium floridanum. The

(Cochitella)

## Brachydontes

large chiton, Acanthopleura granulata, is common along with the mussel Mytilus exustus and the oysters Isognomon alata and I. chemnitziana. - bicolor  
Numerous other animals are found in this zone. They are listed in the species lists.

### 5. Shallow water.

#### Lower platform (Code 2)

The lower platform is difficult to separate from the so-called reef flat. It begins at the bottom of the platform face. It is often distinguished by the somewhat steeper slope, very rough eroded stone floor, and the presence of most of the area of the yellowish-green carpet of Laurencia papillosa and associated green and red algae. Dominant in many places in holes in the rock is the sea urchin Echinometra lucunter, the mussels Area barbata and A. umbonata. Several anemones are found here, Phymanthus crucifer, Aiptasia annulata and Condylactis gigantea. Many species of crabs are found under rocks in this area. For a more complete listing, see the species list.

#### Reef flat (Code 5, 9, 10)

This is a general term that takes in the entire area east of the keys except the reef itself. Distinct communities have not been recognized in that area except for the extensive Thalassia community already mentioned, and the lagoon patch reefs and the outer reef. These will be treated separately.

### 6. Lagoon patch reef (Code 7).

One of the most prominent features found within the Hawk Channel is the lagoon patch reef. These are found around Bache Shoal, Margot Fish Shoal, and back of Triumph Reef, Long Reef and Ajax Reef. These reefs have been studied in detail by Voss and Bayer (1968), Jones (1963), and Ebbs (1966).

Commonly, the patch reef is a structure formed of living masses of coral heads rising directly from the bottom in 10-20 feet of water. They have nearly perpendicular sides and rise to within two or three feet of the surface. The bottom around them is usually flat and covered with Thalassia except for a ring, several yards wide, of clear sand caused by the grazing of parrot fishes. The patch reefs in the monument area range in size from individual coral heads to masses several hundred feet across.

The mass of the reef is made up of corals, primarily Diploria, Eusmilia, Isophyllia, Montastrea, Porites and Siderastrea, with associated Acropora cervicornis, Agaricia, Dichocenia, and others. These corals are usually compacted and often filled in between with coral rubble forming a reef top on which grow a profusion of sea feathers, whips and fans, of which the genera Eunicea, Muricea, Plexaura,

Sponges and alcyonarians are found widespread over much of the monument area. Dense stands occur in the cuts between the islands, where swift currents flow. Sparse growths are found around the islands themselves and throughout the Bay as well. Sponges and alcyonarians, especially the latter, are also important components of the coral patches in the zone to the east of the islands; in this community they are included in the symbol for corals, and are not marked separately.

Patches of the limestone base emerge as bare rocks in some regions, primarily in the surf zone around the islands. In addition to supporting a distinct community, these regions are noteworthy because the rock is greatly eroded and pitted by solution, forming a very sharp, hard substrate that should be avoided by waders and boaters.

Although some corals (e.g., Porites, Manicina, and Siderastrea are scattered throughout the monument area, large coral patches are found in only in two zones. Seaward of the dense Thalassia zone to the east of the islands is an area of dense but discrete coral patch reefs. In addition to large coral heads, these patch reefs also include dense growths of alcyonarians and sponges. Some of the patches, especially in the Margot Fish Shoals, contain large patches of Acropora cervicornis, but this is not really widespread. The patch reefs are scattered throughout a matrix of rather dense Thalassia; they do not form a solid bottom cover.

A zone of outer reefs is located still farther to the east. This is largely an area of dead reefs (indicated by coral rubble) although there is some living coral in this region. Only in the southern end of the outer reef -- around Pacific Light -- do large, ~~luxuriant~~ growths of corals, primarily ~~Acropora palmata~~, occur. Scattered heads of coral  
~~Montastraea~~

(No A.  
palmata)

Finally, in many regions around the islands and along the mainland, mangroves extend for varying distances into the water. This is a distinctive community subject to rather sharp delineation and therefore portrayed accurately on the chart.

Considering all of the zones, the following can be summarized: generally, proceeding from the shore (either mainland or islands) seaward, one passes from either mangroves or bare rocky coast successively through an algal zone, a sparse alcyonarian-sponge zone, and a marine grass zone. The relative extents of these zones are influenced at least partially by depth, bottom type, and salinity. Finally, east of the islands, a coral patch reef zone, a sand patch zone, and a barrier reef coral rubble zone are encountered. The dominant feature of the Bay itself is the large central sand zone with scattered Thalassia, alcyonarians, and sponges. The most prominent features outside the Bay are the dense beds of Thalassia and secondarily the coral patch zone.



# Sea Trail Motel

UNDERWATER GUIDE - REEF TRIPS - PHOTOGRAPHY - CERTIFIED SKIN & SCUBA INSTRUCTION

P.O. BOX 91

ROUTE 1, KEY LARGO, FLORIDA 33037

305-852-8001

Oct. 6, 1975

Office of Coastal Zone Management  
3300 White Haven Street N.W.  
Washington, D.C. 20235

Gentlemen:

We are writing to you as suggested by Dr. Robert Kifer, Program Manager of the Marine Sanctuary's Program, who represented NOAA at the town meeting in Key Largo Sept. 29th.

First of all we would like to receive a copy of the Final Environmental Impact Statement when it is completed.

Next we would like to list our suggestions which we hope will be reviewed and incorporated into the final statement.

1. Put the divers flag down when divers are not in the water, whether you are traveling, anchored, at dock, or whatever.
2. When diving at the reefs, anchor the boat on either side of the reef, in the sand. Most of the reefs are only about 1000 yards wide. Divers may swim to the reefs rather than anchor on them. We have affirmative proof that anchoring on the coral tears, breaks and stresses the coral. This damage allowed to continue would certainly eventually kill the reefs.
3. Make it mandatory that dive trips must have an underwater guide in the water with the people to keep them together and keep them from stressing the coral. Most people including those in private or rental boats do not know how brittle the coral is and how easily it can be broken or stressed.
4. No boats should be allowed out in rough weather. Many boaters pay no attention to the Coast Guard small craft warning. If winds are 15 knots or more, dive trips and boat rentals or whatever should be cancelled. Approximately 90% of the people cannot handle boating, diving, etc. in rough water and consequently smash against the coral, breaking and stressing it.

Thank you for allowing us to voice our suggestions. We sincerely hope that they will be of value to you in your final decision making.

Very truly yours,

*Eva + George Wielander*  
Eva and George Wielander  
Proprietors

# GARY ARSOUCIE

STILL POND, R.F.D. NO. 1 • NORFOLK, CONNECTICUT 06058

16 October 1975

Office of Coastal Zone Management  
National Oceanic and Atmospheric Administration  
Rockville, MD 20852

Gentlemen:

RE: Draft Environmental Impact Statement, Key Largo  
Coral Reef Marine Sanctuary

I fully support the draft EIS and the nomination of a portion of the coral reef complex off Key Largo and the Florida Keys in general. In amplification, I should like to offer the following specific comments:

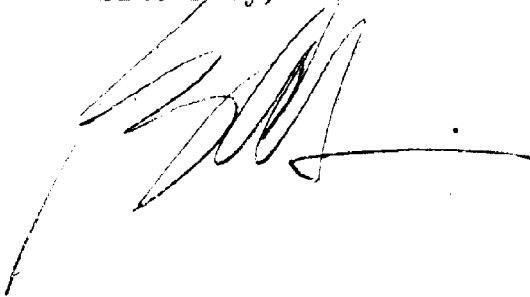
- 1) The most serious, and in fact the only real, defect in the DEIS is the total absence of information concerning the procedure and timetable for review and commentary. It is not enough merely to comply with the public-participation sections of the law; it is necessary that federal agencies actively solicit public input and aid the public in making it (see the Court of Appeals' so-called Storm King decision, 1965).
- 2) Preserving the options for management, for enlarging the sanctuary, and for nominating other coral reef sanctuaries in the future are especially important, and I am happy that OCZM/NOAA included these options.
  - a) I suggest that OCZM/NOAA solicit from Congress an appropriation to study other areas of the Keys' coral reef and to establish some sort of monitoring system so that future endangerment or degradation of the coral reef complex outside the sanctuary can be detected as early as possible and so that nomination in the future of some other tract might not go by the boards purely out of ignorance.
  - b) The agreement between the federal government and the State of Florida for administration and management of the sanctuary by the latter should contain specific reverter provisions so that both parties and the general public shall be informed as to the conditions

under which the people of the United States and their agents are turning over to the people of Florida and their agents the stewardship of property and resources owned by all the people of the United States.

- c) The reefs and other marine environments adjacent to the Marquesas and the Dry Tortugas should be studied at an early date so that options for management, administration, use, and preservation can be developed in a timely manner. As the other islands of the United States which are more accessible become bridged, roaded, developed, and thereby degraded as island environments, these little known extensions of the Keys will become increasingly important for their recreational, scientific, and conservation potential.

Again, let me state my endorsement and support of the draft EIS. And thank you for sending me a copy and giving me an opportunity to comment on it.

Sincerely,

A handwritten signature in black ink, appearing to be a stylized name, possibly "S. J. ...". The signature is written in a cursive style with a long horizontal line extending to the right.

October 2, 1975

PAGE 1

Nancy Hunt

484 N.E. 59 St. #B

Miami, Fla. 33137

Office of Coastal Zone Management

3300 White Haven St., N.W. PAGE 1

Washington, D.C. 20235

Gentlemen:

I'm writing to you concerning the Draft Environmental Impact Statement proposed for the Key Largo Coral Reef Marine Sanctuary.

I very rarely write letters to any government officials because it never seemed to do any good. The very men elected into their positions listen to the majority, and the majority is controlled by the love of money instead of conservation and preservation. The man who is capable of purchasing a large amount of "useless" and "nonproductive" wooded land to build condominiums is usually successful in going over the heads of the local folks who want the woods to remain intact.

The same goes for the Key Largo coral reefs. The government officials in that locality will listen to the people who make their living from exploiting those reefs or else they won't get votes in the next election. I was there, at the hearing, and saw this happening. I went there as a representative for New England Divers, Inc. which is in Miami. Many of the concerned citizens present at the hearing were there to stand up for their own personal, selfish interests such as diving + lobster fishing. The dive shops (a handful) feared a slack in business since divers wouldn't want to visit a reef where they couldn't take anything. The fishermen, already suffering from lost investments, feared even more technicalities. Then a simple, long haired young man from an educated background stood up for his love of the reefs and its inhabitants by putting all these selfish people back in their places and explaining in a calm and absolutely correct manner that the reefs will die soon if something is not done. He said everything I wanted to say, and so well that I began to weep. And then, the whole room full of bickering people became one for this lover of the ocean was darn right about everything he said.

Now, I know you will receive hundreds of letters about why someone wants this or that done about the reefs. You'll hear many suggestions and different points of view, including my own. The decision lies in your hands, possibly without ever experiencing the beauty involved in scuba diving. I've only been certified for a couple of years in the field of scuba diving. Yet I have, in these few years, seen the horrible facts of the death of many once beautiful reefs in the middle Keys. A once brilliantly colored environment filled with all forms of life is now nothing but a mass of white formations, dead coral. A few tropical fish and lobsters live there, but only until someone takes them. This reef in particular is named Looe Key and it's dead on one side while struggling to survive on the other. All types of people who visit these reefs are all there to take something. A butterfly can't be beautiful in the clenched fist. I know this matter only concerns one proposed designation, but I want you fellows to know how serious this matter is while on the subject. Everybody wants to protect their own investments and interests regarding the marine sanctuary which is a human natural desire. Personally, I feel a person spearfishing is easier on the delicate balance of a reef than one fishing. He chooses his catch selectively, aims, and can hit, if good. Most spearfishermen are lucky to hit their prey. Then he must, if smart, return to the boat with his catch, <sup>4 FISH</sup> in order to avoid complications with barracudas & sharks. Now, a person fishing catches his prey on a basis of whatever fish happens to bite the hook, <sup>4</sup> often keeps what he catches, which is usually young, ignorant <sup>(IN THE PROTECTION OF REEFS, NOT OCEAN DEPTHS)</sup> little fish. Think of all the offspring that is denied life from ten little fish going home with the boat instead of one or more larger fish, caught by selection. I can't understand why the government thinks fishing by bait and hook is better than selective spearfishing except for 1) the majority catches fish by bait & hook and 2) the official wouldn't get a vote if <sup>said</sup> he yes, I think spearfishing is more proper than other means of fishing, let's change some laws in order to protect our marine creatures. Anyway, I propose that if people can't spearfish in this sanctuary, they shouldn't be able to fish in any manner at all. \*

Why can't this small Key Largo area, and I mean small because there is many miles of other reefs, ~~be~~ a complete, total, & true sanctuary; not just the proposed area, but Pennecamp as well. It would be the only reef in this continent that would be set aside to protect

and preserve its inhabitants, untouched by the selfish hands of our kind. There would be no lobster traps, no fishing, be it by net, trap, hook, or spearfish, and no taking of anything except those researchers dedicated in learning more about our oceans. A true underwater laboratory in its natural state. A place where one can visit to feed fish by hand, take pictures of everything pleasing as well as educational, and enjoy the beauty of a reef that has been protected from monsterial exploiters. Let me tell you, if this dream came true, Key Largo would be more famous than Disney World, while all the other reefs are taken over by man and dying more with each passing day, thousands would want to see and experience the beauty of a true reef, a free butterfly. These very men that raised all kind of care at that initial hearing would have so much business showing the reef(s) to others, they wouldn't have time to set their nets and traps elsewhere - they wouldn't need to. Of course, Key Largo would be unable to hold oodles of tourists without more hotels and the likes, but if they could stick together and pay attention, some building could be done without destroying what land and trees is there. I bet you didn't know that the millions of birds that fly internationally make Key Largo their resting point coming or going from their lengthy ocean flights. I'm getting carried away, I know, but I've wanted for so long to see a group of people like NOAA to finally start something because alone, I am nothing. I'm willing to work for this Key Largo preservation even though I'm not part of it. Oh a way, I'm thankful I'm not, because the people who live there also earn a living there, and I refuse to exploit the ocean. I couldn't make a living preaching the preservation of coral reefs without someone's support, so with NOAA, maybe I'll make it. It's the city's government system I'm concerned about because it is the network that listens to the voting citizens, who are the exploiters. But, the only thing I can do is help you understand how important this matter is for we all know life depends on our oceans. Without a rest of a coral reef, life in the ocean can't grow strong with age. And Florida is the only state with our kind of coral reefs. Please help others to understand and join together in celebration of being the wealthiest of all men, those that are rich enough to leave this butterfly free for all to admire.

Thank you for your time.

Yours,  
Nancy Hunt



STATE OF FLORIDA

Department of Administration

Division of State Planning

660 Apalachee Parkway - IBM Building

TALLAHASSEE

32304

(904) 488-2401

R. G. Whittle, Jr.  
STATE PLANNING DIRECTOR  
(ACTING)

Lt. Gov. J. H. "Jim" Williams  
SECRETARY OF ADMINISTRATION

CZM REC'D  
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Rubin O'D. Askew  
GOVERNOR

November 17, 1975

due 12/12  
CZM K21-3  
LITER

National Oceanic and Atmospheric  
Administration  
Office of Coastal Zone Management  
Rockville, Maryland 20852

Dear Sir:

Functioning as the state planning and development clearinghouse contemplated in U. S. Office of Management and Budget Circular A-95, we have reviewed the following draft environmental impact statement:

Key Largo Coral Reef Marine Sanctuary  
SAI #76-0612E

During our review we referred the environmental impact statement to the following agencies, which we identified as interested: Department of Administration, Bureau of Land and Water Management; Department of Agriculture and Consumer Services; Department of Commerce; Department of Community Affairs; Department of Legal Affairs; Department of Natural Resources; Department of Environmental Regulation; Department of State; Department of Transportation; and Game and Fresh Water Fish Commission. Agencies were requested to review the statement and comment on possible effects that actions contemplated could have on matters of their concern. Letters of comment on the statement are enclosed from the Department of Administration, Bureau of Land and Water Management and Special Projects Office; Department of Natural Resources; Department of State; Department of Legal Affairs; Department of Community Affairs; and Game and Fresh Water Fish Commission.

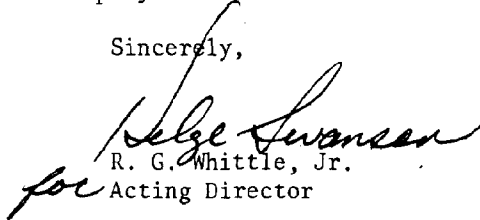
We have reviewed the draft statement and the state agency comments thereon. Based on our review, we find the proposal to be in conformance with state goals and policies. Specifically, Policy #29, "State of Florida Land Development Guide," DSP-BCP-16-75, "Maintain and enhance Florida's natural amenities, especially unique natural features." However, we are disappointed on the overall quality of the draft statement and suggest a review of the guidelines for preparing an Environmental Impact Statement prior to preparing the final report.

National Oceanic and Atmospheric  
Administration  
November 17, 1975  
Page 2

In accordance with the Council on Environmental Quality guidelines concerning statement on proposed federal actions affecting the environment, as required by the National Environmental Policy Act of 1969, and U. S. Office of Management and Budget Circular A-95, this letter, with attachments, should be appended to the final environmental impact statement on this project. Comments regarding this statement and project contained herein or attached hereto should be addressed in the statement.

We request that you forward us copies of the final environmental impact statement prepared on this project.

Sincerely,

  
for R. G. Whittle, Jr.  
Acting Director

RGWjr:kc

Enclosures

cc: Mr. John Bethea  
Mr. Charles Blair  
Mr. Bruce Burkley  
Mr. William Ravenall  
Mr. J. Landers  
Mr. W. N. Lofroos  
Mr. Harmon Shields  
Mr. Eastern Tin  
Mr. E. J. Trombetta  
Mr. H. E. Wallace  
Mr. Robert Williams  
Mr. Walter Kolb



Division of Technical Assistance

A-95 COMMENTS

Environmental Relations  
OCT 28 1975

Originator U.S. Department of Commerce Subject

EIS Key Largo Coral  
Reef Marine Sanctuary

SAI # 76-0612E

Reviewer James H. Sayes

Date 10/21/75

Staff has reviewed the Draft Environmental Impact Statement on the proposal to establish the Key Largo Coral Reef Marine Sanctuary. We would support the proposal.

We would point out that the EIS is certainly not of outstanding quality. If draft was submitted on a proposal which would have an adverse affect on the environment, it would not be approved. Perhaps a review should be made of the EIS requirements to further needed improvements.



STATE OF FLORIDA

Department of Administration

Division of State Planning

660 Apalachee Parkway - 12th Building

TALLAHASSEE

32304

(904) 488-2371

Reubin O'D. Askew  
GOVERNOR

Lt. Gov. J. H. "Jim" Walton  
LEAST SENIOR MEMBER  
SECRETARY OF ADMINISTRATION

Earl M. Sternics  
DIRECTOR

TO: Mr. William Ravenell, Sec.  
Department of Community Affairs  
2571 Ex. Center Circle East  
Tallahassee, Fla. 32301

DATE: 10-10-75  
DUE DATE: 10-24-75

FROM: Bureau of Intergovernmental Relations

SUBJECT: SAI: 76-0612 E

Please review and comment to us on the above draft environmental impact statement, copy attached. In reviewing the statement, you should consider possible effects that actions contemplated could have on matters of concern to your agency.

If you feel that a conference is needed for discussion of the project or resolution of conflicts, or if you have questions concerning the statement, please call Mr. Walt Kolb at (904) 488-2401. Please check the appropriate box below, attach any comments on your agency's stationery and return to BIR or telephone "no adverse comments" by the above due date.

On that date, we intend to consider all review comments received and develop a state position on the project. In both telephone and written correspondence please refer to the above SAI number.

Sincerely,

Chief  
Bureau of Intergovernmental Relations

Enclosure

\*\*\*\*\*

TO: Bureau of Intergovernmental Relations

FROM: COMMUNITY AFFAIRS

SUBJECT: DEIS Review and Comments

No Comments

Comments Attached

Reviewing Agency:

Signature: H. Schvertmann

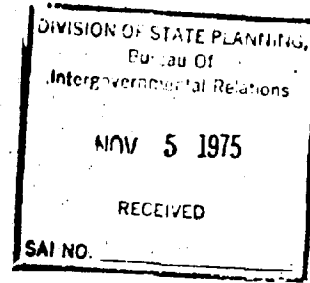
Date: 10/23/75

TO: Bureau of Intergovernmental Relations



BRUCE A. SMATHERS  
SECRETARY OF STATE

STATE OF FLORIDA  
**Department of State**  
THE CAPITOL  
TALLAHASSEE 32304



October 31, 1975

ROBERT WILLIAMS, DIRECTOR  
DIVISION OF ARCHIVES, HISTORY, AND  
RECORDS MANAGEMENT  
(904) 488-1480

IN REPLY REFER TO:

Mr. E. E. Maroney, Chief  
Bureau of Intergovernmental Relations  
Division of State Planning  
660 Apalachee Parkway  
Tallahassee, Florida 32304

Re: SAI 76-0612E: DEIS for Key Largo Coral Reef Marine  
Sanctuary.

Dear Mr. Maroney:

Our agency has reviewed the Draft Environmental Impact Statement for this project for possible impact on archaeological, historical, National Register or National Register eligible sites, and we have the following comments.

Although current files show no recorded sites within the project area the proposed marine sanctuary is within the Bahamas Channel, a major route for Spanish shipping during the Spanish Colonial Period, and very likely contains historic shipwreck sites. However, because of the administrative nature of this project we do not anticipate any effect upon cultural resources in the area and find the consideration of archaeological and historical resources outlined on page 6 of the Draft Environmental Impact Statement to be adequate.

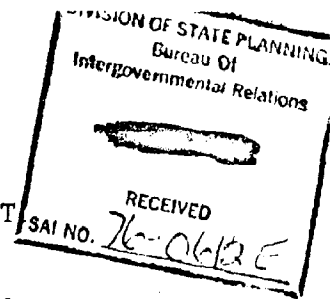
Thank you for your interest in Florida's historical resources. If we can be of further service in this matter, please do not hesitate to call.

Sincerely,

Robert Williams  
State Historic Preservation Officer

RW/Msn

COMMENT OF THE FLORIDA DEPARTMENT OF LEGAL  
AFFAIRS ON THE KEY LARGO CANAL REEF MARINE  
SANCTUARY DRAFT ENVIRONMENTAL IMPACT STATEMENT



Since the primary purpose for establishing the Sanctuary is to protect and preserve the coral and coral reef ecosystems and to insure the health and well being of the coral and associated flora and fauna, it appears wiser to amend the proposed regulations to prohibit bottom fishing within the sanctuary. The logic of this change is supported by the recitation on page 15 of the Draft Statement of the possible increased productivity in nonprotected areas due to the protection in the Sanctuary.

We agree that spear fishing should be prohibited in this area, as provided by the proposed regulations. Further, while not disagreeing with the continued allowance of net fishing in the Sanctuary, provision should be made for monitoring the use of nets and making the appropriate amendment to the regulations to prohibit such use should destruction of coral or coral reef occur.

Other than the above comments, the Draft Statement meets the approval of this Department. We give our wholehearted support to this proposed Federal Action.



STATE OF FLORIDA

*Mr. James copy*

## Department of Administration

### Division of State Planning

660 Apalachee Parkway - IBM Building

Roubin O'D. Askew  
GOVERNOR

TALLAHASSEE

32304

Lt. Gov. J. H. "Jim" Williams  
SECRETARY OF ADMINISTRATION

R.G. Whittle, Jr.  
STATE PLANNING DIRECTOR  
(ACTING)

(904) 488-1115

September 16, 1975

Dr. Robert R. Kifer  
Marine Sanctuary Coordinator  
Office of Environmental Affairs  
Assistant Secretary for Science  
and Technology  
United States Department of Commerce  
Washington, D. C. 20230

Dear Dr. Kifer:

I am pleased to respond to your recent request for comments on the Draft Environmental Impact Statement, "Key Largo Coral Reef Marine Sanctuary." This proposed action is one which is highly desirable and of major importance to the State of Florida, as well as to the nation. The protection of the fragile and irreplaceable coral ecosystems which this action will implement is long overdue. I enthusiastically endorse this action except for the minor exceptions noted below.

It is my strong feeling that regulations for operating the Sanctuary should preclude all bottom fishing. I find it inconsistent within the stated objectives of the DEIS: "to protect and conserve the coral and coral reef ecosystems, to regulate uses thereof to insure the health and well-being of the coral, and associated flora and fauna, and to make available the continual opportunity for the esthetic and recreational enjoyment which healthy reefs afford the American people," to allow activities such as bottom fishing and lobster and crab trapping which are known to be detrimental and alternative to the coral ecosystem. If the goal of the sanctuary is to provide maximum protection to this ecosystem as well as to provide for

Dr. Robert R. Kifer  
September 16, 1975  
Page Two

esthetic and recreational opportunities, I do not feel that the economic benefits to be derived by a relatively few persons within the area should take precedence over the potential for maximum protection which may be provided the ecosystem. Additionally, I feel that all net fishing within the proposed Sanctuary should be banned for the same reasons. I would also note that in the DEIS it is not stated that a proposed goal of the Sanctuary is to provide economic opportunities, destructive and alterative to the ecosystem, for the benefit of local commercial fishermen.

Thank you for providing me the opportunity to comment on this highly significant action. If you should desire further elaboration on any of my statements or views, or to participate in any of the public formal activities involved in the implementation of this proposed action, I am at your service.

Sincerely,

James I. Jones, Ph.D.  
Special Projects Officer  
Division of State Planning  
and  
Marine Science Advisor to  
the Governor

JIJ/bj



STATE OF FLORIDA

# Department of Administration

## Division of State Planning

Reubin O'D. Askew  
GOVERNOR

Earl M. Starnes  
STATE PLANNING DIRECTOR

660 Apalachee Parkway - IBM Building  
DIVISION OF STATE PLANNING  
TALLAHASSEE  
32304  
(904) 488-4925  
OCT 3 1975  
RECEIVED  
SAI NO.

Lt. Gov. J. H. "Jim" Williams  
SECRETARY OF ADMINISTRATION

October 30, 1975

### MEMORANDUM

TO: Wayne Voigt

FROM: Eastern Tin *EWJ*

SUBJECT: SAI 76-0612E

The Bureau of Land and Water Management has reviewed the draft EIS for the Key Largo Coral Reef Marine Sanctuary. The coral reefs of the Florida Reef Tract are a valuable natural resource of Florida and of the Nation. The value and the present stresses which the reefs are presently undergoing were described in the Final Report and Recommendations for the Proposed Florida Keys Area of Critical State Concern. The regulations and restrictions which would accompany the marine sanctuary are compatible with the objectives outlined in the rule (Chapter 22F-8, F.A.C.) designating the Florida Keys as an area of critical state concern and would provide for a greater degree of protection. We, therefore, would recommend that the proposed area be designated as a marine sanctuary.

EWT/TFpk

cc: Walter Kolb



STATE OF FLORIDA

Department of Administration

Division of State Planning

660 Apalachee Parkway - IBM Building

TALLAHASSEE

32304

(904) 488-2371

DIVISION OF STATE PLANNING, Bureau Of Intergovernmental Relations, NOV 4 1975, RECEIVED, SAI Reubin O'D. Askew GOVERNOR, Executive Director Lt. Gov. J. H. "Jim" Williams, Department of Natural Resources, SECRETARY OF ADMINISTRATION

Earl M. Starnes, STATE PLANNING DIRECTOR

TO: Mr. Harmon Shields, Ex. Dir., Department of Natural Resources, 202 Blount St., Crown Building, Tallahassee, Fla. 32304

DATE: 10-10-75

DUE DATE: 10-24-75

FROM: Bureau of Intergovernmental Relations

SUBJECT: SAI: 76-0612E

Please review and comment to us on the above draft environmental impact statement, copy attached. In reviewing the statement, you should consider possible effects that actions contemplated could have on matters of concern to your agency.

If you feel that a conference is needed for discussion of the project or resolution of conflicts, or if you have questions concerning the statement, please call Mr. Walt Kolb at (904) 488-2401. Please check the appropriate box below, attach any comments on your agency's stationery and return to BIGR or telephone "no adverse comments" by the above due date.

On that date, we intend to consider all review comments received and develop a state position on the project. In both telephone and written correspondence please refer to the above SAI number.

Sincerely,

[Handwritten signature]

Chief, Bureau of Intergovernmental Relations

Enclosure

TO: Bureau of Intergovernmental Relations

FROM: Department of Natural Resources

SUBJECT: DEIS Review and Comments

No Comments

X Comments Attached (Also, the Department staff concurs in project.)

Reviewing Agency: Department of Natural Resources

Signature: [Handwritten signature]

Date: 11/3/75

Administrative Assistant





State of Florida  
DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE MEMORANDUM

October 30, 1975

TO : Jim Smith

FROM: Paul Darst *RPDS*

SUBJ: SAI 76-0612E

The Division of Recreation and Parks has coordinated closely with NOAA on this project from the beginning. It will protect and enhance the existing Coral Reef State Park. We strongly favor it.

RPD/sc

Enclosure

COASTAL ZONE  
INFORMATION CENTER

