MARINE AND BRACKISH WATER FISHES OF SOUTHERN PALM BEACH AND NORTHERN BROWARD COUNTIES, FLORIDA

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This thesis was prepared under the direction of the candidate's major professor, Dr. Walter R. Courtenay, Jr., and has been approved by the members of his supervisory committee. It was submitted to the faculty of the College of Science and accepted in partial fulfillment of the requirements for the degree of Master of Science.

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ABSTRACT

Herrema, David Jack. 1974. Marine and brackish water fishes of southern Palm Beach and northern Broward Counties, Florida. Master of Science thesis, Florida Atlantic University, Boca Raton, 257pp.

Five hundred eighty-three (583) species of fishes in 115 families are recorded for this Atlantic coastal locality in southeastern Florida. Two hundred six (206) of these are considered primary reef species. Habitat preferences, depth distributions, and qualitative categories of abundance are included. One new species, Apogon leptocaulus Gilbert, and two new continental records, Acanthemblemaria chaplini Böhlke and Lipogramma trilineata Randall, were collected during this study. L. trilineata is the first confirmed record of the family Grammidae in the continental United States. Microgнathus ensenadae (Silvester) is also added to the fish fauna of the United States. An additional 198 species and 11 families are recorded as neighboring to the study area. Zoogeographic comparisons are discussed. Tropical reef fishes maintain permanent populations at least as far north as Palm Beach, Florida. Five hundred references pertaining to Caribbean and south Florida fishes are cited.

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INTRODUCTION

The first comprehensive study of a Florida fauna was undertaken at Tortugas by William H. Longley. Longley and Hildebrand's (1941) Fishes of the Tortugas was the end result, although several of Longley's publications preceded this work (Longley and Hildebrand, 1941: xi-xiii). Numerous collections in the Gulf of Mexico were compiled by Giles W. Mead (1952) into a list of the fishes of this large area. For the Gulf coast of Florida specifically, lists of fishes have been compiled for Alligator Harbor (Joseph and Yerger, 1956; Yerger, 1961); Cedar Key (Reid, 1954; Kilby, 1955; Caldwell, 1954, 1955a, 1957a; Berry, 1958a, 1958b); Tampa Bay (Springer and Woodburn, 1960; Springer, 1961; Moe and Martin, 1965); the Caloosahatchee area (Springer, 1960a; Gunter and Hall, 1965); and in the Florida Bay area (Kilby and Caldwell, 1955; Tabb and Manning, 1961; Hudson et al., 1970).

The Atlantic coast of Florida, north of the Florida Keys, has received relatively little attention. Areas studied have been Biscayne Bay (Voss et al., 1969); Jupiter Inlet and the Loxahatchee River (Christensen, 1965); Indian River and the St. Lucie Estuary (Evermann and Bean, 1884; Springer, 1960b; Gunter and Hall, 1963); and the St. Johns River (McLane, 1955; Tagatz, 1967).

Early research in the Florida Keys, such as Jordan (1884) and Fowler (1906), was primarily a compilation of species collected.

Starck (1968) provided the first reasonably definitive enumeration of a coral reef fish fauna. With the exception of the semienclosed Biscayne Bay area, no definitive work has been done on the extensive Atlantic coastal area between Alligator Reef and Jupiter Inlet. Species from this area have been included in checklists of Florida fishes (Evermann and Kendall, 1889; Briggs, 1958; Robins, 1958a), although in conjunction with ranges as listed.

This study is a survey of the fish fauna between North Miami and Palm Beach (Figure 1). The proximity of the Florida Current and a similar shelf morphology result in a fairly uniform species assemblage within this area. The Florida Current permits elements of the tropical fauna to colonize northward to the area off Palm Beach (26°45' N). North of this point the Florida Current moves seaward of the shore, and the inshore fauna is temperate in character. A series of step-like shelves, separated by rocky irregular slopes and ridges, characterize the area from Boca Raton south to North Miami (Figures 1 and 2). North of Boca Raton the bottom topography consists of a more or less continuous seaward sediment slope to the outer reef line. Located 1372 m (1500 yds) offshore, the outer reef parallels the shore from Hillsboro Inlet north to Lake Worth. South of Hillsboro Inlet the reef lies progressively farther offshore, lying 3200 m (3500 yds) off Miami Beach (Duane and Meisburger, 1969; this reference contains a detailed description of the geomorphology and sediments of the area). These reefs are distinguished by low-profile and encrusting corals, sponges, and gorgonids. High-profile corals, such as staghorn and brain coral, are not common species.

Research regarding this fish fauna had been initiated (Courtenay et al., in press). This study is a continuation of documenting the fishes of this area, a determination of additional species which may be collected in the future from neighboring sources, and a comparison with the fish faunas of other areas. Hopefully, it will serve as a guide to the taxonomic literature as regards Caribbean and south Florida fishes.

METHODS

Oceanic collections were made between Port Everglades and Boynton Beach, with the majority from between Lauderdale-by-the-Sea and Boca Raton (Figure 1). Collections from the Intracoastal Waterway and adjacent canals are from between Deerfield Beach and Boca Raton, with the exception of three collections made in north Lake Worth at Riviera Beach.

Standard collecting techniques were employed to obtain the majority of fishes listed in the systematic account. These techniques included toxicants and anesthetics, seines, cast nets, night lights, spearing, and hook and line. Visual records are limited to unmistakeably distinct species. In addition to collections and observations made by myself and associates, collections by others in this area (such as by the vessels Gerda and Pelican, and specimens recorded in taxonomic literature) were included. In the literature survey, fishes were considered to be local if collected from off North Miami to off Palm Beach (25°45' - 26°45' N). Finally, species were added based on ranges as given in the literature. Species occurring only at depths exceeding the 200 m (110 fm) contour are excluded.

Unless otherwise noted, the systematic account follows Bailey et al. (1970) with regard to phylogenetic arrangement and nomenclature. The species are listed alphabetically under each family. Species characteristically associated with reefs ("primary reef species" of Starck, 1968) are preceded by an asterisk (*). Inshore species are those which occur shoreward of the outer reef, and which are

equally or more characteristic of areas not associated with reefs (in part, "secondary reef species" of Starck, 1968). These include inhabitants of the surf zone, the sandy areas between the reefs, and many of the wide ranging forms such as certain sharks. Offshore species are pelagic forms which occur primarily from the outer reef seaward, and the demersal species which live at depths greater than 45 m (25 fms). These are characteristically not associated with reefs. In this account, worm-rock "reefs" are generally low profile, inshore sand concretions formed by the sabellariid polychaete Phragmatopoma lapidosa. Patch reefs are low profile reefs of generally limited area, and reefs are of high profile and generally extensive in area. Fishes from the Intracoastal Waterway and its branching canals have been so designated.

To indicate the abundance of each species, five qualitative categories have been used (following Starck, 1968). Rare species are those of which three or fewer specimens have been observed or collected. Occasional ones are species observed or collected at irregular intervals. Frequent species have been collected on numerous occasions, or are taken in a large percentage of collections. Common species are found during virtually every dive or collection. Abundant indicates a common species present in large numbers. The abbreviation "NC" refers to species not collected by myself or my associates. This applies to species recorded from cruises, specimens recorded from this area in the taxonomic literature, and to species whose ranges I obtained from the literature. As regards a species's range as cited in the literature, only that part of the range including my study area is generally listed.

References under a species refer to only that species unless otherwise indicated. Semicolons are used to separate phrases attributable to the same reference; periods to separate references, or references from my own comments. References often referred to and generally not specifically cited include Jordan and Evermann (1896-1900), Jordan et al. (1930), Breder (1948), Gunter (1956), Briggs (1958), Böhlke and Chaplin (1968), and Randall (1968). Leim and Scott (1966) was of considerable value in elminiating northern species from consideration. Generally, references to the higher taxa are excluded. These may be obtained from Greenwood et al. (1966) and Blackwelder (1972). For generalized familial illustrations, see Greenwood et al. (1966) and Böhlke and Chaplin (1968).

The list of neighboring species (Table 1) was prepared simultaneously with the systematic account, and should account for the majority of new additions to the fish fauna of the study area. The legend is self-explanatory, although all references under any particular species must be examined to determine my interpretation of that species's range. A question mark (?) in several instances indicates either my ignorance or the need for more definitive research as regards that species. I have excluded species in Table 1 which have been recorded only as just reaching north Florida on the Atlantic east coast, only from Tortugas, or only from the Florida west coast (exclusive of the Florida Keys).

Abbreviations besides FAU (Florida Atlantic University), are FTU (Florida Technological University), UF (University of Florida), and UMML (University of Miami Marine Laboratory).

RESULTS

Approximately 200 hours of collecting effort by myself and associates resulted in the collection of a total of 346 species of fishes. Eighty-four additional species were included based on fishes collected by others (research vessels and specimens recorded from this area in the literature). Finally, 153 species were added based on their ranges as given in the literature. A total of 583 species, representing 115 families, is included in the systematic account as occurring locally. Of this total, 206 species are considered primary reef fishes.

An additional 198 species and 11 families are listed as neighboring to the study area (Table 1) based on a survey of the literature, personal communications, and observations. Eighty-two (41.4%) of these species occur south of the study area, 11 (5.6%) occur north of the study area, 36 (18.2%) species are disjunct, and for 27 (13.7%) there is a considerable lack of information in the literature. The balance of the species is listed according to my interpretation of their range, in light of confusion in the literature.

A new species of apogonid was collected during this study. It has been described by Gilbert (1972) as Apogon leptocaulus (slendertail cardinalfish). Two species are considered new United States continental records: Acanthemblemaria chaplini Böhlke (papillose blenny), and Lipogramma trilineata Randall (threeline basslet). The collection of L. trilineata is a continental record for the family (Grammidae) as well as the species.

The harlequin pipefish, Micrognathus ensenadae (Silvester), treated as a different color pattern of M. vittatus (Kaup) by Starck (1968), is added to the fish fauna of the United States (see Systematic Account for explanation). No attempt was made to determine range extensions within the continental United States.

In the preparation of this work, 500 references have been cited. The majority are in the systematic account and list of neighboring species. Emphasis is placed on the taxonomic literature as regards fishes of the Caribbean and south Florida in particular. Pertinant geographical surveys, and a limited number of biological and/or history studies, are included.

SYSTEMATIC ACCOUNT

CLASS LEPTOCARDII

Branchiostomidae

Branchiostoma caribaeum Sundevall

Chesapeake Bay to the West Indies; adults live buried in coarse or fine sand, most numerous just below the low tide mark (Bigelow and Farfante, 1948).

Pierce (1965) collected this species from Lake Worth north on the Florida east coast. NC.

Epigonichthyidae

Asymmetron lucayanum Andrews

Circumtropical, with widely separated centers of distribution; like other lancelets, lives much of the time buried in sand (Bigelow and Farfante, 1948).

One specimen collected off Palm Beach by M. Gordon, at a depth of 16.7 m (55 ft), during the course of this study.

CLASS CHONDRICHTHYES

Order SQUALIFORMES

See Garman (1913), Bigelow and Schroeder (1948), Baughman and Springer (1950), Garrick and Schultz (1963), Randall (1963d), Springer (1963), Casey (1964), Clark and von Schmidt (1965), Heemstra (1965), Kato et al. (1967) as regards this order.

Orectolobidae

Ginglymostoma cirratum (Bonnaterre) - Nurse shark

Inshore (1.3 m) to 18 m (60 ft), occasional, observed under ledges.

See Regan (1908) for revision of family.

Rhincodontidae

Rhincodon typus Smith - Whale shark

Offshore, rare. Bigelow and Schroeder (1948) report five records from eastern and southern Florida. See also Springer (1938), Starck (1968). NC.

Note: I have followed Bailey et al. (1970), although the whale shark should probably be treated within the Orectolobidae (C. R. Robins, personal communication).

Odontaspididae

Odontaspis taurus (Rafinesque) - Sand tiger

Fowler (1936) reports six specimens from off Fort Lauderdale, 1932. See also Springer (1938). NC.

Alopiidae

Alopias vulpinus (Bonnaterre) - Thresher shark

New England to the Florida Keys; three or four reports from the east coast of Florida including one from Miami (Bigelow and Schroeder, 1948). NC.

Lamnidae

Carcharodon carcharias (Linnaeus) - White shark

Inshore and offshore, rare. Tropical to warm temperate belts of all oceans; exceedingly irregular in occurrence (Bigelow and Schroeder, 1948). See also Springer (1939). NC.

Isurus oxyrinchus Rafinesque - Shortfin mako

Offshore. A familiar fish on the Florida side of the Straits of Florida, more frequent on the Bahamian side (Bigelow and Schroeder, 1948). The International Game Fish Association (1972) records the women's 130 lb line class record from off Palm Beach, 912 lbs, caught in 1962. NC.

Carcharhinidae

Aprionodon isodon (Valenciennes) - Finetooth shark

Inshore; a tropical species occasionally straying north along the east coast of the U.S. in summer (Bigelow and Schroeder, 1948). See also Springer (1950a). NC.

Carcharhinus acronotus (Poey) - Blacknose shark

Western tropical and subtropical Atlantic; North Carolina to Brazil (Bigelow and Schroeder, 1948). See also Springer (1938). NC.

See Rosenblatt and Baldwin (1958), and Garrick (1967b) as regards the species of Carcharhinus.

Carcharhinus altimus (Springer) - Bignose shark

Reported only from subtropical waters of the western North Atlantic (Casey, 1964). NC.

Carcharhinus falciformis (Bibron) - Silky shark

Offshore, probably frequent. Two specimens were collected by the author while trolling live bait. See also Garrick et al. (1964).

Caraharhinus leucas (Valenciennes) - Bull shark

Inshore, probably occasional to frequent. One observation by the author at 4.5 m (15 ft) depth.

Carcharhinus limbatus (Valenciennes) - Blacktip shark

Inshore and offshore. One of the common pelagic sharks around the Bahamas and southern Florida (Bigelow and Schroeder, 1948). NC

Carcharhinus maculipinnis (Poey) - Spinner shark

Both coasts of southern Florida, common in winter off southeastern Florida and northeastern Florida in the spring (Bigelow and Schroeder, 1948). NC.

Carcharhinus milberti (Valenciennes) - Sandbar shark

Shoreline out to 247 m (135 fms); common from Cape Cod to West Palm Beach in summer, around the tip of Florida in winter (Springer, 1960). See also Springer (1938), Bigelow and Schroeder (1948). NC.

Carcharhinus obscurus (Lesueur) - Dusky shark

Offshore; Massachusetts to southern Florida, only in southern Florida have positively identified specimens been taken in any numbers; more pelagic than either C. milberti or C. leucas, but comes closer inshore than C. longimanus (Bigelow and Schroeder, 1948). NC.

Galeocerdo cuvieri (Peron and Lesueur) - Tiger shark

Inshore and offshore, probably occasional. One was observed during this study by J. Larsen off Pompano Beach. See also Gudger (1949).

Negaprion brevirostris (Poey) - Lemon shark

Inshore, over sand or coral mud; particularly abundant off southern Florida and on the Bahama Banks (Springer, 1950b). See also Springer (1938), Bigelow and Schroeder (1948). NC

Prionace glauca (Linnaeus) - Blue shark

Offshore. Cosmopolitan in the tropical to warm-temperate belts of all oceans; the most plentiful of the larger oceanic sharks of the Atlantic (Bigelow and Schroeder, 1948). NC.

Rhizoprionodon terraenovae (Richardson) - Atlantic sharpnose shark

Marine and brackish water to depths as great as 280 m (153 fms); Bay of Fundy south to Yucatan, Mexico (Springer, 1964). See also Springer (1938), Backus (1957). NC.

Sphyrnidae

Sphyrna lewini (Griffith and Smith) - Scalloped hammerhead

Circumtropical; common in all warm seas (Gilbert, 1967). NC.

Sphyrna mokarran (Rüppel) - Great hammerhead

Inshore and offshore. This species is the most common shark observed in this area, and the only species to approach us closely during our diving operations (in one instance, taking a speared fish from a diver). Often at the surface.

Sypyrna tiburo (Linnaeur) - Bonnethead

Western Atlantic, from New England to southern Brazil (Gilbert, 1967). NC.

Sphyrna zygaena (Linnaeus) - Smooth hammerhead

Common along this coast in winter (C. R. Robins, personal communication). NC.

Squalidae

Squalis acanthias Linnaeus - Spiny dogfish

Inshore and offshore. Although primarily a northern species, at least a few stray to southern Florida and Cuba; found anywhere between the surface and bottom to depths of 183 m (100 fms) (Bigelow and Schroeder, 1948). See also Springer (1938). NC.

Order RAJIFORMES (BATOIDEI)

See Garman (1913), Bigelow and Schroeder (1953a), Wahlquist (1966) as regards this order.

Pristidae

Pristis pectinata Latham - Smalltooth sawfish

Inshore, euryhaline. New York and Bermuda to middle Brazil and the northern Gulf of Mexico (Wahlquist, 1966). A large sawfish, probably this species, was observed during this study by J. van Montfrans off Pompano Beach at a depth of 18-21 m (60-70 ft).

Pristis perotteti Müller and Henle - Largetooth sawfish

Inshore, euryhaline. Salerno, Florida, to Brazil, and to the northern Gulf of Mexico (Wahlquist, 1966). Perhaps even more confined to shallow water (less than 6 m) and estaurine localities than P. pectinata (Bigelow and Schroeder, 1953a). NC.

Rhinobatidae

Rhinobatos lentiginosus (Garman) - Atlantic guitarfish

Inshore on sand bottoms, occasional. The deepest collected was at 11 m (35 ft). See also Garman (1880).

Torpedinidae

Narcine brasiliensis (Olfers) - Lesser electric ray

Observed on sand bottoms from 9 to 21 m (30-70 ft), probably occurs deeper as well; occasional.

Rajidae

Raja garmani Whitley - Rosette skate

Offshore. UMML R/V Gerda, cruise G-847, one specimen from 137-201 m (75-100 fms). M/V Pelican, station 16, 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

Dasyatidae

Dasyatis americana Hildebrand and Schroeder - Southern stingray

Inshore and at the reef edges. Coastal waters from New Jersey to Brazil (Bigelow and Schroeder, 1953a). One specimen collected by the author at reef edge on sand, 9 m (30 ft) in depth.

Note: Stingrays, Dasyatis spp., are frequent both inshore and along the reefs. More collections are needed to determine relative abundance of the species.

Dasyatis sabina (Lesueur) - Atlantic stingray

Inshore, euryhaline. Gulf of Mexico and Florida north to Chesapeake Bay, often running up into fresh water (Bigelow and Schroeder, 1953a). Fowler (1936) examined a specimen from off Fort Lauderdale. NC.

Dasyatis sayi (Lesueur) - Bluntnose stingray

Inshore, euryhaline. Tropical-subtropical waters north to middle Florida, most plentiful in waters less than 2.5-3 m (8-10 ft) deep (Bigelow and Schroeder, 1953a). NC.

Gymnura micrura (Bloch and Schneider) - Smooth butterfly ray

Inshore. Bigelow and Schroeder (1953a) report this ray for this area, although not as common here as farther north; most often in shallow water over sandy bottoms. NC.

Urolophus jamaicensis (Cuvier) - Yellow stingray

Inshore and at the reef edge, occasional. We did not collect any specimens in depths over 6 m (20 ft).

Myliobatidae

Aetobatus narinari (Euphrasen) - Spotted eagle ray

Boca Raton and Hillsboro Inlets, frequent.

Mobulidae

Manta birostris (Walbaum) - Atlantic manta

Inshore and offshore, rare. During this study, two have been observed at the surface over depths of 10-12 m (30-40 ft) (D. P. Herrema and J. van Montfrans, personal communications). See also Fowler (1936), Böhlke and Chaplin (1968).

Mobula hypostoma (Bancroft) - Devil ray

Offshore. On the Atlantic coast of the Americas between about Latitudes 24-25° S and 34-35° N (Bigelow and Schroeder, (1953a). See also Wahlquist (1966). NC.

CLASS OSTEICHTHYES

Order ASIPENSERIFORMES

Acipenseridae

Acipenser oxyrhynchus Mitchill - Atlantic sturgeon

Inshore, occasional. This species has been reported along the coast in this area, particularly during cold winters (C. R. Robins, personal communications). See also Vladykov (1955). NC.

Order ELOPIFORMES

Elopidae

Elops saurus Linnaeus - Ladyfish

Intracoastal Waterway, occasional. May be collected by trolling artificial baits; probably more common than the above would indicate.

See Hildebrand (1964a) as regards this family.

Megalops atlantica Valenciennes - Tarpon

Intracoastal Waterway to brackish water, common. Large individuals have also been observed (occasional) over patch reefs at 6-9 m (20-30 ft) depths. See also Fowler (1936), Breder (1944), and Wade (1962).

Albulidae

Albula vulpes (Linnaeus) - Bonefish

Known from virtually all warm seas, plentiful around southern Florida (Hildebrand, 1964b). Adults are shallow, inshore dwellers (Alexander, 1961). Probably rare or occasional locally, due to lack of suitable habitat. See also Rivas and Warlen (1968). NC.

Order ANGUILLIFORMES

Anguillidae

Anguilla rostrata (Lesueur) - American eel

Intracoastal Waterway to brackish and fresh water. Common in branching canals once fresh water has been reached.

Moringuidae

Moringua edwardsi (Jordan and Bollman) - Spaghetti eel

Two specimens were collected by C. R. Gilbert off Delray Beach, August 1967, at a depth of 19-21 m (65-70 ft).

Xenocongridae

Chilorhinus suensoni Lütken - Seagrass eel

Offshore. Smith (1969) examined four larval specimens from this area (bottom depths to 787 m, gear depth 42-147 m), and numerous specimens from adjacent areas; one of the two common species of western Atlantic zenocongrids, along with Kaupichthys hyoproroides. NC.

See Böhlke (1956a) and Böhlke and Smith (1968) as regards this family.

Chlopsis bicolor Rafinesque - Bicolor eel

Offshore. Smith (1969) examined larval specimens from both north ($27^{o}25'N$) and south ($24^{o}19'N$) of my study area; shallowest bottom depth was 203 m (gear depth 23-90 m); scarce in the western Atlantic in contrast to its abundance in the eastern Atlantic. See also Robins and Robins (1967). NC.

Kaupichthys hyoproroides (Strömann) - False moray

Offshore. Smith (1969) examined larval specimens from this area (bottom depth 366-824 m, gear depth 24-146 m), and numerous specimens from adjacent waters. Böhlke and Smith (1968) report three specimens collected at 4.5-6 m (10-15 ft) in depth, in the vicinity of Alligator Reef, Florida.

Robinsia catherinae Böhlke and Smith

Offshore. Smith (1969) examined a larval specimen from this area (bottom depth 229-238 m, gear depth 38 m) and specimens from adjacent areas. NC.

Muraenidae

*Enchelycore nigricans (Bonnaterre) - Viper moray

Reef, 9-12 m (30-40 ft) in depth, rare. Only one specimen of this species has been collected.

See Ginsburg (1951b) as regards this family.

*Enchelycore sp. - Chestnut moray

Reef, 12 m (40 ft) and 18 m (60 ft), rare. Two juveniles were collected, and identified to this as yet undescribed species following characteristics as listed by Böhlke and Chaplin (1968). The common name is also attributable to this reference.

*Gymnothorax funebris Ranzani - Green moray

Rock jetties at inlets, frequent.

Rock outcroppings and worm-rock "reefs" along shore, 1-3 m in depth, frequent.

Reefs, to 21 m (70 ft), common. This species may be found wherever suitable cover exists (crevices as provided by rocks or reef outcroppings). No individuals have been observed in depths greater than 21 m (70 ft), the area of our "3rd reef," where large individuals are common.

*Gymnothorax moringa (Cuvier) - Spotted moray

Worm-rock "reef," from 3.6 m (12 ft) in depth, to the reef at 21 m (70 ft), occasional.

*Gymnothorax vicinus (Castelnau) - Purplemouth moray

Reef, 11-12 m (35-40 ft) in depth, rare. Three individuals were obtained in a single collection made with F. N. Snelson in September 1971.

*Muraena miliaris (Kaup) - Goldentail moray

Patch reefs, 6-13 m (20-45 ft) in depth, occasional. This beautiful eel has been observed under small coral heads.

Congridae

Ariosoma impressa (Poey) - Bandtooth conger

Primarily inshore, although recorded to a depth of 101 m (55 fms); sandy bottom burrowers; from the Carolinas and Bahamas to Cuba and the Gulf of Mexico (Böhlke and Chaplin, 1968). NC.

See Ginsburg (1951b) as regards this family.

Congrina flava (Goode and Bean) - Yellow conger

Offshore. Jordan and Evermann (1896-1900) examined specimens from 57-203 m (31-111 fms). Florida to Trinidad and throughout the Gulf of Mexico (Briggs, 1958). NC.

Paraconger caudilimbatus (Poey) - Margintail conger

Inshore and offshore, rare. One specimen was collected by B. Snellings from south of the Lake Worth municipal pier, March 1973, depth 14 m (45 ft). This conger has been recorded from as deep as 347 m (190 fms); sandy bottom burrowers (Böhlke and Chaplin, 1968). See also Kanazawa, 1961.

Ophichthidae

Ahlia egmontis (Jordan) - Key worm eel

Inshore. Christensen (1965) extended the range north to Jupiter Inlet from the Florida Keys; prefers high salinities. NC.

See Ginsburg (1951b) as regards this family.

Note: due to the burrowing nature of the ophichthids and our relatively few collections over sand bottoms, the local occurrence of these fishes is poorly known.

Bascanichthys teres (Goode and Bean) - Sooty eel

Inshore. Christensen (1965) extended the range of this species from the Florida Keys to Jupiter Inlet. NC.

*Myrichthys acuminatus (Gronow) - Sharptail eel

Inshore rock outcroppings, rare. One individual was observed along the edge of Boca Raton inlet by J. N. Ehringer; another (or possibly the same) individual was collected in this area in March 1973, estimated total length 38-40 cm. Listed as a primary reef species by Starck (1968).

Myrophis punctatus Lütken - Speckled worm eel

Inshore to brackish water, frequent. This is the most common ophichthid collected in bay areas of the Intracoastal Waterway.

See also Fowler (1941).

Ophichthus gomesi (Castelnau) - Shrimp eel

Inshore, rare. One specimen was caught "off the beach" at Boca Raton (no other data available) and identified by W. R. Courtenay, Jr. See also Gilbert (1968a).

Ophichthus ocellatus (Lesueur) - Palespotted eel

Shore; North Carolina to Brazil (Briggs, 1958). NC.

Ophichthus ophis (Linnaeus) - Spotted snake eel

Brazil to southern Florida and Bermuda; two specimens examined from off Baker's Haulover (4 miles north of Miami Beach) (Böhlke and Robins, 1959a). NC.

Sphagebranchus ophioneus (Evermann and Marsh) - Surf eel

Inshore, occasional. Specimens have been collected at the edge of worm-rock "reef," depths to 1.5 m (5 ft).

Verma kendalli (Gilbert) - Finless eel

Inshore and offshore. Böhlke (1968b) examined specimens from off Palm Beach and Miami, and from adjacent areas to the north and south respectively; the species has been taken from depths between about 4 and 402 m (2-220 fms). NC.

Order CLUPEIFORMES

Clupeidae

Brevoortia smithi Hildebrand - Yellowfin menhaden

Inshore. North Carolina, around Florida, and west to Louisiana; rare on the Florida coast between West Palm Beach and Miami (Dahlberg, 1970). NC.

See above reference, Hildebrand (1948), and Reintjes (1964) as regards species of Brevoortia.

See Berry (1964) and Hildebrand (1964d) as regards this family.

Harengula clupeola Valenciennes - False pilchard

Inshore, common to abundant. Widely used as a bait fish.

Harengula pensacolae Goode and Bean - Scaled sardine

Inshore and in the Intracoastal Waterway, common to abundant.

Note: I have tentatively separated my specimens of the above two species following Storey (1938) and Rivas (1950a), although I concur with Berry (1971) that the two have not been adequately distinguished.

Jenkinsia lamprotaenia (Gosse) - Dwarf herring

Inshore. Florida, Leeward Island, Campéche to Honduras (J. l. viridis from Berry, 1971). NC.

Jenkinsia stolifera (Jordan and Gilbert) - Shortband herring

Inshore. Occurs commonly with the dwarf herring, with which it is often confused (Bailey et al. 1970, from C. R. Robins, personal communication; Böhlke and Chaplin, 1968). NC.

Opisthonema oglinum (Lesueur) - Atlantic thread herring

Inshore and in the Intracoastal Waterway, frequent.

See Berry and Barrett (1963) as regards this genus.

Sardinella brasiliensis (Steindachner) - Orangespot sardine

Inshore and in the Intracoastal Waterway, common to abundant.

Also recorded by Powell et al. (1972) from Lake Worth.

Engraulidae

Anchoa cubana (Poey) - Cuban anchovy

Inshore. Found on both coasts of Florida, the Gulf of Mexico, and the West Indies; apparently rather rare on our southern coast (Hildebrand, 1964c). NC.

Anchoa lamprotaenia Hildebrand - Bigeye anchovy

Inshore. Daly (1970) examined specimens from Lake Worth, and states that the species is abundant from Jupiter southward through the Florida Keys. NC.

Anchoa mitchilli (Valenciennes) - Bay anchovy

Intracoastal Waterway, common to abundant. In one collection in December 1972, 972 individuals were obtained from a bay area of the Intracoastal Waterway; no other species of anchovy were collected. More intensive collecting in the Intracoastal Waterway, and on a year around basis, may reveal a seasonality in these fishes as alluded to by Daly (1970).

Anchoa nasuta Hildebrand and Carvalho - Longnose anchovy

Inshore. Daly (1970) examined several specimens from Lake Worth; large populations appear to occur sporadically in southeastern Florida. See also Hildebrand and Carvalho (1948). NC.

Anchoviella perfasciata (Poey) - Flat anchovy

Inshore. Not known to enter brackish water; West Indies to Florida and the Gulf coast, probably to North Carolina (Hildebrand, 1964c). NC.

Engraulis estauquae (Hildebrand) - Camiguana anchovy

Inshore. Previously known only from the coast of Venezuela (Hildebrand, 1964c), Daly (1970) extended this species's range to the Jupiter area (3 specimens). NC.

Order MYCTOPHIFORMES

Synodontidae

Saurida brasiliensis Norman - Largescale lizardfish

Offshore. Collected off Lauderdale-by-the-Sea by the M/V Pelican, station 16, 137-155 m (75-85 fms), March 1956 (Bullis and Thompson, 1965). NC.

See Norman (1935), Gibbs (1959), and Anderson et al. (1966a, 1966b) as regards this family.

Saurida caribbaea Breder - Smallscale lizardfish

Off the coast of the United States from northeastern Florida to the Florida Straits, and in the Gulf of Mexico (Anderson et al., 1966b). NC.

Saurida normani Longley - Shortjaw lizardfish

Offshore. Collected off Lauderdale-by-the-Sea by the M/V Pelican, station 16, 137-155 m (75-85 fms), March 1956 (Bullis and Thompson, 1965). Starck (1968) records this species as also occurring on reefs. NC.

Synodus foetens (Linnaeus) - Inshore lizardfish

Inshore and offshore. Frequent in the Intracoastal Waterway where it has been collected by trolling artificial baits. Also collected by the M/V Pelican at station 16 described above.

Synodus intermedius (Agassiz) - Sand diver

Offshore bottoms, most records from 37-110 m (20-60 fms) in depth; North Carolina to Brazil (Anderson et al., 1966a, 1966b). Starck (1968) records this species as also occurring on reefs. NC.

Synodus poeyi Jordan - Offshore lizardfish

Primarily offshore. One specimen collected off Palm Beach at a depth of 137 m (75 fms) (Fowler, 1952). Starck (1968) records this species as also occurring on reefs. NC.

*Synodus synodus (Linnaeus) - Red Lizardfish

Reefs from 6-9 m (20-30 ft) to 18-21 m (60-70 ft), frequent. The only lizardfish we have encountered on the reefs.

Trachinocephalus myops (Forster) - Snakefish

Occurs inshore, but is apparently more abundant offshore at about 37-91 m (20-50 fms) in depth; Cape Cod to Brazil (Anderson et al., 1966a, 1966b). Starck (1968) records this species as also occurring on reefs. NC.

Order SILURIFORMES

Clariidae

Clarias batrachus (Linnaeus) - Walking catfish

Collected from a branching canal of the Intracoastal Waterway (salinity 0.03°/oo). Common locally in fresh water, this species has been collected from brackish waters and can live in full strength seawater, at least for limited periods of time (W. R. Courtenay, Jr., personal communication).

Ariidae

Arius felis (Linnaeus) - Sea catfish

Inshore and in the Intracoastal Waterway to brackish water, common. Perhaps the only fish species the bridge and pier fishermen may be assured of catching.

Bagre marinus (Mitchill) - Gafftopsail catfish

Inshore and in the Intracoastal Waterway to brackish water, frequent.

Order BATRACHOIDIFORMES

Batrachoididae

Opsanus beta (Günther) - Gulf toadfish

Inshore, rare. One specimen was collected at Boca Raton Inlet. See Schultz and Reid (1937) as regards species of Opsanus.

Note: Günther, rather than Goode and Bean, as listed by Bailey et al. (1970), is the correct author of this species (C. R. Robins, personal communication).

Opsanus tau (Linnaeus) - Oyster toadfish

Atlantic coast from Miami north to Cape Cod; uncommon in southeastern Florida (Walters and Robins, 1961). NC.

Porichthys plectrodon (Jordan and Gilbert) - Atlantic midshipman

Inshore and offshore. Gilbert (1968b) examined one specimen from off Palm Beach, collected at 35 m (19 fms), and several others from adjacent areas in Florida; from 7-137 m (4-75 fms) in depth. NC.

See Hubbs and Schultz (1939) for a revision of this genus.

Note: P. plectrodon is the species found in North America, rather than P. porosissimus (Valenciennes) (a South American species) as listed by Bailey et al. (1970) (C. R. Robins, personal communication).

Order GOBIESOCIFORMES

Gobiesocidae

Acyrtops beryllina (Hildebrand and Ginsburg) - Emerald clingfish

Inshore, rare. One specimen collected from worm-rock at a depth of 3.7 m (12 ft). This habitat is considerably different from the turtle grass (Thalassia testudinum) beds, where this species normally occurs in the Florida Keys.

See Gould (1965) for the biology of this species.

See Schultz (1944) for a revision of the family, and Brigg's (1955) monograph.

Order LOPHIIFORMES

Antennariidae

*Antennarius multiocellatus (Valenciennes) - Longlure frogfish

Reef at 27 m (90 ft) in depth, rare. One specimen was collected. Böhlke and Chaplin's (1968) specimens are all from water less than 6 m (20 ft) deep.

See Barbour (1942) and Schultz (1957) for revisions of the antennariids.

Antennarius ocellatus (Bloch and Schneider) - Ocellated frogfish

Brazil to North Carolina; reaching a weight of "several pounds" (Barbour, 1942). NC.

Antennarius pauciradiatus Schultz - Dwarf frogfish

Schultz (1957) examined specimens from off Palm Beach; also from Biscayne Bay and Tortugas, Florida, and Cuba; depth range 37-73 m (20-40 fms). NC.

Antennarius radiosus Garman - Singlespot frogfish

Offshore. One specimen collected by UMML R/V Gerda, cruise G-7, 25°46' N, 80°03.5' W, at a depth of 137 m (75 fms). Fowler (1941) examined one specimen from off Palm Beach collected at (or more probably over) a depth of 0.7-0.9 Km (400-500 fms). Schultz (1957) examined Atlantic east coast specimens from Palm Beach to Tortugas, Florida. NC.

Antennarius scaber (Cuvier) - Splitlure frogfish

Inshore. Fowler (1941) reports one specimen from South Inlet, Lake Worth. Often on grassy bottoms with scattered bits of coral, dead conch shells, and similar debris (Barbour, 1942). NC.

Histrio histrio (Linnaeus) - Sargassumfish

Offshore, common. This species is endemic to sargassum (Dooley, 1969). See preceding reference, and Adams (1960) as regards this species and the sargassum complex.

Ogcocephalidae

Halieutichthys aculeatus (Mitchill) - Pancake batfish

Offshore, probably common. Fowler (1952) records one specimen from a depth of 137 m (75 fms) from off Palm Beach, and four specimens from a depth of 146 m (80 fms) from off Boynton Beach. Specimens from my study area have also been collected by the UMML R/V Gerda, cruises G-283 and G-6205, at depths of 101-115 m (55-63 fms). NC.

See Bradbury (1967) as regards the genera of batfishes.

Ogcocephalus nasutus (Valenciennes) - Shortnose batfish

Offshore, probably frequent. Fowler (1952) records two specimens from a depth of 137 m (75 fms) from off Palm Beach, and one specimen from a depth of 146 m (80 fms) from off Boynton Beach. I have no record of the UMML R/V Gerda collecting this species in my study area. NC.

Ogcocephalus radiatus (Mitchill) - Polka-dot batfish

Inshore. The coast of Florida and neghboring waters; very common in shallow bays among weeds, especially about the Florida Keys (Jordan et al., 1930. However, this species was not included by Starck (1968) for the vicinity of Alligator Reef. NC.

Ogcocephalus vespertilio (Linnaeus) - Longnose batfish

Offshore; secondarily associated with reefs (Starck, 1968). New York to Hispaniola and widespread in the Gulf of Mexico (Briggs, 1958). NC.

Zalieutes mcgintyi (Fowler) - Tricorn batfish

Offshore, probably frequent to common. Fowler (1952) records one specimen from a depth of 145 m (80 fms) from off Boynton Beach. Two specimens were also collected in my study area by UMML R/V Gerda, cruise G-419, at a depth of 110-128 m (60-70 fms). NC.

Order GADIFORMES

Gadidae

Merluccius albidus (Mitchill)

Offshore. One specimen in my study area was collected by the UMML R/V Gerda, cruise G-676, at a depth of 190-200 m (104-109 fms). However, Karvella (1973) gives the range of this species as northern Florida on our east coast, Tortugas, and the northern Gulf of Mexico. NC.

Urophycis floridanus (Bean and Dresel) - Southern hake

Offshore. Collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, at a depth of 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

Urophycis regius (Walbaum) - Spotted hake

Offshore, probably frequent. Two specimens were collected in my study area by the UMML R/V Gerda, cruises G-414 and G-847, at depths of 152-165 m (83-90 fms) and 137-201 m (75-110 fms), respectively. Miller (1946) examined specimens from both north and south of my study area. NC.

Ophidiidae

Lepophidium cervinum (Goode and Bean) - Fawn cusk-eel

Offshore, probably frequent. Two specimens were collected in my study area by the UMML R/V Gerda, cruises G-419 and G-847, at depths of 110-128 m (60-70 fms) and 137-301 m (75-110 fms), respectively. Also collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, at a depth of 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

Lepophidium jeannae Fowler - Mottled cusk-eel

Offshore. Secondarily associated with reefs (Starck, 1968). Known from only a few localities: along the Atlantic coast from off Savannah, Georgia, to Key West, Florida, and in the Gulf of Mexico; depth ranges from 29 to 91 m (16-50 fms) (Robins, 1960). NC.

*Ogilbia cayorum Evermann and Kendall - Key brotula

Shallow patch reefs at about 3 m (10 ft) to 11 m (35-40 ft) reefs, common. We have not collected any below 12 m (40 ft). Note: more than one species may presently be classified under this name (Starck, 1968), making the above identification tentative.

Ophidion grayi (Fowler) - Blotched cusk-eel

Probably at least secondarily associated with reefs. Robins (1970) reported this species from Key biscayne, Miami; as did Gilbert (1968a) from Marineland on the northeastern coast of Florida. It is tentatively included here, as it may be disjunct. See also Fowler (1948). NC.

*Ophidion holbrooki (Putnam) - Bank cusk-eel

Reef, 20-21 m (65-70 ft), rare. Two specimens were collected by C. R. Gilbert off Delray Beach in 1967. Probably more common than the above would indicate.

*Petrotyx sanguineus (Meek and Hildebrand) - Redfin brotula

Reefs, 11-12 m (35-40 ft) and 20-21 (65-70 ft), frequent.

Carapidae

Carapus bermudensis (Jones) - Pearlfish

Inshore, occasional. The low rate of occurrence of this species is the direct result of the scarcity of the sea cucumber, *Actinopygia agassizi*, along our coast. The two *A. agassizi* which were collected, at a depth of 6 m (20 ft), each contained a pearlfish. See Smith and Tyler (1969) and Trott (1970) as regards the biology of this species; and Arnold (1956) for a revision of the family.

Macrouridae

Nezumia bairdi (Goode and Bean) - Marlin-spike

Offshore. West Indies to the Gulf of St. Lawrence; up to 91 m (50 fms) in depth, abundant below the 183 m (100 fm) contour (Parr, 1946). This is the only species of the grenadiers which enters Atlantic shore waters (Bailey *et al.*, 1970).
See Goode and Bean (1895) and Briggs (1958) for the deep-water species. NC.

Order ATHERINIFORMES

Exocoetidae

Chriodorus atherinoides Goode and Bean - Hardhead halfbeak

Intracoastal Waterway. One specimen was collected by use of a night-light; however, probably more common than this would indicate.

See Weed (1933) and Rosen (1964) as regards the Hemiramphidae (here included within the Exocoetidae).

Cypselurus comatus (Mitchill) - Clearwing flyingfish

Offshore. Staiger (1965) examined specimens from both north and south of my study area; it can be considered a tropical, coastal (within 300 miles of land) species. NC.

See the above reference as regards species of Cypselurus; and Jordan and Meek (1885), Bruun (1935) and Breder (1938) for reviews of Atlantic Ocean flyingfishes.

Cypselurus cyanopterus (Valenciennes) - Margined flyingfish

Offshore. Throughout the Gulf of Mexico and the Caribbean Sea, and in the Gulf Stream to 39°N Latitude; can be considered coastal as it occurs no more than 400 miles offshore (Staiger, 1965). See also Gibbs and Staiger (1970). NC

Cypselurus exsiliens (Linnaeus) - Bandwing flyingfish

Offshore. Staiger (1965) includes my study area within the range of this species; one of the two oceanic species among the Atlantic Cypselurus (along with C. furcatus); however, this species will only approach to within a few miles of shore. NC.

Cypselurus furcatus (Mitchill) - Spotfin flyingfish

Inshore and offshore. One juvenile (30 mm SL) collected from under floating weed in the Intracoastal Waterway in proximity to Boca Raton Inlet, March 1973. Occurs close inshore, as well as far out to sea (Staiger, 1965).

Cypselurus melanurus (Valenciennes, in Cuvier and Valenciennes, 1846)

Inshore and offshore. Two juveniles (10 & 18 mm SL) collected from under floating weed in the Intracoastal Waterway in proximity to Boca Raton Inlet, March 1973, tentative identification. A coastal species, juveniles often come close inshore; especially common in the Gulf Stream and the Straits of Florida (Staiger, 1956). Note: this is the C. heterurus of Staiger (1965) and Bailey et al. (1970) (Gibbs and Staiger, 1970, and J. C. Staiger, personal communication).

Euleptorhamphus velox Poey - Flying halfbeak

Shore; Massachusetts and Bermuda to Hispaniola, and the Gulf of Mexico (Briggs, 1958). See also Jordan et al. (1930) and Breder (1932). Probably only occasional at the most. NC.

Exocoetus obtusirostris Günther - Oceanic two-wing flyingfish

Offshore. Delaware and Bermuda to Brazil, and in the Gulf of Mexico (Briggs, 1958). See also McKenney (1965). NC.

Exocoetus volitans (Linnaeus) - Tropical two-wing flyingfish

Offshore. McKenney (1965) examined three juveniles from the Florida Current north of Miami. The "commonest" flyingfish in the Atlantic (Bruun, 1935). NC.

Hemiramphus balao Lesueur - Balao

Inshore and offshore (?). In the west Atlantic from off New York to southeastern Brazil, and the Gulf of Mexico (Böhlke and Chaplin, 1968). NC.

Hemiramphus brasiliensis (Linnaeus) - Ballyhoo

Inshore and offshore, frequent. Powell et al. (1972) record six specimens from 5-10 miles off Palm Beach County.

Hirundichthys affinis (Günther) - Fourwing flyingfish

Inshore and offshore. One specimen collected within my study area by the UMML R/V Gerda, cruise G-506, at the surface over a depth of 91-274 m (50-150 fms). See also Lewis et al. (1962) and McKenney (1965). NC

Hirundichthys rondeleti (Valenciennes) - Blackwing flyingfish

Inshore and offshore. Powell et al. (1972) record eight specimens from off Palm Beach Inlet, Boynton Inlet, and Delray Beach. See also Breder (1938) and McKenney (1965). NC.

Hyporhamphus unifasciatus (Ranzani) - Halfbeak

Intracoastal Waterway. One specimen was collected by use of a night-light; however, probably more common than this would indicate.

Oxyporhamphus micropterus (Valenciennes) - Smallwing flyingfish

Offshore. Powell et al. (1972) record two specimens from 4 miles east of Delray Beach. NC.

Parexocoetus brachypterus (Richardson) - Sailfin flyingfish

Offshore. McKenney (1965) examined material from the Bahamas, West Indies and Caribbean Sea, the Straits of Florida, and the Gulf Stream. Stark (1968) lists the species as common offshore from Alligator Reef. NC.

Prognichthys gibbifrons (Valenciennes) - Bluntnose flyingfish

Inshore and offshore. Powell et al. (1972) record four specimens from 5-20 miles east of Palm Beach Inlet. Starck (1968) lists the species as common offshore from Alligator Reef. See also McKenney (1965). NC.

Belonidae

Ablennes hians (Valenciennes) - Flat needlefish

Primarily offshore. Worldwide in tropical and subtropical seas (Collette and Parin, 1970). Powell et al. (1972) record this species from 11-13 miles northeast of Palm Beach Inlet, number of specimens not given. NC.

As regards this family, see Jordan and Fordice (1886), Berry and Rivas (1962), Collette and Berry (1965), Collette and Parin (1970), and Cressey and Collette (1970).

Platybelone argalus (Lesueur) - Keeltail needlefish

Primarily offshore; Bermuda and the Carolinas through the Caribbean and the Gulf of Mexico (Böhlke and Chaplin, 1968). See also Collette and Parin (1970). NC.

Strongylura marina (Walbaum) - Atlantic needlefish

Inshore and in the Intracoastal Waterway to brackish waters, common.

See Breder (1932) and Collette (1968) as regards Strongylura and Tylosurus spp.

Strongylura notata (Poey) - Redfin needlefish

Inshore and in the Intracoastal Waterway to brackish water, common.

Strongylura timucu (Walbaum) - Timucu

Inshore, and also entering brackish water; New England to Brazil, and the Gulf of Mexico (Böhlke and Chaplin, 1968). NC

Tylosurus acus (Lacépède) - Agujon

Primarily offshore. A worldwide polytypic species in tropical and subtropical seas (Collette and Parin, 1970. See also Böhlke and Chaplin (1968). NC.

Tylosurus crocodilus (Person and Lesueur) - Houndfish

Inshore and in the Intracoastal Waterway, frequent. Often collected when trolling artificial baits near the surface.

Cyprinodontidae

Cyprinodon variegatus Lacépède - Sheepshead minnow

Coastal in brackish water from Cape Cod to Mexico (Hildebrand and Schroeder, 1927). This species and Floridichthys carpio, Fundulus grandis, F. similis, and the poeciliid Poecilia latipinna, are the fishes that live successfully in shoal waters of southern Florida (Robins, 1957). NC.

See Hubbs (1924) as regards this family and the poeciliids.

See Carr and Goin (1955), Eddy (1957), Moore (1957), and Smith-Vaniz (1968) for keys to the identification of Florida fresh and brackish water fishes.

Floridichthys carpio (Günther) - Goldspotted killifish

Intracoastal Waterway in brackish water, common in areas of fresh water runoff.

Fundulus confluentus Goode and Bean - Marsh killifish

Intracoastal Waterway in brackish water, occasional. Probably more common than our collections would indicate.

See Rivas (1948) and Brown (1957) as regards this genus.

Fundulus grandis Baird and Girard - Gulf killifish

Typically brackish water; Matanzas River in northeastern Florida to the Florida Keys, and in the Gulf of Mexico (Brown, 1957). See also Fowler (1940). NC.

Fundulus similis (Baird and Girard) - Longnose killifish

Typically salt to brackish water; Matanzas River to Key West, and along the Gulf coast (Brown, 1957). See also Martin and Finucane (1968). NC.

Lucania parva (Baird) - Rainwater killifish

Euryhaline; Massachusetts to the southern tip of Florida, and in the Gulf of Mexico west to Mexico (Briggs, 1958). NC.

Poeciliidae

Gambusia affinis (Baird and Girard) - Mosquitofish

Intracoastal Waterway from a branching canal. We have collected this species only in fresh water (0.03°/oo salinity or less) where it was abundant.

Poecilia latipinna (Lesueur) - Sailfin molly

Intracoastal Waterway and branching canals, brackish to fresh water; common only in fresh water.

Atherinidae

Atherinomorus stipes (Müller and Troschel) - Hardhead silverside

Inshore. Southeastern Florida to Brazil (Briggs, 1958). NC. See Jordan and Hubbs (1919), Schultz (1948), and Rosen (1964) as regards this family.

Membras martinica (Valenciennes) - Rough silverside

Inshore. Atlantic and Gulf coasts from New York to Vera Cruz, Mexico (Robbins, 1969). NC.

Menidia beryllina (Cope) - Tidewater silverside

Intracoastal Waterway from a branching canal. We collected two individuals of this species in fresh water (0.03°/oo salinity). It is probably more common than this would indicate.

Order BERYCIFORMES

Polymixiidae

Polymixia lowei Günther - Beardfish

Offshore, benthic. Long Island to the Lesser Antilles and throughout the Gulf of Mexico (Briggs, 1958). See also Goode and Bean (1895). NC.

Holocentridae

*Holocentrus ascensionis (Osbeck) - Squirrelfish

Patch reefs at 6-9 m (20-30 ft), abundant. Reefs at 6-9 m (20-30 ft) to 18-21 m (60-70 ft), common.

See Woods (1955) for western Atlantic species of Holocentrus.

*Holocentrus rufus (Walbaum) - Longspine squirrelfish

Patch reefs at 6-9 m (20-30 ft), and on the deeper reefs to 21 m (70 ft), frequent to common.

Note: Based on our collections, H. ascensionis is the commoner of these two closely related species, particularly on the inshore patch reefs.

*Holocentrus vexillarius (Poey) - Dusky squirrelfish

Reefs to depths of 21 m (70 ft), common to abundant. We have also collected this species at the edge of worm-rock "reef," at a depth of 1.5 m (5 ft). See also McKenney (1959).

*Myrispristis jacobus Cuvier - Blackbar soldierfish

Reef at 20-21 m (60-70 ft), common. We have not collected this species on the shallower reefs. See also Greenfield (1968).

Order ZEIFORMES

Caproidae

Antigonia capros Lowe - Deepbody boarfish

Offshore. From off southern Massachusetts to Rio de Janeiro, Brazil (Berry, 1959b). See also Fraser-Brunner (1950b) on this genus; and Goode and Bean (1895) as regards the order. NC.

Antigonia combatia Berry and Rathjen - Shortspine boarfish

Offshore. Berry (1959b) examined two specimens from off Boynton Beach, from a depth of 146 m (80 fms); and one specimen from 18 miles east of Delray Beach, depth 549-595 m (300-325 fms). See also Berry and Rathjen (1959). NC.

Order LAMPRIDIFORMES

Lophotidae

Eumecichthys fiski (Günther) - Unicornfish

Offshore, pelagic. Occurs regularly along the southeastern Florida coast (C. R. Robins, personal communication, in Bailey et al., 1970). NC.

See Walters and Fitch (1960) on systematics of this family,

Trachipteridae, and Regalecidae; and Goode and Bean (1895) as regards the Lampridiformes.

Note: the lampridiform fishes are pelagic and many species are exceedingly irregular in occurrence; the species listed here are recorded by Bailey et al. (1970), and may be expected from my study area (three other lampridiform fishes are listed in Table 1).

Trachipteridae

Desmodema polysticta (Ogilby) - Polka-dot ribbonfish

Offshore, pelagic. Worldwide, northeastern Florida to Cuba in the western Atlantic (Briggs, 1958). NC.

Zu cristatus (Bonelli) - Scalloped ribbonfish

Offshore, pelagic. Worldwide, in the western Atlantic from Bermuda and the Gulf of Mexico to Cuba (Briggs, 1958). NC.

Regalecidae

Regalecus glesne (Ascanius) - Oarfish

Offshore, pelagic. One specimen washed ashore at Boca Raton in 1971 and was deposited in the FAU fish collection. Several additional specimens have been found in the Pompano Beach area in previous years and are in the fish collections of the Rosenstiel School of Marine and Atmospheric Science (W. R. Courtenay, Jr., personal communication). See also Walters and Fitch (1960) and Hutton (1961).

Order GASTEROSTEIFORMES

Aulostomidae

*Aulostomus maculatus Valenciennes - Trumpetfish

Inshore patch reefs at 6-9 m (20-30 ft) depths, to the deeper reefs at 18-21 m (60-70 ft), frequent. The majority of our specimens are from depths of about 12 m (40 ft).

See Wheeler (1955) for preliminary revision of the genus.

Fistulariidae

*Fistularia tabacaria Linnaeus - Bluespotted cornetfish

Inshore patch reefs at 6-9 m (20-30 ft), and reefs to about 14 m (45 ft), frequent. Reef at 18-21 m (60-70 ft), occasional.

*Fistularia villosa Klunzinger - Red cornetfish

Uncommon along the southeastern coast of Florida (C. R. Robins, personal communication, in Bailey et al., 1970). NC.

Centriscidae

Macrorhamphosus gracilis (Lowe) - Slender snipefish

Offshore. Worldwide, in the western Atlantic from New Jersey to Brazil (Briggs, 1958). NC.

Macrorhamphosus scolopax (Linnaeus) - Longspine snipefish

Offshore, probably frequent. Two specimens were collected from within my study area by the UMML R/V Gerda, cruises G-283 and G-419, at depths of 101-128 m (55-70 fms). Also collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, depth 137-155 m (75-85 fms) (Bullis and Thompson, 1956); number of specimens not given. NC.

Syngnathidae

*Micrognathus ensenadae (Silvester) - Harlequin pipefish

Reef at 20-21 m (65-70 ft) in depth, rare. Two specimens have been collected. One was deposited at the Florida State Museum by C. R. Gilbert; the remaining specimen is in the collection at FAU

Starck (1968) treated M. ensenadae as a different color pattern

of M. vittatus, although stating that "due to differences in ecology and behavior ... the two forms are probably separate species." M. ensenadae is considered a valid species by Herald (1965), Böhlke and Chaplin (1968), and Robins (personal communication). As a result of my work, and as regards the above, M. ensenadae should be listed in the fish fauna of the continental United States.

See Herald (1942, 1965) for studies on Atlantic pipefishes.

*Micrognathus vittatus (Kaup) - Banded pipefish

Reef, rare. We have collected only two specimens of this species: one from a depth of 12 m (40 ft), the other from a depth of 18 m (60 ft). Probably neither this species nor M. ensenadae are as rare as our collections would indicate. Starck (1968) treats this species as being only secondarily reef associated.

Oostethus lineatus (Kaup) - Opossum pipefish

Intracoastal Waterway from a branching canal. We collected four individuals of this species, and only in fresh water (0.03°/oo salinity).

Syngnathus dunckeri Metzelaar - Pugnose pipefish

Inshore and in the Intracoastal Waterway, rare. One specimen was collected at the edge of a worm-rock "reef," at a depth of 3.7 m (12 ft); another specimen was collected from very shallow water (less than 0.5 m) in the Intracoastal Waterway.

Syngnathus elucens Poey - Shortfin pipefish

Reef, 6 m (20 ft) in depth, rare. Two specimens were collected at one rotenone station.

Starck (1968) lists this species as only secondarily associated with reefs.

Syngnathus louisianae Günther - Chain pipefish

Secondarily reef associated (Starck, 1968). Shore; Virginia to Jamaica and throughout the Gulf of Mexico (Briggs, 1958). NC.

Syngnathus pelagicus Linnaeus - Sargassum pipefish

Offshore, common. This species is endemic to sargassum (Dooley, 1969).

Note: S. pelagicus and the sargassumfish (Histrio histrio) are easily collected in the summer, when sargassum weed is particularly abundant.

Syngnathus scovelli (Evermann and Kendall) - Gulf pipefish

Intracoastal Waterway to brackish water. Either common or absent, depending on specific locality.

Order PERCIFORMES

Centropomidae

Centropomus parallelus Poey - Fat snook

Intracoastal Waterway from branching canals, brackish water, occasional. See also Moe et al. (1966).

See Rivas (1962) as regards Florida species of Centropomus.

Centropomus pectinatus Poey - Tarpon snook

Sea water and the freshwater canals leading to Lake Okeechobee; southern Florida and the West Indies (Carr and Goin, 1955). NC.

Centropomus undecimalis (Bloch) - Snook

Typically inshore and in the Intracoastal Waterway in brackish to fresh water, common. Four world sport fishing records are listed by the International Game Fish Association (1972) as having been caught from areas between Fort Lauderdale and Palm Beach. Five individuals (6-12 lbs. each) were caught in one evening by a commercial snapper fishing boat off Port Everglades, September 1972, fishing at a depth of 26-27 m (85-90 ft) (H. Braune, personal communication).

Serranidae

Anthias asperilinguis Günther - Crimson bass

Offshore. This species should be collected locally with additional deep-water trawling (W. R. Courtenay, Jr., personal communication). NC.

Centropristis striata (Linnaeus) - Black sea bass

Inshore, occasional. I have collected this species only in the northern part of my study area (in the vicinity of South Lake Worth [Boynton] Inlet); these are most common at the edge of patch reefs at depths of around 4.6 m (15 ft).

See Weed (1937) and Miller (1959) as regards this genus.

Diplectrum bivittatum (Valenciennes) - Dwarf sand perch

Inshore, occasional. Observed at the edge of worm-rock or patch reefs; 7.6 m (25 ft) was our deepest collection depth.

See Ginsburg (1958b) as regards this genus.

Diplectrum formosum (Linnaeus) - Sand perch

Inshore, occasional. Observed at the edge of worm-rock or patch reefs.

*Epinephelus adscensionis (Osbeck) - Rock hind

Reef. Massachusetts and Bermuda south through the Caribbean (Smith, 1971). NC.

See also Rivas (1964) and Smith (1961) for keys to the species of this genus.

See Smith (1971) for a revision of the American groupers.

See also Jordan and Swain (1884c).

Epinephelus drummondhayi Goode and Bean - Speckled hind

Offshore (Starck, 1968). Smith (1971) includes both coasts of Florida in the range of this species. NC.

*Epinephelus fulva (Linnaeus) - Coney

Reef, 18-21 m (60-70 ft), occasional. This species is rarely seen on our shallower reefs.

Note: following Smith (1971) Cephalopholis and Dermatolepis (and Alphestes in Table 1) are considered as subgenera of Epinephelus.

*Epinephelus guttatus (Linnaeus) - Red hind

Reef. Smith (1971) examined a specimen from Boynton Beach; it reaches its greatest abundance in Bermuda and the West Indies, mainland records are few. NC.

*Epinephelus inermis (Valenciennes) - Marbled grouper. Reef, 18-21 m (60-70 ft), rare. One individual was observed, and a second one collected, during this study.

*Epinephelus itajara (Lictenstein) - Jewfish

Reef, under ledges, 18-46 m (60-150 ft), occasional. I have not observed this species in shallower depths. Starck (1968) lists this species as only secondarily associated with reefs.

*Epinephelus morio (Valenciennes) - Red grouper

Patch reefs at about 11 m (35 ft), common. Reefs at depths of 11-21 m (35-70 ft), frequent. This is the grouper most frequently caught by local fishermen. Starck (1968) lists this species as only secondarily associated with reefs. See also Moe (1969).

Epinephelus nigritus (Holbrook) - Warsaw grouper

Offshore. 37-457 m (20-250 fms) in depth; New England south to Florida in the Gulf of Mexico (Smith, 1971). NC.

Epinephelus niveatus (Valenciennes) - Snowy grouper

Primarily offshore. Tortugas specimens were taken from between depths of 86 and 172 m (47 and 94 fms)(Smith, 1971). One juvenile (ca. 50 mm TL) was collected by D. P. Herrema, off Boca Raton, from a patch reef 9 m (30 ft) in depth, August 1973. See also Presley (1970).

*Epinephelus striatus (Bloch) - Nassau grouper

Reef at 18-21 m (60-70 ft), juveniles are occasional. Adults have been observed at depths exceeding 30 m (100 ft), although rare.

*Hypoplectrus gemma Goode and Bean - Blue hamlet

Reefs from 6 to 21 m (20-70 ft) in depth, common.

Note: following Böhlke and Chaplin (1968), Starck (1968), and Bailey et al. (1970), my systematic account treats the species within the Hypoplectrus complex as each being distinct.

*Hypoplectrus guttavarius (Poey) - Shy hamlet

Reef, occasional at 18 m (60 ft) to frequent at 27 m (90 ft).

*Hypoplectrus nigricans (Poey) - Black hamlet

Reefs from 11-18 m (35-60 ft), common. A brown phase, the "carmel" hamlet of local aquarists, is also common at these depths.

*Hypoplectrus puella (Cuvier) - Barred hamlet

Reefs to about 14 m (45 ft), common. This species has been collected on patch reefs in as shallow as 3 m (10 ft).

*Hypoplectrus unicolor (Walbaum) - Butter hamlet

Reefs from 6 m (20 ft) to about 26 m (85 ft), common. This is our most abundant hamlet, and the one with the greatest range in depth distribution.

*Liopropoma eukrines (Starck and Courtenay) - Wrasse bass

Reefs at depths of 30 m (100 ft) plus, occasional.

See Starck and Courtenay (1962). See also Schultz (1958b), Randall (1963a), and Robbins (1967a) as regards this genus.

*Liopropoma rubre Poey - Peppermint bass

Reef at 18-21 m (60-70 ft), probably occasional. One individual has been collected and two others observed, all from the same location (the "ledge" off Boca Raton).

*Mycteroperca bonaci (Poey) - Black grouper

Patch reefs at 6-9 m (20-30 ft), frequent. Possibly replaced by Epinephelus morio at depths of 9-12 m (30-40 ft).

*Mycteroperca interstitialis (Poey) - Yellowmouth grouper

Rare; one juvenile was collected from a patch reef at a depth of 6-9 m (20-30 ft).

Mycteroperca microlepis (Goode and Bean) - Gag

Secondarily associated with reefs (Starck, 1968). Smith (1971) examined specimens from New York to the Florida Keys, the Gulf of Mexico, and Brazil; 48-80 m (26-44 fms) on the Campeche Banks. See also McErlean (1963). NC.

*Mycteroperca phenax (Jordan and Swain) - Scamp

Reef, 20-21 m (65-70 ft), rare. One specimen was collected at the "ledge" off Boca Raton.

*Paranthias furcifer (Valenciennes) - Creole-fish

Depths of 18-21 m (60-70 ft) over the reef, "schools" of 50-100 individuals are frequent.

*Petrometopon cruentatum (Lacépède) - Graysby

Patch reefs and reefs from 9-21 m (30-70 ft), common. This is one of our most common groupers, juveniles often appearing in the aquarium fish trade.

Pronotogrammus aureorubens Longley - Streamer bass

Offshore. Two specimens were collected by the UMML R/V Gerda, cruise G-21, in my study area, from a depth of about 200 m (110 fms). NC.

*Serranus annularis (Günther) - Orangeback bass

Reefs, at depths of 20 m (65 ft) to 38 m (125 ft) plus, probably occasional.

Note: we have not done enough work at the deeper depths to determine how common this species (and other serranids) may actually be.

See Robins and Starck (1961) for a key to the species of Serranus.

*Serranus baldwini (Evermann and Marsh) - Lantern bass

Reef at 30 m (100 ft) plus, probably occasional.

Serranus phoebe Poey - Tattler

Primarily offshore. Collected by the M/V Pelican, station 15, off Boynton Beach, at a depth of 55-64 m (30-35 fms) (Bullis and Thompson, 1965); number of specimens not given. See also Robins and Starck (1961). NC.

Serranus subligarius (Cope) - Belted sandfish

Inshore, occasional. My observations have been at depths of 1-3.7 m (3-12 ft).

*Serranus tabacarius (Cuvier) - Tobaccofish

Reefs at 18-21 (60-70 ft) to at least 27 m (90 ft), frequent.

*Serranus tigrinus (Bloch) - Harlequin bass

Reefs at 11-12 m (35-40 ft) to at least 27 m (90 ft), common.

Note: this is another serranid which is common locally in the aquarium fish trade.

*Serranus tortugarum Longley - Chalk bass

Reef at 30 m (100 ft) plus, probably occasional. Starck (1968) lists this species as being only secondarily associated with reefs.

Grammistidae

*Pseudogrammus gregoryi (Breder) - Reef bass

Reefs at 9-12 m (30-40 ft) and at 18-21 m (60-70 ft), frequent. See Schultz (1966) for a key to the genera within this family.

*Rypticus maculatus Holbrook - Whitespotted soapfish

Patch reefs, rare. One specimen was speared off Boca Raton at a depth of 7.6 m (25 ft). Courtenay (1967) states that most specimens which he examined were from depths of 27-91 m (15-50 fms).

See the above reference, and Schultz and Reid (1939, for revisions of the genus.

*Rypticus saponaceus (Bloch and Schneider) - Greater soapfish

Inshore patch reefs as shallow as 1.5 m (5 ft) to reefs at 12 m (40 ft) in depth, frequent.

*Rypticus subbifrenatus (Gill) - Spotted soapfish

Patch reefs from 6-12 m (20-40 ft) in depth, to reefs as deep as 21 m (70 ft), frequent. This fish occurs occasionally in the local aquarium fish trade.

Grammidae

*Lipogramma trilineata Randall - Threeline basslet

Reef at 27 m (90 ft), rare. One specimen (UF 18680) was collected off Boca Raton, in July 1971.

See Böhlke and Chaplin (1968), p. 300 for an illustration of this species. To my knowledge, this is the first record of this species for the continental United States, and the first substantiated record of any member of this family in the United States. There have been unconfirmed reports of the royal gramma or fairy basslet, Gramma loreto Poey, as having been collected by aquarium fish collectors off my study area (Starck, 1968). Over an extensive length of time on the reefs, we have never seen this species. Records of G. loreto are no doubt based on juveniles of the Spanish hogfish (Bodianus rufus) (C. R. Robins, personal communication).

See Böhlke (1960a) and Randall (1963a) as regards this genus, and the family, respectively.

Priacanthidae

Cookeolus boops (Bloch and Schneider) - Bulleye

Offshore. Cape May, New Jersey, to Buenos Aires; only ten specimens have been recorded from the western North Atlantic (Caldwell, 1962a). See also Fowler (1947). NC.

See above reference as regards all western Atlantic priacanthids.

*Priacanthus arenatus Cuvier - Bigeye

Common to abundant on patch reefs at 8-9 m (25-30 ft) in depth. Common under ledges at 12-15 m (40-50 ft).

*Priacanthus cruentatus (Lacépède) - Glasseye snapper

Reef at 11-12 m (30-40 ft), probably occasional.

Note: one (or both) of the above two species has also been observed at 21 m (70 ft) in depth; additional collecting is needed to more accurately determine depth distribution and relative abundance.

Pristigenys alta (Gill) - Short bigeye

Offshore, occasional. My collections of this species have all been juveniles (less than 25 mm TL), found during the months of July and August, around floating sargassum weed. See also Caldwell (1962b).

Apogonidae

*Apogon binotatus (Poey) - Barred cardinalfish

Reef, occasional. This species has definitely been collected from 20-21 m (65-70 ft), and possibly from 27 m (90 ft) (collections on one occasion were inadvertently mixed). See Böhlke and Randall (1968) for a key to the species of Apogon and Astrapogon. See also Schultz (1940).

*Apogon lachneri Böhlke - Whitestar cardinalfish

Reef, occasional. This species has definitely been collected from 18 m (60 ft), and from either 20 m (65 ft) or 27 m (90 ft) (this species was included in a mixed collection).

*Apogon leptocaulus Gilbert - Slendertail cardinalfish

Reef at 20-21 m (65-70 ft), rare. One specimen (the holotype) was collected during this study and described by C. R. Gilbert. It is likely a deepwater species that occasionally strays into shallower areas (Gilbert, 1972).

*Apogon maculatus (Poey) - Flamefish

Under reef ledges, 1-18 m (3-60 ft), common to abundant. Note: this is our most common cardinalfish and a popular species in the aquarium fish trade.

*Apogon phenax Böhlke and Randall - Mimic cardinalfish

Reef at 18 m (60 ft), rare. One specimen was collected. See also Böhlke and Randall (1968).

*Apogon planifrons Longley and Hildebrand - Pale cardinalfish

Occasional on the reefs at 6-9 m (20-30 ft) and 18-21 m (60-70 ft); frequent at 9-12 m (30-40 ft).

*Apogon pseudomaculatus Longley - Twospot cardinalfish

Reefs from 6-12 m (20-40 ft), frequent to common. Occasional at 18-20 m (60-70 ft).

*Apogon townsendi (Breder) - Belted cardinalfish

Reefs at 9 to 21 m (30-70 ft), frequent to common. This species was also in a mixed collection and possibly collected at 27 m (90 ft).

*Astrapogon puncticulatus (Poey) - Blackfin cardinalfish

Reef at 6-9 m (20-30 ft), rare. One specimen was collected.

*Phaeoptyx conklini (Silvester) - Freckled cardinalfish

Reefs at 1-21 m (3-70 ft), common to abundant.

Note: only A. maculatus, among the cardinalfishes, is more abundant.

*Phaeoptyx pigmentaria (Poey) - Dusky cardinalfish

Reefs at 6-12 m (20-40 ft), common. Two specimens were also collected from a worm-rock "reef" at 3.6 m (12 ft) in depth.

*Phaeoptyx xenus (Böhlke and Randall) - Sponge cardinalfish

Reef at 20-21 m (65-70 ft), probably occasional. Three specimens were obtained by C. R. Gilbert in one collection made off Delray Beach in 1967.

See Böhlke and Randall (1968)

Branchiostegidae

Caulolatilus cyanops Poey - Blackline tilefish

Offshore. New Jersey to Puerto Rico (Briggs, 1958). Common off the vicinity of Alligator Reef (Starck, 1968). NC.

Lopholatilus chamaeleonticeps Goode and Bean - Tilefish

Offshore. One specimen reported from off Port Everglades Inlet (Powell et al., 1972); depth not given. Along the outer part of the continental shelf from 82-311 m (45-170 fms) in depth (Leim and Scott, 1966). See also Goode and Bean (1895). NC.

Malacanthus plumieri (Bloch) - Sand tilefish

Common in the vicinity of reefs at depths of 11-24 m (35-80 ft). Note: I consider this a secondary reef species (equally characteristic of areas not associated with the reef), in contrast with Starck's (1968) classification as a primary reef species. See Berry (1958c) as regards this genus.

Pomatomidae

Pomatomus saltatrix (Linnaeus) - Bluefish

Inshore, frequent to common at certain times during the winter, and a popular sport fish when they are "running."

Rachycentridae

Rachycentron canadum (Linnaeus) - Cobia

Inshore and offshore, occasional. My records are based on reports of fishermen; I have not personally seen this fish locally. See also Fowler (1936).

Echeneidae

Echeneis naucrates Linnaeus - Sharksucker

Inshore and offshore. This is our most common species of echeneid, and the only one I have collected (off barracuda and while apparently trying to attach to me). The UMML RV Gerda, cruise G-6, collected one specimen in my area at a depth of 91 m (50 fms).

See Strasburg (1964) for a key to the species of Echeneidae.

Echeneis neucratoides Zuieuw - Whitefin sharksucker

Inshore; New England to the West Indies and the Gulf of Mexico (Böhlke and Chaplin, 1968). NC.

Note: due to the scarcity of, or difficulty in collecting, the host organisms, I have had to rely on the literature in my account of the echeneids.

Phtheirichthys lineatus (Menzies) - Slender suckerfish

Offshore. Worldwide in tropical waters; South Carolina to Colombia (Briggs, 1958). Free-swimming or attached to slow-swimming fishes or immotile objects (Strasburg, 1964, 1967). NC.

Remora australis (Bennett) - Whalesucker

Offshore. Throughout the tropical and temperature Atlantic, Pacific, and Indian Oceans; four species of cetaceans are the only documented hosts (Rice and Caldwell, 1961). NC.

Remora brachyptera (Lowe) - Spearfish remora

Offshore. Circumtropical; Maine to Brazil in the western Atlantic (Briggs, 1958). Found attached to swordfish, ocean sunfish, and the larger sharks (Perlmutter, 1961). NC.

Remora osteochir (Cuvier) - Marlinsucker

Offshore. Fowler (1936) reported one specimen from a sailfish caught "outside" Lake Worth Inlet and another from Ft. Lauderdale. Most commonly found attached to sailfishes and marlins (Perlmutter, 1961). NC.

Remora remora (Linnaeus) - Remora

Offshore. Bermuda and Massachusetts to Argentina (Briggs, 1958). "Frequently" found attached to sea turtles and larger sharks (Perlmutter, 1961). See also Strasburg (1962). NC.

Remorina albescens (Temminck and Schlegel) - White suckerfish

Offshore. Circumtropical; attaches to large slow-moving fishes (C. R. Robins, personal communication). NC.

Carangidae

Alectis crinitus (Mitchill) - African pompano

Generally inshore. I have had occasional reports of fishermen catching this species locally. NC.

See Jordan and Gilbert (1883) for a review of the American carangids; Ginsburg (1952a) and Berry (1958b), Gulf of Mexico carangids.

Caranx bartholomaei Cuvier - Yellow jack

Primarily inshore as adults, frequent over patch reefs from 1.5-14 m (5-45 ft) in depth. I have collected juveniles from floating sargassum weed during the month of July.

See Berry (1959a) as regards Caranx spp.

Caranx crysos (Mitchill) - Blue runner

Inshore patch reefs as shallow as 1.5 m (5 ft) to reefs at 18-21 m (60-70 ft), common. This fish is commonly used as live bait for the larger game fishes. See also McKenney et al. (1958).

Caranx hippos (Linnaeus) - Crevalle jack

Inshore and in the Intracoastal Waterway to brackish water, common.

Caranx latus - Horse-eye jack

Inshore, occasional. Our only collection of this species consisted of four individuals obtained near a rock outcropping which extended from shore to a depth of about 2.4 m (8 ft).

Caranx ruber (Bloch) - Bar jack

Patch reefs at 6-9 m (20-30 ft) to reefs at 18-21 m (60-70 ft), common. This is our most abundant species of Caranx.

Chloroscombrus chrysurus (Linnaeus) - Atlantic bumper

Intracoastal Waterway, rare. One specimen was collected in Lake Boca Raton (an expansion of the Intracoastal Waterway). Possibly more abundant than the above would indicate.

Decapterus punctatus (Agassiz) - Round scad

Primarily offshore, occasional. Collected from under our boat when at anchor, and from under floating sargassum.

See Berry (1968) for a review of the genus.

Decapterus tabl Berry - Redtail scad

Adults are offshore; currently known from only 55 specimens, including some from the east coast of southern Florida (Berry, 1968). NC.

Elagatis bipinnulata (Quoy and Gaimard) - Rainbow runner

Inshore and offshore. Circumtropical; including the Florida Atlantic coast; usually found near the surface; juveniles are frequently found in the sargassum community (Berry, 1969). NC.

Naucrates ductor (Linnaeus) - Pilotfish

Cosmopolitan, an oceanic tropical fish (Liem and Scott, 1966). Powell et al. (1972) record one specimen of Naucrates sp. from off Palm Beach. NC.

Oligoplites saurus (Bloch and Schneider) - Leatherjacket

Intracoastal Waterway, occasional. We have not collected this species outside of this enclosed area.

Selar crumenophthalmus (Bloch) - Bigeye scad

Inshore patch reefs, 6-11 m (20-35 ft) in depth, common to abundant. Occasionally encountered in as shallow as 1.5 m (5 ft) and as deep as 18 m (60 ft).

Note: locally termed the "goggle-eye," this species is widely used as live bait for the larger game fishes.

Selene vomer (Linnaeus) - Lookdown

Inshore and in the Intracoastal Waterway, common. Attracted to bridge and pier lights at night.

Seriola dumerili (Risso) - Greater amberjack

Over reefs at 18-26 m (60-85 ft) in depth, common.

Note: I do not consider this a primary reef species as it is wide-ranging and often near the surface.

See Mather (1958) for a preliminary review of Seriola.

Seriola fasciata (Bloch) - Lesser amberjack

Coastal waters from Cape Hatteras to the West Indies, and well out into oceanic waters (Mather, 1958). NC.

Seriola rivoliana Valenciennes - Almaco jack

Offshore, rare. One juvenile was collected from under floating sargassum during the month of August. Probably more common than this would indicate.

Seriola zonata (Mitchill) - Banded rudderfish

Offshore, rare at Alligator Reef (Starck, 1968). Nova Scotia to Brazil (Mather, 1958). NC.

Trachinotus carolinus (Linnaeus) - Florida pompano

Inshore, surf zone to about 3 m (10 ft), common. Only juveniles have been collected.

Note: additional sampling is needed to determine seasonal abundance of species of Trachinotus.

See La Monte (1958), Fields (1962), Berry and Iversen (1967), and Finucane (1969) as regards the species of Trachinotus.

Trachinotus falcatus (Linnaeus) - Permit

Inshore, surf zone to about 3 m (10 ft), common to abundant. Only juveniles have been collected.

Trachinotus goodei Jordan and Evermann - Palometa

Inshore, rare. One juvenile was collected in the surf zone at Boca Raton, October 1972.

Trachurus lathami Nichols - Rough scad

Secondarily associated with reefs (Starck, 1968). Maine to Florida and throughout the Gulf of Mexico (Briggs, 1958). Young are numerous in the Gulf Stream, off the Florida Keys (Nichols, 1920). NC.

Uraspis secunda (Poey) - Cottonmouth jack

Primarily offshore, probably occasional. One specimen was caught by M. Bryant, off Delray Beach, at a depth of 37 m (120 ft), August 1972. Powell et al. (1972) report one specimen from off Boynton Inlet and another from off Port Everglades Inlet; no depths given.

Vomer setapinnis (Mitchill) - Atlantic moonfish

Inshore, rare. One specimen was collected in the surf zone at Boca Raton, October 1972.

Coryphaenidae

Coryphaena equisetis Linnaeus - Pompano dolphin

Offshore, occasional.

See Gibbs and Collette (1959) as regards these two species.

Coryphaena hippurus Linnaeus - Dolphin

Offshore, particularly common in spring and summer. Five juveniles (19-33 mm SL) were obtained from among floating sargassum weed in one collection in March 1973.

Note: a locally important sport fish, adults are often found in association with floating sargassum and debris. In the author's opinion, second only to the hogfish (*Lachnolaimus maximus*) in table quality.

Bramidae

Brama brama (Bonnaterre) - Atlantic pomfret

Offshore. Worldwide, Massachusetts and Bermuda to Cuba in the western Atlantic (Briggs, 1958). NC.

See Mead (1957) and Mead and Haedrich (1965) as regards the bramid fishes.

Emmelichthyidae

*Emmelichthyops atlanticus Schultz - Bonnetmouth

Reef at 18-21 m (60-70 ft), rare to occasional. Observational records by W. P. Davis and H. F. Sahlman, III.

Lutjanidae

*Lutjanus analis (Cuvier) - Mutton snapper

Reef at 18-21 m (60-70 ft), occasional. Small individuals have been observed in as shallow as 4.6 m (15 ft).

See Jordan and Swain (1884d), Jordan and Fesler (1889), and Anderson (1967) as regards this family.

Lutjanus apodus (Walbaum) - Schoolmaster

Inshore and in the Intracoastal Waterway to brackish water, common. Patch reefs to about 6 m (20 ft) in depth, frequent.

*Lutjanus buccanella (Cuvier) - Blackfin snapper

Reef at 21 m (70 ft) plus, occasional. Juveniles have been observed on the reef at 11-12 m (35-40 ft) and on a patch reef as shallow as 8 m (25 ft). See also Ginsburg (1930).

Lutjanus campechanus (Poey) - Red snapper

Offshore. Rivas (1966) examined specimens from off Miami and Port Everglades; usually at depths of less than 146 m (80 fms). NC.

*Lutjanus cyanopterus (Cuvier) - Cubera snapper

The "ledge" at 18-21 m (60-70 ft), rare. One large individual was observed on several occasions at this location off Boca Raton (F. H. Sahlman, III, personal communication).

See Rivas (1949) and Moe (1966).

*Lutjanus griseus (Linnaeus) - Gray snapper

Intracoastal Waterway to brackish water, common.

Inshore patch reefs and worm-rock "reefs" as shallow as 1 m (3 ft) and reefs to 21 m (70 ft), common to abundant.

This is our most common snapper, adults being particularly abundant on reefs at 9-14 m (30-45 ft) in depth.

Note: I have classified this as a primary reef species because it is so characteristic of the reefs in this area, even though not confined to reefs. See also Starck and Schroeder (1970).

*Lutjanus jocu (Bloch and Schneider) - Dog snapper

Reefs from 11-12 m (35-40 ft), to at least 24 m (80 ft), occasional. All of my records of this species have been sight observations.

*Lutjanus mahogoni (Cuvier) - Mahogany snapper

A primary reef species (Starck, 1968). One individual was caught during this study (W. R. Courtenay, Jr., personal communication). NC.

Lutjanus synagris (Linnaeus) - Lane snapper

Inshore, 1-4.6 m (3-15 ft), occasional to frequent. Primarily juveniles near patch reefs, rock outcroppings, and similar obstructions.

Lutjanus vivanus (Cuvier) - Silk snapper

Primarily offshore. Rivas (1966) examined specimens from off Miami and Port Everglades; usually at depths of 146-220 m (80-120 fms). Moe et al. (1966) also record this species for Palm Beach County; depth was not given. NC.

*Ocyurus chrysurus (Bloch) - Yellowtail snapper

Typically over reefs at 8-21 m (25-70 ft), occasional. Our few specimens have been collected while trolling artifical baits just beneath the surface. It is not as common a fish here as it is in the Florida Keys or the Bahamas.

Pristipomoides aquilonaris (Goode and Bean) - Wenchman

Offshore. North Carolina to both coasts of Florida, and the Caribbean; 40-366 m (22-200 fms) in depth (Anderson, 1966). NC.

*Rhomboplites aurorubens (Cuvier) - Vermilion snapper

Reefs at 21 m (70 ft) plus, occasional. Two specimens were collected in water as shallow as 14 m (45 ft). Also collected offshore at a depth of 137-155 m (75-85 fms), by the M/V Pelican, station 16, off Lauderdale-by-the-Sea (Bullis and Thompson (1965).

Lobotidae

Lobotes surinamensis (Bloch) - Tripletail

Intracoastal Waterway, common. I have not observed this species outside of the confines of the Intracoastal Waterway.

Gerreidae

Diapterus olisthostomus (Goode and Bean) - Irish pompano

Intracoastal Waterway to brackish and fresh water, common at certain localities. Seven individuals were obtained in one rotenone collection at a salinity of 0.03°/oo.

Diapterus plumieri (Cuvier) - Striped mojarra

Inshore, to brackish and fresh water. Atlantic coast of tropical America and the West Indies, north to eastern Florida (Jordan and Evermann, 1896-1900). NC.

Eucinostomus argenteus Baird and Girard - Spotfin mojarra

Inshore near the surf zone, common.

Intracoastal Waterway to brackish and fresh water, common to abundant. This is our most common gerreid.

See Curran (1942) for a revision of this genus.

Eucinostomus gula (Quoy and Gaimard) - Silver jenny

Inshore near the surf zone, and in the Intracoastal Waterway to brackish water, common to abundant.

Eucinostomus havana (Nichols) - Bigeye mojarra

Inshore near the surf zone, probably occasional. Nine individuals were obtained in one collection made at Boca Raton in October 1971.

Eucinostomus lefroyi (Goode) - Mottled mojarra

Intracoastal Waterway to brackish water; common to abundant at the northern limits of my study area. I have not collected this species south of Lake Worth in my study area.

Eucinostomus melanopterus (Bleeker) - Flagfin mojarra

Inshore. This species occurs sporadically in Biscayne Bay, Miami, and should be found in areas directly north (C. R. Robins, personal communication). NC.

Eucinostomus pseudogula Poey - Slender mojarra

Intracoastal Waterway to brackish water, common at the northern limits of my study area. Only one specimen has been collected south of Lake Worth.

Gerres cinereus (Walbaum) - Yellowfin mojarra

Intracoastal Waterway from a branching canal. We have collected this species only in fresh water (0.03o/oo salini ; here four specimens were obtained.

Pomadasyidae

*Anisotremus surinamensis (Bloch) - Black margate

Shallow rock outcroppings at 1.5 m (5 ft) in depth to reefs at 6-9 m (20-30 ft), frequent. Deeper reefs at 9-14 m (30-45 ft) and 18-21 m (60-70 ft), common.

See Jordan and Fesler (1889) as regards sparoid fishes.

*Anisotremus virginicus (Linnaeus) - Porkfish

Shallow rock outcroppings at 1-5 m (5 ft) to reefs at 18-21 m (60-70 ft), common. Particularly common at 9-14 m (30-45 ft).

*Haemulon album Cuvier - Margate

Shallow rock outcroppings at 1.5 m (5 ft) to reefs at 18-21 m (60-70 ft), frequent.

See Jordan and Swain (1884b, and Courtenay (1961) for a review and revision of Haemulon.

*Haemulon aurolineatum Cuvier - Tomtate

Patch reefs and reefs from near shore to depths of 21 m (70 ft), abundant. Juveniles are common around seawalls and pilings in the Intracoastal Waterway. This is our most abundant species of grunt. See also Ginsburg (1948a).

*Haemulon carbonarium Poey - Caesar grunt

Inshore rock outcroppings and patch reefs to around 9 m (30 ft), frequent.

*Haemulon chrysargyreum Günther - Smallmouth grunt

Inshore around rock outcroppings and worm-rock "reefs," frequent to common. Our deepest collection has been at about 3 m (10 ft).

*Haemulon flavolineatum (Desmarest) - French grunt

Reefs from 3-6 m (10-20 ft) to 18-21 m (60-70 ft), abundant. Juveniles are common around seawalls and pilings in the Intracoastal Waterway.

Note: this species and H. plumieri are the next most common species of grunts locally, after H. aurolineatum.

*Haemulon macrostomum Günther - Spanish grunt

Reef at 18 m (60 ft), rare. One specimen was collected during the course of this study. Starck (1968) reports this species as common in the Alligator Reef vicinity.

*Haemulon melanurum (Linnaeus) - Cottonwick

Reefs from 9-21 m (30-70 ft) in depth, frequent. Juveniles are common (on occasion) around inshore rock outcroppings.

*Haemulon parrai (Desmarest) - Sailors choice

Inshore rock outcroppings and worm-rock "reefs" to around 4 m (12 ft), common. Reefs to 21 m (70 ft), occasional to frequent.

*Haemulon plumieri (Lacépède) - White grunt

Reefs from 3-6 m (10-20 ft) to 18-21 m (60-70 ft), abundant.

*Haemulon sciurus (Shaw) - Bluestriped grunt

Inshore rock outcroppings and reefs to 14 m (45 ft), occasional.

*Haemulon striatum (Linnaeus) - Striped grunt

Reef at 6-9 m (20-30 ft), occasional. We have only collected this species on one occasion, in April 1971, when eight specimens were obtained. Starck (1968) reports this species as abundant in the Alligator Reef vicinity.

Orthopristis chrysoptera (Linnaeus) - Pigfish

Inshore and in the Intracoastal Waterway, occasional at Boca Raton to frequent in Lake Worth (the northern limit of my study area).

Pomadasys crocro (Cuvier) - Burro grunt

Intracoastal Waterway from a branching canal. Four specimens of this species were obtained after fresh water (0.03°/oo salinity) had been reached.

Sparidae

Archosargus probatocephalus (Walbaum) - Sheepshead

Intracoastal Waterway to brackish and fresh water, common.

See also Caldwell (1965).

See Jordan and Fesler (1889) on sparoid fishes.

Archosargus rhomboidalis (Linnaeus) - Sea bream

Intracoastal Waterway in brackish water, rare. One specimen was collected at Lake Worth, the northern limit of my study area.

Calamus bajonado (Bloch and Schneider) - Jolthead porgy

Secondarily associated with reefs (Starck, 1968). In Florida, from Ft. Pierce on the southeastern Atlantic coast to northwest Florida in the Gulf of Mexico (Randall and Caldwell, 1966). NC. See Jordan and Gilbert (1884) and Caldwell (1966) for reviews of Calamus.

Calamus calamus (Valenciennes) - Saucereye porgy

Along the reef edge, definitely recorded locally at a depth of 9-12 m (30-40 ft).

Note: Species of Calamus are common along the reef edges to depths of at least 30 m (100 ft); additional collecting is needed to determine relative abundance and depth distribution of the species.

Calamus leucosteus Jordon and Gilbert - Whitebone porgy

As with other species of Calamus, probably only secondarily associated with reefs. Randall and Caldwell (1966) examined specimens from along both coasts of Florida, including the Florida Keys; 9-91 m (5-50 fms). NC.

Calamus nodosus Randall and Caldwell - Knobbed porgy

Associated with reefs; North Carolina to the Florida Keys, and in the Gulf of Mexico; 11-79 m (6-43 fms), but usually over 37 m (20 fms) in depth (Randall and Caldwell, 1966). NC.

Calamus penna (Valenciennes) - Sheepshead porgy

Along the reef edge, definitely recorded locally from a depth of 21 m (70 ft).

Calamus proridens Jordon and Gilbert - Littlehead porgy

Along the reef edge, my specimens have been collected from depths ot 4.6 m (15 ft) and 9-11 m (30-35 ft). Randall and Caldwell (1966) record this species to depths of 60 m (33 fms).

Diplodus argenteus (Valenciennes) - Silver porgy

Inshore from the surf zone to over reefs at 6-9 m (20-30 ft), common to abundant. Referred to locally as the "spot."

Diplodus holbrooki (Bean) - Spottail porgy

Primarily inshore. Open waters of relatively high salinity over shallow or deep flats, with a preference for bottoms covered by vegetation (Caldwell, 1955b). NC.

Lagodon rhomboides (Linnaeus) - Pinfish

Inshore and in the Intracoastal Waterway, frequent. This species is abundant in areas adjacent to my study area (Christensen, 1965; Starck, 1968). See also Caldwell (1957b).

Pagrus sedecim Ginsburg - Red Porgy

Primarily offshore locally. Powell et al. (1972) report one specimen from 1.2 miles off Boynton Inlet. NC.

Sciaenidae

Bairdiella chrysura (Lacépède) - Silver perch

Inshore. Most abundant in sparse vegetation in muddy or sandy areas adjacent to grass beds (Robins and Tabb, 1965). South Atlantic and Gulf coasts of the United States (Jordan and Eigenmann, 1886a). NC.

See Welsh and Breder (1923) as regards this family.

Cynoscion nebulosus (Cuvier) - Spotted seatrout

Intracoastal Waterway to brackish water, occasional to frequent in the Lake Worth area. Lack of suitable habitat (grass flats with adjacent deep water areas) accounts for the scarcity of this species in all but the most northern limits of my study area.

See Hildebrand and Cable (1934), Tabb (1961), and Fitch (1970) as regards this species.

*Equetus acuminatus (Bloch and Schneider) - High-hat

Rock outcroppings and under ledges from near shore to a maximum depth of about 12 m (40 ft), common. This species is very popular with local aquarists.

*Equetus lanceolatus (Linnaeus) - Jackknife-fish

Reef at 18-26 m (60-85 ft), occasional. Juveniles have been observed as shallow as 7.6 m (25 ft).

*Equetus punctatus (Bloch and Schneider) - Spotted drum

Reef at 18-21 m (60-70 ft), frequent. This species and E. lanceolatus also enter the aquarium fish trade, although not with the frequency of E. acuminatus.

*Equetus umbrosus Jordan and Eigenmann - Cubbyu

Reef at 21 m (70 ft), rare to occasional. Three adult specimens were obtained in one collection made at the above depth in September 1971.

Leiostomus xanthurus Lacépède - Spot

Inshore, to brackish and fresh water. Abundant in sounds and estuaries (Welsh and Breder, 1923). South Atlantic and Gulf coasts of the United States (Jordan et al., 1930). NC.

Menticirrhus americanus (Linnaeus) - Southern kingfish

Inshore near the surf zone, common. See also Hildebrand and Cable (1934).

Menticirrhus littoralis (Holbrook) - Gulf kingfish

Inshore. South Atlantic and Gulf coasts of the United States (Hildebrand and Schroeder, 1927). NC.

Micropogon undulatus (Linnaeus) - Atlantic croaker

Inshore and in the Intracoastal Waterway to brackish water, frequent. Reported from permanent fresh water in the St. Johns River by Tagatz (1967).

*Odontoscion dentex (Cuvier) - Reef croaker

Rock outcroppings near shore to reefs at 18-21 (60-70 ft), common. Particularly common on reefs at 6-12 m (20-40 ft) in depth.

Pogonias cromis (Linnaeus) - Black drum

Inshore, to brackish water. Common on sandy coasts; New York to Montevideo (Jordan and Eigenmann, 1886a). Also in the north and eastern Gulf of Mexico (Briggs, 1958). This species was collected by Christensen (1965) in the Jupiter area, but I have no records for my study area. P. cromis may be a disjunct species, and is definitely disjunct as far as abundance is concerned. NC.

Sciaenops ocellata (Linnaeus) - Red drum

Intracoastal Waterway to brackish water, occasional in the Lake Worth area. I have no records for more southern sections of my study area. Reported in fresh water in the St. Johns River by Tagatz (1967).

Umbrina coroides Cuvier - Sand drum

Inshore, in the vicinity of the surf zone, common to abundant. Also see Gilbert (1966).

Mullidae

*Mulloidichthys martinicus (Cuvier) - Yellow goatfish

Patch reefs and worm-rock "reefs" as shallow as 1.5 m (5 ft) to reefs at 18-21 m (60-70 ft) in depth, common.

See Caldwell (1962) as regards this family.

Mullus auratus Jordon and Gilbert - Red goatfish

Offshore. Collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, at a depth of 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

*Pseudupeneus maculatus (Bloch) - Spotted goatfish

Reefs from 6-21 m (20-70 ft), common. Most often seen at the edge of the reef, feeding in the sand.

Note: I have followed Starck (1968) in classifying the preceding two species as primary reef fishes.

Upeneus parvus Poey - Dwarf goatfish

Offshore. Collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, at a depth of 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

See Lachner (1954) for a revision of this genus.

Pempheridae

*Pempheris scomburgki Müller and Troschel - Glassy sweeper

Inshore rock outcroppings and reefs to depths of 21 m (70 ft), common. Found under ledges and in holes, as far back from the opening as possible.

Kyphosidae

Kyphosus incisor (Cuvier) - Yellow chub

Primarily offshore. Juveniles are occasionally found under floating sargassum. Our only adult collected was speared over a reef at a depth of 23 m (75 ft). Small aggregations of very large individuals (around 0.6 m TL), assumed to be this species, have been observed over reefs at 18-24 m (60-80 ft).

See Moore (1962) as regards these two species.

*Kyphosus sectatrix (Linnaeus) - Bermuda chub

Rock outcroppings near shore, to reefs at 6-9 m (20-30 ft), common to abundant. Solitary individuals, small groups, and aggregations of 50-100 individuals have been observed.

Ephippidae

Chaetodipterus faber (Broussonet) - Atlantic spadefish

Inshore and in the Intracoastal Waterway, around rock outcroppings, seawalls, and pilings; occasional.

Reefs from near shore to depths of at least 24 m (80 ft), frequent to common.

Aggregations of 200-300 individuals have been observed moving over the deeper reefs.

Pomacanthidae

*Centropyge argi Woods and Kanazawa - Cherubfish

Reefs at 18-40 m (70-120 ft), common; particularly so at around 34 m (110 ft). Referred to as the "pygmy angelfish" by local aquarists.

See Fraser-Brunner (1933) and Feddern (1972) for a revision of, and a field key to, the angelfishes.

Note: Feddern (1972) separates the angelfishes (Pomacanthidae) from the butterflyfishes (Chaetodontidae), following Burgess (in press).

*Holacanthus bermudensis Goode - Blue angelfish

Reefs from 6 to at least 34 m (20-110 ft), common.

Note: juveniles of Holacanthus and Pomacanthus have also been observed on patch reefs and inshore rock outcroppings as shallow as 0.9 m (3 ft).

*Holacanthus ciliaris (Linnaeus) - Queen angelfish

Reefs from 6-21 m (20-70 ft), common.

*Holacanthus tricolor (Bloch) - Rock beauty

Reefs from 6-21 m (20-70 ft), common. This species is particularly common at depths of 9-14 m (30-45 ft).

*Pomacanthus arcuatus (Linnaeus) - Gray Angelfish

Reefs from 6-21 m (20-70 ft), common.

*Pomacanthus paru (Bloch) - French angelfish

Reefs from 6-21 m (20-70 ft), common.

Note: juveniles of both species have been collected year around, and a disproportionately high number of juvenile P. paru occurs.

Chaetodontidae

*Chaetodon aculeatus (Poey) - Longsnout butterflyfish

Reefs at 24-37 m (80-120 ft), common. Occasionally observed at 18 m (60 ft), and on one occasion as shallow as 11 m (35 ft) (D. P. Herrema, personal communication).

Note: the "longnose butterflyfish" of local aquarists is relatively hardy in the aquarium, although difficult to obtain. This species requires a longer decompression time on ascent than the pygmy angelfish (Centropyge argi); however,

individuals in which we punctured the air bladder (in one instance, with the point of a gaff) apparently suffered no ill effects. Chaetodon (rather than Prognathodes) has been used; following Burgess (in press).

Chaetodon aya Jordan - Bank butterflyfish

As far north as Cape Hatteras along the continental slope of the southeastern United States; usual depth range 35-120 m (115-400 ft) (Hubbs, 1963). NC.

Note: we have made an effort to look for this species at depths exceeding 30 m, and have yet to see one.

*Chaetodon capistratus Linnaeus - Foureye butterflyfish

Reefs from 6-21 m (20-70 ft), frequent.

Note: Juveniles of this and the other species of Chaetodon have been observed on rock outcroppings as shallow as 0.9 m (3 ft). All members of this family are prized aquarium fishes.

*Chaetodon ocellatus Bloch - Spotfin butterflyfish

Reefs from 6-21 m (20-70 ft), common.

Note: this species and C. sendentarius are our most common species of the genus. This is in contrast with the Bahamas, where C. capistratus and striatus are the most common (Böhlke and Chaplin, 1968).

*Chaetodon sedentarius Poey - Reef butterflyfish

Reefs from 6-21 m (20-70 ft), common.

*Chaetodon striatus Linnaeus - Banded butterflyfish

Reefs from 6-21 m (20-70 ft), frequent. This is our least common species of butterflyfish.

Pomacentridae

*Abudefduf saxatilis (Linnaeus) - Sergeant major

Intracoastal Waterway around seawalls and pilings, common, particularly the juveniles.

Inshore around rock outcroppings, worm-rock, and shallow patch reefs, adults are common, juveniles are seasonally abundant (fall and winter).

Reefs from 6-21 m (20-70 ft), common to abundant. This species is most abundant at depths of 6-14 m (20-45 ft), and rare at depths exceeding 24 m (80 ft).

This is one of the most common fishes observed on our reefs.

Abudefduf taurus (Müller and Troschel) - Night sergeant

At the edge of a worm-rock "reef," 1.5 m (5 ft) in depth, rare. One specimen was obtained off Boca Raton in 1967.

*Chromis cyanea (Poey) - Blue chromis

Reefs from 9 m to about 27 m (30-90 ft), common. Abundant at depths of 18-21 m (60-70 ft).

Note: this species is typically found on the reef flats, whereas C. multilineata, our only other abundant species of Chromis, is found along and under the ledges. Both

species, along with the creole wrasse (Clepticus parrai), form feeding aggregations in midwater over the reefs. On the recommendation of A. R. Emery (personal communication to C. R. Robins), the specific names cyanea, insolata, and multilineata take the feminine (-a) ending, rather than the masculine (-us) as listed by Bailey et al. (1970).

*Chromis enchrysurus Jordan and Gilbert - Yellowtail reeffish

Reefs from 11-30 m (35-110 ft), occasional.

*Chromis insolata (Cuvier) - Sunshinefish

Reefs at 18-27 m (60-90 ft), occasional (although more common than C. enchrysurus).

Note: the above depths define our collections of this species; it has been reported at depths of 35-180 ft in the Bahamas, and 50-160 ft in the Florida Keys (Böhlke and Chaplin, 1968).

*Chromis multilineata (Guichenot) - Brown chromis

Reefs from 9-21 m (30-70 ft), common. Abundant at depths of 18-21 m (60-70 ft). One specimen has been collected in as shallow as 4.6 m (15 ft). See also Myrberg, et al. (1967).

*Chromis scotti Emery - Purple reeffish

Reefs from 9-21 m (30-70 ft), frequent to common. See also Emery (1968).

Note: this species and C. cyanea occasionally enter the aquarium fish trade.

*Microspathodon chrysurus (Cuvier) - Yellowtail damselfish

Adults are occasional on reefs at 9-14 m (30-45 ft) in depth.

Note: juveniles (the "Jewelfish" of aquarists) have not been observed, although they are common in the Florida Keys. See also Ciardelli (1967).

*Pomacentrus fuscus Cuvier - Dusky damselfish

Inshore rock outcroppings and worm-rock "reefs" to depths of about 4.6 m (15 ft), common, particularly the juveniles.

Note: the damselfishes (Pomacentrus spp.) are hardy and popular aquarium fishes, although tending to be rather aggressive.

See Rivas (1960) for a review of this genus.

*Pomacentrus partitus Poey - Bicolor damselfish

Reefs from 6-37 m (20-120 ft), common. Abundant at depths of 9-21 m (30-70 ft), on the reef flats.

*Pomacentrus planifrons Cuvier - Threespot damselfish

Inshore around rock outcroppings, patch reefs, and worm-rock "reefs," to reefs at 9-12 m (30-40 ft), common.

*Pomacentrus variabilis (Castelnau) - Cocoa damselfish

Inshore around rock outcroppings, patch reefs, and worm-rock "reefs," to reefs at 18-21 m (60-70 ft), common to abundant.

Note: although local aquarists typically refer to the "beaugregory" as abundant in this area, they are in

actuality referring to the cocoa damselfish (P. variabilis). After extensive collecting and observation, I have yet to encounter P. leucostictus in my study area, although I have observed it on numerous occasions in the Florida Keys.

Cirrhitidae

*Amblycirrhitus pinos (Mowbray) - Redspotted hawkfish

Occasional to frequent on patch reefs at 6-11 m (20-35 ft) in depth. Less frequent on reefs to 21 m (70 ft) in depth, and then only occurring on the reef flats.

See Randall (1963c) for a review of this family.

Labridae

*Bodianus pulchellus (Poey) - Spotfin hogfish

Reefs from 18-27 m (60-90 ft), common. This species has been observed at depths as shallow as 11 m (35 ft), and can be considered as occasional at depths of 37-40 m (120-130 ft).

See Feddern (1963) as regards these species of Bodianus, and Jordan (1887) for a review of labroid fishes.

*Bodianus rufus (Linnaeus) - Spanish hogfish

Reefs at 6-9 m (20-30 ft) to 18-21 m (60-70 ft), and on the patch reefs at 6-11 m (20-35 ft), common.

Note: this species is much more common than B. pulchellus and occurs at shallower depths; both species make excellent aquarium fishes as they are attractive, active, and hardy.

*Clepticus parrai (Bloch and Schneider) - Creole wrasse

Reef at 18-21 m (60-70 ft), common to abundant.

Note: this species forms loose feeding aggregations in midwater over the reefs in association with Chromis multilineata and, to a lesser extent, C. cyanea.

Doratonotus megalepis Günther - Dwarf wrasse

Frequent to common on worm-rock "reefs" at depths of around 1.5 m (5 ft). This is the only location where we have collected this species in any number, and then only during rotenone collections. Böhlke and Chaplin (1968) report this species as being a fish of the turtle-grass beds.

*Halichoeres bivittatus (Bloch) - Slippery dick

Inshore rock outcroppings, patch reefs, and worm-rock "reefs" as shallow as 1 m (3 ft), to reefs at 9-14 m (30-45 ft), abundant. Occasional on reefs at 18-21 m (60-70 ft) in depth, and around pilings and seawalls in the Intracoastal Waterway.

See Jordan and Hughes (1886); Randall and Böhlke (1965) a review of fishes of the genus Halichoeres.

*Halichoeres caudalis (Poey) - Painted wrasse

A primary reef species (Starck, 1968). Randall and Böhlke (1965) examined specimens from both coasts of Florida; all except one specimen were collected at depths of from 27-73 m (15-40 fms). NC.

*Halichoeres cyanocephalus (Bloch) - Yellowcheek wrasse

Reef at 23 m (75 ft), rare. A pair of these fishes was observed in March 1972, and although I spent several minutes trying, I could not approach within spearing range. Primarily at depths in excess of 30 m (100 ft) (Randall and Böhlke, 1965).

*Halichoeres garnoti (Valenciennes) - Yellowhead wrasse

Reefs from 6-21 m (20-70 ft), common. Juveniles are common on patch reefs and around worm-rock as shallow as 1.5 m (5 ft).

*Halichoeres maculipinna (Müller and Troschel) - Clown wrasse

Adults are particularly common on reefs from 6-14 m (20-45 ft) in depth. They are occasionally observed around seawalls and pilings in the Intracoastal Waterway.

Juveniles are common from inshore rock outcroppings as shallow as 1 m (3 ft) to the reefs at 9-14 m (30-45 ft).

*Halichoeres poeyi (Steindachner) - Blackear wrasse

Reef at 6-9 m (20-30 ft), rare. One specimen was collected in April 1971. Seagrass beds are the preferred habitat of this species (Böhlke and Chaplin, 1968).

*Halichoeres radiatus (Linnaeus) - Puddingwife

Worm-rock "reef" at 3.7 m (12 ft) in depth, and on a reef at 6-9 m (20-30 ft), rare. One juvenile was collected at each of these locations, both in the winter (January and February).

*Hemipteronotus novacula (Linnaeus) - Pearly razorfish

A primary reef species (Starck, 1968). Randall (1965b) examined specimens from both coasts of Florida; 7-82 m (4-45 fms) in depth. NC.

*Hemipteronotus splendens (Castelnau) - Green razorfish

Frequent around worm-rock and on patch reefs from 3-7.6 m (10-25 ft) in depth.

*Lachnolaimus maximus (Walbaum) - Hogfish

Reefs from 6 m (20 ft) to at least 37 m (120 ft), frequent to common.

Note: this species suffers heavy predation locally, due to the unfortunate combination of its trusting nature and excellent taste.

*Thalassoma bifasciatum (Bloch) - Bluehead

Inshore rock outcroppings and patch reefs to reefs at 18-21 m (60-70 ft) in depth, common. Abundant at depths of 6-14 m (20-45 ft).

Note: this is our most common member of the family; locally referred to as the "bluehead wrasse."

See Randall and Randall (1963) and Feddern (1965) as regards this species.

Scaridae

Cryptotomus roseus Cope - Bluelip parrotfish

Occasional; we have collected this species in collections made with rotenone on reefs at 7.6 m (25 ft) and at 11-12 m (35-40 ft): and from a mangrove bordered shoreline in the Intracoastal Waterway (33.6°/oo salinity).

See Jordan (1887) for a review of labroid fishes, and Schultz 1958a, 1968) as regards this family.

Nicholsina usta (Valenciennes) - Emerald parrotfish

Secondarily associated with reefs (Starck, 1968). Schultz (1958a) examined specimens from New Jersey, the Carolinas, Florida, and the Florida Keys to Tortugas on the U.S. Atlantic coast. Most common in turtle grass beds; occurs in shallow water and to depths of at least 73 m (240 ft) (Randall, (1968a). NC.

*Scarus coelestinus Valenciennes - Midnight parrotfish

Reefs at 6-14 m (20-45 ft), common during the summer and then often in aggregations of up to 50 individuals.

See Randall (1963b), sexual dichromatism in Scarus.

*Scarus coeruleus (Bloch) - Blue parrotfish

Reef at 18-21 m (60-70 ft), adults are occasional. No juveniles have been obtained in any of our collections made with rotenone.

*Scarus croicensis Bloch - Striped parrotfish

Patch reefs at about 3 m (10 ft) in depth to reefs at 18-21 m (60-70 ft), common.

Note: my accounts of this species, Scarus taeniopterus, and the species of Sparisoma, are based primarily on juveniles obtained with rotenone; additional work is needed to more accurately delimit the depth distributions and relative abundance of the adults.

*Scarus taeniopterus Desmarest - Princess parrotfish

Patch reef at 3-6 m (10-20 ft) rare. One juvenile was obtained by using rotenone.

*Scarus vetula Bloch and Schneider - Queen parrotfish

Reefs at 9-21 m (30-70 ft), occasional (based on observations of the distinctively patterned female).

*Sparisoma aurofrenatum (Valenciennes) - Redband parrotfish

Patch reefs as shallow as 3 m (10 ft) to reefs of at least 20-21 m (60-70 ft), and possibly to 27 m (90 ft) in depth, common.

*Sparisoma chrysopterum (Bloch and Schneider) - Redtail parrotfish

Patch reefs and reefs from 3-14 m (10-45 ft), common to abundant. Occasionally to depths of around 18 m (60 ft).

Note: based on the occurrence of juveniles in our collections, this is the most abundant parrotfish in the study area.

*Sparisoma radians (Valenciennes) - Bucktooth parrotfish

Particularly common on patch reefs at 6-9 m (20-30 ft) in depth. Occasional to at least 20-21 m (65-70 ft), and possibly to 27 m (90 ft).

*Sparisoma rubripinne (Valenciennes) - Redfin parrotfish

Patch reefs and reefs at 6-21 m (20-40 ft), occasional.

See also Randall and Randall (1963).

*Sparisoma viride (Bonnaterre) - Stoplight parrotfish

Patch reefs from as shallow as 3 m (10 ft) to reefs at 9-14 m (30-45 ft), frequent.

This species has also been observed along seawalls and around pilings in the Intracoastal Waterway.

Mugilidae

Agonostomus monticola (Bancroft) - Mountain mullet

Rare; one specimen was collected from a small freshwater canal in Boca Raton, in March 1973. Small, swift streams of the Atlantic drainage (Carr and Goin, 1955).

See Anderson (1957b) on larval specimens from off the Florida coast.

Mugil cephalus Linnaeus - Striped mullet

Inshore and in the Intracoastal Waterway to brackish and fresh water, common to abundant.

See de Sylva et al. (1956), Futch (1966), and Anderson (1958) as regards this species; Jordan and Swain (1884a) and Rivas (1950b) for a review and keys to the family.

Mugil curema Valenciennes - White mullet

Inshore and in the Intracoastal Waterway to brackish water, common to abundant. See also Anderson (1957a).

Note: both of these species of Mugil are important bait fishes locally.

Sphyraenidae

*Sphyraena barracuda (Walbaum) - Great barracuda

Intracoastal Waterway to brackish water, frequent, particularly the juveniles.

Inshore around rock outcroppings, patch reefs, and worm-rock "reefs" from as shallow as 1 m (3 ft) to reefs of at least 43 m (140 ft) in depth, common.

Note: I have classified this species as a primary reef species because it is so typical of our reefs, not because it is confined to reefs.

See de Sylva (1963) as regards the family, and this species in particular.

Sphyraena borealis DeKay - Northern sennet

A secondary reef species (Starck, 1968). Massachusetts to Miami, Florida, and throughout the Gulf of Mexico (de Sylva, 1963). NC.

Sphyraena guachancho Cuvier - Guaguanche

Clear bays and harbors, and along the shoreline in shallow water (Böhlke and Chaplin, 1968). Massachusetts to Brazil, and throughout the Gulf of Mexico and Caribbean Sea (de Sylva, 1963). NC.

Polynemidae

Polydactylus oligodon (Günther) - Littlescale threadfin

Inshore, in and near the surf zone. This species has a distribution similar to that of P. virginicus; evidently a rare species (Randall, 1966b). NC.

Polydactylus virginicus (Linnaeus) - Barbu

Inshore, in and near the surf zone, frequent to common. Note: my specimens correspond to the meristic and morphometric features of P. virginicus as defined by Randall (1966b), except for the number of lateral line scales which are intermediate (65-66) between P. virginicus (53-62) and P. oligodon (68-74).

Opistognathidae

*Opistognathus aurifrons (Jordan and Thompson) - Yellowhead jawfish

Common in the rubble area at the reef edge, 12-26 m (40-85 ft) in depth.

Note: this is an attractive aquarium fish although suitable substrate must be provided, and any aggressive species (e.g. damselfishes) must be removed from the tank. See also Böhlke and Thomas (1961), and Colin (1973).

*Opistognathus whitehursti (Longley) - Dusky jawfish

Common in the rubble area at the reef edge, 3-9 m (10-30 ft). in depth.

See Böhlke (1955b) as regards this species.

Note: all other species of jawfishes which have been recorded for the United States and not here included are primarily from areas south of my study area (Table 1); in extensive research on O. whitehursti, J. Thompson (personal communication) has not encountered any of these species locally, nor have any been taken in our collections made with rotenone.

Dactyloscopidae

Dactyloscopus crossotus Starks - Bigeye stargazer

Inshore near rock outcroppings at a depth of less than 1.5 m (5 ft), rare. One specimen was collected off Boca Raton in 1968.

Dactyloscopus tridigitatus Gill - Sand stargazer

Inshore near a rock outcropping at a depth of less than 2.4 m (8 ft), rare. One specimen was collected off Boca Raton in 1968. Secondarily associated with reefs (Starck, 1968).

*Gillellus greyae Kanazawa - Arrow stargazer

Inshore near rock outcroppings and on worm-rock "reefs" to depths of at least 3.7 m (12 ft), common to abundant.

Note: this species and G. rubrocinctus are associated with the reef rubble zone, rather than bare sand bottoms (Böhlke and Chaplin, 1968). Starck (1968) considered both to be primary reef species.

*Gillellus rubrocinctus Longley - Saddle stargazer

Worm-rock "reefs," patch reefs, and at the edge of higher profile reefs to depths of 9 m (30 ft), occasional.

Uranoscopidae

Astroscopus y-graecum (Cuvier) - Southern stargazer

Inshore, lies buried in sand bottoms with only the top of its head exposed, depths of 2-9 m (7-30 ft), occasional. Only adults have been collected.

See Bean (1879) on the species of Astroscopus, and Berry and Anderson (1961) for a review of this family.

Gnathagnus eregius (Jordan and Thompson) - Freckled stargazer

Primarily offshore. Georgia, eastern Florida, Tortugas, and the northern Gulf of Mexico; predominately at depths in excess of 146 m (80 fms), although a 57.5 mm (SL) specimen from Biscayne Bay was examined (Berry and Anderson, 1961). NC.

Kathetostoma albigutta (Bean) - Lancer stargazer

Offshore. Berry and Anderson (1961) examined specimens collected adjacent to, and from both north and south of, my study area; the Carolinas to the Florida Keys and around the Gulf of Mexico; depth range 40-183 m (22-100 fms), with the majority from 55-100 m (30-60 fms). NC.

Clinidae

*Acanthemblemaria aspera (Longley) - Roughhead blenny

Reefs at 6-9 m (20-30 ft) and 11-12 m (35-40 ft), common in the fall and winter.

See Böhlke (1957a, 1961) as regards the species of emblemariid blennies; Stephens (1961, 1963, 1970) for studies on the Chaenopsidae (here included within the Clinidae); and Springer (1970) on aspects of zoogeography of the family.

*Acanthemblemaria chaplini Böhlke - Papillose blenny

Reef at 6 m (20 ft), rare. One specimen was collected off Boca Raton, in October 1971).

Note: to my knowledge, this is a new record for this species in the continental United States; my identification was confirmed by W. F. Smith-Vaniz. A second specimen, collected from a worm-rock "reef" at 3.7 m (12 ft) in depth, has been tentatively identified as this species on the basis of fin ray counts, although it lacks the fleshy papillae on the head.

*Chaenopsis limbaughi Robins and Randall - Yellow face pikeblenny

A primary reef species (Starck, 1968, who first recorded this species from Florida). One specimen was collected 0.5 miles southeast of Lauderdale-by-the-Sea pier (Powell et al., 1972); I have not confirmed this identification.

*Emblemaria atlantica (Jordan and Evermann) - Banner blenny

Reef at 11-12 m (35-40 ft), rare to occasional. Three specimens were obtained in one collection using rotenone, made off Boca Raton in September 1971. These were identified by F. N. Snelson and deposited at Florida Technological University (FTU).

*Emblemaria pandionis Evermann and Marsh - Sailfin blenny

A primary reef species (Starck, 1968). One specimen was recorded by Powell et al. (1972) from 0.25 miles northeast of Boca Raton Inlet. NC.

*Enneanectes altivelis Rosenblatt - Lofty triplefin

Reefs at 9-12 m (30-40 ft) and 21 m (70 ft), occasional. Collections using rotenone at each of the above depths yielded five and two specimens, respectively.

See Rosenblatt (1960) as regards this genus.

*Labrisomus bucciferus (Poey) - Puffcheek blenny

Work-rock "reef" at a depth of about 1.5 m (5 ft), rare. Two specimens were collected in 1967.

See Hubbs (1953) and Springer (1958) as regards this genus.

*Labrisomus kalisherae (Jordan) - Downy blenny

Reef at 11-12 m (35-40 ft), rare. One specimen was obtained in a collection made with rotenone off Boca Raton in September 1971. This was identified by F. N. Snelson and deposited at Florida Technological University (FTU).

Labrisomus nuchipinnis (Quoy and Gaimard) - Hairy blenny

Inshore around rock outcroppings at depths of less than about 3.7 m (12 ft), common.

This species is also common around rocks in the Intracoastal Waterway.

*Malacoctenus macropus (Poey) - Rosy blenny

Worm-rock "reefs" and patch reefs, from 3 m (10 ft) in depth to reefs at 11-12 m (35-40 ft), frequent. Common at 6-9 m (20-30 ft).

*Malacoctenus triangulatus Springer - Saddled blenny

Reefs from 3-12 m (10-40 ft), common to seasonally abundant (September-November).

*Paraclinus fasciatus (Steindachner) - Banded blenny

Inshore around rock outcroppings and worm-rock "reefs" at depths of less than 3.7 m (12 ft), and usually less than 1.5 m (5 ft), abundant.

*Paraclinus marmoratus (Steindachner) - Marbled blenny

Reefs from 3-12 m (10-40 ft), frequent.

*Paraclinus nigripinnis (Steindachner) - Blackfin blenny

Inshore around rock outcroppings and worm-rock "reefs," abundant.

Common on reefs at 6-9 m (20-30 ft).

Note: this is the most common species of Paraclinus in the Bahamas (Böhlke and Chaplin, 1968); and the most common in my study area, although P. fasciatus is a close second.

*Starksia ocellata (Steindachner) - Checkered blenny

Worm-rock "reefs" as shallow as 3.7 m (12 ft) to reefs at 18-21 m (60-70 ft), frequent. Common at 11-12 m (35-40 ft) in depth.

Collected on several occasions as an inquiline in sponges (Böhlke and Springer, 1961).

See the above reference for a review of the genus, and Gilbert (1970) for an expanded key to the species of Starksia.

Blenniidae

Blennius cristatus Linnaeus - Molly miller

Inshore on rock outcroppings and around worm-rock "reefs" at depths of less than about 2.4 m (8 ft), abundant.

See Tavolga (1954) for a key to the species of Blennius.

See Norman (1943) for a synopsis of the genera, and Springer (1968) on osteology and classification.

*Blennius marmoreus Poey - Seaweed blenny

Inshore on rock outcroppings and worm-rock "reefs" to reefs at 9-12 m (30-40 ft) in depth, common.

Particularly common at depths of 6-9 m (20-30 ft).

*Chasmodes saburrae Jordan and Gilbert - Florida blenny

Rare, one specimen was obtained from a mixed lot of aquarium fishes collected at different locations off Boca Raton; probable depth 6-9 m (20-30 ft), and from a patch reef. See also Springer (1959).

Entomacrodus nigricans Gill - Pearl blenny

Inshore on rock outcroppings and worm-rock "reef" at depths of less than about 2.4 m (8 ft), abundant.

See Springer (1967) for a revision of this genus, and Smith-Vaniz and Springer (1971) synopsis of the tribe Salariini.

Hypleurochilus aequipinnis (Günther) - Oyster blenny

Inshore. Randall (1966a) examined specimens from near both ends of my study area, as well as several from the Caribbean; known from rock outcroppings, pilings, and from around mangrove roots. NC.

See the above reference as regards species of Hypleurochilus.

*Hypleurochilus bermudensis Beebe and Tee-Van - Barred blenny

Reef at 11-12 m (35-40 ft), and possibly as deep as 20 m (65 ft), rare. Two specimens have been collected.

Hypleurochilus geminatus (Wood) - Crested blenny

Inshore. South Atlantic and Gulf coasts of the United States (Jordan and Evermann, 1896-1900). More than one species is currently classified under the name geminatus (Randall, 1966a). NC.

*Ophioblennius atlanticus (Valenciennes) - Redlip blenny

Inshore rock outcroppings and worm-rock "reefs" to reefs at 6-9 m (20-30 ft), occasional.

See Springer (1962) for a review of the species of Ophioblennius.

Callionymidae

Callionymus agassizi Goode and Bean - Spotfin dragonet

Offshore. Fowler (1952) records one specimen from off Boynton Beach, collected at a depth of 146 m (80 fms). NC.

See Schultz and Woods' (1948) key to the genera, and Davis (1966) for a review of the western Atlantic species of the family.

*Callionymus bairdi Jordan - Lancer dragonet

Associated with reefs and rocky-rubble areas in moderate depths (to 91 m); Bermuda, Florida, and the Caribbean (Davis, 1966). NC.

Callionymus pauciradiatus Gill - Spotted dragonet

Primarily inshore; a wide Caribbean distribution; apparently most common along the bays and shallows about south Florida (Davis, 1966). NC.

Eleotridae

Dormitator maculatus (Bloch) - Fat sleeper

Intracoastal Waterway in brackish to fresh water. Common only in fresh water.

See Jordan and Eigenmann (1886b) for a review of the Gobiidae (to include the Eleotridae).

Erotelis smaragdus (Valenciennes) - Emerald sleeper

Inshore. Christensen (1965) extended the range of this species from the Florida Keys, north through my study area, to St. Lucie Inlet. NC.

Gobiomorus dormitor Lacépède - Bigmouth sleeper

This species is frequent in fresh water locally, but I have not collected it in the brackish areas of the Intracoastal Waterway.

Gobiidae

Barbulifer ceuthoecus (Jordan and Gilbert) - Bearded goby

Inshore around rock outcroppings and on worm-rock "reefs" to depths of 3.7 m (12 ft), occasional.

See Jordan and Eigenmann (1886) a review of North American gobies; Koumans' (1932) revision of genera with united ventral fins; and Böhlke and Robins (1968) on Atlantic seven-spined gobies.

Bathygobius soporator (Valenciennes) - Frillfin goby

Intracoastal Waterway to brackish water, often in water only a few centimeters deep, common.

See Ginsburg (1947, 1952b) as regards this genus.

*Coryphopterus dicrus Böhlke and Robins - Colon goby

Reefs at 11-12 m (35-40 ft) and 20-21 m (65-70 ft), occasional. Five specimens have been collected; four of these from one rotenone collection made with F. N. Snelson in September 1971, off Boca Raton, at 11-12 m in depth.

See Böhlke and Robins (1960b, 1962) as regards the species of Coryphopterus.

*Coryphopterus eidolon Böhlke and Robins - Pallid goby

Reef at 20-21 m (65-70 ft) off Delray Beach, C. R. Gilbert collected 22 specimens in one collection using rotenone in August 1967. Only two specimens have been collected since, from a reef at 11 m (35 ft) off Boca Raton.

*Coryphopterus glaucofraenum Gill - Bridled goby

Reefs from 6 to at least 21 m (20-70 ft) and possibly to 27 m (90 ft), common to seasonally abundant (August-September).

Note: this is by far our most common goby.

*Coryphopterus personatus (Jordon and Thompson) - Masked goby

Reefs from 6 to at least 21 m (20-70 ft) and possibly to 27 m (90 ft), frequent.

Common from July to September at depths greater than 11 m (35 ft).

*Coryphopterus punctipectophorus Springer - Spotted goby

Reef at 20-21 m (65-70 ft) or 27 m (90 ft), rare. One specimen was obtained in a rotenone collection made with C. R. Gilbert off Boca Raton in July 1971; collections from the above depths were inadvertently mixed. The specimen was deposited at the Florida State Museum, University of Florida (UF). See also Springer (1960c).

*Coryphopterus thrix Böhlke and Robins - Bartail goby

Reef at 20-21 m (65-70 ft), rare. One specimen was collected by C. R. Gilbert off Delray Beach in August 1967, and deposited at UF.

*Evermannichthys spongicola (Radcliffe) - Sponge goby

Reefs at 4.5-9 m (15-30 ft), an inquiline in sponges, occasional. F. H. Weise has collected this species locally at the above depths, and is confident that it also occurs in deeper water, wherever massive-type sponges occur in any number.

*Gnatholepis thompsoni Jordan - Goldspot goby

Reefs from 6-21 m (20-70 ft), frequent to seasonally common (August-September).

Gobionellus boleosoma (Jordon and Gilbert) - Darter goby

Inshore. North Carolina to Brazil, including the Gulf of Mexico; most abundant over muddy bottoms in shallow, brackish water (Ginsburg, 1932). NC.

See this reference for a revision of the genus.

Gobionellus smaragdus (Valenciennes) - Emerald goby

Intracoastal Waterway in brackish water, frequent to locally abundant.

Gobionellus stigmaturus (Goode and Bean) - Spottail goby

Intracoastal Waterway from a branching canal; 18 specimens were obtained, but only in fresh water (0.03°/oo salinity or less).

Gobiosoma bosci (Lacépède) - Naked goby

Intracoastal Waterway in brackish to fresh water, occasional.

See Ginsburg (1933a) for a revision of Gobiosoma.

*Gobiosoma macrodon Beebe and Tee-Van - Tiger goby

Rare, one specimen was collected from a worm-rock "reef" off Boca Raton at a depth of 3.7 m (12 ft). See also Robins (1958b).

*Gobiosoma oceanops (Jordan) - Neon goby

Reefs from 3-21 m (10-70 ft), common. See also Feddern (1967).

Note: although small, this is an attractive and popular aquarium fish.

*Gobiosoma robustum Ginsburg - Code goby

Intracoastal Waterway to brackish water, common to locally abundant.

See Ginsburg (1933b), and Springer and McErlean (1961) as regards this species.

*Ioglossus calliurus Bean - Blue goby

Frequently observed at the reef edge, 14-24 m (45-80 ft) in depth. See also Randall (1968b).

Lophogobius cyprinoides (Pallas) - Crested goby

Intracoastal Waterway in brackish water, rare. One specimen was collected in Lake Worth, the northern limit of my study area.

*Lythrypnus phorellus Böhlke and Robins - Convict goby

Reef at 20-21 m (65-70 ft), rare. Three specimens were obtained in one collection made with rotenone by C. R. Gilbert off Delray Beach in August 1967, and deposited at UF.

See Böhlke and Robins (1960a) as regards species of Lythrypnus.

*Lythrypnus spilus Böhlke and Robins - Bluegold goby

Reefs at 11-12 m (35-40 ft) and 20-21 m (65-70 ft), rare to occasional, respectively. Our specimens have all been obtained during collections made with rotenone in August and September.

Microgobius gulosus (Girard) - Clown goby

Intracoastal Waterway in brackish water, common in certain localities.

*Quisquilius hipoliti (Metzelaar) - Rusty goby

Reefs at 6-12 m (20-40 ft), occasional. On a reef at 20-21 m (65-70 ft) off Delray Beach, C. R. Gilbert obtained 42 specimens in one collection. All specimens were obtained from August to October. See also Böhlke and Robins (1960a).

Acanthuridae

*Acanthurus bahianus Castelnau - Ocean surgeon

Inshore around rock outcroppings and over worm-rock "reefs" to reefs at 18-21 m (60-70 ft) in depth, common.

See Randall (1955, 1956) as regards the genera within this family, and for a revision of the genus Acanthurus.

*Acanthurus chirurgus (Bloch) - Doctorfish

Inshore around rock outcroppings and over worm-rock "reefs" to reefs as deep as about 14 m (45 ft), common.

Note: this is the most common species of surgeonfish in the study area, and appears to be more confined to the shallower areas.

*Acanthurus coeruleus Bloch and Schneider - Blue tang

Reefs from 3-21 m (10-70 ft), common.

Note: juveniles are occasional around rock outcroppings near shore, and are the popular "yellow tang" of aquarists.

Gempylidae

Gempylus serpens Cuvier - Snake mackerel

Offshore. New York to Colombia in the western Atlantic (Briggs, 1958). NC.

See Grey (1953) as regards gempylid fishes.

Note: gempylids are essentially bathypelagic fishes; however, the species listed here (and one listed in Table 1) are included by Bailey et al. (1970) and are hence known to occur over the continental shelf. Following Bailey et al. (1970), I have treated Gempylidae as distinct from Trichiuridae, although there is considerable doubt as to the validity of this separation (C. R. Robins, personal communication).

Ruvettus pretiosus Cocco - Oilfish

Offshore. Newfoundland to the West Indies in the western Atlantic (Grey, 1953). Rare off the eastern United States (Breder, 1948). NC.

Trichiuridae

Trichiurus lepturus Linnaeus - Atlantic cutlassfish

Primarily offshore, although occasionally occurring inshore and in the Intracoastal Waterway (often in large numbers).

Scombridae

Acanthocybium solanderi (Cuvier) - Wahoo

Primarily offshore, although taken over depths as shallow as 9 m (30 ft), occasional.

Note: a spectacularly fast and long initial run identifies this species when hooked; among game fishes, surpassed only by the dolphin (Coryphaena hippurus) as table fare.

See Fraser-Brunner (1950a) and Rivas (1951) for reviews of the family, and La Monte (1958) on the sport fishing aspects.

Auxis rochei (Risso) - Bullet mackerel

Offshore. The Caribbean (Richards and Randall, 1967), and from Florida to the Carolinas (Bailey et al., 1970, from a personal communication from W. J. Richards). Powell et al. (1972) record five specimens (Auxis sp.) from off Palm Beach County. NC.

See Van Campen and Hoven (1956).

Ausix thazard (Lacépède) - Frigate mackerel

Offshore, and with the same range as A. rochei (above).

See also Godsil (1954). NC.

Euthynnus alletteratus (Rafinesque) - Little tunny

Offshore, common to seasonally abundant (summer). Locally referred to as "bonito."

See Godsil (1954), and de Sylva and Rathjen (1961), as regards this species.

Euthynnus pelamis (Linnaeus) - Skipjack tuna

Offshore, occasional. Referred to as "artic bonito" or "oceanic bonito" locally.

Sarda sarda (Bloch) - Atlantic bonito

Offshore. Nova Scotia to Argentina and the western Gulf of Mexico (Briggs, 1958). NC.

Scomber japonicus Houttuyn - Chub mackerel

Offshore. Massachusetts southward, with several specimens from Florida, the Bahamas, and the Gulf of Mexico (Matsui, 1967). NC.

See Matsui (1967) for a review of this genus.

Scomberomorus cavalla (Cuvier) - King mackerel

Primarily offshore, although taken over depths as shallow as 6 m (20 ft), frequent to seasonally abundant (winter). See also Wollam (1970).

Note: this species has contributed significantly to the local sport fishing charter and party boat industry.

Scomberomorus maculatus (Mitchill) - Spanish mackerel

Primarily inshore. In winter, this species is occasionally abundant moving over the reefs in depths of 3-9 m (10-30 ft).

Scomberomorus regalis (Bloch) - Cero

Frequent over the reefs from near shore (3 m) to depths of at least 24 m (80 ft).

Note: the cero's occurrence does not appear to be seasonally dependent locally; however, it is never abundant as the other species of Scomberomorus are.

Thunnus alalunga (Bonnaterre) - Albacore

Offshore. From south of New England to southern Brazil in the western Atlantic; no records from the Gulf of Mexico (Gibbs and Collette, 1967). NC.

See also Bullis and Mather (1956), Collette (1962), and Iwai et al. (1965) as regards this genus.

Thunnas albacares (Bonnaterre) - Yellowfin tuna

Offshore, probably occasional. The world record yellowfin in the 80 lb line class, women's division, was caught off Pompano Beach in 1957, weight 194 lbs (International Game Fish Association, 1972). NC.

See Rivas (1961) for a review of the subgenera Parathunnus and Neothunnus (genus Thunnus).

Thunnus atlanticus (Lesson) - Blackfin tuna

Offshore, frequent to seasonally abundant (winter).

Note: this species and the little tunny (Euthynnus alletteratus) are the only scombroids commonly caught by trolling offshore.

Thunnus obesus Lowe - Bigeye tuna

Offshore. Considerably offshore between Miami, Florida, and Ocean City, Maryland; the majority of U.S. records are for September through November (Mather and Gibbs, 1958). NC.

Thunnus thynnus (Linnaeus) - Bluefin tuna

Offshore. Only rarely encountered along the east Florida coast, although seasonally abundant (May-June) on the eastern side of the Florida Current (Rivas, 1951). See also Godsil and Holmberg (1950). NC.

Xiphiidae

Xiphias gladius Linnaeus - Swordfish

Offshore. Goode (1881) recognized this as a single species for both the Atlantic and the Pacific; from 18° N to 47° N Latitude in the Atlantic. See also Arata (1954) as regards life history. NC.

Istiophoridae

Istiophorus platypterus (Shaw and Nodder) - Sailfish

From offshore to depths as shallow as about 18 m (60 ft), frequent to common. As regards this species, see Voss (1953), Gehringer (1956), and Morrow and Harbo (1969). See Jordan and Evermann (1926), Rivas (1956), and Royce (1957), as regards the billfishes.

Makaira nigricans Lacepède - Blue marlin

Offshore, occasional. One specimen was caught by E. C. Brookshire off Hillsboro Inlet in May 1973, and, at 666 lbs, is a potential world record (International Game Fish Association, 1973). Two others have been observed at the surface during the course of this study.

See Eschmeyer and Bullis (1968) as regards this species; and La Monte (1955) for a review and revision of the genus.

Tetrapturus albidus Poey - White marlin

Offshore. The world record (all tackle) white marlin was caught off Pompano Beach in April 1953; weight 159.5 lbs, length 9 ft (International Game Fish Association, 1972). NC.

Tetrapturus pfluegeri Robins and de Sylva - Longbill spearfish

Offshore. Robins and de Sylva (1960, 1963) list 15 specimens (or photographs) examined, which were collected (mainly by anglers) from 1955 to 1962 between Miami and West Palm Beach. NC.

Luvaridae

Luvarus imperialis Raginesque - Louvar

Offshore, pelagic. In the western Atlantic from Connecticut to the eastern Gulf of Mexico near the Florida Keys (Briggs, (1958). NC.

Stromateidae

Ariomma bondi Fowler - Silver rag

Offshore. Bathypelagic as adults, most often at depths of less than 200 m (110 fms); the Caribbean and the Gulf of Mexico, north to the southern Gulf of Maine (Haedrich and Horn, 1972). NC.

See the above reference and Haedrich (1967) as regards the stromateids; Haedrich (1968), and Horn (1972), on the ariommids.

Ariomma melanum (Ginsburg) - Brown driftfish

Offshore. Benthopelagic as adults, usually at depths of 200-600 m (110-330 fms); the Caribbean and the Gulf of Mexico, north to New York (Haedrich and Horn, 1972). NC.

Ariomma regulus (Poey) - Spotted driftfish

Primarily offshore. From 25 m (82 ft) to depths exceeding 500 m (275 fms); the Caribbean and the Gulf of Mexico north to New Jersey (McKenney, 1961). NC.

Cubiceps athenae Haedrich - Bigeye cigarfish

Offshore. Haedrich (1965) examined specimens from just off the edge of the continental shelf (100+ fms); at least one of which was collected at the surface. Haedrich and Horn (1972) include my study area in their distribution map for this species, and state that the genus is one of the most poorly known among the stromateids. NC.

Hyperoglyphe perciformis (Mitchill) - Barrelfish

Offshore, pelagic. The east coast of North America, Nova Scotia to Florida (Haedrich, 1967); south to the Florida Keys (Briggs, 1958). NC.

Nomeus gronovii (Gmelin) - Man-of-war fish

Offshore. Frequent among the tentacles of the Portuguese man-of-war (Physalia physalis), which is particularly abundant locally in March and April.

Peprilus paru (Linnaeus) - Harvestfish

Primarily offshore. Generally over a sand or mud bottom at all depths over the continental shelf; Chesapeake Bay southward around Florida, the Gulf of Mexico, to Central and South America (Horn, 1970). NC.

Note: Horn (1970) synonymized P. alepidotus (listed by Bailey et al., 1970) with P. paru.

Psenes cyanophrys Valenciennes - Freckled driftfish

Offshore, pelagic. Legaspi (1956) examined three specimens from my study area which had been collected by the UMML R/V Physalia at the surface over depths of 183-229 m (100-125 fms).

Powell et al. (1972) record seven specimens from 3-8 miles east of Boynton Beach and Palm Beach Inlets. NC.

Tetragonurus atlanticus Lowe - Bigeye squaretail

Offshore. Atlantic, Pacific, and Indian Oceans; young occur near the surface with jellyfishes; adults are probably meso- or bathypelagic (Haedrich, 1967). NC.

See Gray (1955) as regards this genus.

Scorpaenidae

Helicolenus dactylopterus (De la Roche) - Blackbelly rosefish

Offshore. Collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, depth 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

Neomerinthe hemingwayi Fowler - Spinycheek scorpionfish

Offshore. Maryland, south around Florida, and in the northeastern Gulf of Mexico; 55-183 m (30-100 fms) in depth (Eschmeyer, 1969). NC.

See the above reference and Ginsburg (1953b) as regards Atlantic scopaenids.

Pontinus longispinis Goode and Bean - Longspine scorpionfish

Offshore. South Carolina, south around Florida to the northern Gulf of Mexico; 77-375 m (42-205 fms) in depth (Eschmeyer, 1969). NC.

See Eschmeyer (1965b) for notes on Pontinus.

Pontinus rathbuni Goode and Bean - Highfin scorpionfish

Offshore. One specimen was collected near the southern limits of my study area by the UMML R/V Gerda, cruise G-847, at a depth of 137-201 m (75-110 fms). NC.

Scorpaena agassizi Goode and Bean - Longfin scorpionfish

Offshore. Three specimens were collected off Pompano Beach by the UMML R/V Gerda, cruise G-419, at a depth of 110-128 m (60-70 fms). Three additional specimens were collected in the same vicinity by the M/V Pelican, station 16, at a depth of 137-155 m (75-85 fms) (Eschmeyer, 1965a). NC.

See the above reference and Gunter (1943) as regards this genus.

*Scorpaena albifimbria Evermann and Marsh - Coral scorpionfish

Reefs at 18-21 m (60-70 ft) and possibly 27 m (90 ft) in depth, occasional.

Note: a collection from 27 m was inadvertently mixed with one from 18 m.

*Scorpaena bergi Evermann and Marsh - Goosehead scorpionfish

Worm-rock "reef" at 3.7 m (12 ft) in depth, rare. One specimen was collected. Eschmeyer (1965a) examined a specimen collected from a depth of 55-73 m (30-40 fms) off Palm Beach.

Scorpaena brasiliensis Cuvier - Barbfish

Primarily inshore. Virginia south to Brazil; found in shallow waters of bays and harbors and ranges offshore to about 91 m (50 fms) in depth (Eschmeyer, 1965a). NC.

Scorpaena dispar Longley and Hildebrand - Hunchback scorpionfish

Secondarily associated with reefs (Starck, 1968). Fowler (1941) examined one 20 mm specimen collected in 16 m (9 fms) of water off Boynton Beach. See also Eschmeyer (1965a, 1969). NC.

*Scorpaena elachys Eschmeyer - Dwarf scorpionfish

Reef at 73 m (40 fms) off Palm Beach, rare; the only additional specimen from the United States was collected in the Alligator Reef vicinity (Eschmeyer, 1965a, 1969). NC.

Scorpaena grandicornis Cuvier - Plumed scorpionfish

Inshore. Commonly found in grassy areas of channels and bays; three specimens were examined from Port Everglades Beach (Eschmeyer, 1965a). Powell et al. (1972) report one specimen collected at Lake Worth. NC.

*Scorpaena plumieri Bloch - Spotted scorpionfish

Patch reefs as shallow as 3 m (19 ft) to reefs at least 21 m (70 ft), and possibly 27 m (90 ft), in depth, frequent. See also Bredner (1963).

Note: this species and Scorpaenodes caribbaeus are the scorpionfishes most frequently encountered on the local reefs.

*Scorpaenodes caribbaeus Meek and Hildebrand - Reed scorpionfish

Reefs at 9-21 m (30-70 ft) in depth, common.

*Scorpaenodes tredecimspinosus (Metzelaar) - Deepreef scorpionfish

Coral or rocky areas at depths of 8-82 m (25-270 ft) (Eschmeyer, 1969). One specimen was collected within my study area by the UMML R/V Gerda, cruise G-412, at a depth of 37 m (20 fms). NC.

Trachyscorpia cristulata (Goode and Bean) - Atlantic thornyhead

Offshore. Massachusetts to the Florida Straits and in the northern Gulf of Mexico; 132-1097 m (72-600 fms) in depth (Eschmeyer, 1969). NC.

Triglidae

Bellator egretta (Goode and Bean) - Streamer searobin

Offshore. Collected by the M/V Pelican, station 16, off Lauderdale-by-the Sea, depth 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

See Ginsburg (1950) for a review of this family.

Bellator militaris (Goode and Bean) - Horned searobin

Offshore. Two specimens were collected within my study area by the UMML R/V Gerda, cruise G-419, at a depth of 110-128 m (60-70 fms). See also Miller (1965). NC.

Peristedion miniatum Goode - Armored searobin

Offshore. Collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, depth 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

See Teague (1961) for a revision of the American species of Peristedion.

Prionotus alatus Goode and Bean - Spiny searobin

Offshore. Two specimens collected from a depth of 146 m (80 fms) off Boynton Beach (Fowler, 1952). Also collected by the M/V Pelican at station 16 off Lauderdale-by-the-Sea (Bullis and Thompson, 1965). NC.

See Teague (1951, 1952) for revisions of the American species of Prionotus.

Prionotus scitulus Jordan and Gilbert - Leopard searobin

Inshore and offshore. North Carolina to the Floria Keys and in the Gulf of Mexico; 5.5-68 m (3-37 fms) in depth (Ginsburg, 1950). NC.

Prionotus stearnsi Jordan and Swain - Shortwing searobin

Offshore. One specimen was collected at a depth of 137 m (75 fms) off Palm Beach (Fowler, 1952). NC.

Prionotus tribulus Cuvier - Bighead searobin

Inshore and in the Intracoastal Waterway, occasional.

Note: this species has been collected by bottom fishing with cut bait.

Dactylopteridae

Dactylopterus volitans (Linnaeus) - Flying gurnard

Secondarily associated with reefs (Starck, 1968). Powell et al. (1972) record six specimens from off Palm Beach, and one from off Boynton Beach. NC.

Order PLEURONECTIFORMES

Bothidae

Bothus lunatus (Linnaeus) - Peacock flounder

Primarily inshore. Florida and the West Indies; to a depth of about 64 m (35 fms) (Gutherz, 1967). NC.

See Jordan and Goss (1886), Norman (1934), and Topp and Hoff (1972), as regards the flatfishes; and Gutherz (1967) for a field guide to this family.

*Bothus ocellatus (Agassiz) - Eyed flounder

Patch reefs and worm-rock "reefs" from near shore to depths of about 6 m (20 ft), occasional. See also Fowler (1941).

Citharichthys arctifrons Goode - Gulf Stream flounder

Offshore, common to abundant. The UMML R/V Gerda, cruises G-21, 415, 419, 847, has collected numerous specimens from my study area at depths of 109-200 m (60-110 fms). See also Fowler (1952). NC.

See Gutherz and Blackman (1970) as regards this genus.

Citharichthys cornutus (Günther) - Horned whiff

Offshore. New England to Brazil and throughout the Gulf of Mexico (Briggs, 1958). 27-366 m (15-200 fms) in depth (Gutherz, 1967). NC.

Citharichthys macrops Dresel - Spotted whiff

A shallow water species; North Carolina to the southern tip of Florida and throughout the Gulf of Mexico (Topp and Hoff, 1972). NC.

Citharichthys spilopterus Günther - Bay whiff

Primarily inshore. Atlantic and Gulf coasts of the United States, the West Indies, and Caribbean Sea; to depths of about 73 m (40 fms) (Gutherz, 1967). NC.

Cyclopsetta fimbriata (Goode and Bean) - Spotfin flounder

Inshore and offshore. Eastern Gulf and southeastern Atlantic coasts of the United States; 18-90 m (10-49 fms) in depth (Topp and Hoff, 1972). NC.

Etropus crossotus Jordan and Gilbert - Fringed flounder

Primarily inshore. Atlantic coast from Chesapeake Bay to Florida, the Gulf of Mexico, and the West Indies; to 64 m (35 fms) in depth (Gutherz, 1967). Most frequently taken along sandy shores (Hildebrand and Schroeder, 1927). NC.

Etropus microstomus (Gill) - Smallmouth flounder

Offshore. Collected by the M/V Pelican, station 16, off Lauderdale-by-the-Sea, at a depth of 137-155 m (75-85 fms) (Bullis and Thompson, 1965); number of specimens not given. NC.

Etropus rimosus Goode and Bean - Gray flounder

Inshore and offshore. North Carolina to the southern tip of Florida and along the Florida Gulf coast to Alligator Harbor (Topp and Hoff, 1972). 7.3-183 m (4-100 fms) in depth (Gutherz, 1967). NC.

Gastropsetta frontalis Bean - Shrimp flounder

Primarily offshore. Collected by the M/V Pelican at station 16 off Lauderdale-by-the-Sea (Bullis and Thompson, 1965). NC.

See Gutherz (1966) for a key to the species of Ancylopsetta and Gastropsetta.

Paralichthys albigutta Jordan and Gilbert - Gulf flounder

Inshore and offshore, occasional. We have observed this species on sandy bottoms from 3-17 m (10-55 ft). Occurs to depths of 128 m (70 fms) (Gutherz, 1967).

Syacium micrurum Ranzani - Channel flounder

Inshore and offshore, rare. Fraser (1971) examined only two specimens from Florida, both from the lower east coast and from shallow water near inlets. NC.

See the above reference as regards biology and systematics of this genus.

Syacium papillosum (Linnaeus) - Dusky flounder

Inshore and offshore. Fraser (1971) examined specimens from areas adjacent to my study area; the most common species of Syacium in the general south Florida region. NC.

Soleidae

Achirus lineatus (Linnaeus) - Lined sole

Intracoastal Waterway, rare. One specimen was collected in Lake Worth, the northern limit of my study area.

Gymnachirus melas Nichols - Naked sole

Inshore and offshore. Massachusetts south to the Tortugas, the eastern Gulf of Mexico, and the Bahamas; 2-183 m (1-100 fms) (Dawson, 1964). NC.

The above reference is a revision of Gymnachirus. See also Dawson (1962a).

Cynoglossidae

Symphurus minor Ginsburg - Largescale tonguefish

Primarily offshore. Ginsburg (1951a) examined one specimen collected at a depth of 73 m (40 fms) off Palm Beach; primarily a more northern species. NC.

See the above reference for a review of the western Atlantic tonguefishes.

Symphurus parvus Ginsburg - Pygmy tonguefish

Primarily offshore. Ginsburg (1951a) examined specimens from off the Florida Keys, the southern tip of the Florida peninsula, and from off Palm Beach; from 37-110 m (20-60 fms) in depth. NC.

Symphurus piger (Goode and Bean) - Deepwater tonguefish

Offshore. Ginsburg (1951a) examined specimens from the West Indies, Tortugas and the Florida Keys, to off Palm Beach; from 73-457 m (40-250 fms) in depth. NC.

Symphurus plagiusa (Linnaeus) - Blackcheek tonguefish

Inshore. Cape Hatteras to Key West; the most common species of Symphurus on the Atlantic and Gulf coasts of the United States; 0-26 m (0-14 fms) in depth. NC.

Symphurus urospilus Ginsburg - Spottail tonguefish

Inshore. Savannah, Georgia, to southern Florida, and in the Gulf of Mexico; 27-31 m (15-17 fms) is the deepest record for this species (Topp and Hoff, 1972). Struhsaker (1969a) ranked it as "rare" (occurring in less than 10% of trawling stations). NC.

Order TETRAODONTIFORMES

Triacanthodidae

Parahollardia lineata (Longley) - Jambeau

Offshore. Fowler (1952) examined two specimens collected at a depth of 137 m (75 fms) off Palm Beach. NC.

See Gill (1884) for a synopsis of the plectognath fishes; and Tyler's (1968) monograph of the superfamily Triacanthoidea.

Balistidae

Aluterus heudeloti Hollard - Dotterel filefish

Offshore, pelagic (at least as juveniles). Massachusetts to Brazil, and at Bermuda (Berry and Poll, 1961). NC.

Note: following Bailey et al. (1970), the filefishes (Monacanthidae) are placed within the Balistidae.

See Fraser-Brunner (1935a, 1941), Berry and Vogele (1961), Berry and Baldwin (1966), and Moore (1967), as regards this family.

Aluterus monoceros (Linnaeus) - Unicorn filefish

Offshore, pelagic. Powell et al. (1972) report one specimen collected 6-8 miles east of Palm Beach Inlet. See also Berry and Vogele (1961). NC.

*Aluterus schoepfi (Walbaum) - Orange filefish

A primary reef species (Starck, 1968). Nova Scotia to Brazil, Bermuda, and the West Indies (Berry and Poll, 1961). NC.

*Aluterus scriptus (Osbeck) - Scrawled filefish

Patch reefs and reef flats from near shore to depths of at least 21 m (70 ft), occasional.

This species has also been collected in the Intracoastal Waterway (one specimen); the water was not brackish at the collection site.

*Balistes capriscus Gmelin - Gray triggerfish

Inshore around rock outcroppings and worm-rock "reefs" to depths of 6 m (20 ft), common to abundant.

Reefs at depths of 6-15 m (20-50 ft), common.

Note: this is our most common balistid, although rare below depths of 18 m (60 ft).

*Balistes vetula (Linnaeus) - Queen triggerfish

Reef at 11-12 m (35-40 ft), rare. Two juveniles have been observed; one of these was collected by an aquarist.

*Cantherhines macrocerus (Hollard) - Whitespotted filefish

A primary reef species (Starck, 1968). Powell et al. (1972) record one specimen from off West Palm Beach. NC.

See Randall (1964) for a revision of the genera Amanses and Cantherhines.

*Cantherhines pullus (Ranzani) - Orangespotted filefish

Patch reefs as shallow as 3 m (10 ft) to reefs at 11-12 m (35-40 ft), frequent to common.

Canthidermis maculatus (Bloch) - Rough triggerfish

Inshore and offshore. New Jersey to Argentina (Moore, 1967). See also Berry and Baldwin (1966). NC.

Canthidermis sufflamen (Mitchill) - Ocean triggerfish

Offshore and in midwater over reefs as shallow as about 12 m (40 ft), common. Juveniles have been collected from under floating sargassum.

Note: referred to as "ocean tally" by local fishermen.

*Melichthys niger (Bloch) - Black durgon

Reef at 20 m (65 ft), rare. One individual was observed in March 1972, but could not be approached within spear range.

Monacanthus ciliatus (Mitchill) - Fringed filefish

Secondarily associated with reefs (Starck, 1968). One specimen was collected by the UMML R/V Gerda, cruise G-412, at a depth of 37 m (20 fms), southeast of West Palm Beach. NC.

See Fraser-Brunner (1940) as regards this genus.

Monacanthus hispidus (Linnaeus) - Planehead filefish

Primarily offshore, common to abundant under floating sargassum.

Note: along with Histrio histrio, one of the two most numerous fishes in the sargassum complex (Dooley, 1969).

Monacanthus setifer Bennett - Pygmy filefish

Inshore around patch reefs and worm-rock "reefs" to depths of 6-9 m (20-30 ft), frequent. Secondarily associated with reefs (Böhlke and Chaplin, 1968; Starck, 1968).

*Monacanthus tuckeri Bean - Slender filefish

Patch reefs as shallow as 3-6 m (10-20 ft) to reefs at 20-21 m (60-70 ft), common.

Xanthichthys ringens (Linnaeus) - Sargassum triggerfish

Offshore. South Carolina and Bermuda south to the Lesser Antilles, and in the Gulf of Mexico (Moore, 1967). NC.

Ostraciidae

*Lactophrys bicaudalis (Linnaeus) - Spotted trunkfish

Reefs at 4.5-11 m (15-35 ft), occasional.

See Goode (1879), Fraser-Brunner (1935b), and Tyler (1965a, 1965b), as regards this family.

*Lactophrys quadricornis (Linnaeus) - Scrawled cowfish

Inshore around rock outcroppings as shallow as 3 m (10 ft) to reefs at 11-12 m (35-40 ft), frequent.

Lactophrys trigonus (Linnaeus) - Trunkfish

Secondarily associated with reefs (Starck, 1968). New England to Brazil, Bermuda, and the Gulf of Mexico (Böhlke and Chaplin, 1968). NC.

*Lactophrys triqueter (Linnaeus) - Smooth trunkfish

Shallow reefs at 3-6 m (10-20 ft) in depth, frequent.

Tetraodontidae

*Canthigaster rostrata (Bloch) - Sharpnose puffer

Reefs from as shallow as 3 m (10 ft), to at least 24 m (80 ft), common.

The UMML R/V Gerda, cruise G-412, collected a specimen at a depth of 37 m (20 fms) southeast of West Palm Beach.

Note: this is by far our most common species of puffer. See Jordan and Edwards (1886), Gill (1891), and Fraser-Brunner (1943), as regards this family.

Lagocephalus laevigatus (Linnaeus) - Smooth puffer

Offshore. Collected by the M/V Pelican, station 15, at a depth of 55-64 m (30-35 fms) off Boynton Beach (Bullis and Thompson, 1965); number of specimens not given. NC.

Sphoeroides dorsalis Longley - Marbled puffer

Primarily offshore. Widespread in the western Atlantic and adjacent waters; 18-91 m (10-50 fms) in depth (Shipp and Yerger (1969b). NC.

See Shipp and Yerger (1969a, 1969b) as regards the species of Sphoeroides.

Sphoeroides nephelus (Goode and Bean) - Southern puffer

Inshore. Confined to coastal shallow water; abundant on the Atlantic coast of Florida (Shipp and Yerger, 1969a). NC.

Sphoeroides pachygaster (Müller and Troschel) - Blunthead puffer

Offshore. Most of the western Atlantic; 55-183 m (30-100 fms) in depth (Shipp and Yerger, 1969b). NC.

Sphoeroides spengleri (Bloch) - Bandtail puffer

Patch reefs at about 3 m (10 ft) to reefs at 6-9 m (20-30 ft), occasional. Probably only secondarily associated with reefs (Böhlke and Chaplin, 1968, Starck, 1968).

Sphoeroides testudineus (Linnaeus) - Checkered puffer

Primarily inshore. This species is common in the Intracoastal Waterway.

Fowler (1941) records one specimen collected at a depth of 16 m (9 fms) off Boynton Beach.

Diodontidae

*Chilomycterus atinga (Linnaeus) Spotted burrfish

A primary reef species (Starck, 1968). New Jersey and Bermuda to Rio de Janeiro (Briggs, 1958). NC.

See Eigenmann (1885) for a review of this family.

Chilomycterus schoepfi (Walbaum) - Striped burrfish

Intracoastal Waterway, rare. One specimen was collected in Lake Worth, at the northern limit of my study area.

*Diodon holocanthus Linnaeus - Balloonfish

Patch reefs and worm-rock "reefs" from near shore to reefs at 6-9 m (20-30 ft), frequent.

One specimen was collected by the UMML R/V Gerda, station G-412, at a depth of 37 m (20 fms), southeast of West Palm Beach.

*Diodon hystrix Linnaeus - Porcupinefish

Patch reefs, and worm-rock "reefs" from near shore to reefs at about 18 m (60 ft) in depth, occasional.

Molidae

Mola lanceolata Lienard - Sharptail mola

Offshore, pelagic. In the western Atlantic, from Massachusetts to Brazil and the northeastern Gulf of Mexico (Briggs, 1958). NC.

See Fraser-Brunner (1951) for a review of this family.

Mola mola (Linnaeus) - Ocean sunfish

Offshore, pelagic. Newfoundland to Argentina in the western Atlantic (Briggs, 1958). NC.

Ranzania laevis (Pennant) - Slender mola

Offshore, pelagic. Robins (1966b) examined a specimen from off Palm Beach, taken from the stomach of a dolphin (Coryphaena hippurus); quite rare in the western Atlantic. NC.

DISCUSSION

The systematic account contains a total of 583 species, 206 of which are considered primary reef forms. An additional 198 neighboring species are listed in Table 1. Elements of both temperate and tropical faunas exist ("Northern Warm-Temperate region" and "Northern Cool-Tropical subregion," respectively, of Miller, 1968).

Christensen (1965) indicates the possibility of a rather abrupt faunal boundary in the Jupiter Inlet area between temperate and tropical species. This is supported by his collection of several temperate species (including clupeids and sciaenids) which have not been collected farther south, and by a lack of tropical species (inshore) to the north. However, he did not sample the more offshore habitats adjacent to the Florida Current. North of Palm Beach, linear ridges or abrupt slopes are characteristic of the outer shelf zone. Although these features are highly irregular, there is evidence of fairly persistant ridges at depths of 21-27 m (70-90 ft) (Meisburger and Duane, 1971). This area would appear to provide habitat for tropical species. Tropical reef species occur on relatively shallow (18 m) rocky outcroppings off Jacksonville, Florida (H. F. Sahlman, III, personal communication), and many tropical species occur as far north as the Carolinas, at least during the summer months (Robins, 1971). No definitive work has been completed on these fishes north of my study area; hence, the northern limits at which particular tropical species maintain perennial populations are not known.

Inshore temperate species in the northern Gulf of Mexico, and from north of Cape Canaveral on the Florida Atlantic coast, are relatively well known (specific citations may be found in the introduction of this study). As pointed out by Ginsburg (1952b), Briggs (1970), and others, these two faunas are strikingly similar, occupying the same geographic zone on opposite sides of the Florida peninsula ("Carolina Warm-Temperate Region" of Briggs, 1970). My study includes 18 species disjunct in this manner (category #3 in Table 1); four additional species are uncertain. Current speculation favors a post-glacial rise in sea temperatures which resulted in the range of temperate species being displaced north along both sides of southern Florida (Walters and Robins, 1961; Briggs, 1970). Regardless of cause, the present disjunct populations are maintained by peninsular Florida acting as a terrestrial barrier and the Gulf Stream (Florida Current) as a thermal barrier (Rivas, 1954).

An additional 18 species (plus 16 more that are uncertain) are disjunct in another manner. These species occur north of my study area on the Florida Atlantic coast and in the southeastern Gulf of Mexico, to include the Florida Keys (category #4 in Table 1). Several additional species exhibit this type of disjunction in terms of abundance, and are relatively scarse in the study area, although included in the systematic account. This disjunction is apparently ecological in origin, the result of a lack of suitable habitat. The study area treated herein is characterized by a lack of estuarine areas, grass

flats, and other shallow water areas such as occur in Florida Bay and the Gulf of Mexico, and also north of Palm Beach (particularly north of Cape Canaveral) on the Florida Atlantic coast. In addition, the relatively limited shallow oceanic areas within the study area are inhibited by many nocturnally feeding reef inhabitants (e.g., snappers and grunts) which may exclude other fishes competitively. These disjunct species may thus be expected as transients, although their establishment would be doubtful.

The fish fauna of my study area is comparable to the fauna of Alligator Reef (Starck, 1968). Similar collecting techniques were employed, and a large number of collections were made from each area. In addition, I used Starck's qualitative categories of abundance. Starck (1968) recorded 517 species from Alligator Reef, of which 389 are coral reef forms. Two hundred fifty-three are listed as primary reef species; that is, characteristically associated with reefs. I have 583 species listed as occurring locally, 206 of these are primary reef species.

Striking similarities are evident in the reef fish faunas from the two localities. Families which are almost identical on a species by species basis include the Lutjanidae, Pomadasyidae, Chaetodontidae, Pomacanthidae, Pomacentridae, Labridae, Scaridae, Acanthuridae, Ostraciidae, Diodontidae, and Balistidae. Other families, notably the Holocentridae, Serranidae, Apogonidae, and Clinidae, have very similar species representation in both areas, but with additional species occuring at Alligator Reef which have not been found in my study area. These are categorized as occurring south of my study area in the list of

neighboring species (category #2 in Table 1). Although the majority of these southern species are small fishes with limited powers of dispersal, other factors must be involved in excluding them from my collections (the two areas are only about 100 miles apart and there are no geographic barriers). There may be a slight decrease in temperature to the north, but the most apparent explanation would be the decrease in the extent of suitable reef habitat. This may also account for the tendency (with a few notable exceptions) of the reef fishes in my study to be one category of abundance less common than at Alligator Reef (i.e., a common species at Alligator Reef is often frequent here; frequent there is occasional here, etc.). In addition, I made fewer collections in the reef habitat, compared to Starck's collections at Alligator Reef, and may have failed to collect the more rare species that may occur in my study area.

Certain families had a greater number of species recorded for my study area, although additional species were common to both areas. This is the case for the large and/or pelagic fishes and the demersal species, as determined from the literature. Although they were not listed by Starck, it is assumed that most of these species also occur off Alligator Reef. Of the primarily inshore fishes, I found more species in the families Engraulidae, Sparidae, Sciaenidae, Gerreidae, and Scorpaenidae, than were found at Alligator Reef. Other families, such as the Gobiidae, Ophichthidae, and Syngnathidae, had species in common between both areas, plus several species collected from one area but not the other.

Of particular note (mentioned above) are several tropical reef fishes which are common in my study area, but of limited occurrence at Alligator Reef. This has been noted for Centropyge argi (pygmy angelfish) and Chaetodon aculeatus (longsnout butterflyfish) (Starck, 1968; Gilbert, 1972). Gilbert (1972) also discusses the greater abundance of Lutjanus mahogoni (mahogany snapper), Chromis scotti (purple reeffish), and Hypoplectrus gemma (blue hamlet) in my study area than in the Florida Keys. However, I have only one report of L. mahogoni taken during the course of this study. In addition, based on my research, Hypoplectrus nigricans (black hamlet), H. puella (barred hamlet), Pseudogrammus gregoryi (reef bass), Priacanthus arenatus (bigeye), Rhomboplites aurorubens (vermilion snapper), and the apogonids Phaeoptyx pigmentaria (dusky cardinalfish) and P. xenus (sponge cardinalfish) are more common in my study area. This may also be the case for Apogon leptocaulus (slendertail cardinalfish), Lipogramma trilineata (threeline basslet), and Acanthemblemaria chaplini (papillose blenny). These three species were collected during this study and they have not been collected in the Florida Keys. The proximity of the Florida Current and low turbidity, as compared to the Florida Keys, probably accounts for this faunal difference (Starck, 1968).

Robins (1971, 1972) classified the Florida Keys as a mixing ground for continental and insular (island) tropical species. Continental species (faunas) inhabit environments characterized by change in temperature, runoff, and turbidity, areas where embayments are common,

and where the estuarine influence is strong. Insular species (faunas) inhabit clear waters characterized by buffered environmental conditions and with bottom sediments largely of calcium carbonate. As a result of the present study, it has been shown that the area of mixing between these faunas extends north from the Florida Keys, at least to the area of Palm Beach. Again, the necessity for offshore research north of Palm Beach is stressed.

Comparing the fish fauna of my study area to localities other than Alligator Reef is difficult due to the lack of adequate collections from most areas. Longley and Hildebrand (1941) collected 442 nominal species from the Tortugas, of which 300 could be considered reef inhabitants. In comparing the collections made at Tortugas with those from Alligator Reef, Starck (1968) states that "in view of the nature of the differences in recording species and collecting techniques no significant faunal differentiation . . . can be postulated and it is probable none exists." Böhlke and Chaplin (1968) list 496 species, 450 of which are reef forms. However, their collections were conducted over a large group of islands and in many reef situations. The Hawaiian fish fauna is the best known outside of the western Atlantic. Gosline and Brock (1960) list 448 inshore species, 400 of which are reef dwellers. As this is for an archipeligo 1500 miles long, the richness of the Florida reef fauna is evident. The rich Indo-Pacific reef fauna has been poorly studied. The most extensive studies have shown 625 reef species from the Marshall and Marianas Islands (Schultz et al., 1953, 1960, 1966), and 740 species from the Seychelles (Smith

and Smith, 1963). Although these figures are for large island groups, it appears probable that twice as many species occur on Indo-Pacific reefs than occur on West Indian reefs (Starck, 1968).

Additional research in the study area would more accurately define depth distributions and the apparent seasonality exhibited by certain species. Also, many species are probably more common than my data currently indicate. More extensive collecting will presumably result in obtaining those species which I have listed in the systematic account as obtained only from the literature. The majority of new species added to the systematic account will be from those listed as categories #2 or #5 in my list of neighboring species (Table 1). Species in category #4 may be expected as transients. Collections at depths in excess of 24 m (80 ft) are particularly needed.

SUMMARY

This study is an attempt to document the fishes which occur off coastal southestern Florida north of the Florida Keys. Five hundred eighty-three species in 115 families are recorded for this study area. Two hundred six of these are considered primary reef fishes. This compilation is the result of collections by myself and my associates, collections by others in this area, and from ranges listed in the literature. Phylogenetic arrangement and nomenclature follows Bailey et al. (1970), unless otherwise noted. Habitat preferences, depth distributions, and qualitative categories of abundance are included. One new species, Apogon leptocaulus (slendertail cardinalfish), and two new continental records, Acanthemblemaria chaplini (papillose blenny) and Lipogramma trilineata (threeline basslet), were collected during this study. The collection of L. trilineata is the first confirmed record of the family Grammidae in the continental United States. The harlequin pipefish, Micrognathus ensenadae (Silvester), treated as a different color pattern of M. vittatus (Kaup) by Starck (1968), is also added to the fish fauna of the United States.

An additional 198 species and 11 families are recorded as neighboring to the study area. Eighty-two (41.4%) of these species occur south of the study area, 11 (5.6%) occur north of the study area, and 36 (18.2%) species are disjunct. The occurrence of the remaining 69 species is characterized by uncertainty in the literature, although several have been tentatively placed in the above categories based on my interpretations. Additions to the fish fauna of the study area,

other than currently undescribed species, should come primarily from those species listed as neighboring to the south or from those distinguished by a lack of information in the literature.

Two types of disjunct populations occur around Florida. In the first type, populations are found in northeastern Florida and the northern Gulf of Mexico. Peninsular Florida and the Gulf Stream (Florida Current) act as terrestrial and thermal barriers, respectively, to keep these populations separated. In the second type of disjunction, populations occur in northeastern Florida and again in the southeastern Gulf of Mexico, to include the Florida Keys. A lack of suitable habitat and the possibility of competitive exclusion are proposed as the factors separating these populations. Transients may be expected in this latter type of disjunction.

The study area is comparable with Alligator Reef. Similar collecting techniques were used, a large number of collections was made, and the same categories of abundance were employed. The majority of tropical reef fishes were common to both areas. However, additional reef species were found at Alligator Reef which were not found in my study area, and reef species are generally more abundant at Alligator Reef than in my study area. This is explained by the extent of suitable habitat available. Nevertheless, certain reef species are more common north of Miami than at Alligator Reef. This is probably due to the proximity of the Florida Current and decreased turdidity in this area.

Tropical reef fishes maintain permanent populations at least as

far north as Palm Beach. Robins's (1971) area of mixing between continental and insular tropical species should be extended north to this limit. The possibility of a rather abrupt faunal boundary between temperate and tropical species in the vicinity of Jupiter Inlet is supported. However, offshore research north of Palm Beach is necessary to determine the northern extent to which tropical reef species maintain perennial populations.

Five hundred references have been cited in the preparation of this study. It is hoped this will serve as a guide to future workers concerned with Caribbean and south Florida fishes, and will point out the need for additional research in particular areas.

TABLE 1. NEIGHBORING SPECIES: REFERENCES AND DISTRIBUTION.

(1). Species occurring north of study area on the Florida east coast, some of which have been recorded as far south as Jupiter Inlet.

(2). Species occurring south of study area on the Florida east coast, some of which have been recorded as far north as Miami (many of these will occur farther north on the Florida Gulf coast).

(3). Disjunct species occurring north of study area on the Florida east coast, and in the north to western Gulf of Mexico.

(4). Disjunct species occurring north of study area on the Florida east coast, and in the southeastern Gulf of Mexico (to include the Florida Keys) northward.

(5). Lack of information: to include few and/or widely scattered collections (often deep-water species), those with a very limited Florida distribution, and/or uncertainty in the literature.

Of future additions to the fishes of the study area, besides currently undescribed species, the majority are herein listed as (2) and/or (5). Species listed as (4) may be expected as transients.

Petromyzonidae

Petromyzon marinus Linnaeus - Sea lamprey

Bigelow and Schroeder (1948). (1)

Hexanchidae

Hexanchus griseus (Bonnaterre) - Sixgill Shark

Bigelow and Schroeder (1948). (5)

Alopiidae

Alopias superciliosus (Lowe) - Bigeye thresher

Springer (1943), Bigelow and Schroeder (1948). (2)

Carcharhinidae

Carcharhinus longimanus (Poey) - Oceanic whitetip shark

Bigelow and Schroeder (1948), Backus et al. (1956). (2,5)

Carcharhinus springeri (Bigelow and Schroeder) - Reef shark

Bigelow and Schroeder (1948), Briggs (1958), Böhlke and Chaplin (1968). (2)

Hypoprion signatus Poey - Night shark

Bigelow and Schroeder (1948). (5)

Mustelus canis (Mitchill) - Smooth dogfish

Springer (1938, 1939b), Bigelow and Schroeder (1948) Christensen (1965). (4,5)

Mustelus norrisi Springer - Florida smoothhound

Springer (1938, 1939b), Bigelow and Schroeder (1948). (4)

Squatinidae

Squatina dumerili Lesueur - Atlantic angel shark

Bigelow and Schroeder (1948). (4)

Torpedinidae

Torpedo nobiliana Bonaparte - Atlantic torpedo

Bigelow and Schroeder (1953a), Wahlquist (1966). (4,5)

Dasyatidae

Dasyatis centroura (Mitchill) - Roughtail stingray

Wahlquist (1966), Struhsaker (1969b). (3)

Gymnura micrura (Bloch and Schneider) - Smooth butterfly ray

Bigelow and Schroeder (1953a). also in main list (5)

Myliobatidae

Myliobatis freminvillei Lesueur - Bullnose ray

Bigelow and Schroeder (1953a), Christensen (1965). (1)

Myliobatis goodei Garman - Southern eagle ray

Bigelow and Schroeder (1953a). (5)

Rhinoptera bonasus (Mitchill) - Cownose ray

Bigelow and Schroeder (1953a). (3)

Xenocongridae

Kaupichthys nuchalis Böhlke

Smith (1969), not in Bailey et al. (1970). (5)

Muranenidae

Echidna catenata (Bloch) - Chain moray

Jordan et al. (1930), Starck (1968). (2)

Uropterygius diopus Böhlke - Marbled moray

Böhlke (1967). (2)

Muraenesocidae

Hoplunnis macrurus Ginsburg - Silver conger

Lane and Stewart (1968). (5)

Congridae

Conger oceanicus (Mitchill) - Conger eel

Kanazawa (1958). (3)

Conger triporiceps Kanazawa - Manytooth conger

Kanazawa (1958), Starck (1968). (2)

Nystactichthys halis (Böhlke) - Garden eel

Böhlke (1957b), Starck (1968). (2)

Ophichthidae

rognathodon platyventris Böhlke - Stripe eel

Böhlke (1967). (2)

scanichthys scuticaris (Goode and Bean) - Whip eel

Briggs (1958), Christensen (1965), Gilbert (1968a). (3)

ralophia loxochila Böhlke - Slantlip eel

Starck (1968). (2)

rdiichthys springeri Ginsburg - Thread eel

Briggs (1958). (5)

tharchus velifer Goode and Bean - Sailfin eel

Christensen (1965), Gilbert (1968a). (3)

richthys oculatus (Kaup) - Goldspotted eel

Starck (1968). (2)

striophis intertinctus (Richardson) - Spotted spoon-nose eel

Briggs (1958). (3[?],5)

striophis mordax (Poey) - Snapper eel

Briggs (1958), Starck (1968). (2)

rma ansp Böhlke - Academy eel

Böhlke (1968b). (2)

Clupeidae

osa aestivalis (Mitchill) - Blueback herring

Hildebrand and Schroeder (1927). (1)

osa mediocris (Mitchill) - Hickory shad

Hildebrand (1964d), Berry (1971). (1)

Alosa sapidissima (Wilson) - American shad

Briggs (1958). (1)

Brevoortia tyrannus (Latrobe) - Atlantic menhaden

Hildebrand (1964d), Dahlberg (1970). (1)

Dorosoma cepedianum (Lesueur) - Gizzard shad

Miller (1950, 1960), Walters and Robins (1961), Talbot and Sykes (1958). Collected only from fresh water locally. (3)

Dorosoma petenense (Günther) - Threadfin shad

McLane (1955), Briggs (1958). (4)

Etrumeus teres (DeKay) - Round herring

Whitehead (1963), Hildebrand (1964d). (3)

Harengula humeralis Cuvier - Redear sardine

Rivas (1950a), Berry (1971). (2)

Jenkinsia majua Whitehead - Little-eye herring

Starck (1968). (2)

Sardinella brasiliensis (Steindachner) - Orangespot sardine

Hildebrand (1964d), Starck (1968), Berry (1971). (5)

Engraulidae

Anchoa hepsetus (Linnaeus) - Striped anchovey

Daly (1970). (4)

Engraulis eurystole (Swain and Meek) - Silver anchovey

Daly (1970). (5)

Alepisauridae

Alepisaurus ferox Lowe - Longnose lancetfish

Mead (1955), Gibbs (1960), Gibbs and Wilimovsky (1966). (5)

Gobiesocidae

Gobiesox strumosus Cope - Skilletfish

Briggs (1955), Gilbert (1968a). (3,5)

Lophiidae

Lophius americanus Valenciennes - Goosefish

Leim and Scott (1966). (3,5)

Ophidiidae

Brotula barbata (Bloch and Schneider) - Bearded brotula

Hubbs (1944), Briggs (1958). (2)

Oligopus claudei (Torre) - Reef-cave brotula

Cohen (1964), Starck (1968). (2)

Ophidion selenops Robins and Böhlke - Mooneye cusk-eel

Robins and Böhlke (1959), Starck (1968). (4,5)

Otophidium dormitator Böhlke and Robins - Sleeper cusk-eel

Böhlke and Robins (1959b), Starck (1968). (2)

Otophidium omostigmum (Jordan and Gilbert) - Polka-dot cusk-eel

Briggs and Caldwell (1955), Robins (1957). (3)

Parophidion schmidti (Woods and Kanazawa) - Dusky cusk-eel

Woods and Kanazawa (1951), Starck (1968). (2)

Rissola marginata (DeKay) - Striped cusk-eel

W. R. Courtenay, Jr. (personal communication). (1)

Stygnobrotula latebricola Böhlke - Black brotula

Böhlke (1957d), Starck (1968). (2)

Cyprinodontidae

Adinia xenica (Jordan and Gilbert) - Diamond killifish

Hastings and Yerger (1971). (2)

Rivulus marmoratus Poey - Rivulus

Regan (1912), Myers (1927), Harrington and Rivas (1958). (4,5)

Poeciliidae

Gambusia rhizophorae Rivas - Mangrove gambusia

Rivas (1969). (2)

Atherinidae

Allenetta harringtonensis (Goode) - Reef silverside

Jordan and Hubbs (1919). (2)

Holocentridae

Corniger spinosus Agassiz - Spinycheek soldierfish

Anderson and Gutherz (1964). (2,5)

Holocentrus bullisi Woods - Deepwater squirrelfish

Böhlke and Chaplin (1968), Starck (1968). (2,5)

Holocentrus coruscus (Poey) - Reef squirrelfish

Woods (1955), Starck (1968). (2)

Ostichthys trachypomus (Günther) - Bigeye soldierfish

Jordan et al. (1930), Anderson and Gutherz (1964). (2,5)

Plectrypops retrospinis (Guichenot) - Cardinal soldierfish

Starck (1968). (2)

Lampridídae

Lampris regius (Bonnaterre) - Opah

Briggs (1958). (1,5)

Lophotidae

Lophotus capellei (Schlegel) - Crestfish

Goin and Erdman (1951), Briggs (1952, 1958). (2,5)

Stylephoridae

Stylephorus chordatus Shaw - Tube-eye

Briggs (1958). (2,5)

Syngnathidae

Corythoichthys albirostris Heckel - Whitenose pipefish

Herald (1942). (2)

Corythoichthys brachycephalus (Poey) - Crested pipefish

Briggs (1958). (2)

Corythoichthys profundus Herald - Deepwater pipefish

Herald (1965), Robins (1971b). (5)

Hippocampus erectus Perry - Lined seahorse

Ginsburg (1937). (4)

Hippocampus reidi Ginsburg - Longsnout seahorse

Starck (1968). (2)

Hippocampus zosterae Jordan and Gilbert - Dwarf seahorse

Ginsburg (1952b). (2)

Micrognathus crinigerus (Bean and Dresel) - Fringed pipefish

Herald (1942). (2)

Syngnathus floridae (Jordan and Gilbert) - Dusky pipefish

Herald (1965). (4)

Syngnathus springeri Herald - Bull pipefish

Herald (1942). (4)

Centropomidae

Centropomus enciferus Poey - Swordspine snook

Collected locally in fresh water at Margate, Florida (H. F. Sahlman, III, personal communication). See also Rivas (1962). (5)

Percichthyidae

Morone saxatilis (Walbaum) - Striped bass

McErlean (1961), Liem and Scott (1966). (3)

Serranidae

Centropristis ocyurus (Jordan and Evermann) - Bank sea bass

Ginsburg (1952b), Miller (1959). (4)

Centropristis philidelphica (Linnaeus) - Rock sea bass

Miller (1959), Christensen (1965). (4)

Epinephelus afer (Bloch) - Mutton hamlet

Walters (1957), Smith (1971). (2)

Epinephelus flavolimbatus Poey - Yellowedge grouper

Smith (1971). (2,5)

Epinephelus mystacinus (Poey) - Misty grouper

Robins (1967b, 1971a). (2,5)

Hypoplectrus aberrans Poey - Yellowbelly hamlet

Randall (1968a). (2)

Hypoplectrus indigo (Poey) - Indigo hamlet

Randall (1968a). (2)

Liopropoma mowbrayi Woods and Kanazawa - Cave bass

Woods and Kanazawa (1951), Starck (1968). (2)

Mycteroperca venenosa (Linnaeus) - Yellowfin grouper

Smith (1971). (2)

Schultzea beta (Hildebrand) - School bass

Briggs (1958), Robins and Starck (1961), Randall (1963b),

Starck (1968). (2)

Serraniculus pumilio Ginsburg - Pygmy sea bass

Ginsburg (1952b), Starck (1968), Hastings (1973). (4)

Serranus chionaraia Robins and Starck - Snow bass

Robins and Starck (1961). (2,5)

Serranus notospilus Longley - Saddle bass

Robins and Starck (1961). (2,5)

Grammistidae

Rypticus bistrispinus (Mitchill) - Freckled soapfish

Courtenay (1967). (4[?],5)

Apogonidae

Apogon affinis (Poey) - Bigtooth cardinalfish

Starck (1968). (2)

Apogon pillionatus Böhlke and Randall - Broadsaddle cardinalfish

Böhlke and Randall (1968). (2)

Astrapogon alutus (Jordan and Gilbert) - Bronze cardinalfish

Briggs (1958), Starck (1968). (4,5)

Astrapogon stellatus (Cope) - Conchfish

I have made an effort to look for this species and have not encountered it locally, even though the queen conch (Strombas gigas) is relatively common. (2)

Carangidae

Decapterus macarellus (Cuvier) - Mackeral scad

Berry (1968). (5)

Hemicaranx amblyrhynchus (Cuvier) - Bluntnose jack

Jordan and Evermann (1896-1900), Ginsburg (1952a). (5)

Emmelichthyidae

Inermia vittata Poey - Boga

Starck (1968). (2)

Lutjanidae

Apsilus dentatus Guichenot - Black snapper

Starck (1968). (2,5)

Sparidae

Calamus arctifrons Goode and Bean - Grass porgy

Randall and Caldwell (1966). (2,5)

Sciaenidae

Bairdiella batabana (Poey) - Blue croaker

Robins and Tabb (1965), Randall (1968). (2)

Cynoscion nothus (Holbrook) - Silver seatrout

Ginsburg (1929). (3)

Cynoscion regalis (Bloch and Schneider) - Weakfish

Ginsburg (1929). (3)

Larimus fasciatus Holbrook - Banded drum

Jordan et al. (1930), Briggs (1958). (3)

Menticirrhus saxatilis (Bloch and Schneider) - Northern kingfish

Breder (1948), Christensen (1965). (1)

Stellifer lanceolatus (Holbrook) - Star drum

Welsh and Breder (1923), Briggs (1958). (3)

Pomacentridae

Pomacentrus leucostictus Müller and Troschel - Beaugregory

Rivas (1960), personal observations (see P. variabilis in systematic account). (4[?])

Pomacentrus sp. - Honey gregory

Starck (1968). (2)

Labridae

Decodon puellaris (Poey) - Red hogfish

Briggs (1958), Randall (1968a). (2,5)

Halichoeres bathyphilus (Beebe and Tee-Van) - Greenband wrasse

Randall and Böhlke (1965), Starck (1968). (5)

Halichoeres pictus (Poey) - Rainbow wrasse

Starck (1968). (2)

Hemipteronotus martinicensis (Valenciennes) - Rosy razorfish

Starck (1968). (2)

Scaridae

Scarus guacamaia Cuvier - Rainbow parrotfish

Moe et al. (1966), Böhlke and Chaplin (1968), Starck (1968). (2)

Sparisoma atomarium (Poey) - Greenblotch parrotfish

Randall (1965a). (2)

Mugilidae

Mugil gaimardianus Desmarest - Redeye mullet

Jordan and Swain (1884a), Rivas (1950b). (2)

Mugil liza Valenciennes - Liza

Rivas (1950b), Mefford (1955). (2,5)

Mugil trichodon Poey - Fantail mullet

Jordan and Evermann (1896-1900), Rivas (1950b). (2)

Opistognathidae

Lonchopisthus lindneri Ginsburg - Swordtail jawfish

Briggs (1958), Mead (1959), Starck (1968). (2)

Opistognathus cuvieri Valenciennes - Phantom jawfish

Starck (1968). (2)

Opistognathus lonchurus Jordan and Gilbert - Moustache jawfish

Starck (1968), Powell et al. (1972), personal observations (see O. whitehursti in systematic account). (4)

Opistognathus macrognathus Poey - Spotfin jawfish

Starck (1968), personal observations (see O. whitehursti in systematic account). (2,5)

Opistognathus maxillosus Poey - Mottled jawfish

Briggs (1958), personal observations (see O. whitehursti in systematic account). (2)

Percophididae

Bembrops gobioides (Goode) - Goby flathead

Ginsburg (1955). (4,5)

Dactyloscopidae

Gillellus uranidea Böhlke - Warteye stargazer

Böhlke (1968a). (2)

Clinidae

Chaenopsis ocellata Poey - Bluethroat pikeblenny

Böhlke (1957c), Stephens (1963), Robins and Randall (1965). (2)

Emblemaria diaphana (Longley) - Glass blenny

C. R. Gilbert (personal cummunication). (2)

Enneanectes boehlkei Rosenblatt - Roughhead triplefin

Rosenblatt (1960). (2)

Enneanectes pectoralis (Fowler) - Redeye triplefin

Rosenblatt (1960). (2)

Labrisomus gobio (Valenciennes) - Palehead blenny

Starck (1968). (2)

Labrisomus guppyi (Norman) - Mimic blenny

Starck (1968). (2)

Labrisomus haitiensis Beebe and Tee-Van - Longfin blenny

Springer (1958). (2)

Malacoctenus aurolineatus Smith - Goldline blenny

Starck (1968). (2)

Paraclinus grandicomis (Rosén) - Horned blenny

Longley and Hildebrand (1941), Springer (1954), Starck (1968). (2)

Paraclinus infrons Böhlke - Bald blenny

Böhlke (1960b), Starck (1968). (2)

Stathmonotus hemphilli Bean - Blackbelly blenny

Springer (1955). (2)

Blenniidae

Blennius nicholsi Tavolga - Highfin blenny

Tavolga (1954), Christensen (1965). (4)

Chasmodes bosquianus (Lacépède) - Striped blenny

Springer (1959). (3)

Hypleurochilus springeri Randall - Orangespotted blenny

Randall (1966a). (2)

Hypsoblennius hentzi (Lesueur) - Feather blenny

Hubbs (1938), Briggs (1958), Gilbert (1968a). (4)

Hypsoblennius ionthas (Jordan and Gilbert) - Freckled blenny

Hubbs (1938), Briggs (1958). (3)

Gobiidae

Awaous tajasica (Lichtenstein) - River goby

Carr and Goin (1955). (5)

Bathygobius mystacium Ginsburg - Island frillfin

Starck (1968). (2)

Coryphopterus alloides Böhlke and Robins - Barfin goby

Starck (1968). (2)

Coryphopterus hyalinus Böhlke and Robins - Glass goby

Böhlke and Robins (1962). (2)

Coryphopterus lipernes Böhlke and Robins - Peppermint goby

Böhlke and Robins (1962). (2)

Evorthodus lyricus (Girard) - Lyre goby

Christensen (1965). (5)

Gobioides broussonneti Lacépède - Violet goby

Christensen (1965). (3[?],5)

Gobionellus gracillimus Ginsburg - Slim goby

Ginsburg (1953a). (3)

Gobionellus saepepallens Gilbert and Randall - Dash goby

Gilbert and Randall (1968). (2)

Gobionellus stigmalophius Mead and Böhlke - Spotfin goby

Mead and Böhlke (1958), Starck (1968). (2)

Gobiosoma grosvenori (Robins) - Rockcut goby

Robins (1964). (2)

Gobiosoma xanthiprora Böhlke and Robins - Yellowprow goby

Böhlke and Robins (1968). (2)

Lythrypnus nesiotes Böhlke and Robins - Island goby

Starck (1968). (2)

Microgobius thalassinus (Jordan and Gilbert) - Green goby

Briggs (1958), Tagatz (1967). (3)

Nes longus (Nichols) - Orangespotted goby

Böhlke and Robins (1968). (2)

Risor ruber (Rosen) - Tusked goby

Böhlke and Robins (1968). (2)

Microdesmidae

Microdesmus longipinnis (Weymouth) - Pink wormfish

Reid (1936), Dawson (1962a), Robins and Manning (1958),

Robins (1966a). (2)

Microdesmus floridanus (Longley) - Pugjaw wormfish

Christensen (1965). (4)

Gempylidae

Lepidocybium flavobrunneum (Smith) - Escolar

Munro (1949), Schultz (1956), Bartlett and Backus (1962). (5)

Scombridae

Scomber scombrus Linnaeus - Atlantic mackerel

Matsui (1967). (1)

Stromateidae

Hyperoglyphe bythites (Ginsburg) - Black driftfish

Ginsburg (1954), Haedrich (1967), Bailey et al. (1970). (2)

Peprilus triacanthus (Peck) - Butterfish

Caldwell (1961), Collette (1963), Horn (1970). (1)

Psenes maculatus Ginsburg - Silver driftfish

Haedrich (1967), Haedrich and Horn (1972). (5)

Scorpaenidae

Pontinus nematophthalmus (Günther) - Spinythroat scorpionfish

Eschmeyer (1969). (5)

Scorpaena brachyptera Eschmeyer - Shortfin scorpionfish

Eschmeyer (1969). (5)

Scorpaena calcarata Goode and Bean - Smoothhead scorpionfish

Eschmeyer (1966a). (4[?])

Scorpaena inermis Cuvier - Mushroom scorpionfish

Eschmeyer (1965a). (2)

Triglidae

Bellator brachychir (Regan) - Shortfin searobin

Ginsburg (1950), Starck (1968). (5)

Peristedion brevirostre Günther - Flathead searobin

Starck (1968), Bailey et al. (1970). (2[?],5)

Peristedion gracile Goode and Bean - Slender searobin

Starck (1968), Bailey et al. (1970). (2[?],5)

Peristedion greyae Miller - Prickly armored searobin

Miller (1967). (5)

Peristedion thompsoni Fowler - Rimspine searobin

Teague (1961). (2[?],5)

Prionotus ophryas Jordan and Swain - Bandtail searobin

Ginsburg (1950). (4[?],5)

Prionotus roseus Jordan and Evermann - Bluespotted searobin

Ginsburg (1950). (4[?],5)

Prionotus salmonicolor Fowler - Blackwing searobin

Ginsburg (1950). (4[?],5)

Bothidae

Ancylopsetta dilecta (Goode and Bean) - Three-eye flounder

Gutherz (1966). (4)

Ancylopsetta quadrocellata Gill - Ocellated flounder

Gutherz (1966, 1967). (4)

Bothus robinsi Jutare

Gutherz (1967), Topp and Hoff (1972). (5)

Chascanopsetta lugubris Alcock - Pelican flounder

Gutherz (1967). (5)

Citharichthys arenaceus Evermann and Marsh - Sand whiff

Gutherz (1967), Bailey et al. (1970). (4[?],5)

Citharichthys gymnorhinus Gutherz and Blackman

Gutherz and Blackman (1970). (2)

Engyophyrs senta Ginsburg - Spiny flounder

Ginsburg (1933b), Gutherz (1967). (2)

Monolene antillarum Norman - Slim flounder

Gutherz (1967). (5)

Monolene sessilicauda Goode - Deepwater flounder

Gutherz (1967). (5)

Paralichthys lethostigma Jordan and Gilbert - Southern flounder

Ginsburg (1952c). (4)

Paralichthys squamilentus Jordan and Gilbert - Broad flounder

Gutherz (1967). (4,5)

Syacium gunteri Ginsburg - Shoal flounder

Ginsburg (1933b), Topp and Hoff (1972). (4)

Trichopsetta melasma Anderson and Gutherz

Anderson and Gutherz (1967), not in Bailey et al. (1970). (2,5)

Soleidae

Trinectes inscriptus (Gosse) - Scrawled sole

Topp and Hoff (1972). (2)

Trinectes maculatus (Bloch and Schneider) - Hogchoker

Briggs (1958), Starck (1968), Topp and Hoff (1972), not listed by Christensen (1965). (4[?])

Cynoglossidae

Symphurus arawak Robins and Randall - Caribbean tonguefish

Starck (1968). (2)

Symphurus civitatus Ginsburg - Offshore tonguefish

Ginsburg (1951a). (3)

Symphurus diomedianus (Goode and Bean) - Spottedfin tonguefish

Ginsburg (1951a), Topp and Hoff (1972). (4[?])

Triacanthodidae

Hollardia meadi Tyler - Spotted spikefish

Tyler (1966), Bailey et al. (1970). (5)

Ostraciidae

Lactophrys polygonia (Poey) - Honeycomb cowfish

Tyler (1965a). (2)

Tetraodontidae

Sphoeroides maculatus (Bloch and Schneider) - Northern puffer

Shipp and Yerger (1969a). (1)

Diodontidae

Chilomycterus antennatus (Cuvier) - Bridled burrfish

Jordan et al. (1930), Starck (1968). (2)

Chilomycterus antillarum Jordan and Rutter - Web burrfish

Robins (1957), Böhlke and Chaplin (1968). (2,5)

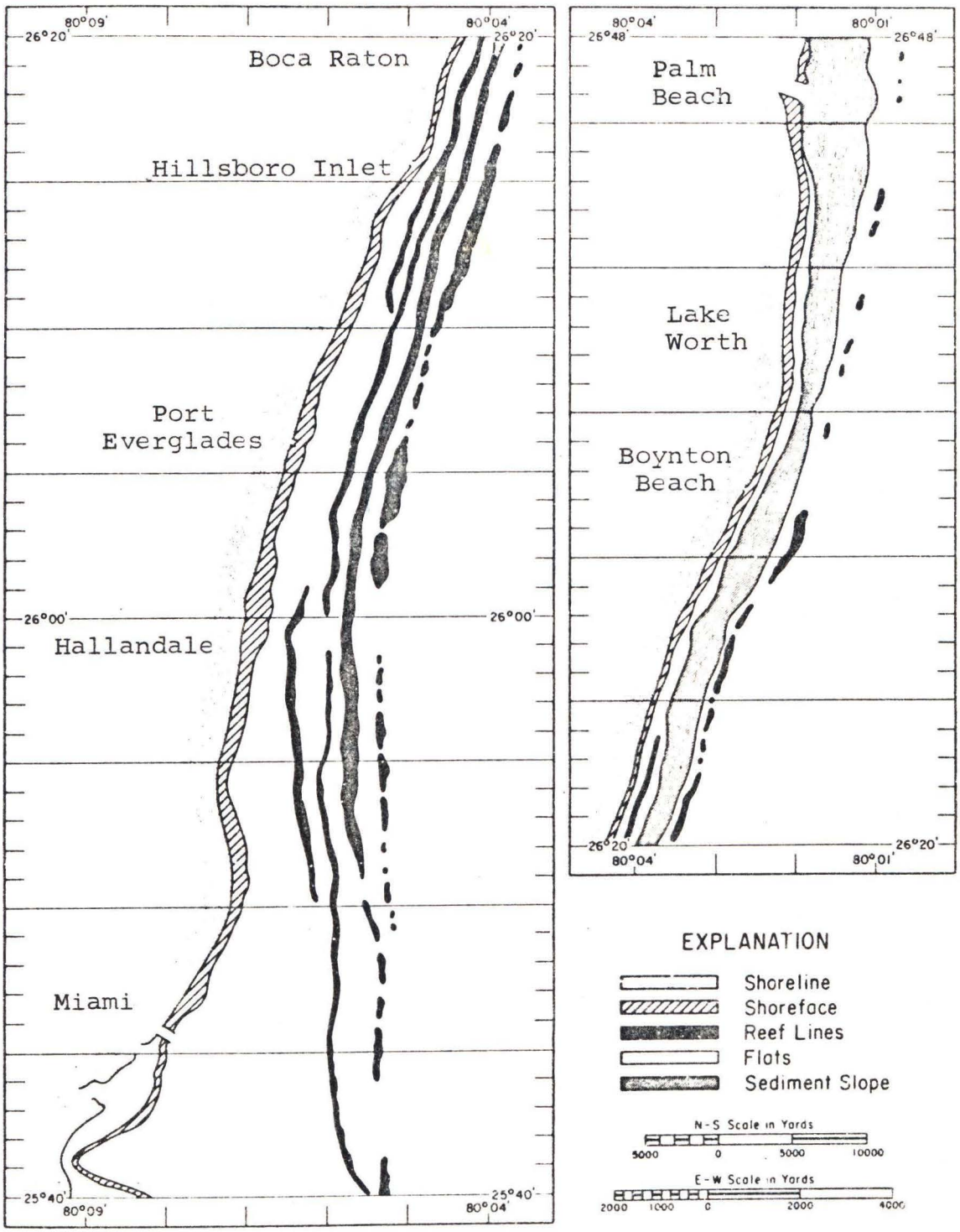

Figure 1. Plan of southeastern Florida shelf morphology, Miami to Palm Beach (from Duane and Meisburger, 1969).

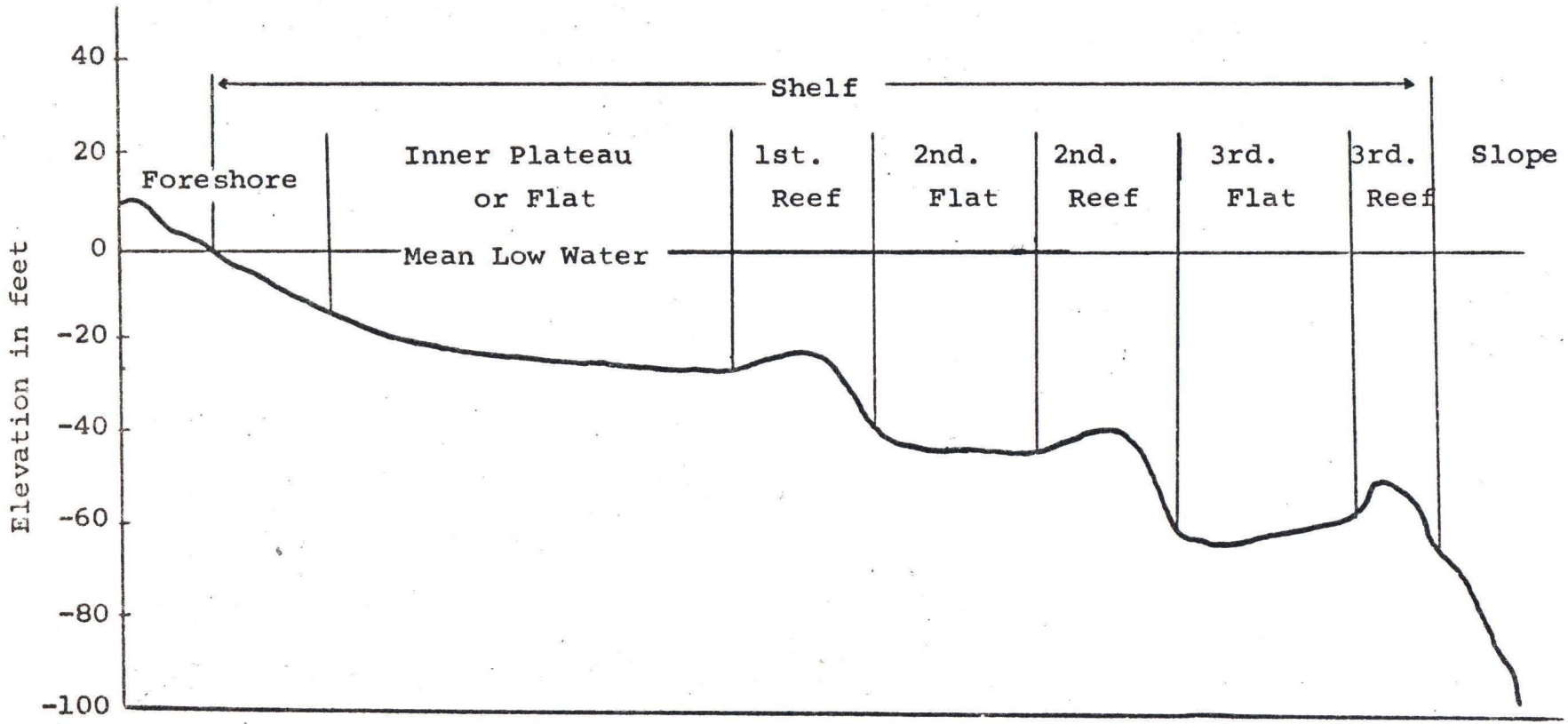

Figure 2. Schematic profile of southeastern Florida shore and shelf morphology, Boca Raton to North Miami (From Duane and Meisburger, 1969).

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VITA

David Jack Herrema was born in Kalamazoo, Michigan, on 25 May 1944. His parents are John Harley Herrema and Ardith Gustafson Herrema. He received his elementary education at Mattawan and Martin public schools, and secondary education at Portage High School, Portage, Michigan, were he graduated in June 1962. He entered Michigan State University in September 1962, and received the Bachelor of Science degree in Fisheries and Wildlife in June 1967.

He was in the United States Army from November 1967 to November 1969. The majority of this time he was a game warden and biologist at Ft. Huachuca, Arizona. He attained the rank of Specialist 5 and received an honorable discharge. He has been employed by the National Marine Fisheries Service in Alaska; the Bureau of Sport Fisheries and Wildlife in the Dakotas and Minnesota; and the Michigan Department of Natural Resources' Game Pathology Laboratory at East Lansing, Michigan. He was also mate on a sport-fishing charter boat in the Florida Keys.

He entered graduate study at Florida Atlantic University in September 1970. Working under Dr. Walter R. Courtenay, Jr., he has been employed on ecological monitoring of the Broward County beach erosion control project, freshwater exotic fish investigations, and three short-term ecological surveys. He participated in a cruise of the University of Miami Marine Laboratory's R/V Columbus Iselin to the Tongue of the Ocean, Bahamas; and in a cruise of the R/V Antares, under

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He is a member of the American Fisheries Society, American Society of Ichthyologists and Herpetologists, Florida Society of Aquatic Biology, International Game Fish Association, International Oceanographic Foundation, and National Georgraphic Society.

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