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FLORIDA STATE UNIVERSITY  
AN ICHTHYOLOGICAL SURVEY OF JUPITER INLET  
AND LOXAHATCHEE RIVER, FLORIDA

By  
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Submitted to the Graduate School of  
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the degree of Master of Science

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## INTRODUCTION

Florida's fish fauna has aroused the curiosity of scholar and layman alike since the days of the early explorers. Early works were largely descriptive and no attempt was made to produce a complete list of species for any given locality.

In the late nineteenth and early twentieth centuries the study of Florida marine fishes was intensified largely through the efforts of D. S. Jordan, W. C. Kendall, B. W. Evermann, J. A. Henshall, Silas Stearns, and others. Still their work was largely descriptive with two notable exceptions: Evermann and Bean's (1897) "Indian River and its Fishes" and Jordan's (1885) "List of Fishes Collected in Key West, Florida, with Notes and Descriptions." The former dealt primarily with fishes of commercial importance but also listed other species; the latter was an emended compilation of earlier works.

The first comprehensive study of a Florida fauna was undertaken by William Longley at Tortugas, an area known to possess one of the richest marine faunas in the western hemisphere. Longley produced a series of papers (for bibliography, see Longley and Hildebrand, 1941: xi-xiii) on the ecology, behavior and coloration of reef

fishes, the groundwork for a more comprehensive treatise on the processes of evolution in reef fishes. This work was cut short by his untimely death. Longley's notes and partial manuscripts were assembled and edited by Samuel F. Hildebrand, who made additions from his own personal knowledge of the area (Longley and Hildebrand, op. cit.: viii-ix).

Gunter's (1945) "Studies on the Marine Fishes of Texas" stimulated an interest in faunal studies which emphasized ecological considerations. Twelve such surveys have been completed in Florida.

Numerous investigations have been carried out on the Gulf coast of Florida: Alligator Harbor (Joseph and Yerger, 1956), Cedar Key (Reid, 1954; Kilby, 1955), Tampa Bay (Springer and Woodburn, 1960), and in the Florida Bay area of Everglades National Park (Tabb and Manning, 1961). Additions to the lists of fishes from these areas have since been made (Yerger, 1961; Caldwell, 1954, 1955a, 1957b; Berry, 1958a, 1958b; Springer, 1961).

The Atlantic coast of Florida has received only scant attention. Only two areas north of the Florida Keys, the St. Johns River (McLane, 1955) and the St. Lucie Estuary (Springer, 1960; Gunter and Hall, 1963a), have been studied.

In recent years a number of investigators (Tagatz and Dudley, 1961; McFarland, 1963; Springer and

Woodburn, 1962a) studied the seasonal occurrence of fishes in selected localities. These studies complemented the ecological surveys which had provided some information on seasonality in fishes.

Apart from information of local interest and usefulness, the results of the ecological surveys and seasonality studies have been twofold: a better understanding of the importance of ecological factors and their effect on various species has been gained; and the basis has been established for a more comprehensive study of the geographic distribution of fishes. Additionally, new information and material is available on certain taxonomic problems.

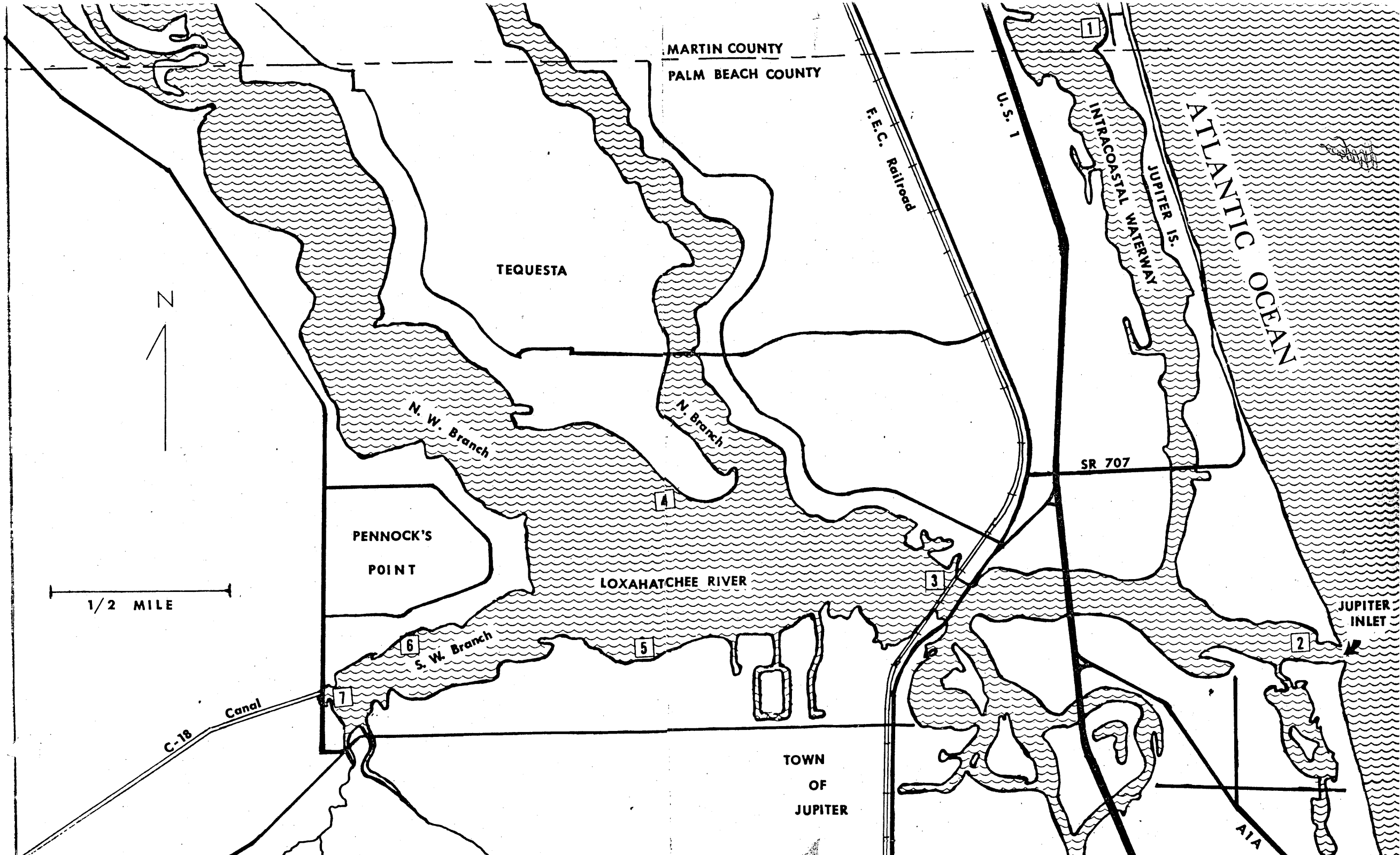
The present work attempts to provide seasonal data for the Jupiter region comparable to that shown by Springer and McErlean (1962a) at Lower Matecumbe Key, and also to provide a comparison among stations in the area which have ecological differences. Due to the scope of the problem and the limited assistance available, no single habitat was studied as intensively as it might have been had only one habitat been investigated. Likewise certain areas of the river were virtually ignored in the effort to adequately sample the established stations.

The third object was to compile as complete a list of fishes from the area as possible. This was accomplished through some special collections, specimens received from

local collectors, records from other institutions and agencies, and reports from fishermen.

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Fig. 1--The Jupiter Inlet - Loxahatchee River Area.  
Locations of permanent stations are indicated by the numbered squares.



MARTIN COUNTY  
PALM BEACH COUNTY

TEQUESTA

PENNOCK'S  
POINT

TOWN  
OF  
JUPITER

LOXAHATCHEE RIVER

ATLANTIC OCEAN

INTRACOASTAL WATERWAY

JUPITER IS.

JUPITER INLET

F.E.C. Railroad

U.S. 1

SR 707

C-18 Canal

A1A

N

1/2 MILE

N. W. Branch

N. Branch

S. W. Branch

1

2

3

4

5

6

7

## THE JUPITER INLET - LOXAHATCHEE RIVER AREA

(Figure 1)

For the purposes of this study the Jupiter Inlet-Loxahatchee River area is defined as that area bounded on the north by latitude  $27^{\circ} 03'$  N., on the south by latitude  $26^{\circ} 53'$  N., on the east by longitude  $79^{\circ} 55'$  W. (slightly beyond the 100 fathom curve), and on the west by longitude  $80^{\circ} 20'$  W. (approximately 15 airline miles west of the town of Jupiter).

Much of the following description of the area was taken from a report issued 12 November 1962 to the Jupiter Inlet Commission by Brockway, Weber, and Brockway, Engineers.

Jupiter Inlet, approximately 14 miles north of Palm Beach Inlet, is one of the oldest natural inlets of record. It provides an outlet for the Loxahatchee River (Jupiter River) and its tributaries which drain about 330 square miles of hinterland, and for the Intracoastal Waterway (Indian River) which in this area is also a natural waterway.

The inlet has been altered from its early state by changes in drainage patterns and by two nearly parallel rock jetties, about 300 feet apart and 400 feet long, built in 1922. Formerly the inlet was wider and deeper



and included much of the area which is now DuBois Bight.

The inlet has had a long history of closings and subsequent re-openings. During the last closure from 1942 to 1947 the river became fresh and its ecology changed greatly. With the re-opening of the inlet in 1947, the ecology of the river was again drastically altered, and a marine fauna became re-established. Since then the inlet has been kept open through periodic dredging.

The mean tidal range in the river is small, about 1.3 feet. Bores of salt water push into the river during the dry season often as far as Pennock's Point. Bottom salinities exceeding 20 ‰ have been reported in the northwest branch of the river beyond Jonathan Dickinson State Park in Martin County. Salinities exceeding 30 ‰ have been recorded at the mouth of the C-18 canal, and may be as high as 7 ‰ as far west as the floodgates. Fishes taken in these waters are often regarded as marine invaders when actually they are living in moderate to high salinities.

During periods of heavy rainfall the salinities in the upper parts of the river fall drastically and the bores of subsurface saline water are pushed back. The C-18 canal, about 105 to 175 feet wide and 12 to 14 feet deep, is designed to release up to 3,460 cubic feet of water per second into the southwest branch of the river.

This can cause a more rapid drop in salinity in this branch than in other parts of the river. In the north and northwest branches of the river storm waters are slowed by a rather tortuous channel through nearly virgin cypress swamps. The time required for maximum discharge of fresh water into the river is greater in these branches.

Salinities in the Intracoastal Waterway remain relatively stable even during periods of heavy rainfall, and rarely fall below 20 ‰.

A regional physical phenomenon is the periodic upwellings of cold water offshore. This water, approximately 20° C. (65-70° F.), has caused temporary distress in some shore fishes. Upwellings were noted on 12 August 1964 and 14 June 1965, but did not result in "fish kills". Winter "kills", as noted by Gunter and Hall (1963: 301) at St. Lucie, are not known at Jupiter.

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## STATIONS

The stations established for this study were chosen with two considerations in mind: accessibility; and suitability for seining operations. The only exceptions to this were the inlet and the railroad bridge stations which were sampled by other means.

Stations 1 through 6 were visited monthly from July, 1960 through June, 1961, except when excessively high tides or other factors prohibited their sampling. In addition some of these were sampled at various times from July, 1961 to April, 1965. Stations 7 through 9 were visited whenever time and conditions permitted.

Permanent stations were not established in fresh water as no seasonal occurrence of fishes was expected. A variety of habitats was sampled and, a list of species compiled together with available ecological information.

### Station 1 (County Line)

The county line station is located on the east side of the Intracoastal Waterway, approximately 2-1/2 miles north of Jupiter Inlet and just north of the Palm Beach-Martin County line. A sandy stretch of beach approximately

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100 yards long terminates at either end in red mangroves, Rhizophora mangle.

At the north end of the station a small area of exposed rock bottom (water-depth 6 inches to 3 feet) grades abruptly into a soft mud bottom. During the summer and fall a calcareous algae, Halimeda incrassata, grows attached to the rock.

At the south end of the station the bottom was usually littered with debris, such as leaves, sticks, and small pieces of tree limbs, especially near shore. In clear areas there were patches of Diplanthera wrightii 2 to 3 feet offshore. These beds continue for 10 to 15 feet, then are replaced by a soft mud bottom. Thirty feet from shore the water is about 4 feet deep and nets were rarely carried beyond this point. At times during the summer there was a considerable amount of unattached algae of various species along the shore.

There are no sources of fresh water along the Intra-coastal Waterway to dilute the seawater except during periods of heavy rainfall.

Salinities never dropped below 20 ‰ and were infrequently less than 30 ‰. Temperatures never were below 20° C. Wave action is slight.

Collections were made with seines from 25 to 40 feet long. Physical conditions at the times of collection may be found in Table 61.

## Station 2 (Jupiter Inlet)

Much of the description of the inlet has been given in the general account of the area. West of the jetties several sandy beaches are suitable for seining. Two areas with grass beds exist on the south side: one at DuBois Park is no longer in existence; the other in DuBois Bight (discussed earlier) contained the only Thalassia testudinum bed in the area. These habitats were sampled on several occasions but no permanent station was established.

The jetties were sampled with hook and line and occasionally with spear guns and rotenone. Swift currents limited the effectiveness of rotenone.

The entire inlet is treated as one station, and habitats were sampled by the most appropriate method. Consequently two or more collections will be recorded in the same month, or even on the same day of the month, and no seasonal occurrence of fishes in the inlet will be given. Physical data for the collections are shown in Table 1.

## Station 3 (Railroad Bridge)

This station is located in the narrowest part of the river at the Florida East Coast Railroad Bridge. Numerous oyster bars occur in the area, as well as the remains of a concrete bridge which forms an artificial bar. Oysters cover much of the bottom. At the end of the railroad bridge the oyster bar and the bridge abutment form a small

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TABLE 1.--Physical data - Station 2

Date	Collecting Method	Sal. ‰	Temp. ° C.
2 July 1960	Hook and line	25.8	31.0
3 July 1960	25' seine	-	36.0+
3 July 1960	Speargun	37.0	30.0
4 July 1960	Hook and line, explosives	37.2	30.0
8 July 1960	Speargun	37.5	30.0
9 July 1960	25' seine	29.3	32.0
19 Aug. 1960	Dip net	22.5	30.0+
30 Aug. 1960	40' seine	16.5	29.5
30 Aug. 1960	40' seine	32.5	30.0
30 Aug. 1960	Hook and line	28.8	30.3
4 Sept. 1960	40' seine, hook and line	35.4	28.25
21 Oct. 1960	40' seine	21.6	27.0
22 Oct. 1960	30' seine, hook and line	21.8	28.0
22 Oct. 1960	40' seine, hook and line	25.1	27.0
25 Nov. 1960	40' seine, hook and line	33.5	26.0
31 Dec. 1960	40' seine	33.5	24.0
31 Dec. 1960	40' seine	31.2	23.0
31 Dec. 1960	40' seine	32.3	21.0
31 Dec. 1960	Hook and line	35.5	21.5
1 Jan. 1961	Hook and line	34.9	22.0
29 Jan. 1961	30' seine, hook and line	36.2	20.5
19 Feb. 1961	Hook and line	35.8	25.0
5 March 1961	30' seine	37.1	24.5

TABLE 1.--Continued

Date	Collecting Method	Sal. ‰	Temp. ° C.
30 April 1961	30' seine, hook and line	37.3	27.0
28 May 1961	30' seine	35.8	26.0
29 June 1961	30' seine, hook and line	34.8	29.0
16 Oct. 1961	Rotenone	26.4	27.8
1 Aug. 1963	Speargun	-	32.0
14 April 1964	Rotenone	36.2	27.25
14 April 1964	Rotenone	36.6	27.5
22 Aug. 1964	Rotenone	33.8	30.5
5 Jan. 1965	Rotenone	-	-

"bay" open only at one end at low tide. This small bay, 75 by 25 feet, was ideal for rotenone collections at nearly low tide. One end had a muddy bottom, but the major portion was covered with oysters. The greatest depth at low tide was 3 feet.

Within the general area of the oyster bars there are a few Diplanthera beds which were too deep for seining but undoubtedly relate to the variety of fish in the area.

Salinities at the station are generally high. However, during periods of heavy rainfall they may be depressed for considerable lengths of time, and substantial faunal changes undoubtedly occur. Physical data for the collections made at this station are shown in Table 2.

TABLE 2.--Physical data - Station 3

Date	Collecting Method	Salinity ‰	Temperature ° C.
17 July 1960	Hook and line	22.4	30.0
24 July 1960	Hook and line	-	32.0
24 July 1960	Hook and line	14.1	32.0
7 Aug. 1960	Hook and line	32.5	31.0
7 Aug. 1960	Hook and line	32.1	31.0
14 Aug. 1960	Hook and line	32.7	29.0
30 Aug. 1960	Hook and line	24.6	30.0
30 Oct. 1960	Hook and line	28.5	27.0
26 Dec. 1960	Hook and line	29.3	17.8
26 Jan. 1961	Hook and line	32.7	21.0
10 Sept. 1961	Rotenone	32.3	32.0
23 June 1963	Rotenone	35.5	31.0
12 April 1964	Rotenone	36.2	26.5
2 Jan. 1965	Hook and line	-	-

## Station 4 (Old Girl Scout Camp)

Station 4 is located on the east side of the northwest fork of the river, approximately 2-1/4 miles west of the mouth of the inlet.

Collections were made along a section of sand beach about 100 yards long. Scattered clumps of Spartina alterniflora, red mangrove, and a few Australian pines, (Quarina equisetifolia, were found on the shore. The



bottom was white sand with patches of Diplanthera. Collections were made up to about 75 feet from shore to depths of 4 feet.

Salinities and temperatures were more variable than in the Intracoastal Waterway and during heavy rainfall salinities below 10 ‰ were found over extended periods. Considerable wave action during the winter is produced by strong northwest winds.

Physical conditions at the station are shown in Table 62. Seines from 25 to 40 feet long were used.

#### Station 5

Station 5 is located on the south side of the river approximately 2 miles west of Jupiter Inlet. The site is a 200 foot sandy beach in front of a private residence, and the only shore vegetation is a small patch of Spartina. The bottom is similar to that of Station 4 but is muddier and there is a small patch of oysters, 6 by 15 feet, near shore. Collections were made only with seines, and physical data is shown in Table 63. Seines were rarely taken more than 50 feet from shore. Salinities are usually similar to those of Station 4 except during periods of heavy rainfall when they averaged several parts per thousand lower.

## Station 6

Station 6 is located on the north side of the southwest branch of the river, 1/4 mile east of the mouth of the C-18 canal. The shore is lined with Spartina alterniflora and Scirpus robustus. Diplanthera beds extend out about 25 feet from shore. The bottom then becomes a deep mud, and seines, 25 to 40 feet long, were rarely taken beyond this point.

At the west end of the station there is a small drainage ditch, about 3 feet wide and 2 feet deep at its mouth, and somewhat wider and deeper farther back. Data on physical conditions are shown in Table 64.

## Station 7

Station 7 was located on the north side of the southwest branch of the river at the mouth of the C-18 canal. The shore was lined with Spartina, Scirpus, and red mangroves. Diplanthera beds extended out from shore for about 15 feet where the bottom became deep mud. Salinities here are quite variable and may vary over short distances. Records of physical conditions for the four collections made are shown in Table 3. Much of this habitat has since been destroyed.

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TABLE 3.--Physical data - Station 7

Date	Collecting Method	Salinity ‰	Temperature ° C.
24 July 1960	25' seine	1.5	32.5
26 Nov. 1960	30' seine	10.8	24.5
1 Jan. 1961	30' seine	30.2	22.0
6 July 1963	Hook and line	19.3	31.0

## Station 8

The station is located on the east side of the Intra-coastal Waterway, 4-1/2 miles north of Jupiter Inlet. In many respects it is similar to the county line station, but is about one-third as large and lacks the mangroves and rock bottom. Some species find an acceptable substitute for the rock in an exposed area of mangrove peat. Physical data are shown in Table 4. Much of the habitat has since been destroyed.

TABLE 4.--Physical data - Station 8

Date	Collecting Method	Salinity ‰	Temperature ° C.
18 July 1960	Hook and line	34.9	31.0
10 Aug. 1960	30' seine	36.3	32.0
23 Aug. 1960	30' seine	31.5	29.0
12 Sept. 1960	40' seine	27.5	27.5
16 Oct. 1960	30' seine	21.6	28.0
20 Nov. 1960	30' seine	20.5	27.0

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## Station 9

This station is located on the beach of Jupiter Island in Martin County, approximately 4-1/2 miles north of Jupiter Inlet. Samples were taken during the summer months only when sea conditions were most favorable. The beach at this point is quite wide. In the summer a shallow barrier bar often forms along the shore providing shelter for small fishes. The bottom is bare sand; quantities of loose marine algae of various species often accumulate in the shallow water behind the bar. Since 25 to 40 foot seines were used, this station could only be sampled when the sea was calm.

Salinities were consistently high; temperatures varied but never fell to levels found in the river. Physical data for collections are shown in Table 5.

## Special Collections

During and following the period of monthly collections from July, 1960 through June, 1961, six special collections were made in localities other than regular stations. Because of their significance, a description of these localities is given. Most of these collections were made with rotenone.

Special collection 1. --South side of river just west of U.S. 1 bridge; small, narrow flat at edge of deepwater channel, covered with Diplanthera wrightii; shore lined

with mangroves, no beach except at low tide; 40 foot seine; temperature 31.3° C.; salinity 28.1 ‰; 9 August 1960.

TABLE 5.--Physical data - Station 9

Date	Collection Method	Salinity ‰	Temperature ° C.
2 July 1960	25' seine	35.5	28.7
5 July 1960	25' seine	37.5	31.0
11 July 1960	25' seine	37.7	29.0
30 July 1960	40' seine	37.3	28.0
10 Aug. 1960	49' seine	37.1	28.8
12 Sept. 1960	40' seine	37.1	23.0
22 Oct. 1960	40' seine	34.1	28.0
11 April 1964	35' seine	36.6	30.0
21 Aug. 1964	30' seine	-	-

Special Collection 2.--Mosquito control ditch on Jupiter Island, 3 miles north of Jupiter Inlet; ditch 30 feet long, 6 feet wide, maximum depth 6 inches; bottom muddy; white mangroves border ditch; this isolated section of ditch connected to Intracoastal Waterway during periods of heavy rainfall or high tides; temperature 30° C.; salinity 22.9 ‰; water heavily stained, slightly turbid; 15 April 1964.

Special Collection 3.--Northwest branch of Loxahatchee River, near Palm Beach County line (Sec. 22, T40S., R41E.).

Remains of steamboat, partially buried in mud or covered with oysters, portions above water; bottom muddy; shore lined with red mangrove; area subject to wide fluctuations in salinity and under tidal influence; rising tide; temperature 33° C.; salinity 29.5 ‰; 7 July 1963.

Habitat now destroyed.

Special Collections 4 and 5.---South end of Big Blowing Rocks on Jupiter Island, near Palm Beach-Martin County line; 50 foot section of beach to depth of 3 feet, a distance of 25 to 30 feet from shore; bottom near shore smooth rock dissected by numerous wave-cut channels 6 to 24 inches wide at right angles to shore; sand-filled pockets in channel bottoms up to 8 inches deep and 24 inches wide; rock usually scoured clean by shifting sands and wave action. Collection 4: 21 August 1964; 1100 to 1230 hours; tide low, water clear, slightly southerly current; temperature 28.5° C.; salinity 36.6 ‰.

Collection 5: 22 August 1964, 0900 to 1030 hours; tide half low, water clear; temperature 29.5° C.; salinity 37.1 ‰.

Special Collection 6.---Sim's Creek, tributary of southwest branch of river, 500 yards from its mouth; channel 150 feet long, 30 feet wide, 3 to 4 feet deep; under tidal influence; little vegetation on the banks; invaded by many marine species; no temperature or salinity data; 30 August 1964.

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## EQUIPMENT AND METHODS

Minnow seines from 25 feet to 40 feet in length were used regularly to sample populations. All were 4 feet deep with 1/4 inch mesh. In fresh water localities a 4 by 4 foot minnow seine was also used. Areas not suited to seining were sampled through the use of hook and line, rotenone and spear guns. Occasional use was made of traps, explosives, and a 125 foot, 3/4 inch stretch mesh gill net.

Collections were made at each station until it was subjectively considered that further efforts would not produce additional information. In some instances it was necessary to stop sampling before this point was reached.

It was usually impossible to preserve all the specimens collected. In such cases several random handfuls were preserved, and then the net carefully checked for less common forms. This procedure was followed by Springer and Woodburn (1960: 12). They considered that such procedures did not seriously affect the validity of the information relating to relative abundance since bias has already been introduced by the type of collecting method used. Some problems in reporting relative abundance are discussed by Gunter (1941).

Specimens were preserved in 10% formalin and returned to Florida State University where they were identified and catalogued. Records of specimens housed in the collections of the University of Miami Marine Laboratory (UMML), the Florida State Museum, University of Florida (UF), and the Florida Board of Conservation Marine Laboratory (FBCML) are also included.

Measurements were made with needle point dividers and millimeter rule, and recorded to the nearest millimeter. All measurements are standard length (SL) unless otherwise noted.

Surface temperatures were taken with glass rod, mercury-filled centigrade thermometers with graduations in whole degrees. On occasions a comparable Fahrenheit thermometer was used, and readings were converted to the centigrade scale.

Surface salinities were determined by salinity hydrometers (Eril Greiner Corp.) calibrated on the basis of 60°/60° F. These readings were corrected for temperature and converted to 15°/4° C. basis of density. The correction for basis of density was taken as -0.0010 (More precise corrections and corrections for other bases of density may be obtained in the Basis of Density Table in U. S. Bureau of Standards Circular 19). Conversion from density to salinity was made through appropriate tables in Zerbe and Taylor (1953).



Station numbers which refer to special collections are prefaced by the letters SC.

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## SYSTEMATIC ACCOUNT

The phylogenetic arrangement of the species, at least to the level of family, and the common names used follow Bailey et al. (1960). Local common names are given in brackets following the accepted common name. Ranges given are those set forth by Briggs (1958) unless stated otherwise.

### CLASS CHONDRICHTHYS

### ORDER SQUALIFORMES

### CARCHARHINIDAE - REQUIEM SHARKS

Carcharhinus limbatus (Müller and Henle) - Blacktip shark

RANGE: Worldwide in tropical and temperate waters; in the western Atlantic from southern New England to southern Brazil and the northern Gulf of Mexico.

One specimen (1029 mm TL) was taken in the southwest branch of the river at the mouth of the C-18 canal on 10 April 1965. Another specimen (699 mm TL) was found at the inlet on 23 July 1960.

The species is infrequently taken in the river, but is regarded as common on the beaches.

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Mustelus canis (Mitchill) - Smooth dogfish

RANGE: Cape Cod (occasionally to Massachusetts Bay and as a stray to Passamaquoddy Bay at the mouth of the Bay of Fundy) and Bermuda southward to Texas, Cuba, the Caribbean region, central Brazil (Rio de Janiero) and Uruguay (Bigelow and Schroeder, 1948: 250).

One specimen, a juvenile male (538 mm TL), was received from fishermen at the south Jupiter Island bridge, 1/2 mile north of Jupiter Inlet on 11 February 1961. This specimen was identified by Mr. Phillip Heemstra of the Florida Board of Conservation, and fits the description given by Bigelow and Schroeder (op. cit.: 224-227).

This is the first record of the fish in Florida. Bigelow and Schroeder (op. cit.: 251) stated that there was ". . . no positive record or rumor of its presence on the east coast of Florida." They acknowledged records of the species from southern Florida but believed that these records referred to M. norrisi, a then relatively new species. Springer and Lowe (1963: 249) stated that there is no overlap of the ranges of M. norrisi, M. canis, and M. higmani. This may be true, but it now seems that the ranges of M. canis and M. norrisi are quite close as M. norrisi is known from southwestern Florida and the Florida Keys (Springer and Lowe, loc. cit.).

M. canis was not listed in Clark and von Schmidt (1965) but was included in Heemstra's (1965) work on the basis of my specimen as well as its occurrence in the Caribbean and northern Gulf of Mexico. It seems to have an unusual distribution pattern as Bigelow and Schroeder (op. cit.: 250) noted ". . . that several more or less isolated populations of Smooth Dogfish exist, their area of distribution being separated one from the next by wide gaps between which little or no intermigration occurs."

SPHYRNIDAE - HAMMERHEAD SHARKS

Sphryna tiburo (Linnaeus) - Bonnethead

RANGE: Worldwide in tropical and temperate waters; in the western Atlantic from Nantucket Sound to southern Brazil and the northern Gulf of Mexico.

One specimen (430 mm TL) was received from fishermen at the south Jupiter Island bridge, 1/2 mile north of the inlet on 11 February 1961. The species is rare on the Atlantic coast compared to its abundance in the Gulf. Springer and Woodburn (1960: 14) reported that the species is frequently taken by fishermen in the Tampa Bay area. Reid (1954: 13) found occasional specimens at Cedar Keys and Joseph and Yerger (1956: 117) reported it as abundant and the most frequently taken shark in Alligator Harbor. Guter and Hall (1963a) and Springer (1960) failed to find

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the species at St. Lucie, nor was it found by Tabb and Manning (1961) at Florida Bay.

ORDER RAJIFORMES

PRISTIDAE - SAWFISHES

Pristis pectinatus Latham - Smalltooth sawfish

RANGE: Both sides of the Atlantic; in the western Atlantic from New York and Bermuda to middle Brazil, and the northern part of the Gulf of Mexico.

This species has not been recorded from the area in recent years. Henshall (1884: 138) reported that sawfish were harpooned in the river and included a figure of the fish.

RHINOBATIDAE - GUITARFISHES

Rhinobatos lentiginosus (Garman) - Atlantic guitarfish

RANGE: Western Atlantic in coastwise waters from Cape Lookout, North Carolina to Yucatán, including the northern Gulf of Mexico (Bigelow and Schroeder, 1953: 67).

No specimens were collected, but one guitarfish was observed at the south end of Big Blowing Rocks, lying on a nearly flat, rocky bottom in water about 18 inches deep.

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## TORPEDINIDAE - ELECTRIC RAYS

Narcine brasiliensis (Olfers) - Lesser electric ray

RANGE: North Carolina to southern Brazil and the northern Gulf of Mexico.

One example (77 mm TL, disc width 44 mm), obtained from Zeke Kindt, was taken along the beach approximately 1 mile south of the inlet on 23 July 1960. It is considerably smaller than the average size at birth (110-120 mm) given by Bigelow and Schroeder (1953: 118). The second specimen, a female (276 mm TL, disc width 143 mm), was collected on Jupiter Island at the south end of Blowing Rocks on 22 August 1964 (Special Collection 5). Temperature 29.5° C.; salinity 37.1 ‰. The species is common along the beach and is often observed lying on sandy bottom between exposed patches of rock in water 3 to 6 feet deep. It shows little fear of divers and will not move far even if disturbed. No observations or reports of this species have been made in the inlet or Intracoastal Waterway.

## DASYATIDAE - STINGRAYS

Dasyatis sabina (LeSueur) - Atlantic stingray

RANGE: Chesapeake Bay to Florida and the northern part of the Gulf of Mexico.

Fifteen specimens (95-280 mm, greatest width of disc) were collected. The largest, a female taken on

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3 July 1963; aborted three young (average disc width 96 mm; average TL, 268 mm)

The Atlantic stingray is common in shallow water over muddy bottoms throughout the study area except on the ocean beach. It is especially abundant at the mouth of the C-18 canal, and on the S Bar of the northwest branch of the river.

Larger specimens than those described have been observed in the area.

#### MYLIOBATIDAE - EAGLE RAYS

etobatus narinari (Euphrasen) - Spotted eagle ray (Whipray)

RANGE: Worldwide in tropical and temperate waters; in the western Atlantic from Chesapeake Bay and Bermuda to Santos, Brazil, and the northern Gulf of Mexico.

No spotted eagle rays were collected; but individuals were observed on several occasions in the inlet and in the Intracoastal Waterway north of the inlet. They are usually seen swimming near the surface, often with the tips of their pectoral fins above the water.

Myliobatis freminvillei (LeSueur) - Bullnose ray

RANGE: Cape Cod to Rio de Janeiro and the northern Gulf of Mexico.

Four juveniles of the Bullnose ray have been collected. One specimen (595 mm TL, disc width 360 mm) was speared on

31 December 1957 in the inlet. Two males (499, 655 mm TL, disc width 346, 336 mm; part of tail missing on one specimen) were taken at the county line station on 11 February 1961. Salinity 38.8 ‰. Another specimen (409 mm TL, disc width 380 mm) was speared by Larry Yeater in the Intracoastal Waterway approximately 1 mile south of the county line station on 27 April 1965.

Bigelow and Schroeder (1953: 444) stated

The most interesting feature of its known range is that it seems never to have been recorded with proof of identity from the northern coast of South America; from the Caribbean; from the southern or northern Gulf of Mexico; from anywhere among the West Indies; or from Florida.

Surveys in Florida completed since Bigelow and Schroeder's publication have failed to report the occurrence of the species. These specimens then constitute the first authenticated records of M. freminvillei in Florida.

CLASS OSTEICHTHYES

ORDER SEMIONOTIFORMES

LEPISOSTEIDAE - GARS

Lepisosteus platyrhincus DeKay - Florida gar

RANGE: Lowlands of Georgia to the southern tip of peninsular Florida and west to the Ochlockonee River in northwest Florida (R. W. Yerger, personal communication).

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Fifty-five specimens (190-380 mm to end of spinal column) were taken from fresh water localities along the Indiantown Road (SR 706). Occasional specimens were taken in the river, and during periods of heavy rainfall juveniles have been observed in the inlet. Adult gars were taken on three occasions at Station 6 (300, 445, 469 mm to end of spinal column) and on one occasion at Station 4 (383, 559 mm to end of spinal column). Temperature range 20 - 34° C.; salinity range <1.0 - 16.6 ‰.

The Florida gar is widespread in fresh water and is common in ditches and small canals having a depth of a foot or more. Rotenone and trammel net collections made in March and May, 1961, by Lake and Stream Survey Team No. 2 of the Florida Game and Fresh Water Fish Commission revealed that gars are abundant in the smaller canals, but comprise less than 1% of the fish population in the larger C-18 canal.

ORDER AMIIFORMES

AMIIDAE - BOWFINS

Amia calva Linnaeus - Bowfin

RANGE: United States east of the Great Plains and throughout Florida.

No specimens were collected although the species is fairly common in the area. A report of the Florida Game

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and Fresh Water Fish Commission's Stream Survey Team No. 2 (1960) listed the species in the C-18 canal. The team's field data reported that bowfin comprised 16.7% (21.4 lbs.) of the catch of a 3 inch mesh trammel net set in the C-18 canal above Flood Gate S-46. The net was set 15 March 1960 and remained in place for 20 hours.

ORDER CLUPEIFORMES

ELOPIDAE - TARPONS

Elops saurus Linnaeus - Ladyfish

RANGE: Atlantic, Indian and western Pacific Oceans; in the western Atlantic from southern New England and Bermuda to Rio de Janeiro, and throughout the Gulf of Mexico.

One specimen (253 mm) was taken at Station 6 on the southwest branch of the river on 23 October 1960.

Ladyfish are common throughout the river but are rarely captured. During the summer months, adults are commonly caught on small feather lures from the south Jupiter Island bridge near the inlet.

Gunter and Hall (1963a: 240) reported that numerous ladyfish and tarpon were killed at St. Lucie during the period of cold weather in February, 1958. No such "kills" were observed or reported during the present study.

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Megalops atlanticus (Valenciennes) - Tarpon

RANGE: Both sides of the Atlantic; in the western Atlantic from the Gulf of Maine and Bermuda to northern Brazil, and throughout the Gulf of Mexico.

One leptocephalus (45 mm) was taken at Station 4 on 29 January 1961. Temperature 20° C.; salinity 28.8 ‰. Tarpon are not uncommon in the river but no adults were taken during the study.

Juveniles and adults are known to enter the freshwater rivers and canals of south Florida (Carr and Goin, 1955: 40) and occur in Lake Okeechobee in considerable numbers (Dequine, 1953: 5). Notes on growth and ecology of young tarpon are given by Harrington (1958).

Tarpon are highly regarded as game fish but generally are not eaten. Most persons I questioned about this reported that tarpon are of poor quality but admitted that they had never tried any. The only first-hand opinion I found was by Fresco (1884: 162-163):

I enquired [sic] of many persons if this fish was edible, and could not obtain any information. Possessing ichthyophagous tendencies, in July I resolved upon determining this matter and cut some steaks from a specimen weighing 128 pounds. I had them fried, and upon testing them I arrived at the conclusion, that as an edible fish the tarpon rates next to the pompano. Several gentlemen tasted the fish and confirmed my opinion. Since that time the flesh of this fish has been sold in this market at ten cents per pound. The flesh is very tender and of a light walnut tint. To many the color of the flesh would be an objection.

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## ALBULIDAE - BONEFISHES

Albula vulpes (Linnaeus) - Bonefish

RANGE: Worldwide in tropical seas; in the western Atlantic from New York [also Massachusetts and perhaps the Bay of Fundy (Hildebrand, 1965a: 141)] and Bermuda to Rio de Janeiro, and throughout the Gulf of Mexico.

Two bonefish were taken during the study period. The first, a juvenile (23 mm), was taken at Station 6 on 25 November 1960. Temperature 24° C.; salinity 16.6 ‰. The second, a leptocephalus (54 mm), was taken on 21 May 1961 at Station 4. Temperature 28° C.; salinity 35.9 ‰.

Bonefish are rarely taken by local fishermen although Henshall (1884: 137) reported that it once was quite common. A local collector has taken specimens approximately 100 mm in length in the Intracoastal Waterway at Peck's Lake, north of Hobe Sound, Florida. These are the largest specimens seen recently.

The smallest specimen seen by Alexander (1961: 14-15) which had completed metamorphosis was 51.2 mm. A 28.5 mm specimen, which she considered to be in the final stages of metamorphosis, did not show any branching of the dorsal and anal fin rays and had no pigmentation. I regard my 23 mm specimen as a juvenile which has just completed metamorphosis, since the body is pigmented and there is

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one branched ray in the anal fin. Scales are not yet apparent. Although scales were present, Alexander (loc. cit.) noted that the major change from a 28.5 mm to a 51.2 mm fish (the only juvenile used in her study) was the development of pigment.

The leptocephalus is in a pre-metamorphosis stage as the teeth are still quite long and directed outward.

Alexander (op. cit.: 28) reported that the salinity range of stations in her study was 25.5 to 36.89 ‰. She offered no conclusions regarding the limits of tolerance for the species.

#### CLUPEIDAE - HERRINGS

Brevoortia smithi Hildebrand - Yellowfin shad

RANGE: North Carolina to the Mississippi Delta (Reintjes, 1963: 110).

Fifteen specimens (178-292 mm) were taken in a gill net at Station 6 in August, November, and December, 1964. Tabb and Manning (1961: 607) reported that the species is common in Florida Bay in the fall and winter. Both Springer (1960: 9) and Gunter and Hall (1963a: 241) reported B. smithi at St. Lucie, but B. tyrannus was much more abundant, the reverse of the situation in the Oxahatchee. Gunter and Hall (loc. cit.) collected B. tyrannus in November, December, and January and

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B. smithi in May. Spinger (loc. cit.) reported mixed collections in March.

Yellowfin shad reportedly have a good flavor and table qualities superior to B. tyrannus (Hildebrand, 1965c: 375) but local fishermen do not know the species.

Brevoortia tyrannus (Latrobe) - Atlantic menhaden

RANGE: Both sides of the Atlantic; in the western Atlantic from Nova Scotia to Florida Bay (modified from Briggs, 1958: 253).

Three menhaden (205, 229, 245 mm) were taken at Station 6 on 27 December 1964.

Atlantic and Gulf coast populations of the large scale menhaden are apparently contiguous, for current studies by Michael Dahlberg have yielded specimens from the Florida Bay area.

Dorosoma cepedianum (LeSueur) - Gizzard shad

RANGE: Atlantic drainage of eastern North America south to Río Pánuco, Mexico (Miller, 1965: 447).

Four adults (222-243 mm) were taken in a gill net at Station 6 in November, 1964 and January, 1965.

Gizzard shad are not common in the river but are reported to be abundant in the C-18 canal above the flood gates. The Game and Fresh Water Fish Commission Stream Survey Team No. 2 recorded gizzard shad as comprising

22.4% (59.7% by weight) of the fishes taken in three rotenone collections in the C-18 canal. One collection was made above the flood gates and two below.

Dorosoma petenense (Günther) - Threadfin shad

RANGE: Ohio River of Kentucky and southern Indiana westward and southward to Oklahoma, Texas, and Florida, thence along the coast of the Gulf of Mexico to northern Guatemala and British Honduras (Belize River). (Miller, 1965: 450).

One specimen (53 mm) was collected in the inlet on 3 December 1960. Temperature 21° C.; salinity 32.3 ‰. This specimen was taken in waters which are more saline than the species prefers, especially in this size range (Miller, loc. cit.) Apparently the species is quite common at St. Lucie where Gunter and Hall (1963a: 242) reported collecting the species 20 times. Briggs (1958: 253) did not list the species on the east coast of Florida.

Harengula clupeiola (Cuvier) - False pilchard

RANGE: Jupiter Inlet, Florida through the Florida Keys, Bahamas, West Indies, and Caribbean coast of Central and South America, from Yucatán to Brazil (modified from Rivas, 1965: 392).

Collections in Jupiter Inlet in July and October, 1960 contained 63 specimens (25-80 mm) of H. clupeiola.

An additional 34 specimens (31-66 mm) were taken in Special Collection 5 on Jupiter Island in August, 1964. Temperature range 27 - 32° C.; salinity range 21.8 - 37.3 ‰.

Rivas (loc. cit.) reported that this species has a range similar to that of H. humeralis and is the most widely distributed member of its genus. These records extend the range northward from the Florida Keys.

Harengula humeralis (Cuvier) - Redear sardine

RANGE: Bermuda and Jupiter Inlet, Florida through the Florida Keys, Bahamas, West Indies, and Caribbean coast of Central and South America, from Yucatán to Venezuela (modified from Rivas, 1965: 388).

This herring is uncommon at Jupiter. Collections made in Jupiter Inlet in August, 1958; October, 1960; and January, 1961 contained 41 specimens (30-120 mm). One specimen (49 mm) was collected on the beach at Station 9 in September, 1960. Temperature range 20.5 - 28° C.; salinity range 21.8 - 37.1 ‰.

These records extend the range of the species northward from the Florida Keys.

Harengula pensacolae Goode and Bean - Scaled sardine

RANGE: Cape Canaveral, Florida, southward to Brazil, including the Gulf of Mexico (Rivas, 1965: 394).



Approximately 1500 specimens (17-81 mm) were preserved and several times that number were released. The species was most frequently taken in the Intracoastal Waterway and was absent from Stations 3, 6, and 7. Errors in sampling are probably responsible for the lack of specimens at Station 3. The species was taken on four occasions on the beach. This species is restricted to areas of higher salinities and only a few individuals were taken when salinities were lower. Temperature range 20 - 34° C.; salinity range 17.8 - 37.5 ‰.

Specimens were taken in the months of June to October. One specimen was taken in December. Similar seasonal occurrence was found at Lower Matecumbe Key (Springer and McErlean, 1962a: 47). The species has been absent from Florida Bay since the fall of 1957 when it was abundant (Tabb and Manning, 1961: 607).

Jenkinsia sp. - Dwarf herring

RANGE: Tropical western Atlantic.

Seven specimens (34-45 mm) were collected at the county line station on 12 September 1960. Temperature 27.25° C.; salinity 29.9 ‰.

A specific identification of these specimens was not possible due to the presence of an undescribed species of Jenkinsia in the Florida Keys reported by Springer and McErlean (1962a: 41). Jenkinsia has not been reported north of the Florida Keys on the Atlantic coast of Florida.

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Opisthonema oglinum (LeSueur) - Atlantic thread herring

RANGE: Gulf of Maine, at Bermuda and throughout the West Indies to Florianopolis, Ilho de Argentina, Santa Catalina, Brazil (Berry and Barrett, 1963: 126).

Catch records of 330 thread herring (24-88 mm) are shown in Table 6.

TABLE 6.--Catch records of Opisthonema oglinum

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
30 July 1960	1	46	42-82	28.0	36.6
10 Aug. 1960	8	82	24-48	32.0	36.3
11 Aug. 1960	1	6	36-60	30.5	36.7
4 Sept. 1960	1	1	88	28.25	35.4
4 Sept. 1960	4	11	26-38	28.5	11.6
12 Sept. 1960	8	104	31-56	27.5	27.5
12 Sept. 1960	1	20	34-47	27.25	29.9
28 Jan. 1961	1	1	43	20.0	33.5
12 Feb. 1961	4	1	43	19.0	28.8
29 June 1961	4	57	33-47	29.0	33.1
22 Aug. 1964	SC5	1	62	29.5	37.1

The species was not listed by Springer (1960) or Gunter and Hall (1963a) at St. Lucie. Tabb and Manning (1961: 607) reported its absence due to lowered salinities from the

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Florida Bay area from January, 1958 to January, 1961; but it had been present in April and October, 1957 and July and August, 1958. In the northern Gulf of Mexico it is apparently uncommon (Gunter, 1945: 23; Joseph and Yerger, 1956: 121; Reid, 1954: 17-18), but may be periodically abundant (Reid, loc. cit.). Large groups of juveniles of Opisthonema and Harengula pensacolatae will often school together with a few Sardinella anchovia, a habit also noted by Springer and Woodburn (1960: 18) at Tampa where Opisthonema is common.

Sardinella anchovia Valenciennes - Spanish sardine

RANGE: New Jersey and Bermuda to Rio de Janeiro, and widespread in the Gulf of Mexico.

Juvenile Spanish sardines were common in collections in areas of high salinity and were rarely taken where salinities fell below 29 ‰. Catch records of the 700 specimens (17-119 mm) collected are shown in Table 7. Adults were collected only in September, 1960 when large series were taken from several schools in the inlet. These specimens agree with the description of S. pinnula, which is widely recognized as a synonym of S. anchovia, given by Hildebrand (1965c: 399-401).

Juveniles are often collected with schools of Harengula pensacolatae and Opisthonema oglinum.

TABLE 7.--Catch records of Sardinella anchovia

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
9 July 1960	2	114	50-65	32.0	29.3
11 Aug. 1960	1	2	30-32	30.5	36.7
4 Sept. 1960	2	500+	84-119	28.25	35.4
12 Sept. 1960	8	2	45-47	27.5	27.5
12 Sept. 1960	1	4	44-50	27.25	29.9
26 Nov. 1960	4	1	29	24.5	24.1
30 April 1961	5	2	25-27	28.0	35.9
30 April 1961	2	44	17-27	27.0	37.3
29 June 1961	4	12	43-62	29.0	33.1
12 April 1964	3	3	29-31	26.5	35.7
21 Aug. 1964	SC4	16	22-35	28.5	36.6

## ENGRAULIDAE - ANCHOVIES

Anchoa cubana (Poey) - Cuban anchovy

RANGE: Melbourne Beach, Florida to Guatemala and the West Indies, also through the northern Gulf of Mexico.

Table 8 gives the catch records of the 120 specimens (16-58 mm) of A. cubana. Tabb and Manning (1961: 607) and Springer and Woodburn (1960: 21) both collected the species in April of 1958 and 1959. One specimen was also

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taken at Tampa Bay in August, 1959. Springer and McErlean (1962a: 43) took 62 specimens in December, 1960 at Lower Matecumbe Key.

TABLE 8.--Catch records of Anchoa cubana

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
26 Dec. 1959	1	1	53	-	-
30 July 1960	1	7	35-45	28.0	36.6
10 Aug. 1960	8	1	29	32.0	36.3
11 Aug. 1960	1	32	29-47	30.5	36.7
12 Sept. 1960	8	8	37-40	27.5	27.5
12 Sept. 1960	1	1	37	27.25	29.9
22 Oct. 1960	2	12	44-52	28.0	21.8
26 Dec. 1960	4	1	37	18.5	31.9
30 Dec. 1960	1	1	42	20.0	23.9
31 Dec. 1960	5	2	40-44	22.0	30.8
28 Jan. 1961	1	21	26-51	20.0	33.5
29 Jan. 1961	5	5	44-52	20.5	34.4
11 Feb. 1961	1	5	40-49	-	38.8
12 Feb. 1961	5	4	50-58	18.25	18.0
12 Feb. 1961	4	15	40-54	19.0	28.8
5 March 1961	4	1	51	25.0	34.2
5 March 1961	5	3	49-51	24.0	34.6

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The lowest salinity previously reported from A. cubana was 22.0 ‰ (Springer and Woodburn, loc. cit.). My largest specimen came from waters with a salinity of 18 ‰.

Anchoa hepsetus hepsetus (Linnaeus) - Striped anchovy

RANGE: Both sides of the Atlantic; in the western Atlantic from Nova Scotia to Montevideo and the northern part of the Gulf of Mexico.

One specimen (41 mm) was collected at Station 6 on 7 July 1960 and seven specimens (66-75 mm) were taken at the county line station in July, 1960. Temperature range 28 - 30° C.; salinity range 7.7 - 36.6 ‰.

This species is rare at Jupiter and seems to be replaced by A. lamprotaenia. The distribution and relationships of these two species in that part of their ranges where they occur together are not clear. Their similarities often result in misidentifications. Gunter and Hall (1963a: 243) collected 24 A. hepsetus from the St. Lucie area, but no A. lamprotaenia. A. lamprotaenia was by far the most numerous engraulid on Lower Matecumbe Key (Springer and McErlean, 1962a: 42).

A. lamprotaenia is not known from the Gulf coast of Florida where A. hepsetus is usually abundant.

Anchoa lamprotaenia Hildebrand - Longnose anchovy

RANGE: Southern Florida to Panama, the West Indies and the northeastern Gulf of Mexico.

Approximately 1624 specimens (20-58 mm) were preserved and many more discarded. This species is second only to A. mitchilli in abundance in the area. It is distributed over a wide variety of habitats and shows a preference for higher salinities despite the fact that it has a salinity range (4.5 - 38.8 ‰) and temperature range (18.25 - 34° C.) similar to A. mitchilli. It was most frequently taken at the county line station and Station 4. Although not numerous, it was taken on the beach on several occasions.

Problems concerning its distribution in Florida and its relationships to A. hepsetus are discussed under that species.

Anchoa lyolepis (Evermann and Marsh) - Dusky anchovy

RANGE: North Carolina to the Gulf of Venezuela, and northern Gulf of Mexico.

Catch records of 412 specimens (25-75 mm) are shown in Table 9. The only Florida survey to record the species is Springer (1960: 9) who took the species on four occasions at St. Lucie. The number of specimens collected as not given for these collections made in the months of



TABLE 9.--Catch records of Anchoa lyolepis

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
4 April 1958	2	1	75	-	-
30 July 1960	1	1	42	28.0	36.6
11 Aug. 1960	1	90	33-48	30.5	36.7
12 Sept. 1960	8	2	39-42	27.5	27.5
12 Sept. 1960	1	3	32-52	27.25	29.9
16 Oct. 1960	1	2	28-29	27.0	24.1
20 Nov. 1960	1	1	29	25.0	25.2
25 Nov. 1960	. <sup>a</sup>	10	25-30	25.0	30.2
26 Nov. 1960	4	172	29-47	24.5	24.1
29 Dec. 1960	4	8	41-45	18.5	31.9
30 Dec. 1960	1	4	34-43	20.0	23.9
31 Dec. 1960	5	1	51	22.0	30.8
28 Jan. 1961	1	10	32-55	20.0	33.5
29 Jan. 1961	5	46	31-56	20.5	34.4
29 Jan. 1961	4	9	34-52	20.0	28.8
29 Jan. 1961	2	1	43	20.5	36.2
12 Feb. 1961	5	8	35-54	18.25	18.0
12 Feb. 1961	4	31	36-58	19.0	28.8
5 March 1961	5	4	40-47	24.0	34.6
5 March 1961	4	3	39-43	-	34.2
22 Aug. 1964	SC5	5	37-49	29.5	37.1

<sup>a</sup>Loxahatchee River 1/2 mile west of Jupiter Inlet, north  
e.

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March and September (Temperature range 21.75 - 23.5° C.; salinity range 14.2 - 29.4 ‰).

Hildebrand (1965b: 202) did not recognize records of the species from the Atlantic coast of the United States.

Anchoa mitchilli diaphana Hildebrand - Bay anchovy

RANGE: South Carolina to Yucatán, and throughout the northern Gulf of Mexico.

Approximately 4500 specimens (20-55 mm) were preserved and many more discarded. Temperature range 18 - 34° C.; salinity range 2.0 - 38.8 ‰.

As in the case along most of peninsular Florida, A. mitchilli is the most abundant member of its genus in the study area. It was taken at all stations including the beach station where it was rare. It was most abundant at the river stations but also common at the county line station. Due to sampling methods used it was not often recorded from the railroad bridge station, but it is probably common there also.

ORDER MYCTOPHIFORMES

SYNODONTIDAE - LIZARDFISHES

Synodus foetens (Linnaeus) - Inshore lizardfish

RANGE: Cape Cod and Bermuda to Santa Catarina, Brazil, and throughout the Gulf of Mexico.

Collections yielded 250 specimens (28-197 mm).  
Temperature range 18.5 - 31.5° C.; salinity range 7.3 -  
37.7 ‰.

Lizardfish were abundant in the Intracoastal Waterway and at Station 4 in the river. They were taken commonly in the inlet and at Station 5 but were less numerous than in the preceding areas. Lizardfish were not common in salinities of less than 30 ‰. Few specimens were collected in the upper reaches of the river; five specimens were taken in two collections at Station 6 when salinities were high. Gunter and Hall (1963a: 245) also reported that this species was restricted to areas of high salinities.

Springer and Woodburn (1960: 22) noted that both Reid (1954: 19) and Gunter (1945: 41) believed that spawning took place in the spring but reported that their smallest specimens (33-35 mm) were taken in November and December. Gunter and Hall (loc. cit.) collected their smallest specimen in January. At Lower Matecumbe Key, Springer and McErlean (1962a: 54) reported their smallest specimen (32 mm) in April but also reported collecting three specimens (36-40 mm) in March.

I collected specimens 30 mm or less in length in March and April and specimens 35 mm or less in length were taken in August, September, and December, 1960 and January, March, April, and May, 1961. During the period from

July, 1960 through June 1961 specimens 45 mm or less were collected in every month except July and November. My smallest specimens (28 mm) were collected in April, 1959 and March, 1961. Gibbs (1959: 234) reported that unmetamorphosed larvae were present offshore during the months of February, May, June, July, August, November, and December.

ORDER CYPRINIFORMES

CYPRINIDAE - MINNOWS AND CARPS

Notemigonus crysoleucas (Mitchill) - Golden shiner

RANGE: Southern Canada east of the Rockies, to the Gulf states; introduced in the western United States (Moore, 1957: 99).

Sixty-two specimens (28-203 mm) were taken in fresh water. Temperature range 20 - 31° C. Golden shiners are not considered common in the area as they were taken in only four localities, two of which are within a half mile of each other. Specimens 30 mm or less in length were taken in April and July.

Notropis maculatus (Hay) - Taillight shiner

RANGE: Missouri southward in the lowlands through Arkansas and southeastern Oklahoma to eastern Texas and Mississippi; on the Atlantic coast from North Carolina to Florida (Moore, 1957: 133).

The species was only collected in fresh water and 98 specimens (21-47 mm) were preserved. Temperature range 20 - 31° C. The taillight shiner is common in ditches and canals where submerged vegetation is abundant and the water is heavily stained. It was not taken in clear water lakes or abandoned shellpits even where there was abundant submerged vegetation.

Notropis petersoni Fowler - Coastal shiner

RANGE: Coastal streams of North Carolina to Palm Beach County, Florida (modified from Briggs, 1958: 261).

Three hundred eleven specimens (10-41 mm) were preserved. Temperature range 17 - 31° C.

The species is widely distributed in fresh water and is not restricted to any one type of habitat. N. petersoni is common in weedy canals with Notropis maculatus, Lucania goodei, Jordanella floridae, Etheostoma fusiforme barratti, and Ennecanthus gloriosus; and in open lake habitats in association with Fundulus seminolis, Cyprinodon hubbsi, Labidesthes sicculus and Lepomis macrochirus.

Specimens 15 mm or smaller were taken in four collections in November and December.

Briggs (loc. cit.) gave the southern limit for the species as Martin County. Specimens have now been taken west of Lake Worth in Palm Beach County. The species probably occurs at least as far south as Broward County.

## CATOSTOMIDAE - SUCKERS

Erimyzon sucetta (Lacépède) - Lake chubsucker

RANGE: Widely distributed from the Great Lakes region and through the Mississippi Valley and eastern Texas, westward to Missouri and Arkansas; the Atlantic Coastal Plain from New York to Florida (Moore, 1957: 86).

Sixty-two specimens (11-245 mm) were collected. Temperature range 17 - 34° C. Chubsuckers are common and widespread in the fresh waters west of Jupiter, in small ditches, creeks and canals. It has not been recorded from the larger C-18 canal. The abundance of gizzard shad, also a detritis feeder, in the C-18 canal may explain its absence. An adult, 245 mm, with breeding tubercles was taken in December, 1960. In March of the following year the smallest examples seen (11 mm) were collected. The breeding season is therefore inferred to be during the winter months.

## ARIIDAE - SEA CATFISHES

Bagre marinus (Mitchill) - Gafftopsail catfish

RANGE: Cape Cod to the West Indies and throughout the Gulf of Mexico.

One specimen (270 mm) was collected at Station 5 in August, 1964 and three specimens (235-356 mm) were taken

at Station 6 in August and November, 1964 and July, 1965.

The gafftopsail catfish is more common in the study area than my records indicate. It is frequently caught by fishermen, even far up the river.

A Game and Fresh Water Fish Commission survey team took two specimens (254, 493 mm fork length) from the northwest branch of the river at Jonathan Dickinson State Park on 28 November 1962.

Tabb and Manning (1961: 609) reported that this species comprised approximately 10% of the catfish killed by oxygen depletion in Florida Bay following Hurricane DONNA.

Galeichthyes felis (Linnaeus) - Sea catfish

RANGE: Cape Cod to Panama and throughout the Gulf of Mexico.

Sea catfish are abundant in the study area and were found from the beach to the upper reaches of the river. Specimens ranged in size from 47 to 343 mm, and the majority of 175 specimens were discarded. Temperature range 20 - 34° C.; salinity range 20 - 37.7 ‰.

The smallest specimens taken were with a school of adults collected at Station 9 on 11 July 1960.

A ripe female was taken in the northwest branch on 5 July 1960 and released about eight grape-sized eggs and a large number of small hyaline eggs.

Ward (1957), studied the reproduction of the Sea catfish in Mississippi, and was not able to comment on Gunter's (1947) suggestion that the male eats the non-functional eggs before beginning the long period of oral gestation. In Mississippi the spawning season extended from the first week in May until the first week in August.

ICTALURIDAE - FRESHWATER NORTH AMERICAN CATFISHES

Ictalurus natalis (LeSueur) - Yellow bullhead

RANGE: Great Lakes region to the Gulf coast and from the Great Plains to the Atlantic coast; introduced on the West Coast (Moore, 1957: 141).

Fourteen specimens (72-245 mm) were taken from the C-18 canal and other smaller canals. Temperature range 25 - 31° C.

Yellow bullheads appear to be more common than I. nebulosus. Large specimens (200+ mm) of this catfish are commonly taken by fishermen in the C-18 canal just above the S-46 floodgates.

Ictalurus nebulosus (LeSueur) - Brown bullhead

RANGE: Southern Canada and North Dakota south to Arkansas and southeastern Oklahoma; on the East Coast from Maine to Florida; introduced on the West Coast (Moore, 1957: 141).



Brown bullheads are not abundant in the area and only four specimens (66-206 mm) were collected. All specimens were collected in fresh water. Temperature range 22.5 - 25° C. Adults are usually restricted to the deeper canals but juveniles often venture into shallow ditches. Field data sheets of the Florida Game and Fresh Water Fish Commission, Lake and Stream Survey Team No. 2, reported limited numbers of the species in the C-18 canal.

Noturus gyrinus (Mitchill) - Tadpole madtom

RANGE: Red River system of North Dakota eastward through the drainage systems of Lakes Michigan, Huron, and Ontario and southward on both sides of the Appalachians to the Gulf states; west of the Mississippi as far as Lake Altus, southwestern Oklahoma; recent records from the Snake River system in Oregon (Moore, 1957: 144). Tabb and Manning (1961: 609) extended the known range in Florida from Lake Okeechobee (Briggs, 1958: 260) to Cape Sable.

Sixty-one specimens (12-60 mm) were collected. Temperature range 17 - 31° C. Madtoms are common in shallow, weedy ditches and along the margins of fresh-water creeks and canals in the area. The smallest specimen (12 mm) was collected in the middle of April and was much lighter in color than adults.

On the basis of records by Tabb and Manning (loc. cit.), N. gyrinus should be added to the list of euryhaline fishes.

## ORDER ANGUILLIFORMES

## ANGUILLIDAE - FRESHWATER EELS

Anguilla rostrata (LeSueur) - American eel

RANGE: Greenland, Labrador and Bermuda to the Guianas and throughout the Gulf of Mexico.

Sixteen specimens were collected in the Jupiter area. Thirteen of the specimens (67-315 mm TL) were collected from a canal along the Indiantown Road (SR 706), about 7 miles west of Jupiter. The smallest specimen was taken in April, 1964. One specimen (368 mm TL) was caught on hook and line in July, 1960 on the river side of the S-46 flood gates in the C-18 canal. One specimen (410 mm TL) was taken in Special Collection 3 in the northwest branch of the river. Temperature range 25 - 33° C.; salinity range <1.0 - 29.5 ‰. The largest specimen seen (ca. 485 mm TL) was regurgitated, in two pieces, by a large green moray (Gymnothorax funebris) caught in the inlet on 31 December 1957.

## MURAENIDAE - MORAYS

Gymnothorax funebris Ranzani - Green moray

RANGE: New Jersey and Bermuda to Rio de Janeiro and the southwestern Gulf of Mexico.

This large moray is not uncommon in the inlet and at the railroad bridge station. One specimen was taken from under a concrete dock in the southwest branch of the river where salinities are often quite low. Catch records are shown in Table 10.

TABLE 10.--Catch records of Gymnothorax funebris

Date	Station	No. of Specimens	TL(mm)	Temp. ° C.	Sal. ‰
31 Dec. 1957	2	1	1200+	-	-
31 Dec. 1960	2	1 <sup>a</sup>	1200+	21.5	35.5
24 Feb. 1961	6	1	568	-	-
29 June 1961	2	1	412	29.0	34.8
10 Sept. 1961	3	6	247-1041	32.0	32.3
23 June 1963	3	3	151-283	31.0	35.5
12 April 1964	3	2	280-349	26.5	35.7
22 Aug. 1964	2	2	694-930	30.5	33.8

<sup>a</sup>Sight record.

The green moray reportedly feeds upon the spotted moray (G. moringa) and presumably other eels (Vernick, 1961: 234). One specimen (1200+ mm TL) upon capture regurgitated a freshwater eel, Anguilla rostrata, about 485 mm in length, which had been bitten in two. Springer and McErlean (1962b: 391) noted that morays always regurgitated their stomach contents when removed from the water.

Very few morays are seen by divers in Jupiter Inlet, but they are commonly seen at Palm Beach Inlet.

Gymnothorax moringa (Cuvier) - Spotted moray

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and North Carolina to Rio de Janeiro and the northern Gulf of Mexico. Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963: 5).

Eleven spotted morays (169-625 mm TL) were taken in the inlet in April and August, 1965. One specimen (269 mm TL) was collected at the railroad bridge station in July 1963. Temperature range 27.25 - 31° C.; salinity range 33.8 - 36.6 ‰. This species is reportedly preyed upon by green morays, G. funebris (Vernick, 1961: 234).

Gymnothorax vicinus (Castelnau) - Purplemouth moray

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Jupiter Inlet, Florida to Bahia, Brazil (modified from Briggs, 1958: 262). Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963a: 5) and in the northern Gulf of Mexico (Caldwell, 1963b: 188).

Two specimens (243-332 mm TL) were collected in the inlet in April and August, 1964. Temperatures 27.25,

30.5° C.; salinities 36.2, 33.8 ‰. Another specimen (628 mm TL) was taken at the railroad bridge station in April, 1965. These specimens extend the range of the species northward from the Florida Keys.

OPHICHTHIDAE - SNAKE EELS

Ahlia egmontis (Jordan) - Key worm eel

RANGE: Jupiter Inlet to Maceió, Brazil and the northeastern Gulf of Mexico (modified from Briggs, 1958: 263). Also reported from the Canal Zone, Panama (Rubinoff and Rubinoff, 1962: 3) and near Puerto Limón, Costa Rica (Caldwell, 1963a: 5) in the western Caribbean.

Six specimens (208-315 mm TL) were taken at the railroad bridge station on 23 June 1963. Three additional specimens (185-321 mm TL) were taken at the same locality on 12 April 1964. Temperatures 31, 26.5° C.; salinities 35.5, 35.7 ‰.

This eel was not as common as Myrophis punctatus with which it was associated. Rotenone collections yielded only nine Key worm eels but numerous spotted worm eels. Farther to the south the species is more abundant, especially in Florida Bay (Tabb and Manning, 1961: 610). It appears to be limited to habitats with higher salinities.

Bascanichthys scuticaris (Goode and Bean) - Whip eel

RANGE: North Carolina to Florida and the northern Gulf of Mexico.

No specimens were taken during the period of regular collections. One example (444 mm TL) was taken in a rotenone collection at the railroad bridge in April, 1964. Temperature 26.5° C.; salinity 35.7 ‰.

Proportional measurements of this specimen fall within the range of variation of B. scuticaris as defined by Ginsburg (1951b: 480), except for the length of the upper jaw which is shorter than usual for the species. The ratio of upper jaw in body depth (1.1) is intermediate between the ranges of variation given by Ginsburg (op. cit.: 467) for B. scuticaris (0.7 - 1.0) and B. teres (1.2 - 1.8).

Bascanichthys teres (Goode and Bean) - Sooty eel

RANGE: Jupiter Inlet through the Florida Keys and the northern Gulf of Mexico (modified from Briggs, 1958: 263).

No specimens were taken in regular collections. One example (583 mm TL) was taken with rotenone at the railroad bridge in April, 1964. Temperature 26.5° C; salinity 35.7 ‰. Another (574 mm TL) was collected at the same locality on 26 April 1965.

These records are a northward extension of range for the species on the Atlantic coast of Florida from the

Florida Keys. Tabb and Manning (1961: 610) reported this species was common in the Florida Bay area, but mentioned that the genus is poorly known and that their identifications were provisional.

Letharchus velifer Goode and Bean - Sailfin eel

RANGE: North Carolina to Jupiter Inlet and the northern Gulf of Mexico (modified from Briggs, 1958: 263).

Two specimens (298, 346 mm TL) of this species were collected in August, 1964 in the inlet. Temperature 30.5° C.; salinity 33.8 ‰.

It appears that this is another example of a northern species with a disjunct population in the northern Gulf of Mexico. Dr. C. Richard Robins (personal communication) reports that the species is not known from Miami. Jordan and Evermann (1896) reported the species from snapper banks off Penasacola and Tampa; however, Ginsburg (1951b) and Springer (1961: 481) knew of no specimens from the Tampa area. On the Gulf coast of Florida the species has been reported only as far east as Panama City (Allison, personal communication).

Myrichthys acuminatus (Gronow) - Sharptail eel

RANGE: Jupiter Inlet, Florida to the Lesser Antilles (modified from Briggs, 1958: 263).

One specimen (418 mm TL) of this eel was taken with rotenone in the oyster beds at the railroad bridge in June, 1963. Temperature 31° C.; salinity 35.5 ‰.

This specimen extends the range of the species northward from the Florida Keys.

Myrophis punctatus Lutken - Spotted worm eel

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and North Carolina to Rio Goyanna, Brazil and the northern Gulf of Mexico.

Catch records of 54 specimens (100-296 mm TL) are shown in Table 11.

TABLE 11.--Catch records of Myrophis punctatus

Date	Station	No. of Specimens	TL(mm)	Temp. ° C.	Sal. ‰
3 July 1960	1	1	244	36-40	-
10 Sept. 1960	3	20	100-245	32.0	32.3
23 June 1963	3	8	125-259	31.0	35.5
12 April 1964	3	9	144-296	26.5	35.7
15 April 1964	SC2	14	133-233	30.0	22.9
30 Aug. 1964	SC6	2	110-146	-	-

Spotted worm eels are probably the most common ophichthid eel in the area and are widely distributed. Because of its burrowing nature, collection records do



not accurately reflect its abundance. Only one specimen was taken in seining operations; all remaining examples with rotenone.

ORDER BELONIFORMES

BELONIDAE - NEEDLEFISHES

Strongylura marina (Walbaum) - Atlantic needlefish

RANGE: Both sides of the Atlantic; in the western Atlantic from Maine to Rio de Janeiro and the northern Gulf of Mexico (modified from Briggs, 1958: 264). Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963a: 5) and Tabago Island, West Indies (Caldwell and Caldwell, 1964: 12).

This needlefish is not as common as S. notata in the study area and only 38 specimens (51-326 mm) were collected. It occurs throughout the study area during the entire year but was most frequently taken in the inlet. Temperature range 21 - 33° C.; salinity range 4.5 - 37.1 ‰.

The smallest specimen was taken near the end of April.

It is reported to be the most common species of needlefish in the brackish waters in Florida Bay (Tabb and Manning, 1961: 611).

Berry and Rivas (1962: 155) recognized S. timucu (Walbaum) as a synonym of S. marina.

Strongylura notata (Poey) - Redfin needlefish

RANGE: Bermuda and St. Lucie Inlet, Florida to the Greater Antilles, the Bahamas, and throughout the Gulf of Mexico (modified from Briggs, 1958: 264).

This is the most common needlefish in the study area and 178 specimens (20-385 mm) were collected. The species was taken at all stations and occurs throughout the entire year. It was most frequently collected at the inlet and the county line station. Temperature range 20 - 33° C.; salinity range 7.3 - 37.6 ‰. Specimens 25 mm or less in length were taken in April, May, and August.

Gunter and Hall (1963b: 597) added this species to the list of euryhaline fishes on the basis of their work at St. Lucie. Their records there extended the range of the species as listed by Briggs (loc. cit.) northward from the Florida Keys. Berry and Rivas (1962: 154-155) recognized records of S. notata from the Bahamas and Cuba, and observed some differences between Atlantic and Gulf coast populations of the species.

Tylosurus acus Lacépède - Agujon

RANGE: Both sides of the Atlantic; in the western Atlantic from Massachusetts and Bermuda to the West Indies, and widespread in the Gulf of Mexico.

Mrs. Susan Kindt collected two specimens (46.5, 49 mm) from the inlet during 28 - 30 September 1961. Because of the small size of these specimens, their identification is provisional.

Tylosurus raphidoma (Ranzani) - Houndfish

RANGE: Both sides of the Atlantic; in the western Atlantic from New York and Bermuda to Bahia, Brazil and the northeastern Gulf of Mexico.

Six specimens (60-223 mm) were captured in the inlet in July and August, 1958 and during September, 1961. Adult houndfish breed offshore and juveniles are rarely taken in inshore waters (Berry and Rivas, 1962: 159-160). These juveniles were probably carried inshore by temporary currents from the nearby Gulf Stream.

HEMIRAMPHIDAE - HALFBEAKS

Hyporhamphus unifasciatus (Ranzani) - Halfbeak

RANGE: Eastern Pacific and both sides of the Atlantic; in the western Atlantic from Massachusetts and Bermuda to Rio de Janeiro and throughout the Gulf of Mexico.

Two collections at Station 9 on the beach at Jupiter Island in July, 1960 (temperature 20° C.; salinity 37.7 ‰), and August, 1964 yielded 14 halfbeaks

(108-136 mm). Seventeen specimens (not measured) were taken from the same locality in August, 1958.

EXOCOETIDAE - FLYINGFISHES

Cypselurus sp. - Flyingfish

RANGE: Worldwide in tropical seas.

Mrs. Susan Kindt collected one specimen (24 mm) in the inlet in October, 1958 and three additional specimens (5.5 to 9 mm) on 6 April 1959. Generic identifications were made by Frederick H. Berry.

Prognichthys gibbifrons (Valenciennes) - Bluntnose flyingfish

RANGE: Both sides of the Atlantic; in the western Atlantic from southern New England to Espirito Santo, Brazil, and throughout the Gulf of Mexico.

No specimens of this small flyingfish were taken in regular collections. Mrs. Susan Kindt took one specimen (13 mm) in October, 1958 and eleven additional specimens (6-13 mm) on 6 April 1959. These specimens were identified by Frederick H. Berry.

Brunn (1935: 67) reported taking females with ripe eggs from the end of April through the middle of August. Breder (1938: 77-78) made no comment on Brunn's data, but reported specimens of the following sizes: 15.0 - 18.5 mm in June, 20 - 27 mm around the first of April,

21.5 - 37.5 mm the latter part of February, and 27 mm in the latter part of March. These data together with the Jupiter records would suggest a slow growth rate or an extended breeding season.

Breder (op. cit.: 76) also noted that the Gulf of Mexico apparently serves as a nursery ground for this species, and that adults are typically recorded from the open Atlantic. No explanation for this apparent difference in range of young and adults was offered.

#### ORDER CYPRINODONTIFORMES

#### CYPRINODONTIDAE - KILLIFISHES

Cyprinodon hubbsi Carr - Lake Eustis minnow

RANGE: Vicinity of Lake Eustis, Lake County Florida and Palm Beach County, Florida (modified from Briggs, 1958: 266).

This small cyprinodont, when first described by Carr (1936), was thought to be restricted to Lake Eustis, Florida. The range of the species was later extended to include Lake Weir, Marion County (Reid, 1949) and Lakes Harris, Dora, and Griffin in Lake County (Hellman, 1953). Cyprinodon hubbsi was considered by both Carr (1937: 73) and Reid (loc. cit.) to be a marine relict population.

In December, 1960 I made the first of a series of collections of this species in Palm Beach County. I now

have over 500 specimens (13-39 mm) taken from at least six freshwater localities on the Indiantown Road (SR 706) west of the Sunshine State Parkway (Florida Turnpike). Temperature range 17 - 33.5 ° C. Specimens were subsequently collected in several localities west of West Palm Beach and Lantana. The widespread distribution of the species in the area suggests that it is not a recent introduction. In all cases C. hubbsi was taken on a sandy bottom, free of submerged or emergent vegetation. Usually these sites were the margins of shallow lakes and the edges of some canals. In these habitats it was most frequently associated with Fundulus seminolis, Gambusia affinis, Notropis petersoni, Labidesthes sicculus, and young Lepomis macrochirus and Micropterus salmoides. These are almost identical to the principal associates, listed by McLane (1955: 157), except for the substitution of Labidesthes sicculus for Menidia beryllina atrimentis, another atherinid.

In certain areas populations of C. hubbsi became isolated from bodies of deeper water during the dry season in shallow roadside ditches usually less than 4 inches deep. These ditches were devoid of any vegetation both submerged and emergent with the exception of a coarse, particulate algae on the bottom. In these situations C. hubbsi occurred in great numbers in association with Gambusia affinis, Poecilia latipinna, Fundulus confluentus,

and Jordanella floridae. If the water was deep enough, juvenile Lepomis might be present. In addition these fish are generally more robust than those taken in the typical lake habitat and somewhat deeper bodied than those described by Carr (1936: 162). I have since seen specimens of comparable size in recent collections from Lake Eustis and Lake Dora.

This species has not been taken in any other habitat than those described, and C. variegatus is not known to occur in the Jupiter area.

McLane (1955: 155-156) had opportunity to observe both C. hubbsi and C. variegatus in the field and noted that C. hubbsi is confined to a very narrow habitat and is relatively far less abundant than C. variegatus. He observed that C. variegatus occupied a wide variety of habitats in the St. Johns River.

There has been some speculation that C. hubbsi was a stunted form of C. variegatus due to its occurrence in fresh water. McLane (1955: 149-153) observed C. variegatus in the St. Johns River from the salt marshes near its mouth to Lake Harney in fresh water and noted no differences. Chipman (1958) also reported that there was no definite correlation between body depth and salinity in Cyprinodon variegatus.

Fundulus chrysotus (Günther) - Golden topminnow

RANGE: South Carolina to eastern Texas, north to Missouri and Tennessee (Moore, 1957: 154).

Golden topminnows are common in a variety of weedy, fresh water habitats in the area and 135 specimens (18-53 mm) were preserved. Temperature range 17 - 31° C. The species prefers the margins of canals and other weedy places but will sometime venture a short distance into open water.

Based on Tabb and Manning (1961: 613), this species should be added to the list of euryhaline fishes.

Fundulus cingulatus Valenciennes - Banded topminnow

RANGE: New Jersey to Florida and Alabama (Moore, 1957: 154).

This cyprinodont was recorded from only three localities in the area. It is not common but may be locally abundant. One specimen (25 mm) was taken at Limestone Creek at the Indiantown Road (SR 706) in November, 1958, and two additional specimens (28 mm, 37 mm) were taken from a roadside pond approximately 1 mile west of the Limestone Creek in March, 1961. A small drainage ditch emptying into the C-18 canal near its mouth yielded 144 specimens in collections made in October, November, and December, 1960. This ditch was drying up and the fish were trapped in the deeper portions. In the final stages



of drying up, the salinity of the water in the ditch rose to 2.5 ‰. Temperature range 18 - 27° C.; salinity range <1 - 2.5 ‰.

Fundulus confluentus Goode and Bean - Marsh killifish

RANGE: Cheapeake Bay, Virginia to Corpus Christi, Texas (Kenneth Relyea, personal communication).

Various localities along the Indiantown Road (SR 706) produced 143 specimens (25-71 mm) of the Marsh killifish. Temperature range 21.7 - 33.5° C.

The common name of this species is somewhat of a misnomer in the Everglades region as it seldom enters brackish water. Kenneth Relyea, who has studied geographic variation in the species, advises me that F. pulvereus (Evermann), the Bayou killifish of Alabama, Mississippi, Louisiana, and Texas, should be regarded as a junior synonym of F. confluentus.

Fundulus confluentus was not abundant in any of the habitats in which it was found except in roadside ditches during the end of the dry season in late winter and spring. In the final stages of drying up, the ditches usually have from 1 to 4 inches of water and the bottoms are covered with a thick layer of particulate algae. Under these crowded conditions F. confluentus is one of the most abundant species, and is usually found in association with Mollienesia latipinna, Gambusia

affinis, Cyprinodon hubbsi and Jordanella floridae.

Occasionally a small centrarchid will be present if the water is deep enough. These shallow ditches are subject to extreme fluctuations in temperature. In southern Florida the species rarely enters open waters. Gunter and Hall (1963a: 251) took only one specimen far up the northwest fork of the St. Lucie River. Tabb and Manning (1961: 614) found it on the edges of open water only during periods of heavy rainfall. Habitat selection by the species in other localities seems to be quite different from that of Everglades populations.

Fundulus grandis Baird and Girard - Gulf killifish

RANGE: Northeastern Florida to the north coast of Cuba and west to Mexico.

Catch records of the Gulf killifish are shown in Table 12. In addition to the regular stations, the species was also taken in Special Collections 1 and 2.

This large killifish is abundant in the northern Gulf of Mexico and declines in numbers toward the southern part of Florida. Considerable numbers were reported by Gunter (1945: 42), Joseph and Yerger (1956: 125), and Kilby (1955: 197). Reid (1954: 28) even took the species on several occasions in open water in the Gulf. Springer and Woodburn (1960: 25-27) reported considerably fewer specimens from the Tampa Bay area. Phillips and Springer

(1960) failed to find the species in the Caloosahatchee River area and Springer and McErlean (1962a) found no examples at their station on Lower Matecumbe Key. Tabb and Manning (1961: 614) reported they collected the species on two occasions in fresh water several miles from the coast in the Cape Sable area. Kilby and Caldwell (1955: 203) collected specimens from salt water in the same general locality. Neither Gunter and Hall (1963a) nor Springer (1960) found the fish at St. Lucie.

TABLE 12.--Catch records of Fundulus grandis

Date	Station	No. of Specimen	SL(mm)	Temp. ° C.	Sal. ‰
3 July 1960	2	1	43	36.0	-
24 July 1960	7	83	17-69	32.5	1.5
7 Aug. 1960	6	2	56,56	33.0	10.2
9 Aug. 1960	SC1	3	54-67	31.3	28.1
26 Nov. 1960	7	14	35-65	24.5	10.8
1 Jan. 1961	7	2	54-56	22.0	30.2
12 April 1964	3	3	58-75	26.5	35.7
15 April 1964	SC2	110	13-93	30.0	36.6

In his discussion of F. grandis, Darnell (1962: 329) erroneously reported F. heteroclitus as occurring on the Gulf coast of Florida.

Fundulus notti lineolatus (Agassiz) - Starhead topminnow

RANGE: Mansemond County in southeastern Virginia south along the Atlantic coastal plain to Palm Beach County, Florida and west along the Gulf coastal plain to the Ochlockonee River of Georgia and western Florida (modified from Brown, 1958: 479).

Collections from five freshwater localities contained 18 specimens, 18 to 51 mm in length. Temperature range 17 - 24° C. The smallest example was taken in January, 1961. The species is not common but is widespread in the area, preferring clear water in natural ponds with grassy margins.

Briggs (1958: 266) reported the southern limit of the species as Highlands County, Florida. Specimens have now been taken in Palm Beach County as far south as the intersection of Donald Ross Road and the Florida East Coast Railroad tracks.

Fundulus seminolis Girard - Seminole killifish

RANGE: Northern Florida as far west as the Ochlockonee River and throughout peninsular Florida (modified from Brown, 1957: 76).

This species was taken in sixteen collections made along the Indiantown Road (SR 706) from the Sunshine State Parkway to the intersection of the Bee-line Highway (SR 710). Temperatures range 17 - 33.5° C. The

collections were made from April, 1960 to April, 1964 except during 1962 when no collections were made. The 385 specimens ranged in size from 19 to 122 mm. Specimens 22 mm or smaller were taken in the months of December, March, April, and August. Tabb and Manning (1961: 614) extended the range of the species to the tip of the Florida peninsula.

Jordanella floridae Goode and Bean - Flagfish

RANGE: Throughout Florida and west along the Gulf coast to Mexico.

Flagfish were abundant in a variety of freshwater habitats which offered some submerged vegetation, and 364 specimens (16-39 mm) were collected. Temperature range 17 - 31° C. In times of drought, however, they are often associated with Cyprinodon hubbsi, Fundulus confluentus, F. seminolis, Mollienesia latipinna, and Gambusia affinis in shallow, weedless ditches.

On the basis of the report of Tabb and Manning (1961: 614), this species should be added to the list of euryhaline fishes.

Lucania goodei Jordan - Bluefin killifish

RANGE: Throughout the Florida peninsula.

Lucania goodei is abundant in weedy fresh water habitats and 791 specimens (9-31 mm) were collected.

Temperature range 17 - 31° C. It was found in both clear and heavily stained waters where vegetation was abundant, but never in the open lake environment.

Two specimens (17, 18 mm) were taken in Sim's Creek about 500 yards from its mouth on the southwest branch of the river. Marine species are typically found in this part of the creek, but on this occasion several fresh water species were also present. Unfortunately the water sample for this collection was destroyed.

POECILIIDAE - LIVEBEARERS

Gambusia affinis holbrooki (Girard) - Eastern mosquitofish  
RANGE: Southern New Jersey southward on the coastal plain to Florida and southern Alabama (Rosen and Bailey, 1963: 95).

Easily the most common fish in the fresh waters of Florida, the mosquitofish is found in almost any habitat and occasionally ventures into waters of moderate salinity. The species was taken on 36 occasions in fresh water and on six occasions at Stations 6 and 7 in the southwest branch of the river where it was always near a source of fresh water and may have returned to it periodically. Temperature range 17 - 33.5° C. Salinities recorded for collections made in the southwest branch ranged from 1.5 to 24.2 ‰. Breeding probably takes place over the entire year except during periods of extreme cold weather.

Heterandria formosa Agassiz - Least killifish

RANGE: South Carolina to the southern tip of Florida  
and west to Louisiana.

Collections contained 334 specimens (6-23 mm).

Temperature range 17 - 31° C.

Heterandria was abundant in weed-choked fresh water  
creeks and canals, and occurred wherever there was enough  
submerged vegetation to provide adequate cover.

Poecilia latipinna (LeSueur) [= Mollienesia latipinna  
LeSueur] - Sailfin molly

RANGE: Southeastern North Carolina, southward along the  
coast, throughout peninsular Florida and the Florida  
Keys, westward along the Gulf coastal United States,  
and southward in Atlantic coastal Mexico to Yucatán  
(Rosen and Bailey, 1963: 54).

Three hundred sixty-three specimens (13-52 mm) were  
collected. Sailfin mollies are widely distributed in  
fresh water and occasionally enter the river. They were  
taken on three occasions at the mouth of the C-18 canal,  
and once at Station 6 on the southwest branch of the  
river. In each case they were near a source of fresh water  
to which they might return (see also discussion of Gambusia  
affinis). Temperature range 17 - 32.5° C. The salinity  
range for the collections taken in the southwest branch  
was 1.5 to 30.2 ‰.

Three additional specimens (35-66 mm) were taken at the county line station in July, 1960 and May, 1961.

Temperature range 28 - 32° C.; salinity range 29.3 - 36.6 ‰. Specimens considerably larger than those reported herein are sometimes found by fish hobbyists and other collectors.

Hippocampus obtusus Ginsburg - Offshore seahorse

RANGE: Known from five specimens: One from off Cape Hatteras, North Carolina (the type); two from Bermuda (Kanazawa, 1952: 77); one from St. Lucia, British West Indies (USNM 170162); and one from the Intracoastal Waterway, 2-1/2 miles north of Jupiter Inlet, Florida.

One specimen (42 mm GL) was taken at the county line station on 6 July 1960. Temperature 31° C; salinity 34.8 ‰.

The following counts and measurements were taken: Trunk segments 11, dorsal rays 17, pectoral rays 17, depth 6.5 mm (15.5%). The shape and distribution of the tubercles agree with the description given by Ginsburg (1937: 577-578) as do the counts and measurements with the exception of body depth which is greater than any previously reported. This specimen, however, is smaller than any known and the specimens reported by Kanazawa (1952) indicated that body depth may decrease with age.



The species was described by Ginsburg (1933b: 562) from a single specimen. It is distinguished from H. erectus by its slender trunk (depth 10.5 - 12%, 15.5%) and by its tubercles which are ". . . reduced to mere stout blunt stumps or knobs." (Ginsburg, 1937: 578). These "knobs" are developed only on every fourth segment of the trunk and tail, whereas there is full development of the tubercle in erectus.

This is the first record of the species in continental waters.

The genus is now under study by Mrs. Myvanwy Dick of the Museum of Comparative Zoology. She suspects obtusus may not be a valid species, but as yet had not reached a definite conclusion (personal communication).

Hippocampus zosterae Jordan and Gilbert - Dwarf seahorse

RANGE: Bermuda and Jupiter Inlet, Florida to Cuba and the northern Gulf of Mexico (modified from Briggs, 1958: 267).

The Dwarf seahorse is much more common than its larger congeners. Seining operations yielded 31 specimens (13-37 mm GL); catch records are shown in Table 13. Males with young were collected as late as October 16 and December 27. Strawn (1958: 17-18) found only one male with young after mid-October.

TABLE 13.--Catch records of *Hippocampus zosterae*

Date	Station	No. of Specimens	GL(mm)	Temp. ° C.	Sal. ‰
26 April 1959	1	2 <sup>a</sup>	28-30	-	-
26 Dec. 1959	1	1	25	-	-
27 Dec. 1959	1	2 <sup>a</sup>	26-28	-	-
6 July 1960	1	1	-	31.0	34.8
30 July 1960	1	1	26	28.0	36.6
10 Aug. 1960	8	3	20-24	32.0	36.3
11 Aug. 1960	1	7	15-37	30.5	36.7
23 Aug. 1960	8	2	20-25	29.0	31.5
16 Oct. 1960	8	2	22-25	28.0	26.6
20 Nov. 1960	8	1	22	27.0	20.5
20 Nov. 1960	1	1	30	25.0	25.2
30 Dec. 1960	1	1	26	20.0	23.9
28 Jan. 1961	1	2	22-23	20.0	33.5
29 April 1961	1	3	13-27	25.0	37.3
27 June 1961	1	1 <sup>a</sup>	29	27.0	36.8
14 April 1961	2	1	20	-	-

<sup>a</sup>Collections containing males with young.

These specimens extend the range of the species from Biscayne Bay, Florida. Springer (1960) and Gunter and Hall (1963a) extensively sampled the grass beds at St. Lucie but failed to find the species.

Oostethus lineatus (Kaup) - Opossum pipefish

RANGE: Both sides of the Atlantic; in the western Atlantic from South Carolina to Rio de Janeiro, and widespread in the Gulf of Mexico.

Catch records of six specimens (63-169 mm) are shown in Table 14.

TABLE 14.--Catch records of Oostethus lineatus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
21 Feb. 1959	2	1	111	-	-
30 Oct. 1960	4	1	63	26.6	9.7
26 Dec. 1960	6	2	105-113	18.0	24.2
28 May 1961	6	1	69	28.0	26.8
30 Aug. 1964	SC6	1	169	-	-

This pipefish prefers waters of low salinity and is not common in Florida. McLane (1955: 144) is the only investigator to report the species in recent years. He collected the species in San Carlo's Creek near the mouth of the St. John's River. The salinity was reported to be about 15 ‰. Caldwell, Ogren, and Giovannoli (1959: 18) noted that some of their Costa Rican specimens differed considerably in tail ring counts from Florida material.

Syngnathus dunckeri Metzelaar - Pugnose pipe fish

RANGE: Bermuda and North Carolina to the Lesser Antilles.

Also reported from Tortuga Island, Venezuela  
(Caldwell and Caldwell, 1964: 15).

Eleven specimens (50-77 mm) of the pugnose pipefish were taken in DuBois Bight near the inlet on 4 April 1958. Two additional specimens (40, 50 mm) were collected at the county line station on 30 December 1958. Temperature 29° C.; salinity 23.9 ‰. Herald (1942: 132) considered this to be "strictly an insular and semi-pelagic species." It has since been shown to occur over a wider area and in inshore habitats. According to Tabb and Manning (1961: 617), S. dunckeri was common in Florida Bay until April, 1957 and has since been rare. Springer and McErlean (1962a: 54) took one specimen at Lower Matecumbe Key. Longley (1941: 59-60) reported that it is not rare at Tortugas, and breeding takes place in late June and July.

Syngnathus floridae (Jordan and Gilbert) - Dusky pipefish

RANGE: Southern Florida to the northern Gulf of Mexico.

Table 15 shows the catch records of 23 specimens (45-136 mm). This is reported to be the most abundant pipefish in the Florida Bay area (Tabb and Manning, 1961: 617). I have collected many specimens from the Miami area, but it is uncommon at Jupiter and only one collection has

been reported from St. Lucie Inlet (Springer, 1960: 16).  
No males with eggs in the brood pouch were seen.

TABLE 15.--Catch records of Syngnathus floridae

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
6 July 1960	1	3	75-99	31.0	34.8
11 Aug. 1960	1	1	111	30.5	36.7
26 Nov. 1960	7	1	45	24.5	10.8
11 Feb. 1961	1	1	110	-	38.8
21 May 1961	4	2	111-136	28.0	35.5
21 May 1961	5	1	85	28.0	36.0
21 May 1961	1	4	45-85	29.0	37.6
27 June 1961	1	11	50-118	27.0	36.8

Syngnathus fuscus Storer - Northern pipefish

RANGE: Bay of Fundy to Jupiter Inlet, Florida (modified from Briggs, 1958: 267).

This is a northern species and was not known to occur farther south on the Atlantic coast than St. Augustine, Florida (Briggs, loc. cit.). Catch records of the twelve specimens (52-173 mm) collected are shown in Table 16.

Syngnathus louisianae Günther - Chain pipefish

RANGE: Virginia to Jamaica and throughout the Gulf of Mexico.

TABLE 16.--Catch records of Syngnathus fuscus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
16 Oct. 1960	1	1	63	27.0	24.1
26 Dec. 1960	4	1	52	18.5	31.9
30 Dec. 1960	1	1	97	20.0	23.9
28 Jan. 1961	1	8	67-173	20.0	33.5
11 Feb. 1961	1	1	118	-	38.8

Collections contained 260 specimens (49-223 mm). Temperature range 18 - 33° C.; salinity range 4.5 - 38.8 ‰.

This pipefish was the second most abundant member of its genus in the study area. The species was abundant in areas with grassy bottoms and high salinities, but were uncommon elsewhere; only five specimens were taken at Station 6 and none at Station 7. Examples were collected in the study area during the entire year.

None of the specimens examined were male with young. Springer and Woodburn (1960: 32-33) found the same situation existed in the Tampa Bay area and speculated that all of their specimens were juveniles and that adults were considerably larger. They concluded that if this were true then adults were rare in inshore waters. My data and that of Springer and McErlean (1962a: 54) support this conclusion.

No S. louisianae were taken in Florida Bay where S. floridae is the most abundant pipefish (Tabb and Manning, 1961: 617).

Joseph and Yerger (1956: 129) reported that S. louisianae was the most abundant pipefish in Alligator Harbor.

Syngnathus scovelli (Evermann and Kendall) - Gulf pipefish  
RANGE: Northeastern Florida possibly to Panama and throughout the Gulf of Mexico.

This species is the most common pipefish in the study area and 433 specimens (22-90 mm) were collected. Temperature range 18.5 - 36-° C.; salinity range 1.5 - 37.6 ‰. Specimens were collected throughout the year and the species was taken at least three times at every station except Stations 3 and 9. The lack of specimens at Station 3 is due to the sampling methods used. The species was most frequently taken at the county line station and Station 4.

Breeding probably occurs during the entire year. Males with eggs were found throughout the year except during October, February, and March. The smallest male with young seen by Springer and Woodburn (1960: 31) was 60 mm in length. I have recorded numerous examples of 53 - 60 mm in length; the smallest seen was 48 mm.

## ORDER PERCIFORMES

## CENTROPOMIDAE - SNOOKS

Centropomus pectinatus Poey - Tarpon snook (Flatsides snook)

RANGE: The Caloosahatchee River and St. Lucie Inlet, Florida through the West Indies, and in the Atlantic drainage of Central and South America to Brazil (modified from Rivas, 1962: 58-59).

Six specimens (36-44 mm) were collected by the Lake and Stream Survey Team of the Florida Game and Fresh Water Fish Commission on 7 March 1960 in the C-18 canal below the flood gates. Two additional specimens (112, 325 mm) were taken at Station 6 on the southwest branch of the river in August, 1960 (temperature 33° C.; salinity 10.2 ‰) and January, 1965. One specimen (422 mm TL) is larger than the largest (400 mm TL) seen by Rivas (loc. cit.) or recorded in the literature up to that time, and local fishermen report even bigger specimens. Conservation law prohibits the taking of snook of any species which are less than 18 inches (457 mm) in length. Marshall (1958:30) extended the range on the east coast of Florida from Card Sound, Dade County, Florida.



Centropomus undecimalis (Bloch) - Common snook

RANGE: Both coasts of tropical America; in the western Atlantic from North Carolina to Rio de Janeiro and the northern Gulf of Mexico.

Collections contained 70 specimens (16-363 mm), largely juveniles less than 100 mm in length. Temperature range 18 - 36-° C.; salinity range 9.6 - 38.8 ‰.

Common snook are abundant in the study area and numerous individuals are caught in the inlet by fishermen during the summer months. Specimens in excess of 40 pounds are reported almost every year from the inlet or the beaches in the Jupiter area. The abundance of this fish in these areas is due to aggregations which begin to form just inside the inlet during late March and early April. Both ripe males and females were found in these groups and they are no doubt spawning aggregations. Similar aggregations have been observed in Palm Beach Inlet.

Marshall (1958: 29) noted that spawning took place from late June to mid-November. Juveniles were especially common in the river and to a lesser extent in the grass beds in the vicinity of the inlet during winter and early spring. A large nursery area exists for the species in the Intracoastal Waterway north of the county line station and in the river. Specimens 25 mm or less in length were taken from late October until mid-February.

Other aspects of the biology of C. undecimalis are given by Marshall (op. cit.) and Volpe (1959).

Linton and Rickards (1965: 185) noted that C. undecimalis is rarely found north of Volusia County., Florida and reported on growth and other aspects of the ecology of an unusual summer population of snook at Sapelo Island, Georgia.

Records from the northern Gulf of Mexico are rare. Yerger (1961: 112) reported on a single specimen at Alligator Harbor.

#### SERRANIDAE - SEA BASSES

Centropristes philadelphicus (Linnaeus) - Rock sea bass

RANGE: In the Atlantic from Cape Henry, Virginia to Palm Beach, Florida; in the Gulf from Cape Haze, Florida to Brownsville, Texas (Miller, 1959: 61).

Three specimens (51-60 mm) were taken at the county line station on 6 July and 11 August 1960. The temperatures were 31.0 and 30.5° C. and the salinities 34.8 and 36.7 ‰.

Centropristes striatus striatus (Linnaeus) - Black sea bass

RANGE: Commonly from Cape Cod south to Cape Canaveral; occasionally north to the Gulf of Maine and south to the Florida Keys (Miller, 1959: 47).

One specimen (91 mm) was taken at the railroad bridge station on 23 June 1963. Two additional specimens (51, 55 mm) were collected at the county line station on 30 July 1960. Temperatures 31 and 28° C.; salinities 35.5 and 36.6 ‰.

Diplectrum bivittatum (Valenciennes) - Dwarf sand perch  
RANGE: Jupiter Inlet, Florida to Uruguay (modified from Briggs, 1958: 272). Additional records from Columbia, Venezuela, and Aruba Island, Netherland West Indies in Caldwell and Caldwell (1964: 16).

Two specimens (20, 51 mm) were taken at the county line station on 30 July 1960 and 21 May 1961. Temperature (on both occasions) 28° C.; salinities 36.6 and 36.0 ‰.

These records extend the range given by Briggs (loc. cit.) for D. radiale, here considered to be a synonym of D. bivittatum, from Tortugas.

Diplectrum formosum (Linnaeus) - Sand perch

RANGE: North Carolina to Uruguay and throughout the Gulf of Mexico.

Four specimens (25-63 mm) were collected at the county line station in September, November, and December, 1960 and June, 1961. Other specimens were taken at the railroad bridge station (1, 75 mm) in June, 1963 and under the U.S. 1 bridge (1, 64 mm) in July, 1963. Temperature range 20 - 32° C.; salinity range 23.9 - 36.8 ‰.

Epinephelus itajara (Lichtenstein) - Jewfish

RANGE: Both coasts of the Americas in the western Atlantic from Massachusetts to Rio de Janeiro, Brazil; on the Pacific coast from northern Mexico to Callao, Peru (Smith, 1961).

Four specimens (127-323 mm) were collected from the inlet in September, 1957; March, 1958; July, 1958; and July, 1960. Temperature 30° C.; salinity 37.5 ‰ (July, 1960).

Jewfish are not common in the area, but occasional small specimens are taken. It seems probable that in the past it was more common. Henshall (1884: 142) wrote of taking a large specimen from the lighthouse dock in the middle of February, 1882. He gives the following account:

The boys soon had him on the wharf with the sharks. It proved to be an immense jew-fish or black grouper (Epinephelus nigritus), and reminded one at the first glance of a gigantic black bass. It measured seven feet in length, and six and a half feet in girth at the pectoral fin. The spines of the dorsal fin were as thick as a man's fingers. The next morning, Mr. Armour brought down a large steelyard, upon which it weighed three hundred and forty pounds. Its huge proportions were then photographed by the assistant light-keeper, Mr. Spencer, with the deck and crew of the Rambler in the background.

Local residents report having caught large jewfish as late as the middle 1930's in Limestone Creek (now destroyed by the digging of the C-18 canal) which emptied into the southwest branch of the river near the mouth of the present C-18 canal. The species is common offshore.

Epinephelus morio (Valenciennes) - Red grouper

RANGE: Katama Bay, Massachusetts and Bermuda to Rio de Janeiro, Brazil (Smith, 1961).

Four specimens (44-126 mm) were taken at the railroad bridge station in August, 1960 and June, 1963. Temperatures 30 and 31° C.; salinities 24.6 and 35.5 ‰. Two of the specimens, 71 and 77 mm, were taken on hook and line, the others with rotenone.

Hypoplectrus unicolor (Walbaum) - Butter hamlet

RANGE: Bermuda and Florida to Panama and the northwestern Gulf of Mexico.

Two juveniles (40, 33 mm) were collected in the inlet in April and July, 1958 and four additional specimens (32-41 mm) were taken at the county line station in July and August, 1960. Temperatures for the latter two collections were 28.0 and 30.5° C.; salinities 36.6 and 36.7 ‰.

Mycteroperca bonaci (Poey) - Black grouper

RANGE: Massachusetts and Bermuda to Rio de Janeiro and widespread in the Gulf of Mexico.

Two specimens (60, 117 mm) were collected at the railroad bridge station on 23 June 1963. Temperature 31° C.; salinity 35.5 ‰. These specimens were identified by Mr. Martin Moe.

Mycteroperca microlepis (Goode and Bean) - Gag

RANGE: Virginia and Bermuda to Rio de Janeiro, and the northern Gulf of Mexico.

Catch records of the six specimens (39-171 mm) of M. microlepis collected are shown in Table 17.

TABLE 17.--Catch records of Mycteroperca microlepis

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
30 Dec. 1956	8	1	171	-	-
10 Sept. 1961	3	1	119	32.0	32.3
23 June 1963	3	3	39-68	31.0	35.5
22 Aug. 1964	2	1	109	30.5	33.8

These specimens were taken from the railroad bridge eastward in areas of high salinity. Dr. C. Richard Robins identified the majority of the specimens.

<sup>P</sup>Ryticus maculatus Holbrook - Soapfish

RANGE: Atlantic coast of North America from Cape Hatteras to Jupiter Inlet; Gulf of Mexico from off Cape Sable northward through the Gulf (modified from Walter R. Courtenay, Jr., personal communication).

One specimen (79 mm) was taken at the railroad bridge station on 23 June 1963. Temperature 31° C.; salinity 35.5 ‰. This record extends the range on the Atlantic

coast southward from Cape Canaveral.

The genus is currently being revised by Walter Courtenay, Jr. who informs me that two species have been confused by Schultz and Reid (1939); Rypticus maculatus was previously synonymized under R. saponacues saponaceus.

Serranus baldwini (Evermann and Marsh) - Lantern bass

RANGE: Southeastern Florida (as far north as Jupiter Inlet) and the Bahamas southward through the islands (Haiti, Puerto Rico and St. John in the U. S. Virgin Islands) to northern South America (off Surinam) (modified from Robins and Starck, 1961: 269). [sight record - Curaçao (Randall, 1963a: 105)].

Two specimens (38, 44 mm), of this small serranid fish were taken at the railroad bridge on 23 June 1963.

Temperature 31° C.; salinity 35.5 ‰. These specimens extend the known range of the species north from Palm Beach.

#### LOBOTIDAE - TRIPLETAILS

Lobotes surinamensis (Bloch) - Tripletail

RANGE: Atlantic, Indian, and western Pacific Oceans; in the western Atlantic from Bermuda and Massachusetts to Argentina (38° S.) and throughout the Gulf of Mexico.

One specimen (25 mm) was taken in the inlet in September, 1961 and another (457 mm, 7.5 lbs.) from off Pennock's Point, approximately 2-1/2 miles west of the inlet in January, 1963. Twenty-seven juveniles (not measured) were collected from the inlet by Mrs. Susan Kindt in June, July, August, and October, 1958. The largest specimen reported to me was an adult (27.5 lbs.) taken by Phi Williams at the railroad bridge in June or July, 1963. A photograph of the fish hangs in Jim Whalen's Tackle Shop in Jupiter.

#### LUTJANIDAE - SNAPPERS

Lutjanus analis (Cuvier) - Mutton snapper

RANGE: Massachusetts to Rio de Janeiro and the northern and eastern Gulf of Mexico.

Collections contained 297 specimens (15-176 mm). Temperature range 18.5 - 34° C.; salinity range 4.5 - 37.3 ‰.

The mutton snapper was found throughout the study area except in the upper parts of the river. No specimens were taken at Stations 6 or 7 in the southwest branch. Small juveniles were plentiful but specimens exceeding 100 mm in length were rare. None were taken during January and February.

This species is not as abundant as L. griseus or L. synagris, but juveniles have a wider distribution than



L. apodus and L. synagris. This is no doubt due to a wider salinity tolerance.

Specimens 20 mm or less in length were collected from March to August. Springer and McErlean (1962a: 48) reported specimens of that size in October at Lower Matecumbe Key. Longley and Hildebrand (1941: 119) noted that the species is common at Tortugas.

Lutjanus apodus (Walbaum) - Schoolmaster

RANGE: Both sides of the Atlantic; in the western Atlantic from Massachusetts and Bermuda to Bahia, Brazil, and the northern and eastern Gulf of Mexico.

Collections yielded 122 specimens (11-120 mm) taken from waters ranging in temperature from 17 to 36+° C.

Schoolmasters are not as abundant in the area as L. griseus, L. analis, and L. synagris but are quite common in the inlet. Rivas (1949: 152) stated that L. apodus frequently occurs in fresh water; however, I found it only within a narrow salinity range (24.1 - 37.6 ‰). Like L. synagris, only one specimen (14 mm) was collected in the river (Station 4) west of the railroad bridge. Young adults are not uncommon at the railroad bridge but are not abundant.

There is some question as to whether the species remains in the area throughout the year as no examples were collected in February or March. Springer and McErlean (1962a: 48-49) failed to find the species in March and April at Lower Matecumbe Key.

Specimens 20 mm or less in length were collected in April, May, July, August, and September. Springer and McErlean (loc. cit.) took specimens within the same range from June to September. L. apodus was the most abundant snapper at Lower Matecumbe Key, but it was not recorded in Florida Bay. I find no mention of the species in recent surveys on the Florida Gulf coast.

Lutjanus cyanopterus (Cuvier) - Cubera snapper

RANGE: Southern Florida to Brazil.

Three specimens of this rare snapper were collected. One specimen (188 mm) was taken in the narrows of the northwest branch of the river near the Martin County line on 3 August 1960. Another example (45 mm) was taken at Station 4 on 26 November, 1960. These specimens were examined by Prof. Luis R. Rivas and their identification confirmed. An additional specimen (30 mm) was collected at Station 4 on 30 October 1960. This specimen lacks the median backward projection of vomerine teeth that is typical of L. griseus, L. apodus, and L. jocu. Its color pattern is typical of L. griseus and L. cyanopterus but it lacks other key characteristics. Most L. griseus would have developed the median projection of vomerine teeth at this size; however, this identification of this specimen remains provisional until confirmed.

Temperature range 24.5 - 31.0° C; salinity range 3.7 - 24.1 ‰.

Rivas (1949: 151) noted that juveniles of this species are extremely rare. Evermann and Marsh (1900: 170) reported that the species is rather common in Puerto Rico and attains a length of 2 to 4 feet. Rivas (op. cit.: 150) reported a 1000 mm (80 lbs.) specimen taken offshore from Ft. Pierce, Florida, the first specimen recorded from Florida.

Snappers in excess of 10 pounds are infrequently taken in the Jupiter area; some are undoubtedly L. cyanopterus. I have seen a photograph of one such fish which I am certain was a Cubera snapper.

Lutjanus griseus (Linnaeus) - Gray snapper (Mangrove snapper)

RANGE: Both sides of the Atlantic; in the western Atlantic from Massachusetts and Bermuda to Rio de Janeiro, and throughout the Gulf of Mexico.

Mangrove snappers are the most abundant members of their family in the study area. Collections contained 656 specimens (12-568 mm), many of which were taken in water of low salinity. Temperature range 18 - 36+° C.; salinity range <1.0 - 36.6 ‰. The species is probably present in the area during the entire year although no specimens were taken in February.

The population in the area consists almost entirely of juveniles. Only one adult (568 mm, 10-1/2 lbs.) was collected in the inlet in April, 1965. According to Croker (1962: 380) this fish would have been more than seven years old. Other adults have been observed in the inlet. Juveniles 20 mm or less in length were collected from late April until late October. Springer and McErlean (1962a: 49) took specimens within this size range at Lower Matecumbe Key in August and September. Tabb and Manning (1961: 619) found no evidence of adults in Florida Bay.

There is some evidence of migrations in this species. Topp (1963: 17) reported that a Gray snapper tagged and released at Jupiter Inlet was recovered at Eau Gallie, 76 miles away, 106 days after tagging.

The color of the water has a marked effect on the degree of color observed in the fish. Specimens collected in the inlet are usually quite gray with some orange tint; others taken in the river where the water is heavily stained are often maroon with considerable black and some reds in the dorsal fin.

Lutjanus jocu (Bloch and Schneider) - Dog snapper

RANGE: Massachusetts to Natal, Brazil, and widespread in the Gulf of Mexico.

Catch records of the 30 specimens (22-180 mm) collected are shown in Table 18.

TABLE 18.--Catch records of Lutjanus jocu

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
9 July 1960	2	1	51	32.0	29.3
17 July 1960	3	1	171	30.0	22.4
24 July 1960	3	1	152	32.0	-
24 July 1960	. <sup>a</sup>	1	180	32.5	0.7
3 Aug. 1960	. <sup>b</sup>	2	79-146	31.0	3.7
7 Aug. 1960	5	1	45	34.0	19.6
7 Aug. 1960	3	1	140	31.0	32.1
10 Aug. 1960	8	3	36-73	32.0	36.3
23 Aug. 1960	8	3	22-29	29.0	31.5
30 Aug. 1960	3	2	87-164	30.0	24.6
23 Oct. 1960	6	1	76	27.0	2.0
30 Oct. 1960	3	4	72-129	27.0	28.5
26 Dec. 1960	6	1	35	18.0	24.2
2 Jan. 1961	3	1	108	21.0	32.7
29 Jan. 1961	2	1	104	20.5	36.2
10 Sept. 1961	3	1	101	32.0	32.3
12 April 1964	3	1	94	26.5	35.7
30 Aug. 1964	SC6	3	72-82	-	-
2 Jan. 1965	3	1	103	-	-

<sup>a</sup>C-18 canal at Indiantown Rd. (SR 706) Control Dam

<sup>b</sup>Northwest branch of Loxahatchee River, 4 miles west, 2-1/4 miles north of Jupiter Inlet.

Temperature range 18 - 34° C.; salinity range <1.0 - 36.3 ‰.

The Dog snapper occurs throughout the study area and is not uncommon in waters of low salinity. It was abundant around the oyster bars at the railroad bridge station. The largest seen (180 mm) was taken in the C-18 canal at the flood gates.

Little is known of the biology of L. jocu in Florida. It was listed by Briggs (1958: 279) and Robins (1958: 58), but has not been reported by any of the recent Florida surveys except Longley and Hildebrand (1941: 119). They gave color notes and noted that L. jocu was much less numerous than L. griseus and L. apodus; but it was not uncommon about Tortugas.

Evermann and Marsh (1900: 172) reported that L. jocu occurred in greater numbers at Key West in the fall and winter but was not very common at any time.

Rivas (1949: 150-152) reported that L. jocu like L. griseus preferred protected waters and sometimes entered fresh water. Notes on size and color were also given.

Lutjanus synagris (Linnaeus) - Lane snapper

RANGE: North Carolina and Bermuda to Santos, Brazil, and throughout the Gulf of Mexico.

Collections contained 388 specimens (18-128 mm). Temperature range 20 - 32° C.; salinity range 17.8 - 38.8 ‰.

Lane snappers are more numerous than the other species of snappers, except for L. griseus. They are restricted to areas of high salinity and only one specimen (21 mm), collected at Station 4, was taken west of the railroad bridge station. Juveniles were especially abundant at the county line station and were frequently taken at the railroad bridge station. Lane snappers probably occur in the study area during the entire year despite the fact that none were collected in May.

Specimens 25 mm or less were collected from June until December. Reid (1954: 40) and Springer and Woodburn (1960: 40) reported that there was no evidence of spawning in the Florida Bay area, and juveniles leave long before they become adults. Likewise, no adults were found at Jupiter.

Ocyurus chrysurus (Bloch) - Yellowtail snapper

RANGE: Both sides of the Atlantic; in the western Atlantic from Massachusetts and Bermuda to Rio de Janeiro and widespread in the Gulf of Mexico.

Table 19 shows the catch records of the juvenile yellow-tail snappers collected at the inlet and the county line station. The species is not uncommon offshore and the Intracoastal Waterway may serve as a nursery area. Longley (1941: 121) reported that juveniles are found in the turtle grass beds at Tortugas where the yellowtail is one of the

most abundant species. Tabb and Manning (1961: 620) stated that the species is rare in Florida Bay and Springer and McErlean (1962a: 50) at Lower Matecumbe Key reported only three species taken in September and November, 1960. Springer and Woodburn (1960: 41) noted that the species is occasionally taken offshore in the Tampa Bay area.

TABLE 19.--Catch records of Ocyurus chrysurus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
6 July 1960	1	2	30-34	31.0	34.8
30 July 1960	1	11	20-37	28.0	36.6
11 Aug. 1960	1	8	13-36	30.5	36.7
12 Sept. 1960	1	3	27-31	27.25	29.9
29 Jan. 1961	2	1	76	20.5	36.2
27 June 1961	1	6	15-43	27.0	36.8
13 Aug. 1961	2	4	25-31	-	-
22 Aug. 1964	2	1	73	30.5	33.8

APOGONIDAE - CARDINALFISHES

Apogon maculatus (Poey) - Flamefish

RANGE: Massachusetts and Bermuda to Bahia, Brazil, and the eastern Gulf of Mexico. Also known from near Puerto Limón, Costa Rica (Caldwell, 1963a: 6) and Caledonia Bay, Panama (Caldwell and Caldwell, 1964: 18).



One specimen (83 mm) was taken at the inlet on 4 July 1960 and three additional specimens (64-74 mm) were collected at the railroad bridge station on 23 June 1963. One specimen (11 mm), probably this species, was collected in the inlet on 14 April 1964. Temperature range 27.25 - 31.0° C.; salinity range 35.5 - 37.2 ‰.

I also have records of two specimens (not measured) taken in the inlet in December, 1957 and December, 1958.

This handsome fish is not uncommon in the inlet, but usually remains well-hidden in rock crevices and therefore is not often observed or collected.

Longley (1941: 87) noted that A. maculatus is the most common member of its genus at Tortugas and that it is preyed upon by Lutjanus griseus and L. apodus.

Apogon pseudomaculatus Longley - Twospot cardinalfish

RANGE: Bermuda and Florida to the northeastern and southwestern Gulf of Mexico.

One example (31 mm) was taken on 23 June 1963 at the railroad bridge station. Temperature 31° C.; salinity 35.5 ‰. Three specimens (19, 40, 44 mm) were taken in the inlet on 22 August 1964. Temperature 30.5° C.; salinity 33.8 ‰. These specimens were identified by Dr. C. Richard Robins.

Apogon stellatus (Cope) [ = Apogonichthys stellatus (Cope) ]  
Conchfish

RANGE: Bermuda and Jupiter Inlet, Florida to Columbia and southwestern Gulf of Mexico (modified from Briggs, 1958: 275). Also known from 2 miles S.W. of Cape la Vela, Columbia (Caldwell and Caldwell, 1964: 18).

Two specimens (18, 34 mm) were collected at the county line station on 30 July 1960 and 29 April 1961. Temperatures 28 and 25° C.; salinities 36.6 and 37.3 ‰. This is one of the few apogonids which is found in grass beds rather than on reefs or jetties. Its dark color is in strong contrast to the other brightly colored members of its genus. These records extend the range of the species northward from the Florida Keys; however, the species probably occurs here only seasonally.

#### CENTRARCHIDAE - SUNFISHES

Chaenobryttus gulosus (Cuvier) - Warmouth

RANGE: The Mississippi River system in Kansas, Iowa, and southern Wisconsin to southern Michigan, Lake Erie, western Pennsylvania, and south through the Mississippi Valley; on the Atlantic coast from New York southward to Florida and the Rio Grande (Moore, 1957: 168).

Warmouth are common and widely distributed in fresh waters of the area. Three hundred twenty-nine specimens

(9-160 mm) were collected from April, 1960 to April, 1964. Temperature range 17 - 34° C. Usually warmouth were taken in strictly fresh water but on one occasion one was taken in a nearly dried up ditch in which the salinity was 2.5 ‰.

Specimens 30 mm or smaller were collected in the months of November, December, January, March, April, and July. The smallest group of specimens collected (9-20 mm) was taken in April, 1961. Warmouth probably breed year round in years when rainfall and temperature are favorable.

Enneacanthus gloriosus (Holbrook) - Bluespotted sunfish

RANGE: Southeastern New York to Florida (Moore, 1957: 172).

This small sunfish is abundant in the shallow waters of weedy fresh water creeks and canals in the area. Two hundred twenty specimens (12-46 mm) were collected. Temperature range 17 - 31° C.

Adults in breeding coloration were found in March and April but the size ranges of specimens in my collections indicate a more extended breeding season.

Elasoma evergladei Jordan - Everglades pygmy sunfish

RANGE: South Carolina to Florida (Moore, 1957: 174).

This pygmy sunfish is not common and only nine specimens (13-26 mm) were taken from four fresh water localities in

the area. Temperature range 17 - 27° C. The fish was found in ditches and sluggish creeks and canals where vegetation was abundant.

Lepomis macrochirus Rafinesque - Bluegill

RANGE: Widespread in the Great Lakes region to the St. Lawrence drainage, throughout the Mississippi Valley, and along the Gulf coast from Mexico to Florida, and thence north on the Atlantic coast to Virginia (Moore, 1957: 171).

Easily the most common sunfish in the area, the bluegill is found in all types of fresh water habitats and 844 specimens (14-121 mm) were collected. Temperature range 17 - 33.5° C. All specimens were collected in fresh water with the exception of two examples (26, 45 mm) taken in Special Collection 6 (Sim's Creek). The salinity of the water at the time is not known but a number of marine forms were taken in the same collection.

This is the only sunfish which was taken in the open fresh water lake habitat.

Lepomis marginatus (Holbrook) - Dollar sunfish

RANGE: Lower Mississippi Valley from Tennessee, Arkansas, and southeastern Oklahoma to Texas and Florida and north on the east coast to South Carolina (Moore, 1957: 171).

This small sunfish is widespread in fresh water and 330 specimens (16-59 mm) were collected. Temperature range 17 - 31° C. The species was not taken in the open lake habitat, but was common to abundant elsewhere. Specimens 20 mm or less in length were taken in the months of November, March, April, and July, indicative of a prolonged breeding season.

Lepomis microlophus (Günther) - Redear sunfish

RANGE: Mississippi River Basin in Indiana and Missouri south to Alabama, Florida, Louisiana, and Texas (Moore, 1957: 171).

This sunfish did not seem to be as widely distributed as the other members of its genus, but consistently attained larger sizes. It was often locally abundant in fresh waters and 175 specimens (20-152 mm) were collected. Temperature range 20 - 34° C.

Lepomis punctatus (Valenciennes) - Spotted sunfish (Stumpknocker)

RANGE: Southern Indiana southward in the Mississippi Basin including Missouri, Arkansas, southeastern Oklahoma, and central Texas, to the Gulf states; on the east coast as far north as North Carolina (Moore, 1957: 170).

One hundred thirteen specimens (16-110 mm) were collected. Temperature range 17 - 31° C. Stumpknockers are

widely distributed in fresh waters; however, they appear to be the least abundant of the four species of Lepomis in the area. The species was collected from both clear and heavily stained waters but was not collected from open lakes. One specimen (27 mm) was taken in the southwest branch of the river about 1/4 mile east of the mouth of the C-18 canal in August, 1964, following a period of heavy rainfall.

Specimens 20 mm or less in length taken in the months of November, December, January, March, April, and July suggest an extended breeding season.

Micropterus salmoides floridanus LeSueur - Florida Largemouth bass

RANGE: Florida peninsula.

Largemouth bass are widespread in local fresh water lakes, creeks, and canals and 430 specimens (11-356 mm) were collected. Temperature range 17-31° C. All except two juveniles (57, 58 mm), taken in Special Collection 6 in Sim's Creek, were taken in fresh water. Salinity records are not available for the Sim's Creek collection but the bass and a number of other fresh water fishes were associated with numerous marine species. Specimens 20 mm or less were taken in January, March, and April. The smallest specimens (11 mm) were taken in January, 1961 and April, 1961. Breeding probably occurs throughout the winter months except during periods of extreme cold weather.

## PERCIDAE - PERCHES

Etheostoma fusiforme barratti (Holbrook) - Swamp darter  
RANGE: Pee Dee River of North and South Carolina, south along the Atlantic Coastal Plain below the Fall Line throughout most of peninsular Florida; west along the Gulf Coastal Plain as far as Caddo Lake on the Texas-Louisiana border; and north in the former Mississippi Embayment as far as McCurtain Co., Oklahoma and Reelfoot Lake, Tennessee; other localities by introduction (Collette, 1962: 177).

Swamp darters were common in fresh water along the Indiantown Road (SR 706) and 63 specimens (19-46 mm) were collected, the smallest specimens in April, 1960. Temperature range 17 - 31° C. The preferred habitats seem to be mats of submerged vegetation along the margins of small canals and creeks.

Etheostoma fusiforme was not recorded in the Everglades National Park area by either Kilby and Caldwell (1955) or Tabb and Manning (1961).

## POMATOMIDAE - BLUEFISHES

Pomatomus saltatrix (Linnaeus) - Bluefish

RANGE: Worldwide in distribution; in the western Atlantic from Nova Scotia and Bermuda to Argentina (40° S.), and widespread in the Gulf of Mexico.

Bluefish are common in the study area during the winter and spring and occasionally penetrate the river for a distance of 2-1/2 to 3 miles from the inlet. Numerous specimens (approximately 300 mm) were caught in the inlet on 22 October 1960. Temperature 27° C.; salinity 25.1 ‰. Several specimens (approximately 275 mm) were seen at the south jetty in the middle of April, 1965. Three specimens (256-271 mm) were caught off Pennock's Point, approximately 2-1/2 miles west of the inlet on 5 January 1963. Fishermen reported they caught one specimen (2-1/2 to 3 lbs.) from the same general locality on 28 March 1962 and four others (1-3/4 to 4-1/2 lbs.) near the railroad bridge station on 7 March 1962.

RACHYCENTRIDAE - COBIAS

Rachycentron canadum (Linnaeus) - Cobia

RANGE: Worldwide in distribution; in the western Atlantic from Bermuda and Massachusetts to Argentina (35° S.), and widespread in the Gulf of Mexico.

One specimen (22 mm) was taken at the inlet on 19 August 1960. Temperature estimated to be above 30° C.; salinity was 22.5 ‰. This species is present offshore the year round (Moe, 1963: 112).



## CARANGIDAE / JACKS, SCADS, AND POMPANOS

Caranx bartholomaei Cuvier. - Yellow jack

RANGE: Massachusetts to Maceió, Brazil, and the northern Gulf of Mexico.

Table 20 gives the catch records of juvenile Yellow jacks collected in the study area.

TABLE 20.--Catch records of Caranx bartholomaei

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
July 1958	2	1	21	-	-
Sept.-Nov. 1958	2	1	40	-	-
26 Nov. 1960	4	1	25	24.5	24.1
27 June 1961	1	1	64	27.0	36.8
14 Aug. 1961	2	7	21-54	-	-
3 Sept. 1961	2	17	23-44	29.0	36.8
30 Sept. 1961	2	2	38-50	-	-
26 Nov. 1961	2	1	49	-	-

No adults were taken. Berry (1959: 486-487) stated that a 38 mm specimen from Cape Lookout, North Carolina was the smallest example known from inshore waters of this continent and a 32.5 mm specimen from Guano Island, Virgin Islands was the smallest specimen taken from any inshore waters recorded in the literature at that time. Several of my

specimens are smaller than those records. Spawning of the Yellow jack was estimated to take place from mid-February to mid-September (Berry, loc. cit.).

Caranx crysos (Mitchill) - Blue runner

RANGE: Both sides of the Atlantic; in the western Atlantic from Nova Scotia and Bermuda to São Paulo, Brazil, and throughout the Gulf of Mexico.

Three specimens were taken in the inlet in 1958 by Mrs. Susan Kindt; one (18 mm) in July and two (27.5, 101 mm) in August. Seven specimens (74-118 mm) were also taken on the beach, 4-1/2 miles north of Jupiter Inlet in August of the same year. The smallest of these was removed from the stomach of a snook, Centropomus undecimalis. On 10 August 1960 one specimen (83 mm) was caught at the same locality. Temperature 28.8° C.; salinity 37.1 ‰. In September, 1960 one specimen (89 mm) was taken from the inlet. Temperature 28.25° C.; salinity 35.4 ‰.

McKenny, Alexander and Voss (1958: 197) recognized the juveniles as members of the Sargassum community, and they reported specimens 12.1 to 24.2 mm in length taken inshore at Matecumbe Key, Florida. Berry (1959: 534) suggested that specimens of this size in inshore waters are the result of temporary currents from the nearby Gulf Stream.

Blue runners are common around the shallow reefs

Caranx latus Agassiz - Horse-eye jack

RANGE: New Jersey and Bermuda to Rio de Janeiro, and widespread in the Gulf of Mexico.

This jack, like C. hippos, is euryhaline (Gunter, 1956a: 350) and is often found with C. hippos in the river. Catch records of the 41 specimens (30-200 mm) collected are shown in Table 21.

Berry's (1959: 501) statement that juveniles adopt an inshore habitat at about 20 mm or larger, agrees with my findings. I had few opportunities to examine specimens of 150 mm or more in length and I was not able to determine if adults are found in the river. Local fishermen do not usually distinguish between C. hippos and C. latus.

Gunter and Hall (1963a: 256) took specimens up to 170 mm at St. Lucie.

Berry (op. cit.: 502) estimated that spawning extends from mid-March to mid-July. In Puerto Rico Erdman (1956: 320) reported specimens in breeding condition in June.

Caranx ruber (Bloch) - Bar jack

RANGE: Bermuda and off New Jersey probably to Rio de Janeiro, and widespread in the Gulf of Mexico.

Three examples of this species were obtained from Mrs. Susan Kindt who collected them from the inlet. One specimen (25 mm) was taken in July, 1958 and two additional specimens (24.5, 27.5 mm) in September, 1961.

TABLE 21.---Catch records of *Caranx latus*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
Aug. 1958	2	3	79-152	-	-
15 Aug. 1958	9	7	41-49	-	-
28 Feb. 1959	2	1	200	-	-
31 Jan. 1960	6	1	122	-	-
3 Aug. 1960	. <sup>a</sup>	4	43-57	31.5	8.1
7 Aug. 1960	6	1	60	33.0	10.2
28 Aug. 1960	5	1	44	30.0	4.5
30 Aug. 1960	2	1	43	29.5	16.5
30 Aug. 1960	2	6	34-48	30.0	32.5
4 Sept. 1960	4	5	30-51	28.5	11.6
12 Sept. 1960	8	1	52	27.5	27.5
12 Sept. 1960	9	5	43-55	23.0	37.1
12 SEpt. 1960	1	2	42-46	27.25	29.9
30 Oct. 1960	4	1	36	28.0	17.8
28 May 1961	6	1	59	28.0	26.8
29 June 1961	4	1	57	29.0	33.1

<sup>a</sup>Northwest branch of Loxahatchee River, 2.6 miles northwest of Jupiter Inlet, East side.

According to Berry (1959: 468) this species is rare in inshore waters and these specimens constitute the second inshore record of the species in Florida. Previous records were from Tortugas. The occurrence of the Bar jack at Jupiter is undoubtedly due to the proximity of the Gulf

Stream which has been shown to carry numerous juveniles during the months from April to November (Berry, loc. cit.).

Chloroscombrus chrysurus (Linnaeus) - Bumper

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Massachusetts to Uruguay (35°30' S.), and throughout the Gulf of Mexico.

Catch records of the 157 specimens taken are shown in Table 22.

TABLE 22.---Catch records of Chloroscombrus chrysurus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
22 Oct. 1960	1	17	49-59	20.0	23.0
30 Dec. 1960	9	1	140	28.0	34.1
31 Dec. 1960	2	1	50	23.0	31.2
31 Dec. 1960	2	136	41-72	21.0	32.3
26 Nov. 1961	2	1	15	-	-
4 Dec. 1961	7	1	121	-	-

Bumpers are common in the inlet, in the river and in the Intracoastal Waterway near the inlet. Occasionally they are taken on the beach and as far up the river as the mouth of the C-18 canal. Adults are common under the bridge to Jupiter Island and often may be seen feeding.

Decapterus punctatus (Agassiz) - Round scad

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Nova Scotia to Rio de Janeiro and the northeastern and southwestern Gulf of Mexico.

On 16 August 1958 five adults (147-157 mm) were run ashore by predators on Jupiter Island, 4-1/2 miles north of Jupiter Inlet. Four other specimens (87-95 mm) were collected from the inlet on 4 September 1960. Temperature 28.25° C.; salinity 35.4 ‰. Large schools of these fishes are seen from time to time in the inlet and in the surf along the beach. They are highly prized by the local fishermen for live bait.

Elagatis bipinnulatus (Quoy and Gaimard) - Rainbow runner

RANGE: Worldwide in tropical waters; in the western Atlantic from Massachusetts to Columbia and the northern Gulf of Mexico.

One specimen (30 mm) was taken at the county line station on 29 April 1961 and five (27-39 mm) were taken in the inlet on 3 September 1961. Temperatures 25 and 29° C.; salinities 37.3 and 36.8 ‰. Another specimen (26 mm) was collected in the inlet on 26 November 1961 by Mrs. Susan Kindt. All specimens taken in the inlet were secured by dipping up and shaking Sargassum.

This species is apparently quite uncommon inshore as it has not been recorded by any of the recent surveys of Florida fishes including Longley and Hildebrand (1941).

Oligoplites saurus (Bloch and Schneider) - Leatherjacket

RANGE: Gulf of Maine to Uruguay and throughout the Gulf of Mexico.

Catch records of the 43 Leatherjackets (17-143 mm) are shown in Table 23. Juveniles of this euryhaline fish (Gunter and Hall, 1963a: 257) are common throughout the river which serves as a nursery ground. Adults are also widely distributed in the river but are not often captured. They are common under the bridge to Jupiter Island, just north of the inlet, and often may be observed feeding with Chloroscombrus chrysurus.

Although common throughout southern Florida, their abundance in the northern Gulf of Mexico is variable. They are reported as uncommon in some places (Gunter, 1945: 60-61; Reid, 1954: 34) and abundant in others (Joseph and Yerger, 1956: 133).

Selar crumenophthalmus (Bloch) - Bigeye scad

RANGE: Worldwide in tropical waters; in the western Atlantic from Nova Scotia and Bermuda to Rio de Janeiro and throughout the Gulf of Mexico.

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TABLE 23.--Catch records of *Oligoplites saurus*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
July 1958	2	1	26	-	-
Sept.-Nov. 1958	2	1	103	-	-
24 July 1960	7	1	52	32.5	1.5
7 Aug. 1960	5	1	23	34.0	19.6
11 Aug. 1960	1	1	99	30.5	36.7
28 Aug. 1960	5	15	18-41	30.0	4.5
4 Sept. 1960	4	2	17-28	28.5	11.6
12 Sept. 1960	8	8	32-46	27.5	27.5
21 Oct. 1960	2	1	67	27.0	21.6
1 Jan. 1961	6	2	129-134	21.2	30.4
1 Jan. 1961	7	1	109	22.0	30.2
29 Jan. 1961	4	4	128-143	20.0	28.8
29 June 1961	5	4	28-54	30.0	22.5
7 July 1963	SC3	1	57	33.0	29.5

Five Bigeye scad were collected from the area. One specimen (94 mm) was taken on Jupiter Island, 4-1/2 miles north of Jupiter Inlet, on 15 July 1958 when a school of these fishes was run ashore by predators. Another (97 mm) was taken in the inlet by Mrs. Susan Kindt in August, 1958. Three additional specimens (63-71 mm) were taken from the inlet on 4 September 1960. Temperature 28.25° C.; salinity 35.4 ‰.



Selene vomer (Linnaeus) - Lookdown (Moonfish)

RANGE: Eastern Pacific and both sides of the Atlantic; in the western Atlantic from Nova Scotia and Bermuda to Argentina (38° S.), and widespread in the Gulf of Mexico.

Sixty-two specimens (24-216 mm) were collected. Temperature range 18.25 - 31.3° C.; salinity range 18.0 - 37.3 ‰. Gunter and Hall (1963a: 257) took the species in salinities as low as 16.2 ‰, but it probably enters waters of lower salinity.

S. vomer is common throughout the study area, and was seen as far inland as the flood gates on the C-18 canal. Schools of adults are very common in the inlet and the Intracoastal Waterway during the summer months. Fishermen using cane poles and small feather lures, have caught enough to fill a washtub during a single night in the summer.

Seriola rivoliana (Cuvier and Valenciennes) [ = S. falcata Valenciennes - Almaco jack

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and North Carolina to Buenos Aires, Argentina, and the northern Gulf of Mexico.

Catch records of the 12 specimens of S. rivoliana are shown in Table 24. All specimens were juveniles and many

were associated with Sargassum. Only one specimen was taken from the river where it may have been carried with seaweed.

TABLE 24.--Catch records of Seriola rivoliana

Date	Station	No. of Specimens	SL(mm)	Temp. °C.	Sal. ‰
July 1958	2	1	46	-	-
Oct. 1958	2	1	18	-	-
26 Nov. 1960	4	1	25	24.5	24.1
3 Sept. 1961	2	5	17-40	29.0	36.8
30 Sept. 1961	2	1	43	-	-
26 Nov. 1961	2	3	26-52	-	-

Trachinotus carolinus (Linnaeus) -- Pompano

RANGE: Bermuda and Massachusetts to Santos, Brazil, and throughout the Gulf of Mexico.

Catch records of 244 specimens (12-108 mm) collected are shown in Table 25.

Young pompanos are common on the beaches from April to October. Fields (1962: 194) stated that in Georgia "the fish apparently leave the beaches at about 60-70 mm., because only an occasional straggler of that size or larger is taken by beach seining." On Jupiter Island the fish remain on the beach longer, and numerous individuals 60 mm or greater in length were taken. After August, sea

conditions are generally not favorable for seining on the beach and I do not have sufficient data to determine the length of time the pompanos remain on the beach during the fall and winter months. Adult pompano are not uncommon in the inlet and provide excellent sport for fishermen. [For discussion of coloration of juveniles, see T. glaucus.]

TABLE 25.--Catch records of Trachinotus carolinus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
Aug. 1958	2	1	59	-	-
2 July 1960	9	44	23-69	28.7	35.5
5 July 1960	9	38	16-70	31.0	37.5
11 July 1960	9	94	22-80	29.0	37.7
30 July 1960	9	15	59-74	28.0	37.3
10 Aug. 1960	9	11	48-83	28.8	37.1
12 Sept. 1960	9	23	31-85	23.0	37.1
22 Oct. 1960	9	5	53-108	28.0	34.1
11 April 1964	9	5	12-27	30.0	36.6
21 Aug. 1964	9	8	48-60	-	-

Trachinotus falcatus (Linnaeus) - Permit

RANGE: Both sides of the Atlantic; in the western Atlantic from Massachusetts to Rio Grande do Sul, Brazil, and widespread in the Gulf of Mexico.

Juvenile Permit are quite common in the inlet and river and 89 specimens (5.5-64 mm) were collected. Catch records are shown in Table 26.

TABLE 26--Catch records of *Trachinotus falcatus*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
Aug. 1958	2	3	7-48	-	-
20 Aug. 1958	2	1	48	-	-
24 Aug. 1958	5	3	38-58	-	-
Sept.-Nov. 1958	2	5	8-29	-	-
14 Dec. 1958	2	5	5.5-8	-	-
March 1959	2	2	13,13	-	-
3 Aug. 1960	4	2	9-15	31.0	7.3
19 Aug. 1960	2	3	8.5-11	30.0+	22.5
28 Aug. 1960	5	1	14	30.0	4.5
30 Aug. 1960	2	15	18-64	30.0	32.5
4 Sept. 1960	2	1	19	28.25	35.4
22 Oct. 1960	2	7	35-43	27.0	25.1
31 Dec. 1960	2	12	20-55	21.0	32.3
5 March 1961	4	1	15	25.0	34.2
29 April 1961	1	2	15-20	25.0	37.3
30 April 1961	4	3	13-19	28.0	35.4
21 May 1961	1	2	1-13	29.0	37.6
21 May 1961	5	8	10-43	28.0	36.0
28 May 1961	2	2	18-20	26.0	35.8

TABLE 26.---Continued.

Date	Station	No. of Specimens	SL(mm)	Temp. °C.	Sal. ‰
28 May 1961	6	4	12-25	28.0	26.8
29 June 1961	5	2	26-38	30.0	22.5
1 Oct. 1961	2	12	10-39	27.8	26.4
26 Nov. 1961	2	1	25	-	-

Fields (1962: 198) reported that since juveniles occur here throughout most of the year, the recruitment pattern of young was different from that of the Georgia coast. This was attributed to a prolonged breeding season, much of which was believed to be restricted to subtropical waters. In contrast to the situation described by Fields (*op. cit.*: 197-198) juveniles of *T. falcatus* are not found on the beach in association with *T. glaucus* and *T. carolinus*, but penetrate the inlet, and inhabit the river and estuararies. Juvenile Permits show marked differences from their congeners in their tolerance of low salinities; specimens were taken in salinities as low as 4.5 ‰. Their dark coloration is also much better suited to life on grass flats than along white sand beaches.

Adults are not common at Jupiter.

Trachinotus glaucus (Bloch) - Palometa

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Massachusetts to Argentina (39° S.) and widespread in the Gulf of Mexico.

Catch records for nine specimens (11-126 mm) of T. glaucus, the least common member of its genus are shown in Table 27.

TABLE 27.--Catch records of Trachinotus glaucus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
2 July 1960	9	3	61-126	28.7	35.5
11 July 1960	9	1	47	29.0	37.7
30 July 1960	9	2	61-76	28.0	37.3
10 Aug. 1960	9	1	76	28.8	37.1
22 Oct. 1960	9	1	11	28.0	34.1
30 April 1961	4	1	11	28.0	35.9

Eight specimens were collected on the beach in association with T. carolinus, and the remaining specimen at Station 4 in the river. Fields (1962: 202) reported that the Palometa is so uncommon the beaches of Brunswick, Georgia, that a summer of intensive collecting yielded only 12 specimens. He made no comment on the time of their occurrence there. My specimens infer a spawning period and shoreward movement of juveniles similar to that described by Fields

(op. cit.: 193-194) for T. carolinus, with the exception that there is still no evidence for offshore spawning. Large specimens up to 126 mm were taken on the beach.

Juveniles of T. glaucus are difficult to separate from T. carolinus as the soft dorsal and anal fins are not much elongated. Fields (op. cit.: 195, 203) offered color notes on both species to aid in identification. Soft dorsal and anal fin ray formulas are usually sufficient to separate most specimens; however, recognition of color patterns permits much more rapid identification. Juveniles of T. glaucus exhibited the following coloration:

Interspinous membranes of dorsal and anal with many melanophores. Melanophores on soft dorsal and anal profuse. Melanophores on stomach few and faint. Caudal fin darker than in T. carolinus.

Juveniles of T. carolinus exhibited the following coloration:

Interspinous membranes of dorsal and anal hyaline, first rays of soft dorsal may have melanophores, soft anal with yellow pigment changing to cinnamon near the tips of first rays in some. Melanophores on stomach usually few but large, dark, and diffuse. Caudal fin lighter than in T. glaucus.

Adult Palometa are occasionally taken in the inlet.

## CORYPHAENIDAE - DOLPHINS

Coryphaena hippurus Linnaeus - Dolphin

RANGE: Worldwide in tropical waters; in the western Atlantic from Nova Scotia and Bermuda to Brazil, and throughout the Gulf of Mexico.

Five young dolphins were secured from the inlet. Four specimens were collected by Mrs. Susan Kindt on 24 December 1958 (2, 17-31 mm), 21 February 1959 (1, 17 mm), and 30 September 1961 (1, 18.5 mm). The remaining specimen was taken on 3 September 1961 from Sargassum. Temperature 29° C.; salinity 36.8 ‰. In the Jupiter area, only C. hippurus was taken, in contrast to the findings of Gibbs and Collette (1959: 41), who reported that C. equiselis was more numerous in their samples. They noted, however, that C. equiselis seems to be strictly oceanic over deeper waters, and upheld the contention that C. hippurus tolerates coastal waters and breeds farther inshore than C. equiselis.

## GERRIDAE - MOJARRAS

The classification within this family follows Curran (1942). I have accepted all of the forms described with the exception of Eucinostomus pseudogula Poey which I find indistinguishable from Eucinostomus argenteus Baird and Girard.



Diapterus olisthostomus (Goode and Bean) - Irish pompano  
(Sand perch)

RANGE: Northeastern Florida to Bahia, Brazil.

Juveniles of this gerrid are found over the entire study area with the exception of the beaches. They are especially abundant in the upper reaches of the river. Large numbers were taken at Stations 4, 5, and 6. Adults are common from Station 5 to the railroad bridge station in the summer. Collections contained 1196 specimens (16-182 mm) and twice that number could have been collected easily.

D. olisthostomus does not attain the size nor do adults seem to be as common in the upper reaches of the river as Eugerres plumieri. This euryhaline gerrid was found over a wide range of salinities, from 1.5 to 36.6 ‰, and temperatures ranged from 18.0 to 36.0+° C.

Gunter and Hall (1963a: 259-262) confused this species with E. plumieri which is common at St. Lucie. A specimen, seen in a photograph (page 261) of a sample of fishes from trawl TS 7, is clearly E. plumieri.

Specimens 20 mm or less in length were collected in July, October, November, and December, 1960 and January, 1961, and indicate either a long breeding season, or a spring and fall breeding season.

Eucinostomus argenteus Baird and Girard - Spotfin mojarra

RANGE: Both coasts of tropical America; in the western Atlantic from New Jersey to Rio de Janeiro, and widespread in the Gulf of Mexico.

This is the most abundant gerrid in the study area and probably the most abundant of the marine fishes.

Over 7000 specimens (9.5-179 mm) were collected and many more were discarded. Temperature range 18 - 36° C.; salinity range 1.5 - 38.8 ‰. It was found at all stations and is present in inland waters during the entire year. Few specimens more than 100 mm in length were collected. Adults larger than 100 mm are usually found in the inlet. For monthly size ranges consult the species lists of Stations 1, 4, 5, and 6.

My observations tend to confirm the generality that E. argenteus is more abundant in areas of low salinity and E. gula is more abundant in areas of high salinity. In contrast to the findings of every other survey in the state, Tabb and Manning (1961: 623) found the reverse to be true. In the upper reaches of the river where salinities are low E. argenteus abounds; E. gula is uncommon. E. gula on the other hand is more numerous at the county line station.

The observation of Springer and Woodburn (1960: 45-46) that there seems to be ecological separation of only the young seems to hold in some areas, but I took juveniles of both species together on many occasions. Springer and

Woodburn (loc. cit.) reported that E. argenteus and E. gula were infrequently taken in the same seine haul. Except in the far upper reaches of the river this is definitely not the case at Jupiter, or at Lower Matecumbe Key (Springer and McErlean, 1962a: 45). There was usually a predominance of one species or the other but rarely total exclusion.

As noted earlier, I find this species indistinguishable from Curran's (1942) E. pseudogula. I have several series of individuals which are close to E. gula; they hardly differ except in color pattern. I find in many mixed collections that the juveniles of E. argenteus and E. gula are not separable.

Eucinostomus gula (Quoy and Gaimard) - Silver jenny  
RANGE: Massachusetts and Bermuda to Argentina (38° S.),  
and throughout the Gulf of Mexico.

Over 3500 specimens (10-124 mm) were collected. Temperature range 18 - 36+° C.; salinity range 4.5 - 38.8 ‰.

This species is not as common as E. argenteus and tends to be more restricted to areas of higher salinities. In the Intracoastal Waterway it is one of the most abundant forms. Size ranges are found in the species lists of Stations 1, 4, 5, and 6. Problems of its ecology and distribution are discussed under E. argenteus.

Eucinostomus melanopterus (Blecker) - Flagfin mojarra

RANGE: Jupiter Inlet, Florida and other localities (see below).

Catch records of the 76 specimens (13-135 mm) collected are shown in Table 28.

This species has one of the widest distributions of any of the gerrids in the study area but it is not very common. It was most frequently collected in the inlet, but was taken at least once at each station except Station 6, and was found in salinities as low as 1.5 ‰. It was taken twice on the beach.

There still exists some confusion as to the identity of this species and some authors have considered Curran's (1942) E. melanopterus to be E. pseudogula. Consequently, distribution records require extensive re-examination.

Some notes on the pigmentation of the dorsal fin are given under Lepidochir havana.

Eugerres plumieri (Cuvier) - Striped mojarra (Goat)

RANGE: St. Lucie Inlet, Florida and the Tampa Bay area southward to Bahia, Brazil, and west to Mexico (modified from Briggs, 1958: 280).

This euryhaline gerrid is the largest member of its family in the study area. Collections contained 483 specimens (16-260 mm) and larger numbers of adults could easily have been obtained. Temperature range 21 - 36+° C.;

TABLE 28.--Catch records of Eucinostomus melanopterus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
21 Sept. 1957	2	1	80	-	-
7 April 1957	2	2	16-52	-	-
15 Aug. 1958	9	1	89	-	-
Sept.-Nov. 1958	2	1	27	-	-
27 Dec. 1959	1	4	55-57	-	-
11 July 1960	9	1	135	29.0	37.7
24 July 1960	7	1	55	32.5	1.5
30 July 1960	1	1	66	28.0	36.6
3 Aug. 1960	. <sup>a</sup>	27	13-80	31.5	8.1
4 Sept. 1960	2	1	48	28.25	35.4
30 April 1961	2	19	14-27	27.0	37.3
21 May 1961	4	3	25-44	28.0	35.9
28 May 1961	2	6	37-46	26.0	35.8
27 June 1961	1	1	63	27.0	36.8
29 June 1961	4	3	51-69	29.0	33.1
29 June 1961	2	1	55	29.0	34.8
10 Sept. 1961	3	1	76	32.0	32.3
12 April 1964	3	2	69-79	26.5	35.7

<sup>a</sup>Northwest branch of Loxahatchee River, 2.6 miles N.W. of Jupiter Inlet.

salinity range 1.5 - 34.9 ‰. The species is widely distributed and is most abundant in the river and the Intracoastal Waterway.

Adults of this species seem to be more common than adults of D. olisthostomus, but the reverse is true of juveniles. No explanation for this could be found.

Tabb and Manning (1961: 622) stated that this is the common mojarra of brackish and fresh waters in the Florida Bay area. Its confusion with D. olisthostomus by Gunter and Hall (1963a) is discussed under D. olisthostomus. Briggs (loc. cit.) did not report any Atlantic coast records of the species in Florida.

Gerres cinereus (Walbaum) - Yellowfin mojarra

RANGE: Both coasts of tropical America; in the western Atlantic from Bermuda and Jupiter Inlet, Florida to Rio de Janeiro and the northern and western Gulf of Mexico.

Catch records of the 14 specimens are shown in Table 29. This gerrid is not common in the river, but adults are frequently seen over open sand bottoms in the middle of the inlet. Their deeply forked tails and the dusky bars on their sides make them easily recognizable. These records extend the range of the species northward from the Florida Keys.

TABLE 29.---Catch records of Gerres cinereus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal ‰
21 Sept. 1957	2	3	75-102	-	-
27 Dec. 1959	1	1	100	-	-
6 July 1960	1	1	145	31.0	34.8
9 July 1960	2	3	65-119	32.0	29.3
7 Aug. 1960	5	1	29	34.0	19.6
12 Sept. 1960	1	1	106	27.25	29.9
26 Nov. 1960	7	1	51	24.5	10.8
12 April 1964	3	3	44-55	26.5	35.7

Lepidochir havana (Nichols) - Bigeye mojarra

RANGE: Bermuda and Jupiter Inlet, Florida to Natal, Brazil  
(modified from Briggs, 1958: 280).

Catch records of the 32 specimens (13-75 mm) collected are shown in Table 30. This mojarra has a wider distribution than Ulaema and is slightly more numerous, but is also restricted to waters of high salinity.

Young of this species are difficult to separate from young Eucinostomus argenteus but some may be recognized by the exceedingly dark black smudge on the tip of the spinous dorsal. The smudge is as dark as that in E. melanopterus but lacks the well-defined clear "window" beneath it. In L. havana this fin is hyaline to the base with a few

scattered melanophores, whereas E. melanopterus has a band of melanophores along the base of the fin.

These specimens extend the range of the species northward from the Florida Keys.

TABLE 30.--Catch records of Lepidochir havana

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
15 Aug. 1958	9	1	58	-	-
9 July 1960	2	4	40-47	32.0	29.3
11 Aug. 1960	1	3	13-58	30.5	36.7
30 Aug. 1960	2	2	27-30	30.0	32.5
4 Sept. 1960	2	1	70	28.25	35.4
21 May 1961	5	1	22	28.0	36.0
28 May 1961	2	2	34-41	26.0	35.8
29 June 1961	2	13	18-40	29.0	34.8
25 Nov. 1963	2	1	75	26.0	33.5
12 April 1964	3	1	74	26.5	35.7
22 Aug. 1964	2	3	23-65	30.5	33.8

Ulaema lefroyi (Goode) - Mottled mojarra

RANGE: Bermuda and North Carolina to Natal, Brazil, and the northeastern Gulf of Mexico.

This mojarra is restricted to areas of high salinity and is common only over sandy bottoms. Catch records of the 71 specimens (20-64 mm) are shown in Table 31.



TABLE 31.--Catch records of Ulaema lefroyi

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
9 July 1960	2	2	24-41	32.0	29.3
30 April 1961	2	49	22-46	27.0	37.3
28 May 1961	2	1	38	26.0	35.8
27 June 1961	1	4	45-64	27.0	36.8
29 June 1961	2	4	21-28	29.0	34.8
22 Aug. 1964	2	11	20-61	30.5	33.8

Springer and McErlean (1962a: 45) took this fish nearly all year at Lower Matecumbe Key. It was recorded only during summer months at Jupiter.

#### POMADASYIDAE - GRUNTS

Anisotremus surinamensis (Bloch) - Black margate

RANGE: Florida to Bahia, Brazil, and the northern Gulf of Mexico.

This grunt is common in the inlet and around rocky areas along the beach, but it is not as abundant as A. virginicus and seems to have a more restricted distribution in the area. Five specimens (135-192 mm) were taken from the inlet in February, 1958; September, 1959; August, 1960; and December, 1960. The species was also found at the south end of Big Blowing Rocks where 53 specimens (44-76 mm) were secured in August, 1964 (Special Collections 4 and 5).

Longley and Hildebrand (1941: 129) reported observing a few individuals in similar habitats at Tortugas. Temperature range 21.5 - 30.3° C.; salinity range 28.8 - 37.1 ‰. Several large adults, approximately 500 mm in length, were seen in the inlet on 10 April 1965.

Anisotremus virginicus (Linnaeus) - Porkfish

RANGE: Bermuda and off Anastasia Island, Florida to Santa Catarina, Brazil, and the eastern and southern Gulf of Mexico (modified from Briggs, 1958: 279). Also reported from Caledonia Bay, Panama (Caldwell and Caldwell, 1964: 20).

Porkfish were taken from the inlet northward to Station 7 in the Intracoastal Waterway and westward to the railroad bridge station. It is generally found around bridges, docks, and rocks. Fourteen specimens (53-153 mm) were contained in six collections made in July, 1960 and 1963, and August, 1961 and 1964. Temperature range 30 - 31° C.; salinity range 22.4 - 36.8 ‰. Although the species was only taken during the summer months, I believe its absence from other collections is due to sampling errors.

Tabb and Manning (1961: 623) noted that the species was rare in Florida Bay and reported five specimens taken in October, 1958. Their observed temperature, 25° C., was lower than any recorded for the species at Jupiter. Springer and Woodburn (1960: 41) reported knowledge of

only two specimens taken in the Tampa Bay area. Longley and Hildebrand (1941: 129) considered Porkfish uncommon at Tortugas and inferred that the species feeds at night. Six of my specimens were caught on hook and line during the daylight hours, usually in the afternoon. The remaining eight specimens were taken with rotenone and by dipnet.

Anderson and Gutherz (1964: 303) recently reported specimens which extended the range of the species from southern Florida to off Anastasia Island, Florida.

Haemulon aurolineatum Cuvier [ = Bathystoma aurolineatum ]  
Tomtate

RANGE: Cape Cod and Bermuda to Brazil and along the Central American coast throughout the Gulf of Mexico  
(Courtenay, 1961: 121).

Apparently rare in south Florida, three specimens were collected. One specimen (19 mm) was taken at the county line station on 30 July 1960, and another (28 mm) on 11 August 1960. A juvenile (83 mm) was caught on hook and line under the U.S. 1 bridge, approximately 0.6 miles west of the inlet on 17 June 1963. Temperature range 28 - 32° C.; salinity range 32.3 - 36.6 ‰. The Tomtate was not recorded in surveys at St. Lucie or Lower Matecumbe Key, and Tabb and Manning (1961: 633) noted that it was never common in Florida Bay.

Haemulon chrysargyreus Günther - Smallmouth grunt

RANGE: Jupiter Inlet southward to Brazil and along the Central American coast to the southern Gulf of Mexico (modified from Courtenay, 1961: 124).

Two specimens (57, 70 mm) were taken at Station 8 on Jupiter Island on 12 September 1960, and two additional specimens (75, 77 mm) were collected in the inlet on 22 August 1964. Temperatures 23.0 and 30.5° C.; salinities 37.1 and 33.8 ‰.

Courtenay (loc. cit.) recorded this grunt from the Miami area, and Longley and Hildebrand (1941: 123) reported that it abounded at Tortugas. No other Florida records were found. These specimens extend the range of the species northward from the Miami area.

Haemulon flavolineatum (Desmarest) - French grunt

RANGE: Bermuda and Jupiter Inlet, Florida south through the West Indies to Brazil and along the Central American coast to the southern Gulf of Mexico (modified from Courtenay, 1961: 97).

Table 32 shows the catch records of the French grunt, the third most common member of its genus in the Jupiter area. These records extend the range of the species from the Miami area, and there is little doubt it is established in the Jupiter region.

TABLE 32.--Catch records of Haemulon flavolineatum

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. °/oo
7 Feb. 1958	2	1	80	"	"
30 July 1960	1	1	17	28.0	36.6
10 Aug. 1960	8	1	26	32.0	36.3
11 Aug. 1960	1	10	18-27	30.5	36.7
27 June 1961	1	9	18-19	27.0	36.8
10 Sept. 1961	3	1	56	32.0	32.3
12 April 1964	3	1	70	26.5	35.7
23 June 1963	3	9	75-100	31.0	35.5
22 Aug. 1964	2	9	43-61	30.5	33.8

Haemulon macrostomum Günther - Spanish grunt

RANGE: Bermuda and Jupiter Inlet through the West Indies to Brazil and along the Atlantic coast of Panama (modified from Courtenay, 1961: 110). Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963a: 6).

One specimen (60 mm) was taken in the inlet on 1 October 1961. Temperature 27.8° C.; salinity 26.4 ‰.

The species was formerly known only as far north on the Atlantic coast as the Florida Keys (Courtenay, loc. cit.)

Haemulon parrai (Desmarest) - Sailors choice

RANGE: St. Lucie Inlet, Florida through the West Indies to Brazil and along the Central American coast to the southern Gulf of Mexico (modified from Courtenay, 1961: 92).

During the study 745 specimens were collected. Temperature range 20.5 - 34.0° C.; salinity range 4.5 - 36.8 ‰.

Without question this is the most abundant grunt in the Jupiter area, and juveniles are common in grass beds in the Intracoastal Waterway where salinities are high. Occasionally juveniles were found as far up the river as Station 4 and 5 where salinities are sometimes low. Adults were common in the inlet and around the oyster bars at Station 3.

The species more tolerant of low salinities than any of the other local Haemulon. Juveniles were encountered in salinities as low as 4.5 ‰.

Size ranges found here and reported by Springer and McErlean (1962a: 46) indicate a probable breeding period beginning in the spring, perhaps in March and April.

Springer (1960: 11) extended the range of the species from the Florida Keys to St. Lucie Inlet, Florida.

Haemulon plumieri (Lacépède) - White grunt

RANGE: Chesapeake Bay to Brazil and along the Central American coast to the northern Gulf of Mexico (Courtenay, 1961: 115).

The second most common member of its genus, the White grunt was taken at the inlet, the railroad bridge station, and several localities in the Intracoastal Waterway. Catch records are shown in Table 33.

TABLE 33.--Catch records of Haemulon plumieri

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal ‰
2 July 1960	2	1	121	31.0	25.
17 July 1960	3	1	109	30.0	22.
30 July 1960	1	18	19-47	28.0	36.
10 Aug. 1960	8	6	24-44	32.0	36.
11 Aug. 1960	1	49	20-37	30.5	36.
23 Aug. 1960	8	4	29-41	29.0	31.
12 Sept. 1960	8	2	34-40	27.5	27.
12 Sept. 1960	1	27	24-43	27.25	29.
16 Oct. 1960	1	1	32	27.0	24.
27 June 1961	1	90	18-31	27.0	36.
10 Sept. 1961	3	4	51-74	32.0	32.
22 Aug. 1964	2	1	63	30.5	33.

Courtenay (loc. cit.) stated that this is the most abundant species in inshore Florida waters. However, it is not nearly so abundant as H. parrai at Jupiter, and was not reported from St. Lucie at all. Apparently it is more common from the Miami area southward.

Haemulon sciurus (Shaw) - Bluestriped grunt

RANGE: Bermuda and Jupiter Inlet, Florida through the West Indies to Brazil and along the coast of Central America into the southern Gulf of Mexico; occasional stragglers along the Atlantic coast as far as South Carolina in the summer months (modified from Courtenay, 1961: 82).

Table 34 shows the catch records of 17 specimens (60-137 mm) of the Bluestriped grunt taken at Jupiter.

TABLE 34.--Catch records of Haemulon sciurus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
4 Sept. 1960	4	1	72	28.5	11.6
10 Sept. 1961	3	5	60-91	32.0	32.3
23 June 1963	3	4	82-112	31.0	35.5
12 April 1964	3	6	100-137	26.5	35.7
14 April 1964	2	1	106	27.25	36.2



This handsome fish is most often taken at the railroad bridge station. Although not common, I believe the species is a permanent resident of the area and that these specimens do not represent stragglers.

Orthopristis chrysopterus (Linnaeus) - Pigfish

RANGE: Massachusetts and Bermuda to Florida and throughout the Gulf of Mexico.

Pigfish are widespread in the study area but were not taken in the inlet, on the beach or in the upper reaches of the river at Stations 6 and 7. It was not often taken where salinities were low. Juveniles were common in the grass beds of Station 4 and at the county line station. Adults were frequently caught at the railroad bridge station.

Collections contained 191 specimens (18-167 mm). Temperature range 24 - 36\*° C.; salinity range 4.5 - 37.6 ‰.

No specimens were taken from January until March when the first juveniles were collected. Springer and Woodburn (1960: 42-43) noted that the species is not as common in south Florida as it is in the northern Gulf of Mexico, and that adults move offshore during the winter months.

## SCIAENIDAE - DRUMS

Bairdiella chrysura Lacepède - Silver perch

RANGE: New York to Florida and throughout the Gulf of Mexico.

Unlike most other areas in Florida, there apparently are very few Bairdiella in the Jupiter area. Eighteen specimens (48-80 mm) were collected at Stations 4 and 5 in July and August, 1960. One specimen (37 mm) was collected in DuBois Bight in April, 1959. No adults were taken. Temperature range 31 - 34° C.; salinity range 7.3 - 19.6 ‰.

Cynoscion nebulosus (Cuvier) - Spotted seatrout (Spotted weakfish, speckled trout)

RANGE: Both sides of the Atlantic; in the western Atlantic from New York to Florida and throughout the Gulf of Mexico.

Catch records of 47 specimens are shown in Table 35. No adults were collected but they are not uncommon and are frequently taken by local fishermen. Reports were given of one specimen (432 mm TL) taken at Pennock's Point in March, 1962 and another (508 mm TL) taken in the Intra-coastal Waterway, 2-1/2 miles south of the railroad bridge station in February, 1962. Tabb and Manning (1961: 626) reported that the species apparently did not spawn successfully in the Florida Bay area and that juveniles

were uncommon there. Iversen and Tabb (1962: 546) demonstrated that the growth of east coast populations of Spotted seatrout was faster than Gulf coast populations, and that there was little migration between populations.

TABLE 35.--Catch records of Cynoscion nebulosus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
26 April 1959	2	1	23	-	-
24 July 1960	4	10	14-85	33.0	10.5
30 July 1960	1	3	32-54	28.0	36.6
3 Aug. 1960	4	1	21	31.0	7.3
7 Aug. 1960	5	1	90	34.0	19.6
9 Aug. 1960	SC1	4	16-23	31.3	28.1
11 Aug. 1960	1	2	22-58	30.5	36.7
23 Aug. 1960	8	2	21-23	29.0	31.5
28 Aug. 1960	5	3	17-44	30.0	4.5
4 Sept. 1960	4	4	16-24	28.5	11.6
29 April 1961	1	1	18	25.0	37.3
21 May 1961	1	1	21	29.0	37.6
21 May 1961	4	5	18-44	28.0	35.9
21 May 1961	5	4	14-19	28.0	36.0
27 June 1961	1	3	28-46	27.0	36.8
29 June 1961	5	2	20-27	30.0	22.5

Equetus acuminatus (Bloch and Schneider) - Cubbyu (Top hat)

RANGE: Bermuda and North Carolina to Rio de Janeiro and throughout the Gulf of Mexico.

Three specimens were collected from the inlet. The first (50 mm) was taken in August, 1958 by Mrs. Susan Kindt; the others (60, 62 mm) on 1 October 1961 and 22 August 1964. The temperatures for the latter two collections were 27.8° C. and 30.5° C. The salinities were 26.4 ‰ and 33.8 ‰.

The species is much more numerous in the inlet than these data would suggest. Juveniles and adults are common, especially in the summer, in deeper water about the rocks of the south jetty.

Equetus pulcher (Steindachner) - Striped drum

RANGE: Jupiter Inlet to the Lesser Antilles (modified from Briggs, 1958: 280).

One specimen (29 mm) was taken in the inlet by Mrs. Susan Kindt in July, 1957 and identified by Dr. Daniel M. Cohen. This extends the range of the species from the Florida Keys.

Leiostomus xanthurus Lacépède - Spot

RANGE: Gulf of Maine to Florida and throughout the Gulf of Mexico.

Juvenile Spots are seasonally quite common in the river but are rarely found in the inlet or the Intracoastal Waterway. Collections contained 845 specimens (9-84 mm) which were all taken from December, 1960 to April, 1961. Gunter and Hall (1963a: 265) collected juveniles in May at St. Lucie.

Adults are rare throughout the area and only two examples (163, 203 mm) were collected. These were taken in November, 1960 and August, 1964. The smaller came from the stomach of a Paralichthys lethostigma.

Temperature range 18 - 31° C.; salinity range 18.0 - 38.8 ‰.

Spawning and growth of the Jupiter population follows the pattern of northern Gulf of Mexico populations studied by Sundarara (1960: 58). Tabb and Manning (1961: 628) reported that they could find no evidence of spawning in Florida Bay, and the occurrence of adults was sporadic.

Menticirrhus littoralis (Holbrook) - Gulf Kingfish (Whiting)

RANGE: Virginia to Florida and throughout the Gulf of Mexico.

Catch records of 326 specimens are shown in Table 36. The species is much more abundant on the beach than M. saxatilis and is about as plentiful as Umbrina coroides. Springer and Woodburn (1960: 59-60) reported that the

species was common in the Tampa Bay area along the Gulf beaches, and discussed its spawning and growth.

TABLE 36.--Catch records of *Menticirrhus littoralis*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
15 Aug. 1958	9	17	41-108	-	-
2 July 1960	9	46	26-131	28.7	35.5
5 July 1960	9	60	15-169	31.0	37.5
11 July 1960	9	25	30-124	29.0	37.7
30 July 1960	9	47	20-76	28.0	37.3
10 Aug. 1960	9	29	17-87	28.8	37.1
12 Sept. 1960	9	4	34-49	23.0	37.1
22 Oct. 1960	9	43	16-150	28.0	34.1
11 April 1964	9	15	29-109	30.0	36.6
21 Aug. 1964	9	36	40-124	-	-
22 Aug. 1964	9	4	43-77	29.5	37.1

*Menticirrhus saxatilis* (Bloch and Schneider) Northern kingfish

RANGE: Maine to Florida.

*M. saxatilis* is not as common as *M. littoralis* or *Umbrina coroides*, with which it is associated.

The species was taken only at Station 9 on the beach and 31 specimens (15-152 mm) were collected. Temperature range 28 - 31° C.; salinity range 35.5 - 37.7 ‰. The smallest specimens were taken on 5 July 1960.

Micropogon undulatus (Girard) - Atlantic croaker

RANGE: Massachusetts to Argentina (40° S.) and throughout the Gulf of Mexico.

The croaker is common in the Loxahatchee River and large adults are frequently caught by local fishermen. Catch records of 58 specimens (15-432 mm) are shown in Table 37.

TABLE 37.---Catch records of Micropogon undulatus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
25 Nov. 1960	6	7	15-33	24.0	16.6
26 Dec. 1960	6	20	17-34	18.0	24.2
30 Dec. 1960	1	1	36	20.0	23.9
29 Jan. 1961	4	4	27-34	20.0	28.8
5 Jan. 1963	.a	9	8-17	-	-
6 July 1963	7	2	340±	31.0	19.3
23 Aug. 1964	4	8	241-300	-	-
24 Aug. 1964	6	3	358-370	31.0	-
27 Nov. 1964	6	2	262-293	-	-
27 Dec. 1964	6	2	260-274	23.8	-

<sup>a</sup>2-1/2 miles west of Jupiter Inlet off Pennock's Point.

Gunter and Hall (1963a: 266-269), Springer and Woodburn (1960: 60-62), and Gunter (1945: 71-73) discussed spawning and growth of the croaker in St. Lucie, the Tampa Bay area and Texas.

Gunter (loc. cit.) reported that few fish more than two years old and 290 mm in length survive, and these large fish were referred to as "golden croakers". Gunter and Hall (loc. cit.) reported taking a number of individuals of that size or longer, and noted that several of their specimens were larger than any seen by Gunter (loc. cit.) in Texas. No explanation for the greater frequency of large individuals was given. A large proportion of large adults was also noted at Jupiter. Tabb and Manning (1961: 628) reported that the species is rare in Florida Bay.

The color pattern of Jupiter specimens is different from that of northern Gulf coast specimens and resembles that of the Caribbean species, M. furnieri.

Pogonias cromis (Linnaeus) - Black drum

RANGE: Massachusetts to Argentina (40° S.) and the northern and eastern Gulf of Mexico. [Occasionally taken as far north as Canada (Bleakney, 1963: 173)].

Fourteen specimens (90-310 mm) were collected in the southwest branch at Stations 6 and 7 in July, 1963; November and December, 1964; and January, 1965. Other specimens include: one (173 mm) taken at the inlet in October, 1960; one (153 mm) from the river near the U.S. 1 bridge in November, 1960 and two (205, 218 mm) from the railroad bridge station in January, 1965. Large juveniles



and young adults are common at the railroad bridge station in January. Temperature range 25 - 31° C.; salinity range 19.3 - 30.2 ‰.

The occurrence of young and juveniles in brackish water was discussed by Frisbie (1961); however, I took no specimens smaller than 90 mm from the river and Gunter and Hall (1963a: 269) did not collect specimens smaller than 205 mm at St. Lucie. The smallest specimen taken by Springer and Woodburn (1960: 63) at Tampa Bay was 143 mm. Simmons and Breuer (1962: 196) reported that standard lengths of 140 - 180 mm are reached in one year; 210 - 250 mm in one and one-half years, and 290 - 330 mm in two years. It seems therefore that the nursery areas for the Black drum in south Florida are not yet known. Simmons and Breuer (op. cit.: 208) also reported that there is little movement of Black drum from bay to bay or from the bays to the Gulf in Texas.

Sciaenops ocellata (Linnaeus) - Red drum (Channel bass)

RANGE: Massachusetts to Florida and west along the Gulf coast to Tampico, Mexico; probably present at Tuxpan (Simmons and Breuer, 1962: 185).

Catch records of 43 specimens are shown in Table 38.

Adult Channel bass are not abundant in the study area although fishermen occasionally make good catches. Juveniles were common during the winter in the southwest branch,

but few were found elsewhere. Simmons and Breuer (op. cit.: 187) stated that juveniles are found in protected water with little wave action. They also noted that "there is a distinct avoidance of currents and a preference for isolated grassy clumps or slightly muddy bottom." This type of habitat is abundant in the southwest branch of the river.

TABLE 38.--Catch records of *Sciaenops ocellata*

Date	Station	No. of Specimens	SL(mm)	Temp. °C.	Sal. ‰
26 Nov. 1960	7	3	15-38	24.5	10.7
26 Dec. 1960	6	1	23	18.0	24.2
26 Dec. 1960	4	1	29	18.5	31.9
31 Dec. 1960	2	1	21	24.0	33.5
1 Jan. 1961	7	8	27-52	22.0	30.2
11 Feb. 1961	6	7	36-69	19.0	19.7
7 Sept. 1963	2	1	610-660	-	-

Juveniles first appeared in the collections in November. Gunter and Hall (1963a: 269) collected juveniles in October. Springer and Woodburn (1960: 63) believed spawning took place in their area in late September or early October. Tabb and Manning (1961: 628) reported a ripe male in mid-November in Florida Bay.

Umbrina coroides Cuvier - Sand drum

RANGE: Chesapeake Bay to Brazil (Carter R. Gilbert,  
personal communication).

Catch records of 392 specimens are shown in Table 39.

TABLE 39.--Catch records of Umbrina coroides

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
15 Aug. 1958	9	193	41-86	-	-
2 July 1960	9	1	44	28.7	35.5
5 July 1960	9	56	43-76	31.0	37.5
30 July 1960	9	67	45-84	28.0	37.3
10 Aug. 1960	9	56	55-89	28.8	37.1
12 Sept. 1960	9	11	53-101	23.0	37.1
26 Nov. 1960	2	1	230	26.0	33.5
31 Dec. 1960	2	2	21-23	21.0	32.3
11 April 1964	9	1	58	30.0	36.6
21 Aug. 1964	SC4	2	47-59	-	-
22 Aug. 1964	SC5	2	61-69	29.5	37.1

This species is found along the beach and is often taken in the inlet over sandy bottom. It is not known to enter the Intracoastal Waterway or the Loxahatchee River. It attains a larger size than the Meniticirrhus with which it is associated, and is probably an active competitor. Dr. Carter R. Gilbert, who recently completed a revision

of the genus, informs me that Jupiter Inlet is probably near the northern extreme of the normal range of the species.

#### MULLIDAE - GOATFISHES

Pseudupeneus maculatus (Bloch) - Spotted goatfish

RANGE: New Jersey and Bermuda to Santos, Brazil; the western Caribbean sea and throughout the Gulf of Mexico (Caldwell, 1962: 407).

One specimen (43 mm) was taken in the inlet by dipnet on 3 September 1961. Temperature 29° C.; salinity 36.8 ‰. The color pattern exhibited was that described by Caldwell (op. cit.: 419) for specimens still in the pelagic phase of life.

#### SPARIDAE - PORGIES

Archosargus probatocephalus (Walbaum) - Sheepshead

RANGE: Nova Scotia to Florida and throughout the Gulf of Mexico.

Sheepshead are common throughout the study area. Relatively few specimens were collected but the species has been observed on numerous occasions. Catch records of the 11 specimens (41-302 mm) are shown in Table 40.

The species was frequently observed in water of low salinity and is euryhaline (Gunter, 1956: 350). Adult

sheepshead were abundant in the inlet in April, 1965 and this may have been a spawning aggregation. Spawning takes place in the spring in the Tampa Bay area, but Springer and Woodburn (1960: 65) were not able to determine the site of spawning. Most of my specimens are consistent with the length-frequency diagram presented by Springer and Woodburn (loc. cit.) with the exception of the 71 mm specimen collected in August.

TABLE 40.--Catch records of Archosargus probatocephalus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
3 July 1960	2	1	210	30.0	37.0
3 Aug. 1960	4	1	256	31.0	7.3
7 Aug. 1960	5	3	41-47	34.0	19.6
30 Dec. 1960	1	1	302	20.0	23.9
11 Feb. 1961	6	1	84	19.0	21.0
30 Aug. 1964	SC6	1	71	-	-
27 April 1965	2	3	184-289	-	-

Archosargus rhomboidalis (Linnaeus) [ = A. unimaculatus (Bloch)] - Sea bream

RANGE: New Jersey to Rio de Janeiro and the eastern Gulf of Mexico, and west to Yucatán.

(One adult (270 mm) was seined on a grass bed, 0.3 miles west of the inlet on 9 August 1960 (Special Collection 1). Temperature 31.3° C.; salinity 28.1 ‰.

A second specimen (262 mm) was speared at the railroad bridge on 28 May 1965. Four adults and a juvenile were observed in the inlet along the south jetty on 10 April 1965. Dr. David K. Caldwell informs me that these are the first records in Florida north of the Upper Keys. Most local fishermen do not know the species.

Calamus arctifrons Goode and Bean - Grass porgy

RANGE: Florida to Ilha Grande, Brazil and the northeastern Gulf of Mexico.

Grass porgies are rare in the study area. One specimen (37 mm) was collected at the county line station on 6 July 1960 another too small for positive identification (14 mm), was taken at Station 4 in the river on 21 May 1961. Temperatures 31 and 28° C.; salinities 34.8 and 35.9 ‰. Several Grass porgies were observed on one occasion at the railroad bridge station but none were captured.

The species is common in the Florida Keys as far north as the Miami area; however, I consider these examples to be strays.

Diplodus caudimacula (Poey) - (Spots)

RANGE: Not yet defined.

Catch records of the 36 specimens (11-205 mm) collected are shown in Table 41.

TABLE 41.--Catch records of *Diploodus caudimacula*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
4 July 1960	2	5	33-65	30.0	37.2
26 July 1960	. <sup>a</sup>	8	79-102	30.0	36.3
25 Nov. 1960	2	1	204	26.0	33.5
31 Dec. 1960	2	1	205	21.5	35.5
29 Jan. 1961	2	1	187	20.5	36.2
30 April 1961	2	2	43-49	27.0	37.3
28 May 1961	2	4	25-28	26.0	35.8
1 Oct. 1961	2	2	54-58	27.8	26.4
17 July 1963	. <sup>b</sup>	1	95	32.0	32.3
14 April 1964	2	10	11-35	27.25	36.2
22 Aug. 1964	SC5	1	77	29.5	37.1

<sup>a</sup>South Jupiter Island Bridge, Intracoastal Waterway.

<sup>b</sup>Under U.S. 1 Bridge.

Dr. David K. Caldwell of the Los Angeles County Museum informs me (personal communication) that the species found in this area is not *D. holbrooki*. The growth of the species was found to be different than that described by Caldwell (1955) for *D. holbrooki*.

This species is common around the inlet jetties and under the bridge to Jupiter Island just north of the inlet. Large adults are occasionally taken in the inlet.

Lagodon rhomboides (Linnaeus) - Pinfish (Sailor's Choice)

RANGE: Massachusetts and Bermuda to Florida and throughout the Gulf of Mexico.

Approximately 2000 specimens (15-153 mm) were collected. Temperature range 18 - 34° C.; salinity range 4.5 - 38.8 ‰.

Pinfish is one of the most abundant species found in the Jupiter area. It is a year-round resident of the area and specimens were collected at least twice from all stations, including the open beach. Specimens were most frequently taken at the county line station and Station 4 in the river.

Most of my specimens were juveniles as the smallest sexually mature fish seen by Caldwell (1957: 124) was 128 mm. Specimens of this size or larger were most frequently taken at the inlet and the railroad bridge station.

Breeding is believed to take place offshore and Caldwell (op. cit.: 121) reported that postlarvae (11 mm) first appeared at Cedar Key in early December. I have records of 15 specimens (11-16 mm) in the end of December. Specimens 20 mm or less were taken from December to May. Springer and Woodburn (1960: 66) reported similar records at Tampa Bay. Caldwell (loc. cit.) believed spawning continued from mid-October to March.



## KYPHOSIDAE - SEA CHUBS

Kyphosus incisor (Cuvier) - Yellow chub

RANGE: Both sides of the Atlantic; in the western Atlantic from Woods Hole, Massachusetts, Bermuda and the Bahamas to Porto Inhuama, Brazil (Moore, 1962: 454).

This is the most common species of Sea chub in the area, and all specimens reported here were taken in the inlet. Moore (loc. cit.) reported three specimens (8.5-19.9 mm) taken at Jupiter in the months of July, August, and December, 1958, one of four inshore records of the species in Florida. Nine specimens (11-26 mm) were taken in August, September, and November, 1961 by Mrs. Susan Kindt. Nine additional specimens (13-26 mm) were taken on 3 September 1961. Temperature 29° C.; salinity 36.8 ‰. One adult (297 mm) was speared on 1 August 1963. This specimen exceeds by 45 mm the largest seen by Moore (loc. cit.) in his study. Previously the only known specimens larger than 150 mm were from Tortugas, Florida (3); Nassau, Bahamas (1); and Porto Inhuama, Brazil (1). Several juveniles (probably this species) approximately 100 to 150 mm in length were seen in the inlet on 10 April 1965.

Juveniles of this species, like its congener, K. sectatrix, are members of the Sargassum community and exhibit a color pattern very similar to that described by Randall and Randall (1960: 472) for K. sectatrix. Moore

(op. cit.: 466) could not determine when this juvenile color pattern is lost.

Kyphosus sectatrix (Linnaeus) - Bermuda Chub

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Massachusetts to Brazil and the northern Gulf of Mexico (modified from Briggs, 1958: 282).

Moore (1962: 453) reported one specimen (22.5 mm) of K. sectatrix from Jupiter Inlet. At that time the specimen constituted the only record of the species in the area and one of three records in Florida. One additional specimen (17 mm) was taken from the inlet on 3 September 1961. Temperature 29° C.; salinity 36.8 ‰.

Juveniles of this species are members of the Sargassum complex (although not mentioned by Adams, 1960: 81) and up to 75 mm exhibit a color pattern resembling seaweed (Randall and Randall, 1960: 472; Moore, 1962: 457).

As yet there is no evidence that adult Bermuda chubs live in the area.

Dawson (1963a: 81) cited several records of the species from the Florida Gulf coast and the northern Gulf of Mexico not mentioned by Moore (1962: 459).

## EPHIPPIDAE - SPADEFISHES

Chaetodipterus faber (Broussonet) - Atlantic spadefish

RANGE: Massachusetts to Santos, Brazil and throughout the Gulf of Mexico.

Thirty-eight specimens (8.1-311 mm) were collected from the study area. Temperature range 24.5 - 31.3° C.; salinity range 4.5 - 37.0 ‰.

Juvenile Spadefish are common in the study area from August to November. They are especially abundant in August when the smallest specimens were taken. These juveniles were collected at all stations except Station 9 on the beach. Large juveniles and adults (127-303 mm) are common in the inlet during the summer months and one specimen (311 mm) was collected from the oyster bars near Station 3 in April. As diving conditions in the inlet are not generally good during the winter months, I am not able to say whether they remain there during the entire year. Schwartz (1960: 123) stated that throughout their range Spadefish were not known to inhabit waters less than 36 feet deep during the winter. Tabb and Manning (1961: 632) reported that in Florida Bay, which averages less than 6 feet in depth, Spadefish were most abundant during the fall and winter. Spadefish have been reported at St. Lucie in March, 1960 (Springer, 1960: 13) and January, 1957 (Gunter and Hall, 1963a: 271-272). At Lower Matecumbe

Key Springer and McErlean (1962a: 44) took juveniles from October to December, 1960. It seems therefore that Spadefish may seek deeper water during the winter in the northern part of their range and on the Gulf coast of Florida as far south as the Tampa Bay area, but not necessarily on the lower east coast and the southern tip of Florida.

CHAETODONTIDAE - BUTTERFLYFISHES

Chaetodon capistratus Linnaeus - Foureye butterflyfish

RANGE: Massachusetts to the Lesser Antilles and Panama.

Also known from near Puerto Limón, Costa Rica  
(Caldwell, 1963a: 6).

One example (15 mm) was taken in the inlet in the period from September to November, 1958 by Mrs. Susan Kindt. Adult Chaetodon are not known in the area.

Chaetodon ocellatus Bloch - Spotfin butterflyfish

RANGE: Massachusetts to Mamanguape, Brazil, and widespread in the Gulf of Mexico. Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963a: 7).

One specimen (14 mm), identified by Dr. David K. Caldwell, was taken from the inlet in August, 1958 by Mrs. Susan Kindt. The species is considered a stray in the area.

Holacanthus ciliaris (Linnaeus) - Queen Angelfish

RANGE: Jupiter Inlet through the Florida Keys and the northeastern and southwestern Gulf of Mexico to Bahia, Brazil (modified from Briggs, 1958: 282).

One example (110 mm) was taken in the inlet on 14 April 1964. Temperature 27.5° C.; salinity 36.6 ‰. Two juveniles were observed in the inlet on 10 April 1965. The species is not common in the area, and this record extends the northerly range of the species on the Atlantic coast of Florida.

Pomacanthus arcuatus (Linnaeus) - French angelfish

RANGE: New York to Rio de Janeiro and the southwestern Gulf of Mexico. Also reported from the northeastern Gulf of Mexico (Caldwell, 1963b: 188) and Caledonia Bay, Panama (Caldwell and Caldwell, 1964: 25).

Catch records of specimens of French angelfish are shown in Table 43. The two largest specimens were collected with a speargun and the remainder with rotenone. Identification of juveniles and adults was accomplished with descriptions given by Longley and Hildebrand (1941: 151). The species is not uncommon in the inlet and frequently ventures into the Intracoastal Waterway where it is found around bridges. Because of their beauty, juveniles are much sought after by local aquarists.

TABLE 42.--Catch records of Pomacanthus arcuatus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
3 July 1960	2	1	142	30.0	37.0
1 Oct. 1961	2	3	47-71	27.8	26.4
14 April 1964	2	2	18-67	27.5	36.6
22 Aug. 1964	2	4	34-52	30.5	33.8
10 April 1965	2	1	194	-	-

## POMACENTRIDAE - DAMSELFISHES

Fishes in the genus Abudefduf were identified with the aid of Longley and Hildebrand (1941). All of the specimens in the genus Eupomacentrus were identified by Dr. Loren P. Woods of the Chicago Natural History Museum.

Abudefduf saxatilis (Linnaeus) - Sergeant major

RANGE: Both sides of the Atlantic and the eastern Pacific; in the western Atlantic from Rhode Island and Bermuda to Uruguay and throughout the Gulf of Mexico.

Table 43 shows the catch records for the 202 specimens of A. saxatilis. This abundant species is restricted to waters of high salinity, but will tolerate lower salinities for short periods of time. A. saxatilis is much more aggressive than A. taurus and is often observed swimming in midwater or feeding near the surface.

TABLE 43.---Catch records of Abudefduf saxatilis

Date	Station	No. of Specimens	SL(mm)	Temp. °C.	Sal. ‰
13 Sept. 1959	2	5	90-103	-	-
2 July 1960	2	29	79-115	31.0	25.8
4 July 1960	2	5	85-109	30.0	37.2
30 Aug. 1960	2	19	75-118	30.3	28.8
22 Oct. 1960	2	8	88-118	27.0	25.1
31 Dec. 1960	2	15	108-123	21.5	35.5
1 Jan. 1961	2	8	92-125	22.0	34.9
29 Jan. 1961	2	3	108-123	20.5	36.2
19 Feb. 1961	2	7	87-116	25.0	35.8
29 June 1961	2	2	111-119	29.0	34.8
14 Aug. 1961	2	3	11	-	-
3 Sept. 1961	2	3	9-18	29.0	36.8
10 Sept. 1961	3	3	36-61	32.0	32.3
1 Oct. 1961	2	1	89	27.8	24.4
26 Nov. 1961	2	3	20-24	-	-
23 June 1963	3	9	19-53	31.0	35.5
12 April 1964	3	14	39-66	26.5	35.7
14 April 1964	2	14	13-97	27.25	36.2
14 April 1964	2	4	15-27	27.5	36.6
21 Aug. 1964	SC4	2	47-64	28.5	36.6
22 Aug. 1964	SC5	34	23-81	30.5	33.8
5 Jan 1965	2	11	19-102	-	-

Longley and Hildebrand (1941: 184) observed spawning repeatedly at Tortugas in June, July, and August.

Abudefduf taurus (Müller and Troschel)

RANGE: Jupiter Inlet to the Lesser Antilles (modified from Briggs, 1958). Also recorded from Caledonia Bay, Panama (Caldwell and Caldwell, 1964) and near Puerto Limón, Costa Rica (Caldwell, 1963a).

Eight specimens were taken in the inlet: October, 1961 (1, 21 mm); April, 1964 (2, 42-66 mm); August, 1964 (4, 36-63 mm) and January, 1965 (1, 70 mm). One specimen (90 mm) was taken at the railroad bridge station in June, 1963. Temperature range 27.7 - 30.5° C.; salinity range 27.5 - 36.2 ‰. Several individuals were seen along the south jetty as late as April, 1965.

If not immediately identified in the field by its color pattern of brown bars with cream-colored interspaces, the behavior of A. taurus will often aid the observer in recognition. A. taurus is a timid fish when compared with the boldness exhibited by A. saxatilis. At the approach of a diver it quickly darts into the nearest rock crevice and usually remains there unless able to find an inconspicuous rear exit. A. saxatilis is not especially frightened by divers and sometimes will make some small attempt to defend its territory from the intruder. A. taurus seldom ventures more than a few feet from the rocks,



whereas A. saxatilis is often seen feeding on the surface of at some distance from the jetty. Other aspects of its behavior are discussed by Longley and Hildebrand (1941: 185-186).

Eupomacentrus dorsopunicans (Poey) [= (in part) P. fuscus Cuvier and Valenciennes of Rivas (1960)] Dusky damselfish

RANGE: Greater Antilles through the Bahamas and the Florida Keys to Jupiter Inlet, Florida (L. P. Woods, personal communication).

Catch records of 38 specimens (28-90 mm) are shown in Table 44.

TABLE 44.--Catch records of Eupomacentrus dorsopunicans

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
4 July 1960	2	3	77-85	30.0	37.2
30 Aug. 1960	2	1	83	30.3	28.8
1 Oct. 1961	2	1	42	27.8	26.4
23 June 1963	3	4	49-60	31.0	35.5
12 April 1964	3	1	31	26.5	35.7
14 April 1964	2	7	28-86	27.25	36.2
14 April 1964	2	20	28-90	27.5	36.6

The species is the second most common member of its genus and quite common in the inlet. In the field, juveniles (about 30 mm) may be recognized by the narrow black bars

on the sides, a large black spot on the soft dorsal which extends down onto the back, and a rust-colored nape, a distinctive field character. Like E. variabilis, occasional specimens are taken on hook and line.

Loren P. Woods (personal communication) believes that the name fuscus should be restricted to South American specimens, a view not shared by Rivas (1960: 141) who placed dorsopunicans in synonymy with fuscus. Rivas (op. cit.: 144) listed specimens from as far north as the Bahamas and Biscayne Bay.

Eupomacentrus leucostictus (Müller and Troschel) -  
Beaugregory

RANGE: Both sides of the Atlantic; in the western Atlantic from Maine and Bermuda to Bahia, Brazil and the eastern and southwestern Gulf of Mexico.

The Beaugregory is the least common Damselfish in the area. Three specimens (28-61 mm) were taken in the inlet in April, 1958 and August, 1964 and 23 specimens (19-82 mm) from the railroad bridge station in September, 1961, June, 1963, and April, 1964. Temperature range 26.5 - 32° C.; salinity range 32.3 - 35.7 ‰.

Juveniles of this handsome species are sought after for aquarium fishes. In an aquarium they are aggressive and exhibit strong territoriality.

Eupomacentrus variabilis (Castelnau) - Cocoa damselfish

RANGE: Near Jupiter Inlet, Florida and the Bahamas to Bahia, Brazil and the southwestern and northeastern Gulf of Mexico (modified from Briggs, 1958: 283).

Catch records of 162 specimens (12-104 mm) are shown in Table 45. Easily the most common member of its genus, it was observed in the Intracoastal Waterway about 1/2 mile north of the inlet as well as the localities listed in Table 45. A number of adults were taken on hook and line baited with pieces of shrimp although it is usually considered to be a vegetarian species. Juveniles of this species have a color pattern similar to E. leucostictus and are often kept in salt water aquaria. Local collectors usually do not distinguish between the two species.

The range given above was modified from Pomacentrus xanthurus, considered by Rivas (1960: 147) to be a synonym of P. variabilis. Tortugas was the only Florida locality given by Briggs. Rivas (op. cit.: 151) listed specimens as far north as Boca Raton Inlet, Florida and the Bahamas. The Jupiter specimens then constitute an extension of range for the species.

TABLE 45.---Catch records of Eupomacentrus variabilis

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
4 April 1958	2	1	41	-	-
Aug. 1958	2	4	15-28	-	-
Nov. 1958	2	5	14-22	-	-
26 April 1959	2	1	83	-	-
30 Aug. 1959	2	3	39-92	-	-
1 Jan. 1960	2	1	89	22.0	34.9
4 July 1960	2	1	81	30.0	37.2
24 July 1960	3	1	64	32.0	14.1
22 Oct. 1960	2	2	85-98	27.0	25.1
10 Sept. 1961	3	1	48	32.0	32.3
1 Oct. 1961	2	14	35-104	27.8	26.4
23 June 1963	3	22	12-80	31.0	35.5
12 April 1964	3	13	41-82	26.5	35.7
14 April 1964	2	3	77-91	27.25	36.2
14 April 1964	2	8	63-98	27.5	36.6
22 Aug. 1964	2	79	36-90	30.5	33.8
5 Jan. 1965	2	3	16-49	-	-

## LABRIDAE - WRASSES

Doratonotus megalepis Günther - Dwarf wrasse

RANGE: Bermuda and Jupiter Inlet to the Lesser Antilles  
and Panama (modified from Briggs, 1958: 283).

One example (16 mm) was taken at the county line station on 30 July 1960. Another (19 mm) was taken on 12 September 1960. Two consecutive collections (Special Collections 4 and 5) made in August, 1964 on Jupiter Island at the south end of Big Blowing Rocks produced 13 specimens (19, 23-38 mm). Temperature range 27.25 - 29.5° C.; salinity range 29.9 - 37.1 ‰. The specimens collected by Springer and McErlean (1962a: 45) and Longley and Hildebrand (1941: 198) were all taken in grass beds as were the two juveniles taken at the county line station. At the south end of Big Blowing Rocks where the species was abundant, there are few small crevices to provide cover, and no grass of any kind.

These records extend the range of the species northward from the Florida Keys.

Halichoeres bivittatus (Bloch) - Slippery dick

RANGE: North Carolina and Bermuda to Ilha Victoria, Brazil, and the northeastern and southwestern Gulf of Mexico.

Slippery dicks were found inshore only within the area from the inlet west to the railroad bridge station and north to Station 9 in the Intracoastal Waterway; fifty-three specimens (23-173 mm) were collected. An additional 16 specimens (29-72 mm) were taken at the south end of Big Blowing Rocks in August, 1964. Temperature range 26.5 - 32° C.; salinity range 25.1 - 37.2 ‰.

I found adults only in areas with oyster shell or rock bottoms; juveniles were occasionally taken in grass beds.

The degree of pigmentation varies greatly from one individual to another. Several adults taken from the inlet had the black lateral bands so well-developed that the other colors on the side were almost completely obscured. In other specimens of comparable size they were faint. The following color notes were made from a 27 mm specimen taken at Station 9 in August, 1960: Body tinted with orange, especially the fins; black spot at base of last dorsal ray; dorsal spot with clear ocellus; lateral band behind pectoral fin lacking.

Longley and Hildebrand (1941: 101-102) reported that the species was common at Torgugas, and was found both over grassy bottoms and over coral stacks. Ripe fish were reported in July. Springer and Woodburn (1960: 69) reported that it was one of the most abundant species offshore in the Tampa Bay area, but infrequent inshore.

The species is found in the Alligator Harbor area during the summer months.

#### SCARIDAE - PARROTFISHES

Fishes in this family were identified with the aid of Schultz (1958).

Cryptotomus roseus Cope - Bluelip parrotfish

RANGE: Bermuda and Jupiter Inlet, Florida to Bahia, Brazil  
(modified from Briggs, 1958: 284).

This scarid occurs seasonally on the grass beds in the Intracoastal Waterway. Twenty-two specimens (15-44 mm) were collected at the county line station from July to November, 1960 and in May and June, 1961. Temperatures, salinities, and size ranges taken each month are shown in Table 61.

One specimen (18 mm) was taken at Station 8 in August, 1960. Temperature 29° C.; salinity 31.5 ‰.

Longley (1941: 205-206) noted that the breeding season extends from June to August and that females are sexually mature at a length of 62 mm.

Young of this species are sometimes difficult to separate from young of Nicholsina usta.

These records extend the range of the species northward from the Florida Keys.

Nicholsina usta (Valenciennes) - Emerald parrotfish

RANGE: New Jersey to Rio de Janeiro, and the northeastern and southwestern Gulf of Mexico.

Catch records of the 72 specimens (15-108 mm) collected are shown in Table 46.

TABLE 46.--Catch records of Nicholsina usta

Date	Station	No. of Specimens	SL(mm)	Temp. °C.	Sal. ‰
4 April 1958	2	1	59	-	-
26 Dec. 1959	1	3	16-28	-	-
27 Dec. 1959	1	19	17-45	-	-
7 July 1960	1	16	16-44	31.0	34.8
30 July 1960	1	11	16-108	28.0	36.6
10 Aug. 1960	8	1	31	32.0	36.3
11 Aug. 1960	1	9	21-47	30.5	36.7
12 Sept. 1960	1	7	27-41	27.25	29.9
16 Oct. 1960	1	5	37-51	27.0	24.1
20 Nov. 1960	1	3	15-45	25.0	25.2
29 April 1961	1	1	23	25.0	37.3
27 June 1961	1	5	22-70	27.0	36.8

The Emerald parrotfish has a seasonal occurrence at Jupiter and all of the specimens were judged to be juveniles. The species is restricted to the inlet and the Intracoastal Waterway.

Young of this species are often difficult to distinguish from young Cryptotomus roseus, and a few of the specimens recorded may be that species.



Scarus croicensis Bloch - Striped parrotfish

RANGE: Massachusetts and Bermuda to Maceió, Brazil, and the eastern and southwestern Gulf of Mexico.

This species was taken seasonally, from May to October. It is restricted to areas of high salinities and was rarely taken in waters of less than 29 ‰. All of the larger specimens were taken at the railroad bridge station. Catch records of 117 specimens (12-85 mm) are shown in Table 47.

TABLE 47.--Catch records of Scarus croicensis

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
3 July 1960	2	1	21	36.0	-
6 July 1960	1	6	13-21	31.0	34.8
9 July 1960	2	7	17-35	32.0	29.3
30 July 1960	1	31	16-31	28.0	36.6
11 Aug. 1960	1	34	14-34	30.5	36.7
10 Sept. 1960	3	10	24-67	32.0	32.3
12 Sept. 1960	1	5	18-31	27.25	29.9
16 Oct. 1960	1	1	18	27.0	24.1
21 May 1961	4	1	16	28.0	35.9
21 May 1961	5	2	12-16	28.0	36.0
27 June 1961	1	5	15-18	27.0	36.8
23 June 1963	3	14	22-85	31.0	35.5

All of my specimens are young and juveniles. The smallest specimen (12 mm) was taken in March. Little is known of the reproduction of this species. Randall and Randall (1963: 53-54) observed spawning of S. croicensis in March in the Virgin Islands. Courtship behavior was seen during the months of February, March, April, June, and August, but they noted that these dates of observations were not intended to indicate a spawning season.

Randall (1963b: 228-229) demonstrated a meristic difference between S. croicensis and S. taeniopterus, a form which it resembles closely.

Scarus guacamaia Cuvier - Rainbow parrotfish

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Jupiter Inlet to Argentina and west to Yucatán (modified from Briggs, 1958: 284).

Juvenile Rainbow parrotfish were common around the oyster bars at the railroad bridge station where 88 specimens (49-108 mm) were collected in September, 1961; June, 1963; and April, 1964. Two specimens (220, 86 mm) were taken at the inlet in July, 1960 and January, 1965. One juvenile (49 mm), probably a stray, was collected at the county line station in July, 1960. Few juvenile parrotfish were observed in the inlet. Temperature range 26.5 - 31° C.; salinity range 32.3 - 37.5 ‰.

These records extend the range of the species northward from the Florida Keys. Randall (1963) presented notes on coloration of the species, and demonstrated meristic separation between S. guacamaia and S. coelestinus.

Sparisoma sp. - Parrotfish

Included under this name are juveniles of S. chrysopterum, S. radians, and S. rubripinne which were too small for specific identification. All specimens were taken at the county line station except 11 juveniles (19-34 mm) taken at the south end of Big Blowing Rocks in Special Collections 4 and 5. Details of temperature, salinity, and size ranges are found in Table 61. Records of these specimens are included to allow comparison with a similar table by Springer and McErlean (1962a: 42-55).

Sparisoma chrysopterum (Bloch and Schneider) - Redtail parrotfish

RANGE: Jupiter Inlet, Florida, to Bahia, Brazil (modified from Briggs, 1958: 284).

This appears to be the rarest scarid in the study area and probably occurs here only seasonally. It may be more numerous but small juveniles are difficult to separate from juvenile S. rubripinne because the shape of the head and the dorsal cirri have not yet fully developed.

One specimen (48 mm) was taken at Station 8 on 23 August 1960. An additional 29 specimens (53-113 mm) were collected at the railroad bridge station on 10 September 1961.

Temperatures 29 and 32° C.; salinities 31.5 and 32.3 ‰.

These records extend the range of the species northward from Lower Matecumbe Key where Springer and McErlean (1962a: 52) reported numerous specimens.

Sparisoma radians (Valenciennes) - Bucktooth parrotfish

RANGE: Both sides of the Atlantic; in the western Atlantic from southern Florida to Bahia, Brazil, and the western Gulf of Mexico.

This species occurs seasonally at the county line station. Thirty-three specimens (27-75 mm) were collected from July to October, 1960 and in May and June, 1961. Temperatures, salinities and monthly size ranges may be found in Table 61.

Springer and McErlean (1962a: 53) took specimens within the same size range from June to December. Longley (1941: 210) stated that the species abounds at Tortugas. He noted that females are mature at 70 mm or less and are ripe in July. Eggs were reported to be pelagic.

Sparisoma rubripinne (Valenciennes) - Redfin parrotfish

RANGE: Massachusetts and Bermuda to Rio de Janeiro and west to Yucatán. Also from San Thomé Island, West Africa. (Bauchot and Blanc, 1961: 6)

This species, like others in its family, is restricted to areas of high salinity and was taken on only three occasions in salinities of less than 30 ‰. Similar observations were made by Tabb and Manning (1961: 633). Juveniles were frequently taken on grass beds and about oyster bars from April to November. Springer and McErlean (1962a: 53) reported juveniles of S. rubipinne from May to February of 1960-61 at Lower Matecumbe Key. Adults are usually found in the inlet and occur there at least until December. Catch records of the 63 specimens (24-334 mm) are shown in Table 48.

The problem of identifying young Sparisoma is discussed under S. chrysopterum and S. radians. Some of the specimens less than 40 mm identified as S. rubripinne may be these species.

Several adults taken in the inlet were in the "axillare" phase described by Randall (1963b: 234). Numerous individuals observed in the inlet displayed the color pattern illustrated in Plate III C of the same paper. Observations on spawning and growth of the species are given by Randall and Randall (1963).

TABLE 48.--Catch records of Sparisoma rubripinne

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
30 July 1960	1	11	28-68	28.0	36.6
10 Aug. 1960	8	2	34-72	32.0	36.3
11 Aug. 1960	1	3	47-63	30.5	36.7
16 Oct. 1960	1	16	24-58	27.0	24.1
26 Nov. 1960	1	3	35-51	25.0	25.2
31 Dec. 1960	2	1	334	21.0	32.3
29 Jan. 1961	2	1	314	20.5	36.2
21 May 1961	4	2	25-31	28.0	35.9
10 Sept. 1961	3	8	73-118	32.0	32.3
1 Oct. 1961	2	1	103	27.8	26.4
23 June 1963	3	9	32-80	31.0	35.5
12 April 1964	3	2	102-154	26.5	35.7
14 April 1964	2	1	189	27.25	36.2
22 Aug. 1964	2	3	78-105	30.5	33.8

## ACANTHURIDAE - SURGEONFISHES

Acanthurus bahianus Castelnau - Ocean Surgeon

RANGE: Massachusetts and Bermuda to Bahia, Brazil, and the southwestern Gulf of Mexico. Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963a: 8); Caledonia Bay, Panama (Caldwell and

Caldwell, 1964: 29); Ascension and St. Helena Island, and possibly from the western Indian Ocean (Smith, 1965: 110-111).

Two adults (both 210 mm) were speared on the south side of the inlet in August, 1963 and another specimen (91 mm) was taken with rotenone in August, 1964. The two larger specimens exceed by 40 mm the largest specimen seen by Randall (1956: 226) in his review of the genus. Smith (loc. cit.) reported specimens from the south Atlantic of 267 mm and ". . . about 270 mm in length

A juvenile (41 mm) was taken at the south end of Big Blowing Rocks in August, 1964 (Special Collection 5). Temperature range 28.5 - 30.5° C.; salinity range 33.8 - 36.6 ‰.

Adults are often seen in small schools in the inlet with A. chirurgus, a habit noted by Longley and Hildebrand (1941: 156) and Randall (op. cit.: 225). This species appears to be restricted to the jetty and reef areas.

Acanthurus chirurgus (Bloch) - Doctorfish

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Massachusetts to Rio de Janeiro and the northeastern and southwestern Gulf of Mexico. Also known from near Puerto Limón, Costa Rica (Caldwell, 1963a: 8).

During the summer months surgeonfish are common in the inlet feeding among the jetty rocks. In July, 1960 two adults (160, 177 mm) were speared on the south side of the inlet as were two others in August, 1963 (163 mm) and in April, 1965 (224 mm). The latter approaches the largest seen by Randall (1956: 224), 228 mm, collected in Panama. A fifth (116 mm) was taken with rotenone in August, 1964. Two specimens (58, 81 mm) were taken with rotenone, in June, 1963 and April, 1964 respectively, from the oyster bar at the F. E. C. RR bridge. Temperature range 26.5 - 31° C.; salinity range 33.8 - 37.5 ‰. All except one specimen were taken in water above 35 ‰ salinity, but the presence of this species at the railroad bridge suggests that it can tolerate lower salinities for short periods of time.

#### TRICHIURIDAE - CUTLASSFISHES

Trichiurus lepturus Linnaeus - Atlantic cutlassfish

RANGE: Atlantic, Indian, and western Pacific Oceans; in the western Atlantic from Massachusetts to Argentina and throughout the Gulf of Mexico.

Four specimens (857-933 mm TL) were received from fishermen at the south Jupiter Island bridge, 1/2 mile north of the inlet on 3 August 1961. The species is more common in the area than this record indicates as it is commonly taken by fishermen at night near the railroad bridge.



## ELEOTRIDAE - SLEEPERS

Dormitator maculatus (Bloch) - Fat sleeper

RANGE: North Carolina to Rio de Janeiro, and in the tributaries on all sides of the Gulf of Mexico.

Twenty-seven specimens (22-68 mm) of the fat sleepers were taken in eight collections in four localities.

Salinities recorded ranged from  $<1.0$  ‰ at the abandoned shellpits, 6 miles west of Jupiter to  $21.0$  ‰ in a drainage ditch (Station 6). Temperature range  $17 - 27^{\circ}$  C.

The species is not abundant but is widely distributed.

This species was not mentioned by Gunter (1956a) or Gunter and Hall (1963b), and should be added to the list of euryhaline fishes.

Eleotris sp. - Sleeper

RANGE: Widespread in tropical fresh waters; all species considered to be euryhaline.

Seven specimens (22-41 mm) were taken in Special Collection 2 on Jupiter Island on 15 April 1964. Temperature  $30^{\circ}$  C.; salinity  $36.6$  ‰.

The present taxonomic confusion regarding the number of species in this genus and their distribution makes a more specific identification impractical.

Erotelis smaragdus (Valenciennes) - Emerald sleeper

RANGE: St. Lucie Inlet, Florida to Natal, Brazil and the northern Gulf of Mexico (modified from Briggs, 1958: 287).

Catch records of 20 specimens (26-89 mm) are shown in Table 49.

TABLE 49.--Catch records of Erotelis smaragdus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. °/oo
4 April 1958	2	1	36	-	-
Sept. Nov. 1958	2	1	89	-	-
26 Dec. 1960	1	1	43	18.5	31.9
10 Sept. 1961	3	15	26-54	32.0	32.3
23 June 1963	3	1	41	31.0	35.5
12 April 1964	3	1	30	26.5	35.7

Springer (1960: 10) collected the species over mud bottom in the Indian River near St. Lucie Inlet in September, 1957. The temperature reported was 29.0° C. and the salinity 27.5 °/oo. The species has not been recorded in other recent surveys in Florida.

Ginsburg (1953a: 21) described the subspecies civitatum from the northern Gulf of Mexico (St. Vincent's Island), and designated Atlantic coast populations as the subspecies smaragdus.

Gobiomorus dormitor Lacépède - Bigmouth sleeper

RANGE: Atlantic slope from southern Florida and Texas to Surinam and the West Indian Islands (Miller, 1959: 5).

Two bigmouth sleepers were taken at Flood Gate S-46 on the C-18 canal. The first specimen (186 mm) was taken on hook and line on 26 July 1960. Temperature 29.5° C.; salinity 5.0 ‰. The second specimen (169 mm) was one of approximately 15 to 20 individuals seen on 25 April 1965 among the rocks at the base of the flood gate. These specimens were observed at night and nearly all were in water less than 4 inches deep.

## GOBIIDAE - GOBIES

Fishes in this family were identified with the aid of Ginsburg (1932, 1933a, and 1947) and Böhlke and Robins (1960).

Bathygobius soporator (Valenciennes) - Frillfin goby

RANGE: Both sides of the Atlantic; in the western Atlantic from North Carolina to Santos, Brazil, and throughout the Gulf of Mexico (modified from Briggs, 1958: 288).

Collections contained 329 specimens (14-79 mm). Temperature range 18 - 36+° C.; salinity range 10.5 - 38.8 ‰. Gunter and Hall (1963a: 273) reported one juvenile in water of 1.26 ‰.

The frillfin goby is one of the most abundant members of its family in the study area. It was found at all stations except Station 9 on the beach and Station 7. The lack of specimens from Station 7 is probably accidental.

The species was especially abundant at the jetties in the inlet and around the oyster bars at the railroad bridge station.

Springer and Woodburn (1960: 72) and I both noted gravid females in June. The species was not reported from Florida Bay.

Coryphopterus glaucofraenum Gill - Bridled goby

RANGE: North Carolina and Bermuda, Florida and the Bahamas, the Greater and Lesser Antilles and the islands off the Venezuelan coast, and the "hump" of Brazil (Böhlke and Robins, 1960: 110).

All of the 127 specimens (16-28 mm) collected were taken at the county line station in July, August, and September, 1960 and June, 1961. Temperature range 27 - 31° C.; salinity range 29.9 - 36.8 ‰.

This goby is noted for its occurrence in a wide variety of habitats, from murky embayments and canals to the white coral sand bottoms in clear water preferred by most other members of the genus (Böhlke and Robins, op. cit.: 111-112). It appears to be seasonal in the study area.

Evorthodus lyricus (Girard) - Lyre goby

RANGE: Chesapeake Bay to Dutch Guiana and throughout the Gulf of Mexico. Also reported from Tortuguero, Costa Rica (Caldwell, Ogren and Giovannoli, 1959: 28).

Table 50 gives the catch records of the 62 specimens.

TABLE 50.--Catch records of Evorthodus lyricus

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
21 Sept. 1957	2	1	45	-	-
20 Aug. 1958	2	1	27	-	-
24 July 1960	7	6	32-39	32.5	1.5
24 July 1960	4	1	30	33.0	10.5
7 Aug. 1960	6	1	40	33.0	10.2
7 Aug. 1960	5	2	36-52	34.0	19.6
28 Aug. 1960	5	2	20-47	30.0	4.5
11 Feb. 1961	6	22	21-42	19.0	21.0
15 April 1964	SC2	26	19-56	30.0	22.9

Lyre gobies have a wide distribution in the area and may be locally abundant. They show a preference for waters of lower salinity. The species was collected once by Springer (1960: 11) at St. Lucie, but has not been reported in any other recent Florida survey.

Growth and sexual characters of the lyre goby are discussed by Ginsburg (1931).

Gobioides broussonneti Lacépède - Violet goby

RANGE: Southeastern Florida to Rio de Janeiro and the northern Gulf of Mexico.

On 30 September 1963 one specimen (302 mm) of this large goby was collected by Frank Lund. The fish was found dying on a small mangrove island in the river approximately 1/4 mile west of the railroad bridge.

Thirteen specimens (250-590 TL), including the largest specimen ever recorded, were reported by Gunter and Hall (1963a: 275) from St. Lucie in 1957 and 1958. Recorded temperatures ranged from 16.1 to 28.7° C. and salinities ranged from 0.22 to 25.5 ‰. Gunter and Hall (1963b: 597) added this species to the list of euryhaline fishes.

Gobionellus boleosoma (Jordan and Gilbert) - Darter goby

RANGE: North Carolina to Natal, Brazil, and the northern Gulf of Mexico.

This goby is the most common member of its genus and one of the most abundant of its family in the study area. Collections contained 231 specimens (11-33 mm). The beach site was the only station at which it was not found. It was about equally common at all stations except the railroad bridge station where suitable habitat is limited.

I find no record of the species on the Gulf coast of Florida, including Florida Bay, except at Cedar Key where it occurs seasonally (Reid, 1954: 57-58). The species is common at Lower Matecumbe Key (Springer and McErlean, 1962a: 46) and St. Lucie (Springer, 1960: 11; Gunter and Hall, 1963a: 273-274).

Gobionellus smaragdus (Valenciennes) - Emerald goby

RANGE: South Carolina to Rio de Janeiro.

This goby is not common although it may be locally abundant. One specimen (48 mm) was collected in DuBois Bight near the inlet on 31 December 1959 and 49 specimens (22-49 mm) were taken in Special Collection 2 on Jupiter Island on 15 April 1964. Temperatures 24 and 30° C.; salinities 33.5 and 22.9 ‰.

Gobionellus stigmaturus (Goode and Bean) - Spottail goby

RANGE: Bermuda to the northeastern Gulf of Mexico.

Three specimens (24-28 mm) were taken in DuBois Bight near the inlet on 26 April 1959. Four other specimens (22-32 mm) were taken at the county line station on 27 December 1959, 6 July 1960, and 30 December 1960. Temperatures 31 and 20° C.; salinities 34.8 and 23.9 ‰ (last two collections).

Ginsburg (1934: 11) stated that it was common around Key West. Springer and McErlean (1962a: 46) reported collecting 14 specimens from Lower Matecumbe Key in October and December, 1960.

Gobiosoma bosci (Lacepede) - Naked goby

RANGE: Massachusetts to Hispaniola and throughout the Gulf of Mexico south to Tampico, Mexico.

One example (23 mm) was taken at the county line station on 29 December 1959. Nineteen additional specimens (13-23 mm) were taken in Special Collection 3 in the northwest branch of the river on 7 July 1963. Temperature 33° C.; salinity 29.5 ‰. The species is apparently more common in the northern parts of Florida.

Gobiosoma ginsburgi Hildebrand and Schroeder - Seaboard goby

RANGE: Massachusetts to Charleston, South Carolina; and Jupiter Inlet, Florida (modified from Ginsburg, 1933a: 39).

Two specimens (25, 23 mm) of this small goby were collected at the railroad bridge station on 12 April 1964. Temperature 26.5° C.; salinity 35.7 ‰.

These specimens were identified by Dr. Carter R. Gilbert and confirmed by Dr. C. Richard Robins. They constitute the first record of the species in Florida and extend the range southward from Charleston, South Carolina, a distance of approximately 400 airline miles.



Dawson (1963b: 585-586) noted that there were no records of Gobiosoma ginsburgi in Florida, and that a disjunct population in the Gulf of Mexico having some morphological differences, supports the separation of a Gulf of Mexico population (G. longipala) from G. ginsburgi. The occurrence of a population of G. ginsburgi in southern Florida will throw additional light on this problem.

Gobiosoma robustum Ginsburg - Code Goby

RANGE: Southeastern Florida to Bahia, Brazil, and the northern Gulf of Mexico.

The Code goby is rare in the study area. One specimen (19 mm) was collected in August, 1960 at Station 8 in the Intracoastal Waterway and another (24 mm) was taken at Station 4 in the river in December, 1960. Temperatures 29 and 18.5° C.; salinities 31.5 and 31.9 ‰.

Spawning and growth in the Tampa Bay area were discussed by Springer and McErlean (1961).

Lophogobius cyprinoides (Pallas) - Crested goby

RANGE: Bermuda and southern Florida to Hispaniola and west to Panama.

The crested goby was found in several localities in the river and was locally abundant. Catch records are shown in Table 51. Tabb and Manning (1961: 635) reported the goby was abundant in the oyster community, but also present elsewhere. My records support their findings.

Springer (1960: 8, 12) took the species once at St. Lucie on sand bottom in March, 1959. Briggs (1958: 288) considered the species to be euryhaline, and on the basis of the salinity range (0 - 30 ‰) reported by Tabb and Manning (op. cit.: 634-635) it should be added to the list of euryhaline fishes.

TABLE 51.--Catch records of Lophogobius cyprinoides

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
4 April 1958	2	3	26-33	-	-
10 Sept. 1961	3	22	23-52	32.0	32.3
7 July 1963	SC3	120	15-50	33.0	29.5
12 April 1964	3	10	22-35	26.5	35.7

Microgobius gulosus (Girard) - Clown goby

RANGE: Northeastern Florida to the eastern and northern Gulf of Mexico.

Collections contained 218 specimens (13-35 mm). Temperature range 18 - 34° C.; salinity range 1.5 - 36.6 ‰.

Clown gobies are abundant in the river but were rare east of the railroad bridge station and in the Intracoastal Waterway. No specimens were collected from the inlet. This is in contrast to Springer and Woodburn's (1960: 73) findings at Tampa Bay where they took the majority of their

specimens in waters of moderately high salinity (20 - 30 ‰). Kilby (1955: 229) reported the species was not found in water above 10.5 ‰ at Bayport or below 15 ‰ at Cedar Key.

The species probably occurs throughout the river during the entire year despite the fact that no specimens were collected in April. Joseph and Yerger (1956: 141) reported a seasonal occurrence at Alligator Harbor.

The species is apparently rare at St. Lucie.

Microgobius microlepis Longley and Hildebrand - Banner goby  
RANGE: Jupiter Inlet to Tortugas, Florida (modified from Briggs, 1958: 289).

Two specimens (23, 24 mm) were taken at the county line station on 11 August 1960. Temperature 30.5° C.; salinity 36.6 ‰

These specimens were identified by Dr. Carter R. Gilbert. The records extend the range given by Briggs (loc. cit.) from Tortugas.

#### MICRODESMIDAE - WORMFISHES

Microdesmus floridanus (Longley) - Pugjaw minnow  
RANGE: Known from Jupiter Inlet, Dry Tortugas, the Florida Keys (Big Pine Key), and the Bahamas (New Providence Island) (modified from Robins and Manning, 1958: 304).

Two examples (59, 62 mm) of this rare species were taken at the railroad bridge station on 23 June 1963. Temperature 31° C.; salinity 35.5 ‰.

Fin formulas for the two specimens are D. XIV, 31; A. 31; and D. XII, 32; A. 31. Dawson (1962b: 335) presented a key to the Atlantic species of Microdesmus; and speculates that M. floridanus is the common species in the southern part of Florida. These specimens double the number known from Florida and constitute the northernmost record of the species.

#### SCORPAENIDAE - SCORPIONFISHES AND ROCKFISHES

Fishes in this family were identified with the aid of Ginsburg (1953) and Eschmeyer (1965).

##### Scorpaena brasiliensis Cuvier - Barbfish

RANGE: Virginia south to Brazil, including the Gulf of Mexico and Caribbean Sea (Eschmeyer, 1965: 132).

Twenty-two specimens (19-169 mm) were collected in the area from the inlet to the county line station and west to the railroad bridge station. Included are specimens from collections made as early as January, 1958 to April, 1965. Temperature range 25 - 33° C.; salinity range 24.1 - 38.8 ‰.

This species seems restricted to areas of suitable bottom and high salinities. Juveniles are usually taken in grassy areas; adults often occur over more exposed sand

and shell bottoms. Eschmeyer (loc. cit.) stated that S. brasiliensis is one of the most common species of Scorpaena in the western north Atlantic Ocean.

Specimens 25 mm or less were taken in the months of June, August, and September.

Scorpaena grandicornis Cuvier - Lionfish

RANGE: Bermuda and Florida (St. Lucie Co.) to southern Brazil including the Bahamas, Cuba, Jamaica, Haiti, Dominican Republic, Puerto Rico, Guadeloupe, St. Lucia, Curaçao, Columbia, Honduras, and Panama (Eschmeyer, 1965: 121).

Catch records of the 23 specimens (20-65 mm) are shown in Table 52. This scorpaenid is generally found in grass beds and appears to be as common as S. brasiliensis. It also seems to have a somewhat wider salinity tolerance than other members of the genus in the area.

The name "lionfish" proposed by Bailey et al (1960: 36) for this species is a poor choice; it is a comparatively small species and rarely is cause for concern to humans. In general usage the name "lionfish" is applied to the Indo-Pacific scorpaenids of the genus Pterois.

TABLE 52.--Catch records of *Scorpaena grandicornis*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
20 April 1957	8	1	35	-	-
21 Sept. 1957	2	1	52	-	-
4 April 1958	2	3	27-43	-	-
26 April 1959	2	1	41	-	-
6 July 1960	1	3	28-55	31.0	34.8
24 July 1960	4	1	65	33.0	10.5
30 July 1960	1	1	31	28.0	36.6
10 Aug. 1960	3	1	47	32.0	36.3
23 Aug. 1960	8	4	20-63	29.0	31.5
30 April 1961	4	3	21-41	28.0	35.4
21 May 1961	1	2	32-48	29.0	37.6

*Scorpaena plumieri* Bloch - Spotted scorpionfish

RANGE: Eastern Pacific Ocean, western Atlantic Ocean and St. Helena and Ascension in the South Atlantic; in the western Atlantic from Massachusetts to Rio de Janeiro, Brazil (Eschmeyer, 1965: 126).

Catch records of the 22 specimens (13-190 mm) of *S. plumieri* are shown in Table 53. The species is common but restricted to areas of rocky bottom or oyster bars with high salinities.

Juveniles and adults are often observed at the inlet jetties and under the south Jupiter Island bridge. Their

form and coloration make them difficult to distinguish at a distance, and they generally are noticed only at close range. These fish are not easily frightened, but the "warning" attitude of expanded pectoral fins described by Breder (1963) was elicited on several occasions when fish were prodded.

TABLE 53.--Catch records of *Scorpaena plumieri*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
28 Dec. 1957	3	1	176	-	-
26 July 1960	. <sup>a</sup>	1	137	30.0	36.3
4 Sept. 1960	2	1	142	28.25	35.4
11 Feb. 1961	1	1	13	-	38.8
30 April 1961	2	1	90	27.0	37.3
3 Sept. 1961	. <sup>a</sup>	1	190	29.0	36.8
1 Oct. 1961	2	3	65-117	27.8	26.4
23 June 1963	3	5	48-155	31.0	35.5
17 July 1963	. <sup>b</sup>	1	114	32.0	32.3
12 April 1964	3	4	34-159	26.5	35.7
14 April 1964	2	2	26-27	27.5	36.6
22 Aug. 1964	SC5	1	64	29.5	37.1

TRIGLIDAE - SEAROBINS

Identifications were made with the aid of Ginsburg (1950) and Teague (1951).

Prionotus scitulus scitulus Jordan and Gilbert - Leopard searobin

RANGE: North Carolina to Venezuela.

Four P. scitulus (32-115 mm) were collected at the county line station in October and December, 1960 and April and May, 1961. Two additional specimens (46, 63 mm) were taken at Station 4 and from the inlet in December, 1960 and September, 1961. Temperature range 18.5 - 29.0° C.; salinity range 23.9 - 37.6 ‰.

This species was not recorded from St. Lucie, and was not as common as P. tribulus in Florida Bay (Tabb and Manning, 1961: 635-636).

Prionotus tribulus tribulus Cuvier - Bighead searobin

RANGE: North Carolina to Florida; a questionable record from New York.

Catch records of the eight specimens of P. tribulus are shown in Table 54. As most of the specimens are small and juveniles are imperfectly described the identifications are provisional. However, their general appearance and occurrence in the area during the fall and winter months support my identification. Gunter and Hall (1963a: 280) took the species during two winters at St. Lucie and discussed its seasonal occurrence.



TABLE 54.---Catch records of *Prionotus tribulus*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
26 Dec. 1959	1	1	41	-	-
4 Sept. 1960	4	2	17-18	28.5	11.6
12 Sept. 1960	1	1	19	27.25	29.9
1 Jan. 1961	7	1	19	22.0	30.2
28 Jan. 1961	1	2	34-48	20.0	33.5
11 Feb. 1961	6	1	38	19.0	19.7

## URANOSCOPIDAE - STARGAZERS

*Astroscopus y-graecum* (Cuvier) - Southern stargazer

RANGE: Cape Hatteras, North Carolina, southward along the United States Atlantic and Gulf coasts and the coast of Central and South America to Santos, Brazil (Berry and Anderson, 1961: 573).

One juvenile (40 mm) was collected in the Intracoastal Waterway at the county line on 28 January 1961. Temperature 20° C.; salinity 33.5 ‰. One adult uranoscopid seen at the east end of DuBois Bight also may have been this species.

## DACTYLOSCOPIIDAE - SAND STARGAZERS

This family is currently being revised by Dr. James E. Böhlke of the Academy of Natural Sciences of Philadelphia. He advises me that the ranges of the species have been

greatly extended and altered due to new records and changes in classification. Therefore, ranges will not be given in these accounts. Dr. Böhlke identified all of the specimens reported here.

Dactyloscopus crossotus (Meek and Hildebrand)

Eight specimens (31.0-38.7 mm) were collected at the south end of Blowing Rocks on 21 and 22 August 1964 (Special Collections 4 and 5). Temperatures 28.5 and 29.5° C.; salinities 36.6 and 37.1 ‰.

When the species was originally described, it was placed in the genus Cokeridia (Meek and Hildebrand, 1918: 906). I use the genus Dactyloscopus on the authority of Dr. Böhlke.

Dactyloscopus tridigitatus Gill - Sand stargazer

One specimen (47 mm) was collected on the south side of the inlet on 1 October 1961. Temperature 27.8° C.; salinity 26.4 ‰. This habitat has now been completely destroyed by the rebuilding of the south jetty. Seventeen specimens (31-47 mm) were taken at the south end of Big Blowing Rocks on 21 and 22 August, 1964 (Special Collections 4 and 5). Temperatures 28.5 and 29.5° C.; salinities 36.6 and 37.1 ‰.

Gillellus grayae Kanazawa - Arrow stargazer

One specimen was taken in DuBois Bight near the inlet on 26 April 1959. Three additional specimens were taken in the inlet (39 mm) on 1 October 1961 and at the south end of Big Blowing Rocks (43, 47 mm) (Special Collection 5) on 22 August 1965. Temperatures 27.8 and 29.5° C.; salinities 26.4 and 37.1 ‰.

As noted in the discussion of Dactyloscopus tridigitatus, the inlet habitat has been destroyed.

Heteristius rubrocinctus (Longley) - Saddle stargazer

One specimen (39 mm) was collected on 14 April 1964 on the south side of the inlet. Temperature 27.25° C.; salinity 36.2 ‰.

This species occurs in nearby Palm Beach Inlet also.

## CALLIONYMIDAE - DRAGONETS

Callionymus pauciradiatus Gill [ = C. calliurus Eigemann and Eigemann ] - Spotted dragonet

RANGE: Bermuda and Florida through the Bahamas and the Antilles to Columbia; in Florida from St. Lucie Co. on the Atlantic coast to Cedar Keys on the Gulf coast; common in the Biscayne Bay area; pelagic young taken as far north as North Carolina (modified from Davis, 1964). Also reported from

Caledonia Bay, Panama and Cubagua Island, Venezuela  
(Caldwell and Caldwell, 1964: 32).

An adult male (26.5 mm) of this unusual fish was taken in the Intracoastal Waterway at the county line station in August, 1960. Temperature 30.5° C.; salinity 36.6 ‰. In his review of the Atlantic members of the family, Davis (op. cit.) noted that this fish is typically found in such inshore habitats; usually in grass beds or on sandy bottoms.

Davis (op. cit.) in his synonymy of C. pauciradiatus failed to acknowledge records of the species from off Tampa Bay (Springer and Woodburn, 1960: 75) and at Lower Matecumbe Key (Springer and McErlean, 1962a: 44), both reported as C. calliurus.

As the species is apparently rare in the Jupiter area, this example is considered a stray.

#### CLINIDAE - CLINIDS

Labrisomus nuchipinnis (Quoy and Gaimard) - Hairy blenny

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and St. Augustine, Florida to Rio de Janeiro, Brazil and the Texas coast in the northwestern Gulf of Mexico (Springer, 1959b: 428). Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963a: 10).

Catch records of the 717 specimens (28-141 mm) are shown in Table 55.

TABLE 55.--Catch records of Labrisomus nuchipinnis

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
24 Aug. 1957	2	8	84-108	-	-
25 Dec. 1957	2	1	121	-	-
29 Dec. 1957	3	6	77-108	-	-
30 Dec. 1957	2	14	87-130	-	-
31 Dec. 1957	2	19	76-126	-	-
1 Feb. 1958	2	33	76-129	-	-
6 Feb. 1958	3	7	70-126	-	-
7 Feb. 1958	2	35	80-135	-	-
4 April 1958	2	20	72-122	-	-
7 April 1958	2	26	72-123	-	-
28 Dec. 1958	2	25	81-127	-	-
26 April 1959	2	15	71-128	-	-
13 March 1960	2	14	88-122	-	-
2 July 1960	2	7	97-122	31.0	25.8
4 July 1960	2	9	88-128	30.0	37.2
30 Aug. 1960	2	16	81-127	30.3	28.8
4 Sept. 1960	2	6	110-133	28.25	35.4
22 Oct. 1960	2	1	122	27.0	25.1
25 Nov. 1960	2	7	76-127	26.0	33.5
31 Dec. 1960	2	5	88-133	21.5	35.5
1 Jan. 1961	2	3	94-135	22.0	34.9

TABLE 55.--Continued

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
29 Jan. 1961	2	5	94-130	20.5	36.2
19 Feb. 1961	2	4	91-120	25.0	35.8
30 April 1961	2	3	88-108	27.0	37.3
29 June 1961	2	2	112-114	29.0	34.8
1 Oct. 1961	2	63	57-141	27.8	26.4
17 July 1963	2 <sup>a</sup>	2	103-110	32.0	32.3
23 June 1963	3	12	75-112	31.0	35.5
12 April 1964	3	6	75-112	26.5	35.7
14 April 1964	2	34	64-127	27.25	36.2
14 April 1964	2	13	90-132	27.5	36.6
21 Aug. 1964	SC4	79	28-124	28.5	36.6
22 Aug. 1964	SC5	169	29-120	29.5	37.1
22 Aug. 1964	2	35	31-131	30.5	33.8
5 Jan. 1965	2	13	54-89	-	-

<sup>a</sup>Collection made near this station.

Easily the most common blenny in the area, L. nuchipinnis is abundant in almost any situation where rocks and fairly high salinities are available. Springer (op. cit.: 485) stated that the hairy blenny has the widest distribution of any of the subtribe Labrosomini in the Atlantic. Corrections and additions to Springer's (1959b) study of the Labrisomini are given in Springer (1959c). Longley and

Hildebrand (1941: 250) reported that the species is rare at Tortugas and Carter R. Gilbert informs me that it is much more abundant north of the Florida Keys than in the more southerly parts of its range where it is in association with other closely related forms.

Paraclinus fasciatus (Steindachner) - Banded blenny

RANGE: Florida near Jupiter Inlet to Tortugas, Cape Sable, St. Martins, Waccasassa River Bay, Cedar Keys, and St. Marks; Cuba: Havana, Windmill Beach, and Lucia Bay; Andros Island, Bahamas; Port-au-Prince Bay, Haiti; Virgin Islands; St. Andrews Island, B.W.I., Trinidad; Curaçao; Bay of Guanta, Venezuela; Sabanilla, Columbia; Colón, Panama; Old Providence Island; and Puerto Barrios, Guatemala (modified from Springer, 1955: 439).

One specimen (24 mm) was taken in the Intracoastal Waterway, 4-1/2 miles north of Jupiter Inlet on 23 August 1960. Temperature 29° C.; salinity 31.5 ‰.

Much of the original habitat at the collection site has now been destroyed. Formerly the bottom consisted of sand and shell with pockets of mud and detritus. Along the shore outcroppings of mangrove peat still remain.

This specimen extends the range of the species on the east coast northward from the Miami area.

Paraclinus nigripinnis - Blackfin blenny

RANGE: Near Jupiter Inlet through the Florida Keys; Governor's Island, Bimini, Andros Island, and Cay Sal Bank, Bahamas; Cabanas Bay and Windmill Beach, Cuba; Port-Au-Prince Bay, Haiti; Puerto Rico; Virgin Islands; Barbados; Natal, Brazil; Cape San Roman, Venezuela; Old Providence Island and Bermuda (modified from Springer, 1955: 435). Also reported from near Puerto Limón, Costa Rica (Caldwell, 1963a: 10).

A total of 63 specimens (14-37 mm) were taken in two successive collections at the south end of Big Blowing Rocks in August, 1964 (Special Collections 4 and 5). Temperatures 28.5 and 29.5° C.; salinities 36.6 and 37.1 ‰.

The majority of the specimens were adults, and a number of gravid females were noted. The condition of the females taken in my collections would indicate spawning takes place in August and September. Springer and McErlean (1962a: 51) in their study at Lower Matecumbe Key, failed to find specimens smaller than 37 mm in their November to February samples.

The incidence of specimens lacking the last dorsal soft ray (3.2%) was greater than that noted (2.4%) by Springer (1955: 426). Incomplete rays were found in ten



specimens (15.9%), four of which possessed only a tiny rudiment entirely covered by scales.

These specimens are a northward extension of the range of the species from Key Largo, Florida.

#### BLENNIDAE - COMBTOOTH BLENNIES

Fishes in this family were identified with the aid of Springer (1959a) and Tavoilga(1954).

#### Blennius cristatus Linnaeus - Molly Miller

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and southern Florida to Pernambuco, Brazil and throughout the Gulf of Mexico.

This blenny is common along the jetties of the inlet and abundant in the rocky areas along the beach. Seventeen specimens (19-75 mm) were taken in the inlet in October, 1960; April and August, 1964. Fifty-three specimens (16-56 mm) were collected on two consecutive days (Special Collections 4 and 5) in August, 1964. Temperature range 27.25 - 30.5° C.; salinity range 26.4 - 37.1 ‰.

In the inlet divers commonly observe Molly Millers on jetty rocks. They show little fear and will allow divers to move their hands to within a few inches before swimming away.

Blennius marmoreus Poey - Seaweed blenny

RANGE: New York to Venezuela and the northeastern Gulf of Mexico.

Five specimens of the Seaweed blenny were collected; two from the inlet in April of 1959 and 1964; two from the south end of Big Blowing Rocks in August, 1964 (Special Collections 4 and 5); and one from the railroad bridge station in June, 1963. Temperature range 27.25 - 31° C.; salinity range 35.5 - 37.1 ‰.

This is the rarest member of its genus in the area. Longley (1941: 266) reported that the species was not common at Tortugas but was widely distributed. Tabb and Manning (1961: 636) made only one collection of the species in Florida Bay. Springer and Woodburn (1960: 76) reported that it was one of the most common forms on the reefs offshore in the Tampa Bay area. Reid (1954: 61) did not believe the species was common north of the Florida Keys. It was noted that B. cristatus, which is common at Jupiter and is usually found in association with B. marmoreus, is not known to occur in the Tampa Bay area. This fact, along with my own observations, leads me to believe that there is vigorous competition between the two species.

Blennius nicholsi Tavoilga - Highfin blenny

RANGE: Northeastern to southwestern Florida.

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Catch records of the nine Highfin blennies collected are shown in Table 56.

TABLE 56.--Catch records of Biennius nicholsi

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
13 April 1960	3	1	40	-	-
28 August 1960	4	1	17	30.0	4.5
23 June 1963	3	1	18	31.0	35.5
7 July 1963	SC3	3	34-45	33.0	29.5
12 April 1964	3	2	23-25	26.5	35.7
30 Aug. 1964	6	1	27	-	-

This blenny, unlike B. cristatus and B. marmoreus, is commonly found in upper parts of the river in areas of marked salinity fluctuations and prolonged periods of low salinity. It occurs around oyster bars and pilings.

Hypleurochilus aequipinnis - None

RANGE: Florida, Yucatan, Venezuela, the Greater Antilles and West Africa (J. E. Randall, personal communication).

Two specimens of this species have been recorded from the inlet. The first specimen (31 mm) was taken sometime during the period from September to November, 1958 by Mrs. Susan Kindt. The second (31 mm) was taken on 17 February 1959 by Mrs. Flora Hodgson.

One small specimen (16 mm), possibly this species, was collected at the county line station on 20 November 1960. Temperature 25° C.; salinity 25.2 ‰.

The two larger specimens were identified by Dr. John E. Randall, who is currently revising the Hypleurochilus bermudensis complex.

BROTULIDAE - BROTULAS

Dinematichthys cayorum (Evermann and Kendall) - Key brotula

RANGE: Bermuda, Bahamas, and Jupiter Inlet to Panama

(modified from Briggs, 1958). Also known from

the Tampa Bay area in the Gulf of Mexico (Springer and Woodburn, 1960: 77).

Three specimens of this species have been collected from the area. On 23 June 1963 one specimen (43 mm) was taken at the railroad bridge. Temperature 31° C.; salinity 35.5 ‰. Two additional specimens (37, 39 mm) were taken from the inlet on 22 August 1964. Temperature 30.5° C.; salinity 33.8 ‰.

The species has not been recorded previously from rock jetties or oyster bars. Longley and Hildebrand (1941: 277), Springer and Woodburn (loc. cit.), and Rubinoff and Rubinoff (1962: 6) reported the species only from coral formations and rocky offshore reefs. Notes on color and reproduction are given in Longley and Hildebrand (loc. cit.).

These are the first specimens reported north of the Florida Keys. I have also taken the species from Palm Beach Inlet.

OPHIDIIDAE - CUSKEELS

Parophidion schmidti (Woods and Kanazawa) - None

RANGE: Bermuda, Martin County, Florida through southern Florida, New Providence and Exuma areas of the Bahamas and Jamaica (modified from Böhlke and Robins, 1959: 51; Robins and Böhlke, 1959: 8).

Also known from near Puerto Limón, Costa Rica in the western Caribbean (Caldwell, 1963a: 10).

Dr. C. Richard Robins (personal communication) reports that he has specimens from other localities, including southern Florida, which have not yet appeared in the literature.

One specimen (34 mm) was taken on 22 August 1964 in a rotenone collection on Jupiter Island at the south end of Big Blowing Rocks (Special Collection 5). Temperature 29.6° C.; salinity 37.1 ‰.

The beach at this point is rocky with pockets of sand. In contrast to the usual protected habitats of the species described by Böhlke and Robins (op. cit.: 51-52) and Robins and Böhlke (loc. cit.), this area is fully exposed and subject to considerable wave action. There is no Thalassia or grass of any type in the area. However, this specimen

had only recently completed metamorphosis and its capture in this habitat may have been accidental.

STROMATEIDAE - BUTTERFISHES

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

RANGE: Atlantic, Indian, and western Pacific Oceans; in the western Atlantic from Bermuda and Massachusetts to Brazil and throughout the Gulf of Mexico.

One specimen (19 mm) was taken in the inlet in January, 1958 by Mrs. Susan Kindt.

Psenes cyanophrys Cuvier - Freckled driftfish

RANGE: Atlantic, Indian, and western Pacific Oceans; in the western Atlantic from Massachusetts to the Lesser Antilles, and widespread in the Gulf of Mexico.

One specimen (28 mm) was taken at Station 4 on 21 May 1961. Temperature 28° C.; salinity 35.9 ‰.

Longley and Hildebrand (1941: 75) reported numerous specimens up to 150 mm ". . . dropped by terns in their rookery on Bird Key." None was observed alive in the area. They considered the species to be tropical and a stray in Florida waters.

## SPHYRAENIDAE - BARRACUDAS

Sphyraena borealis Dekay - Northern sennet

RANGE: Massachusetts and Bermuda to Panama and the north-central Gulf of Mexico.

Five juvenile barracuda (15-52 mm) were collected in the inlet in April, 1959 and August, 1961. One additional specimen (35 mm) was taken at the county line station in February, 1961.

The small size of these specimens makes their identification provisional. Adult sennet are occasionally caught by fishermen along the beach.

Sphyraena barracuda (Walbaum) - Great barracuda

RANGE: Both sides of the Atlantic and the western Pacific; in the western Atlantic from Massachusetts to Rio de Janeiro, and widespread in the Gulf of Mexico.

The Great barracuda is abundant in the study area and 555 specimens (15-510 mm) were collected. Specimens were taken at all localities except the beach stations but were most frequently taken at the county line station and at the inlet. Temperature range 18 - 36.° C.; salinity range 4.5 - 37.6 ‰.

Juveniles up to about 150 mm are common at the river stations. Large juveniles and young adults up to about 500 mm, as well as smaller individuals, are found in the

inlet and Intracoastal Waterway. Larger adults are infrequently seen in the inlet but are common offshore.

Juveniles 25 mm or less in length were taken from late April to mid-September. De Sylva (1963: 65-66) stated that young barracuda in the Florida Keys grow an average of 4 inches (102 mm) in standard length during the period from April to October, and in November they move into deeper water. I have numerous records of specimens taken in November and December, 1959 and 1960. S. barracuda was absent from all collections, from January to March.

The lowest salinity reported for the species by de Sylva (1963: 92) was 16.7 ‰. Gunter and Hall (1963: 275) reported taking one specimen when the salinity was 2.7 ‰.

#### MUGILIDAE - MULLET

Mugil cephalus Linnaeus - Striped mullet (Black mullet)

RANGE: Worldwide in tropical waters; in the western Atlantic from Nova Scotia and Bermuda to Santos, Brazil, and throughout the Gulf of Mexico.

Approximately 4000 specimens (16-290 mm), almost entirely juveniles, were collected. Adults are not frequently taken in small mesh nets as they usually jump over the top. Temperature range 18 - 32.5° C.; salinity range 1.5 - 38.8 ‰.



Striped mullet are common in the study area throughout the year. Juveniles 25 mm or less are abundant in the upper parts of the river during the winter from November to March and are common elsewhere. Anderson (1958: 504) reported that juveniles remain at sea until they are 18 - 28 mm long and then begin to move inshore. They appeared on the beaches of Georgia in November and moved into the estuaries in January. My specimens were in the estuary by November.

Adults 440 mm or more are not uncommon in the Intra-coastal Waterway and in the upper parts of the river.

Mugil curema Valenciennes - White mullet (Silver mullet)

RANGE: Both sides of the Atlantic and the eastern Pacific; in the western Atlantic from Massachusetts and Bermuda to Santos, Brazil, and widespread in the Gulf of Mexico.

Silver mullet are not nearly as numerous as Striped mullet in the study area. Two hundred thirty-one specimens (15-260 mm) were collected. Specimens were taken at all stations but were most numerous in the inlet. Temperature range 19 - 36-° C.; salinity range 1.5 - 37.3 ‰. As noted in the discussion of M. cephalus, the collection data does not reflect the abundance of adults in the area due to the selectivity of the gear used.

In addition to the usual seasonal occurrence of juveniles, April to August (Anderson, 1957: 410-414), specimens 25 mm or less in length were taken in November and December, 1960; and January and February, 1961.

#### ATHERINIDAE - SILVERSIDES

Allenetta harringtonensis (Goode) - Reef silverside

RANGE: Near Jupiter Inlet to Columbia and the southwestern Gulf of Mexico (modified from Briggs, 1958: 293).

Two specimens (38, 46 mm) were taken at the county line station on 12 September 1960. Temperature 27.25° C.; salinity 29.9 ‰. On the same date ten specimens (31-46 mm) were taken on the beach, 4-1/2 miles north of Jupiter Inlet.

These records extend the range of the species from the Florida Keys.

Labidesthes sicculus (Cope) - Brook silverside

RANGE: Great Lakes region and New York to the southern tip of Florida and westward to Oklahoma and Texas.

Approximately 1780 Brook silversides (17-75 mm) were collected from fresh water localities. One specimen (29 mm) was taken in Special Collection 6 in Sim's Creek. No salinity readings are available but it was associated with a number of marine species. The species is widely distributed in fresh water but is especially abundant in

clear, sand bottom lakes, and to a lesser degree in other bodies of clear water.

Menidia beryllina (Cope) - Tidewater silverside

RANGE: Massachusetts to the southern tip of Florida and west to Veracruz, Mexico.

Tidewater silversides were taken in July, November and December, 1960 and January, 1961. All of the 115 specimens (29-49 mm) were collected at Stations 6 and 7 near the mouth of the C-18 canal. Temperature range 18 - 32° C.; salinity range 1.5 - 30.2 ‰. A distinct preference was shown for waters of low salinity. This was also reported by Gunter and Hall (1963: 278) and Springer (1960: 12) at St. Lucie, and by Tabb and Manning (1961: 638) in Florida Bay.

#### ORDER PLEURONECTIFORMES

#### BOTHIDAE - LEFT-EYE FLOUNDERS

Bothus sp. - None

RANGE: Near Jupiter Inlet and Lower Matecumbe (Springer and McErlean, 1962a) and the Tampa Bay area (Martin Moe, personal communication) and other localities.

One specimen (22 mm) was taken at the county line station on 30 December 1960. Temperature 20° C.; salinity 23.9 ‰.

Records of this undescribed species were combined by Springer and McErlean (op. cit.: 41) with those of B. ocellatus.

The specimen was identified by Mrs. Thelma Brockman who has studied the systematics of the species.

Bothus ocellatus (Agassiz) - Eyed flounder

RANGE: New York and Bermuda to Rio de Janeiro and the northeastern and southwestern Gulf of Mexico.

Thirty-three specimens (20-71 mm) were collected in the study area. Temperature range 20 - 32° C.; salinity range 24.1 - 37.6 ‰. It was most frequently taken in the Intracoastal Waterway at the county line station where it probably occurs the entire year (see Table 61). It was rarely collected in the river; only three specimens (22-32 mm) were collected at Station 4 in April and May, 1961 when salinities were high. Other specimens included: six specimens (23-71 mm) collected in the inlet in January, March, and April, 1961 and August, 1964; and eight specimens (31-54 mm) taken at Station 9 in December, 1956; and July and August, 1960.

The species was taken frequently at Lower Matecumbe Key (Springer and McErlean, 1962a: 44) and Tortugas (Longley and Hildebrand, 1941: 47-48) but has not been reported elsewhere.

Citharichthys arenaceus Evermann and Marsh - None

RANGE: Jupiter Inlet, Florida through the West Indies to Bahia, Brazil (modified from Norman, 1934: 149).

One specimen (140 mm) was taken on the beach at Jupiter Island, 4-1/2 miles north of Jupiter Inlet (Station 9) on 5 July 1960. Temperature 31° C.; salinity 37.5 ‰.

This specimen agrees with the description of C. arenaceus given by Parr (1931: 22-23) and Norman (op. cit.: 148-149). The following counts and measurements were taken: D. 72, A. 52, P. 11, depth 75 mm (1.9 in SL), gill rakers 12 (including the raker in the angle).

Parr (loc. cit.) noted that this is a shallow water form which reaches a length of about 140 mm.

This record constitutes a new addition of the fauna of Florida and the continental United States, and extends the range of the species from Puerto Rico.

Citharichthys macrops Dresel - Spotted whiff

RANGE: St. Lucie Inlet, Florida to the Florida Keys and throughout the Gulf of Mexico (modified from Briggs, 1953: 296).

The Spotted whiff is rare in the study area. One specimen (52 mm) was taken in the inlet on 31 December 1960 and another (21 mm) on 5 March 1961. Temperatures 21 and 24.5° C.; salinities 32.3 and 37.1 ‰. Briggs (loc. cit.) did not give any localities for the species

on the Atlantic coast. It has been recorded from Lower Matecumbe Key (Springer and McErlean, 1962a: 44) and from St. Lucie (Gunter and Hall, 1963a: 280).

Citharichthys spilopterus Günther - Bay whiff

RANGE: New Jersey to Santos, Brazil, and throughout the Gulf of Mexico.

The Bay whiff is abundant in the study area and 328 examples (14-117 mm) were collected. Specimens were taken at all stations except Stations 8 and 9 during every month except October. Temperature range 18 - 32° C.; salinity range 1.5 - 37.6 ‰.

I find no record of its occurrence on the Atlantic coast of Florida south of Jupiter or on the Gulf coast of Florida. This is in contrast to the statement of Evermann and Marsh (1900: 326) who stated that it was "everywhere abundant on sandy shores of the warmer parts of the western Atlantic, in shallow water . . ." and the range given by Briggs (1958: 296). Gunter and Hall (1963a: 280-281) and Springer (1960: 10) reported that it was common at St. Lucie. Gunter (1945: 85-86) reported that in Texas the species moved offshore during the winter. His smallest specimens (21-55 mm) were collected in April. Specimens 20 mm or less in length were taken at Jupiter from November to April. Gunter and Hall (loc. cit.) took one specimen (19 mm) as late as May.

Paralichthys albigutta Jordan and Gilbert - Gulf flounder

RANGE: North Carolina to Florida and the northern Gulf of Mexico.

Three specimens (23-54 mm) were taken at Stations 1, 4, and 5 in January, April, and March, 1961, respectively. One specimen (33 mm) was collected in DuBois Bight in April, 1959. No adults were seen in the study area. Temperature range 20 - 28° C.; salinity range 33.5 - 35.4 ‰.

This species is more common the Gulf coast. It was taken on only two occasions each by Springer (1960: 16) and Springer and McErlean (1962a: 51), but was not taken in Florida Bay.

Paralichthys lethostigma Jordan and Gilbert - Southern flounder

RANGE: North Carolina to Florida and the northern Gulf of Mexico.

One specimen (394 mm) was taken at Station 6 in the southwest branch on 25 November 1965. Temperature 24° C.; salinity 16.6 ‰. Gunter (loc. cit.) noted that the species is most common below 25 ‰.

Southern flounders are occasionally caught in the study area but they are not common. Similar situations were reported by Tabb and Manning (1961: 639) in Florida Bay and by Springer and Woodburn (1960: 86) in the Tampa Bay area. McLane (1955: 334) listed this species but that

section of his dissertation containing the annotated list of species of this family was not available to me and I have no knowledge of its abundance in the St. Johns River system.

These findings are in disagreement with Ginsburg's (1952: 330) statement that P. lethostigma is common or abundant throughout its range. In the Gulf, the species appears to be common in Texas (Gunter, 1945: 86-88).

Paralichthys squamilentus Jordan and Gilbert - Broad flounder

RANGE: North Carolina to Tortugas and the northern Gulf of Mexico (modified from Ginsburg, 1952: 333).

One specimen (87 mm) was taken on the beach, 4-1/2 miles north of Jupiter Inlet on 11 April 1964. Temperature 30° C.; salinity 36.6 ‰. The specimen was identified by Elmer J. Gutherz.

Records of 29 inshore specimens (13.5-128 mm) reported from North Carolina (Rothschild and Deubler, 1960: 254-255) supported Ginsburg's (loc. cit.) tentative conclusion ". . . that the young fish live in shallow water and migrate in deep water to attain growth."

Syacium micrurum Ranzani - Dusky flounder

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and near Jupiter Inlet, Florida to



Rio de Janeiro and the northeastern and southwestern Gulf of Mexico (modified from Briggs, 1958: 297).

Two specimens (147, 35 mm) were taken in the inlet in August, 1958 and April, 1961. Temperature 27° C.; salinity 37.3 ‰ (latter collection). Another example (119 mm) was collected at the county line station in December, 1959.

These specimens extend the range of the species northward from the Florida Keys.

#### SOLEIDAE - SOLES

Achirus lineatus (Linnaeus) - Lined sole

RANGE: Florida to Uruguay, and widespread in the Gulf of Mexico.

This small sole is uncommon in the study area and only 15 specimens (10-47 mm) were collected. The species is widely distributed and was taken at least once at all stations except Stations 8 and 9. It was also taken in Special Collections 2 and 3. Temperature range 20 - 33° C.; salinity range 7.3 - 33.5 ‰. All except two specimens were taken in salinities above 15 ‰.

It is probable that the species occurs in the area during the entire year; however, it was not collected during the months of February, March, May, and June. The species also appears to be uncommon at St. Lucie (Gunter and Hall, 1963a: 282), but is abundant in Florida Bay

where Tabb and Manning (1961: 639-640) noted that young were present from October to January. Springer and Woodburn (1960: 86-87) reported a similar situation in the Tampa Bay area. Specimens 15 mm or less in length were taken at Jupiter from October to January.

One partially albinistic specimen (36 mm) was found. Dawson (1962a) makes no mention of albinistic or partially ambicolorate individuals in Achirus.

#### CYNOGLOSSIDAE - TONGUEFISHES

Identifications were made with the aid of Ginsburg (1951).

Symphurus plagiusa (Linnaeus) - Blackcheek tonguesole

RANGE: New York to Argentina (40° S.) and the northern Gulf of Mexico.

Tonguesoles are not common in the study area but they were collected at least once from each station in the river except Station 5 and 9. They were more common in the inlet than elsewhere but were not found on the beach. The 12 specimens were small (22-50 mm), and all were taken during the winter and spring from November to April. Temperature range 18 - 26.5° C.; salinity range 24.2 - 37.1 ‰.

In contrast to Gunter and Hall (1963a: 282) and Springer and Woodburn (1960: 87) who collected their smallest specimens (29 and 23.7 mm, respectively) in October, I took my smallest specimen in April. Springer and McErlean

(1962a: 54) took their smallest specimen (21 mm) in February.

ORDER GOBIESOCIFORMES

GOBIESOCIDAE - CLINGFISHES

Identification was made with the aid of Briggs (1955).

Gobiesox strumosus Cope - Skilletfish

RANGE: Bermuda and New Jersey to Santos, Brazil, and throughout the Gulf of Mexico.

One specimen (17 mm) was taken at the county line station on 27 June 1961. Temperature 27° C.; salinity 36.8 ‰.

The color of this specimen is olive green to the area of the caudal peduncle; caudal peduncle and the caudal fin are cream-colored. Runyan (1961) described the early development of the Skilletfish at Solomons, Maryland.

ORDER TETRAODONTIFORMES

BALISTIDAE - TRIGGERFISHES

Balistes capriscus Gmelin - Gray triggerfish

RANGE: Both sides of the Atlantic, in the western Atlantic from Nova Scotia and Bermuda to Argentina (35° 30' S.) and throughout the Gulf of Mexico.

Eight examples (24-55.5 mm) were collected in the inlet in July and August, 1958. Identification of these specimens was made by Dr. Eugenie Clark.

Five other specimens (9- 39.5 mm), probably this species, were collected from the same locality in July and August, 1958 and August and September, 1961.

Juveniles of this species are often taken in patches of Sargassum.

Canthidermis sufflamen (Mitchill) - Ocean triggerfish

RANGE: Massachusetts to the Lesser Antilles and the northcentral and western Gulf of Mexico.

One example (57 mm) was collected in the inlet in August, 1958 by Mrs. Susan Kindt. The specimen was identified by Frederick H. Berry.

#### MONACANTHIDAE - FILEFISHES

Alutera heudelotti Hollard - Dotterel filefish

RANGE: Eastern and western Atlantic, from Massachusetts to Brazil and at Bermuda, and from Angola to Cape Blanco, Spanish Western Sahara (Berry and Poll, 1961: 360).

One specimen (36.5 mm) was taken in the river at the U.S. 1 bridge, approximately 1/2 mile west of the inlet on 17 July 1963. Temperature 30° C.; salinity 36.8 ‰. The common name used above was proposed by Bailey et al

(1960: 48) for A. ventralis Longley, which was shown to be a synonym of A. heudelotti Hollard by Berry and Poll (1961: 361).

Alutera schoepfi (Walbaum) - Orange filefish

RANGE: Nova Scotia and Bermuda to Bahia, Brazil, and throughout the Gulf of Mexico.

Five specimens (377, 68.0, 22.7-33 mm) were reported from Jupiter Inlet by Berry and Vogele (1961: 101). These were taken in June, August, and September to November, 1958. One additional specimen (43 mm) was taken on 19 August 1960 in the inlet. Temperature above 30° C. (estimated); salinity 22.5 ‰. An adult (371 mm) was found on the beach, 2 miles north of the inlet in April, 1962.

Alutera scripta (Osbeck) - Scrawled filefish

RANGE: Worldwide in tropical waters; in the western Atlantic from Massachusetts to Brazil and the northern Gulf of Mexico.

One specimen (27.0 mm) was reported by Berry and Vogele (1961: 100) from Jupiter Inlet, collected July, 1958. On 3 September 1961 another specimen (134 mm) was taken from the inlet. Temperature 20° C.; salinity 36.8 ‰.

Monacanthus ciliatus (Mitchill) - Fringed filefish

RANGE: Both sides of the Atlantic; in the western Atlantic from Newfoundland and Bermuda to Argentina, and widespread in the Gulf of Mexico.

Specimens of this filefish were taken from the inlet to Station 8 in the Intracoastal Waterway. None were taken elsewhere in the study area where salinities are more variable. The 85 examples collected were taken in the summer months from July to September in 1960 and from June to September in 1961. It was the second most abundant filefish during the summer months. Temperature range 27 - 32° C.; salinity 29.9 - 36.8 ‰.

Stephanolepis hispidus (Linnaeus) - Planehead filefish

RANGE: Both sides of the Atlantic; in the western Atlantic from Nova Scotia and Bermuda to Santos, Brazil, and throughout the Gulf of Mexico.

The most common and widely distributed filefish in the study area, S. hispidus was taken in each month of the collection period except October and November, 1960 and April, 1961. It was taken on two occasions in April, 1959. The species was most common at the county line station and at the inlet. It was taken once at Station 4 and twice at Station 5 in the river. All of the 338 examples collected were juveniles (6-60 mm), and it is very likely that they were brought into the river and the

Intracoastal Waterway with Sargassum. When the seaweed died or was cast up on the shore, they were forced to leave it and find shelter elsewhere.

Temperature range 18.25 - 31.0° C.; salinity range 16.5 - 38.8 ‰. Tabb and Manning (1961: 641) reported specimens in salinities as low as 14 ‰. The species is abundant in Florida Bay.

Specimens 15 mm or less in length were taken in every month except June and November. Springer and McErlean (1962a: 40) took specimens 25 mm or less in length in every month of the year except July when no specimens were collected.

Stephanolepis setifer (Bennett) - Pygmy filefish

RANGE: Vineyard Sound, Massachusetts to the Bahamas and the Lesser Antilles, and widespread in the Caribbean Sea and the Gulf of Mexico (Berry and Vogele, 1961: 97, 108-109).

One specimen (27 mm) was collected in the inlet by Mrs. Susan Kindt in August, 1961. Four additional specimens (20-26 mm) were taken in September, 1961 from the same locality. Temperature 29° C.; salinity 36.8 ‰. These individuals were taken from patches of Sargassum.

Berry and Vogele (1961: 109) noted that S. setifer is more of an offshore and insular inhabitant than S. hispidus.

Its occurrence at Jupiter is probably due to the nearness of the Gulf Stream.

OSTRACIIDAE - TRUNKFISHES

Lactophrys sp. - Trunkfish

RANGE: Tropical western Atlantic.

Thirty-nine specimens (5.5-10 mm) of unidentified trunkfish were collected. Temperature range 24.5 - 30+° C.; salinity range 10.8 - 38.8 ‰.

It is probable that the majority of these are L. trigonus or L. quadricornis, but the possible occurrence of young of other species can not be discounted. In contrast to the seasonal occurrence of juveniles and adults of the aforementioned species, these young were collected in every month except July.

Lactophrys trigonus (Linnaeus) - Trunkfish

RANGE: Massachusetts and Bermuda to Bahia, Brazil, and the northern Gulf of Mexico.

Seventeen specimens, all juveniles (6-104 mm) were collected in the inlet and the Intracoastal Waterway. Catch records are shown in Table 57. At Lower Matecumbe Key this species was found to be much more abundant than L. quadricornis, and young were present over much of the year (Springer and McErlean, 1962a: 48). The species was not recorded from Florida Bay and is reportedly rare



at Tampa Bay (Springer and Woodburn, 1960: 89). The species has not been recorded from Cedar Key but Joseph and Yerger (1956: 144) reported one specimen (45 mm) from Alligator Harbor. Springer (1960: 11) reported one collection taken at St. Lucie in September, 1957 (temperature 27.5° C.; salinity 14.2 ‰).

TABLE 57.--Catch records of *Lactophrys trigonus*

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
30 Dec. 1956	. <sup>a</sup>	1	53	-	-
21 March 1959	2	1	17	-	-
26 April 1959	. <sup>b</sup>	1	102	-	-
27 Dec. 1959	1	1	17	-	-
27 Dec. 1959	1	1	46	-	-
6 July 1960	1	1	21	31.0	34.8
30 July 1960	1	1	21	28.0	36.6
11 Aug. 1960	1	1	30	30.5	36.7
12 Sept. 1960	1	6	6-11	27.25	29.9
16 Oct. 1960	8	1	16	28.0	21.1
27 June 1961	1	1	34	27.0	36.8
30 Sept. 1961	2	1	34	-	-

<sup>a</sup>Intracoastal Waterway 4 miles north of Jupiter Inlet.

<sup>b</sup>Intracoastal Waterway 2-1/2 miles north of Jupiter Inlet.

Lactophrys quadricornis (Linnaeus) - Cowfish

RANGE: Both sides of the Atlantic; in the western Atlantic from Massachusetts and Bermuda to Rio de Janeiro, and widespread in the Gulf of Mexico.

Two small specimens ( 29, 23 mm) were taken in the inlet in April, 1958 and during the period from September to November, 1961. Cowfish are more common in the Intra-coastal Waterway and 14 specimens (7.5- 169 mm) were collected in January, 1958; March, 1959; and July through September, 1960. Temperature range 27.25 - 32.0° C.; salinity range 29.9 - 36.7 ‰. Two sportsmen caught two specimens (361, 370 mm) in a cast net near the county line station on 12 August 1964. These specimens were taken during an upwelling of cold water offshore, and the temperature of the incoming tide was unseasonably cold, about 19.4° C. (67° F.). These unusually large fish were swimming sluggishly on the surface. The average for large specimens taken in other Florida surveys was 160 to 180 mm except in the northern Gulf of Mexico where it was about 120 to 125 mm.

The largest specimens reported by Gunter (1945: 84) were 210 and 237 mm.

## TETRAODONTIDAE - PUFFERS

Sphaeroides sp. - Puffers

RANGE: Tropical and subtropical western Atlantic.

Forty-two specimens (ca. 5-18 mm) were collected which represent young of S. nephelus chiefly, together with some S. testudineus, S. spengleri and perhaps other species.

Specimens were collected in every month except April, June, July, and October. Temperature range 18 - 30+° C.; salinity range 16.6 - 37.1 ‰.

Sphaeroides nephelus (Goode and Bean) - Southern puffer

RANGE: Southeastern Florida and throughout the Gulf of Mexico.

Catch records of the 22 specimens collected are shown in Table 58.

Sphaeroides nephelus is about as common as S. spengleri in the study area, but seems to occur more often in the river stations. Both are common in the Intracoastal Waterway. Many of the S. nephelus were larger than the S. spengleri, and some were as big as many large S. testudineus.

TABLE 58.--Catch records of *Sphaeroides nephelus*

Date	Station	No. of Specimens	SL (mm)	Temp. ° C.	Sal. ‰
26 April 1959	2	1	148	-	-
6 July 1960	1	2	59-94	31.0	34.8
9 July 1960	2	1	52	32.0	29.3
30 July 1960	1	1	99	28.0	36.6
11 Aug. 1960	1	1	179	30.5	36.7
30 Aug. 1960	4	1	18	31.0	8.6
4 Sept. 1960	4	2	20-24	28.5	11.6
12 Sept. 1960	1	2	17-42	27.25	29.9
16 Oct. 1960	1	1	28	27.0	24.1
20 Nov. 1960	1	1	82	25.0	25.2
30 Dec. 1960	1	1	19	20.0	23.9
28 Jan. 1961	1	1	182	20.0	33.5
11 Feb. 1961	6	2	14-24	19.0	19.7
30 April 1961	4	1	43	28.0	35.4
28 May 1961	6	1	37	28.0	26.8
27 June 1961	1	2	30-70	27.0	36.8
29 June 1961	4	1	39	29.0	33.1

*Sphaeroides spengleri* (Bloch) - Bandtail puffer.

RANGE: Both sides of the Atlantic; in the western Atlantic from Bermuda and Massachusetts to Santos, Brazil, and widespread in the Gulf of Mexico.

Catch records of the 30 specimens taken are shown in Table 59.

TABLE 59.--Catch records of Sphaeroides spengleri

Date	Station	No. of Specimens	SL(mm)	Temp. ° C.	Sal. ‰
2 Feb. 1958	2	1	61	-	-
26 Dec. 1959	1	1	52	-	-
6 July 1960	1	3	42-45	31.0	34.8
30 July 1960	1	1	54	28.0	36.6
30 Oct. 1960	5	1 <sup>a</sup>	13	26.0	9.7
26 Dec. 1960	4	1	26	18.5	31.9
31 Dec. 1960	2	1	14	24.0	33.5
28 Jan. 1961	1	1 <sup>a</sup>	13	20.0	33.5
29 Jan. 1961	5	1	23	20.5	34.4
29 Jan. 1961	4	1	14	20.0	28.8
11 Feb. 1961	1	1	27	-	38.8
12 Feb. 1961	4	2	19-25	19.0	28.8
30 April 1961	5	2	30-32	28.0	35.9
30 April 1961	4	7	22-41	28.0	35.4
27 June 1961	1	4	11-26	27.0	36.8
30 Sept. 1961	2	1	38	-	-
23 June 1963	3	1	134	31.0	35.5

<sup>a</sup> Identification questionable.

About as common as S. nephelus, this species appears to be somewhat more restricted to waters of higher salinities. It usually was not taken in the river during periods of heavy rainfall. As in the Florida Bay area (Tabb and Manning, 1961: 642), it never attains the size of S. nephelus.

In Florida Bay S. spengleri replaces S. testudineus as the most abundant species, and Tabb and Manning (loc. cit.) believed it to be more abundant in the inner bays than S. nephelus. They took seven of nineteen collections (37%) in salinities of 14 to 20 ‰. On Lower Matecumbe Key, S. spengleri and S. nephelus are found in about equal numbers (Springer and McErlean, 1962a: 53).

Sphaeroides testudineus (Linnaeus) - Checkered puffer

RANGE: Rhode Island to Sao Francisco do Sul, Brazil, and the southwestern Gulf of Mexico (modified from Briggs, 1958: 300)

One of the most abundant fishes in the study area, S. testudineus is found throughout the river and the Intra-coastal Waterway. Collections contained 577 specimens (8-210 mm). Temperature range 18 - 36° C.; salinity range 1.5 - 38.8 ‰. It far surpasses all other puffers in the area in numbers, size, and salinity tolerance. Gunter and Hall (loc. cit.) reported it in salinities as low as 0.36 ‰. It was also noted as the most abundant puffer

at St. Lucie by both Springer (1960: 16) and Gunter and Hall (1963a: 284).

Oddly, in spite of its numbers and apparent success in this part of the Florida coast, it seems to be absent from Florida Bay, the Florida Keys, Tortugas and the entire Gulf coast of Florida. Briggs (loc. cit.) stated that S. testudineus is widespread in the Gulf of Mexico but I believe this to be in error. I find only one reference to its occurrence in the Gulf of Mexico. Springer and Bullis (1956: 101) reported two collections (Stations 426 and 427) made by the M/v Oregon in the Gulf of Campeche in the southwestern Gulf of Mexico. References to its occurrence in the Caribbean Sea are numerous.

Breeding takes place in the fall. Adults begin to congregate in groups of four or five in the inlet in late August and later form larger aggregations. They move into shallow water and partially bury themselves in the loose sand. Although it has not been confirmed, spawning probably takes place in the inlet. Young become identifiable at about 8 to 9 mm when they attain the adult color pattern. These young began to appear in collections at Stations 6 and 7 and occasionally Stations 4 and 5 during the early part of November. Gunter and Hall (loc. cit.) suggested that the breeding season is long, but this is still conjectural.

Young and juveniles are abundant in the upper reaches of the river in the winter and spring and are rarely found elsewhere. The selection of lower salinity waters by juveniles has been noted for other species by Gunter (1956b:, 1957).

The Checkered puffer is a good food fish, but highly toxic if not properly cleaned, and therefore avoided by most fishermen. It is considered a nuisance by hook and line fishermen.

#### DIODONTIDAE - PORCUPINEFISHES

##### Chilomycterus sp.

One specimen (12 mm) was collected in Jupiter Inlet on 19 August 1960. The temperature was estimated at above 30° C. and the salinity was 22.5 ‰. Two other specimens (31, 41 mm) were collected in the inlet on 3 July 1961. A fourth specimen (38 mm) was taken in the Intracoastal Waterway, 3-1/2 miles north of Jupiter Inlet on 4 February 1965 by W. A. Lyons and Ed Brownell of the Florida State Board of Conservation.

These specimens are nearly identical with published descriptions and figures of Lyosphaera globosa Evermann and Kendall, especially the smallest specimen. One differed from the others in that its ground color was bright red instead of yellow.



I have discussed these specimens with Dr. C. Richard Robins. Both he and Dr. James Tyler believe that L. globosa represents the young of either C. atinga or C. antillarum. The most recent reference to L. globosa appeared in Breder (1948: 236).

Chilomycterus schoepfi (Walbaum) - Striped burrfish

RANGE: Massachusetts to Rio de Janeiro and throughout the Gulf of Mexico.

Juvenile burrfish are common seasonally in the study area where salinities are high. Adults are not common, only two specimens (approximately 141 mm, the caudal fin had been lost at the caudal peduncle; and 169 mm) were taken at the county line station in December, 1959 and August, 1960. Twenty-five juveniles were collected at the inlet, the county line station, and Stations 4 and 5 from April to August. One specimen (52 mm) was taken in the inlet in November, 1961. Temperature range 25 - 36+° C.; salinity range 22.5 - 37.6 ‰.

Springer and Woodburn (1960: 89-90) reported that juveniles occur in Tampa Bay during the same part of the year as at Jupiter. In contrast, Gunter and Hall (1963a: 284) took one 15 mm specimen in January. Springer and McErlean (1962a: 44) reported juveniles occurred later in the year at Lower Matecumbe Key than at Jupiter, but reported no specimens as small as 15 mm in the winter.

Diodon holacanthus Linnaeus - Balloonfish

RANGE: Worldwide in tropical waters; in the western Atlantic from Jupiter Inlet, Florida to Brazil, and west to Yucatan.

Four specimens were secured from the inlet. Three were collected by Mrs. Susan Kindt in March, 1959 (1, 83 mm), November, 1961 (1, 32 mm) and November, 1962 (1, 104 mm). The remaining specimen (45 mm) was collected on 3 September 1961. Temperature 29° C.; salinity 36.8 ‰. Specimens were identified with the aid of descriptions in Longley and Hildebrand (1941: 391). Springer and McErlean (1962a: 45) took one specimen (42 mm) in September, 1960. Springer and Woodburn (1960: 90) reported one specimen (92 mm) taken in December, 1958 in the Tampa Bay area.

ORDER LOPHIIFORMES

ANTENNARIIDAE - FROGFISHES

Antennarius scaber (Cuvier) - Splitlure frogfish

RANGE: New Jersey to Rio de Janeiro and the southeastern and western Gulf of Mexico.

One example (32 mm) was collected at the county line station on 21 May 1961. Temperature 29° C.; salinity 37.6 ‰.

This specimen exhibits the juvenile color pattern of dark spots and blotches described by Schultz (1957: 74).

Histrio histrio (Linnaeus) - Sargassum fish

RANGE: Atlantic and western Pacific Oceans; in the western Atlantic from Massachusetts and Bermuda to Rio de Janeiro and widespread in the Gulf of Mexico.

Eight Sargassum fish were taken from the inlet: two (20, 29 mm) in July, 1958; one (11.5 mm) in the period from September to November, 1958; four (10-25 mm) in August, 1961; and one (15 mm) in September, 1961. One specimen (19 mm) was taken in a seine at Station 4 on 30 April 1961. Temperature 28° C.; salinity 35.4 ‰. The largest specimen seen, 76 mm, was taken from Sargassum in the Intracoastal Waterway, 4-1/2 miles north of Jupiter Inlet on 16 October 1964. The specimens taken in the inlet in the months of July, August, and September are larger than any found by Adams (1960: 78) and support her theory that "Histrio probably breeds in the Florida Current area during most if not all of the year."

#### QUESTIONABLE RECORDS

I have not seen specimens of either of the species, both sciaenids, listed below. They are included on the basis of the records given and on the knowledge that both

have been reported from nearby St. Lucie by Springer (1960) and Gunter and Hall (1963a).

Cynoscion regalis (Bloch and Schneider) - Weakfish

RANGE: Nova Scotia to Jupiter Inlet, Florida (modified from Briggs, 1958: 280).

No specimens of this fish were taken during the study period and the species is apparently rare at Jupiter.

A report of a fish population sample taken by the Florida Game and Fresh Water Fish Commission in the northwest branch of the river at Jonathan Dickinson State Park on 28 November 1962 listed the silver trout as one of the species taken. The salinity was 20.3 per cent [sic].

A local sportsman, Raymond Baird, also reported taking a specimen, 459 mm TL (18 inches, 2 pounds), from the river near the railroad bridge station on 23 March 1962.

This species is more abundant than C. nebulosus at St. Lucie, the reverse of the situation here. Gunter and Hall (1963a: 271) reported collecting 131 specimens of C. regalis but only one specimen (52 mm) of C. nebulosus. These records extend the range of C. regalis southward from St. Lucie

Stellifer lanceolatus (Holbrook) - Star drum

RANGE: Virginia to Florida and the northern Gulf of Mexico.

No specimens of this species were collected. The species is listed on the basis of a report to the Martin County Commissioners from the Florida Game and Fresh Water Fish Commission issued on 30 November 1962. It was recorded in a rotenone collection made on 28 November 1962 in the northwest branch of the Loxahatchee River at Jonathan Dickinson State Park. The salinity was given as 20.3 per cent [sic].

## DISCUSSION

### Faunal Composition

Two hundred sixty-seven species representing 169 genera and 78 families are recorded from the Jupiter Inlet - Loxahatchee River. The richness of the fauna is fully appreciated only when compared to faunal lists of other Florida localities; only two exceed 200 species (Tortugas and the Tampa Bay area), and most have less than 150 species. Longley and Hildebrand (1941) recorded 435 species from Tortugas, the richest fauna known in the United States. The Tampa Bay area, which extends into the Gulf of Mexico for a distance of 70 miles, has slightly over 300 species (Martin Moe, personal communication). If offshore habitats were sampled in the Jupiter area, its faunal list would undoubtedly be enlarged.

The fauna possesses elements of north temperate, tropical and pelagic Gulf Stream faunas. This varied composition is not unexpected since this part of the Florida coast has long been suspected as the location of a faunal boundary. Parr (1933: 62) stated:

It is also suggested that the transition from the midwinter temperature conditions in the southern section of the Atlantic coastal waters of the United States to the midwinter temperatures of the Straits of Florida may take the form of a relatively abrupt warm

front somewhere in the neighborhood of the region between Jupiter Inlet and Cape Canaveral, Florida, rather than the form of a gradual and equally distributed increase in temperature. On the basis of this assumption we should, therefore, expect to find a critical and perhaps limiting point for the winter migrations of subtropical species in the vicinity of Cape Canaveral.

Recent unpublished data of the Bureau of Sports

Fisheries also suggest such a winter break, but indicate that it might occur between Jupiter Inlet and Palm Beach Inlet. Some supporting evidence is found in the occurrence of several species which have their southern limit at Jupiter (Letharcus velifer, Sygnathus fuscus, Gobiosoma ginsburgi).

Parr (loc. cit.) reported that no such barrier existed during the summer, but my evidence is to the contrary; many of the fishes found at Jupiter during the summer and fall, especially scarids, pomadasysids, gerrids, and plectognaths, were not found farther north at St. Lucie where few tropical elements appear in the fauna. The summer offshore upwellings of cold water probably do not influence this situation. When faunas north and south of Jupiter Inlet are better known, these boundaries will be better defined.

In addition to the tropical elements already mentioned, many tropical pomacentrids, scorpaenids, clinids, and blennids are also common in the Jupiter area. However, the numerous species of tropical gobies typical of the Florida Keys were not found here.

The tropical element at Jupiter also contains such species as Sphaeroides testudineus and Umbrina coroides which are scarce in the Florida Keys, absent from the eastern and northern Gulf of Mexico, but abundant in the Caribbean and the southwestern Gulf of Mexico. These unusual distributions are not yet explained. Likewise, the significance, if any, of the occurrence of Citharichthys arenaceus, and the similarity of local Micropogon to Micropogon furnieri, both Puerto Rican species are unknown.

The ranges of 45 species are extended (See Table 60) and others are redefined. Briggs (1958: 223) noted that the ranges of approximately 135 species listed from the Florida Keys did not extend to the mainland. This figure has been considerably reduced by Springer (1960), Springer and Woodburn (1960), and the present report.

Within the Jupiter area essentially four ecological areas were recognized: the ocean beach; the inlet and connecting waters including the Intracoastal Waterway and the river west to the railroad bridge; the river west of the railroad bridge; and the fresh waters. Of these, the last is by far the most distinct.

#### The Ocean Beach

A limited number of collections were made on the beach, but these were sufficient to demonstrate both the relative paucity of the fauna in variety and in numbers, and differences in the population structure from Florida Gulf



TABLE 60.--List of species with ranges extended to the  
Jupiter Inlet area, Florida

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<u>Harengula clupeola</u>	<u>Haemulon macrostomum</u>
<u>Harengula humeralis</u>	<u>Haemulon sciurus</u>
<u>Jenkinsia sp.</u>	<u>Cynoscion regalis</u>
<u>Notropis petersoni</u>	<u>Equetes pulcher.</u>
<u>Gymnothorax vicinus</u>	<u>Holacanthus ciliaris</u>
<u>Ahlia egmontis</u>	<u>Abudefduf taurus</u>
<u>Bascanichthys teres</u>	<u>Eupomacentrus dorsopunicans</u>
<u>Myrichthys acuminatus</u>	<u>Eupomacentrus variabilis</u>
<u>Cyprinodon hubbsi</u>	<u>Doratonotus megalepis</u>
<u>Fundulus notti lineolatus</u>	<u>Cryptotomus roseus</u>
<u>Hippocampus obtusus</u>	<u>Scarus guacamaia</u>
<u>Hippocampus zosterae</u>	<u>Sparisoma chrysopterum</u>
<u>Syngnathus fuscus</u>	<u>Gobiosoma ginsburgi</u>
<u>Diplectrum bivittatum</u>	<u>Microgobius microlepis</u>
<u>Rypticus maculatus</u>	<u>Microdesmus floridanus</u>
<u>Serranus baldwini</u>	<u>Paraclinus fasciatus.</u>
<u>Apogon stellatus</u>	<u>Paraclinus nigripinnis</u>
<u>Eucinostomus melanopterus</u>	<u>Dinematichthys cayorum</u>
<u>Gerres cinereus</u>	<u>Parophidion schmidtii</u>
<u>Lepidochir havana</u>	<u>Allenetta harringtonensis</u>
<u>Haemulon chrysargyreus</u>	<u>Citharichthys arenaceus</u>
<u>Haemulon flavolineatum</u>	<u>Syacium micrurum</u>
	<u>Diodon holacanthus</u>

---

coast beach populations. With respect to the species of drum and pompano, the population structures of the Jupiter beaches is more similar to Texas beach populations described by Gunter (1945) than to either Tampa Bay or Cedar Keys (Reid, 1954; Springer and Woodburn, 1960). Trachinotus falcatus largely replaces T. carolinus on the Gulf beach at Tampa (Springer and Woodburn (op. cit.: 97)), but unlike the Jupiter beaches the species are not totally separated. T. glaucus was not found at Tampa. Springer and Woodburn (loc. cit.) noted that Lagodon rhomboides and Leiostomus xanthurus were abundant on the Tampa beaches; they are rare or absent from the Jupiter beach populations. Menticirrhus littoralis was common in both areas.

The paucity of beach species is to a large degree due to the rapidly increasing depth offshore, the relatively great amount of wave action, and differences in bottom composition. These are all related to the narrow continental shelf along this part of the Florida coast. Springer and Woodburn (loc. cit.) also noted the scarcity of beach species and suggested that the beach was an extreme habitat and that only a few niches were available. The occurrence of numerous species along the beach where rock outcrops appear would seem to support this contention. The fishes of these rocky areas of the beach have some affinities to tropical reef populations, but these areas are

not large or stable enough to develop a distinctive population.

Marked seasonality is probably another feature of the beach habitat. However, this area was not sampled sufficiently to determine the extent to which seasonality alters the population structure.

#### The Inlet - Intracoastal Waterway Area

This area harbored the greatest number of species, over half of those reported. It may also possess the greatest biomass, but this is a subjective evaluation influenced by seasonal changes and collecting methods. Certainly during the summer and fall the biomass supported by the area is great. This is especially true of the county line station (1) where collections usually contained numerous individuals of 45 to 50 species during that time of year. Most numerous were species of Lutjanus, Eucinostomus, Anchoa, Harengula, Haemulon, Lagodon, Sparisoma, and Syngnathus. Gunter (1961: 184) noted that undiluted sea water near shore provides optimum conditions for the greatest number of species. A reduction in the number of species present occurs in lower salinities, as in the river, and in the open sea.

The list of species from the Intracoastal Waterway (Table 61) is more similar to that of Lower Matecumbe Key (Springer and McErlean, 1962a) than to those of either St. Lucie (Springer, 1960; Gunter and Hall, 1963a) or

Florida Bay (Tabb and Manning, 1961), areas which are geographically closer. There are no habitats on the beaches of the lower east coast of Florida north of Miami comparable to the grass beds and flats on Lower Matecumbe Key.

Relative stability of temperature and high salinity, together with protected grass beds, combine in the Intra-coastal Waterway to produce a suitable habitat for many tropical species.

The tropical species mentioned in the general faunal discussion are a prominent feature of the Inlet-Intracoastal Waterway area during the summer. Only a few remain during the winter with the north temperate forms.

The seasonal occurrence of juveniles of tropical species (see Table 61) follows closely the pattern shown by Springer and McErlean (1962a) in the Florida Keys. In general, juveniles appear in April or May and remain until the end of December or early January. The scarids best illustrate this pattern. Some of the species missing from the county line station (1) during January and February may have only moved into deeper water nearby.

The importance of the Intracoastal Waterway as a nursery ground for many game and forage species, especially lutjanids and the more stenohaline gerrids, cannot be over-emphasized. Juvenile Centropomus undecimalis and Caranx hippos are quite common north of Station 8.

TABLE 61.--Physical data and monthly occurrence of fishes at Station No. 1. N = number of specimens; R = size range, standard lengths in millimeters

		1960 JUL	JUL	AUG	SEP	OCT
Date		6	30	11	12	16
Salinity ‰		34.8	36.6	36.7	29.9	24.1
Temperature ° C.		31.0	28.0	30.5	27.25	27.0
<u>Achirus</u>	N					1
<u>lineatus</u>	R					47
<u>Allenatta</u>	N				2	
<u>harringtonensis</u>	R				38-46	
<u>Anchoa</u>	N		7	32	1	
<u>cubana</u>	R		35-45	29-48	37	
<u>Anchoa</u>	N	3	4			
<u>hepsetus</u>	R	66-75	71-78			
<u>Anchoa</u>	N	1	12	187	196	70
<u>lamprotaenia</u>	R	40	34-49	25-42	28-52	20-27
<u>Anchoa</u>	N		1	90	3	2
<u>lyolepis</u>	R		42	33-45	32-52	28-29
<u>Anchoa</u>	N			2	76	
<u>mitchilli</u>	R			35-42	24-52	
<u>Antennarius</u>	N					
<u>scaber</u>	R					
<u>Apogon</u>	N		1			
<u>stellatus</u>	R		18			
<u>Archosargus</u>	N					
<u>probatocephalus</u>	R					
<u>Astroscopus</u>	N					
<u>y-graecum</u>	R					
<u>Bathygobius</u>	N		1	1		
<u>soporator</u>	R		17	19		

TABLE 61.--Continued

NOV	DEC	1961 JAN	FEB	APR	MAY	JUN
20	30	28	11	29	21	27
25.2	23.9	33.5	35.8	37.3	37.6	36.8
25.0	20.0	20.0	-	25.0	29.0	27.0

	3 40-44	21 26-51	5 40-49
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	56 25-49	11 27-41	57 20-54	21 25-33
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1 29	4 34-43	10 32-55
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	350 24-48	161 23-44	116 20-49
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1 32
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1 34
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1 302
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1 40
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2 30-31
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4 24-34
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2 19-41
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1 21
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1 25
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1 24
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TABLE 62.--Continued

		1960				
		JUL	AUG	SEP	OCT	NOV
<u>Caranx</u>	N					
<u>hippos</u>	R					
<u>Caranx</u>	N			5	1	
<u>latus</u>	R			30-51	36	
<u>Chaetodipterus</u>	N		2			
<u>faber</u>	R		18			
<u>Chiliomycterus</u>	N					
<u>schoepfi</u>	R					
<u>Citharichthys</u>	N		1	1		2
<u>spilopterus</u>	R		85	85		19-50
<u>Cynoscion</u>	N	10	1	4		
<u>nebulosus</u>	R	14-85	21	16-24		
<u>Dasyatis<sup>a</sup></u>	N		1			1
<u>sabina</u>	R		260			256
<u>Diapterus</u>	N	9	33	14	66	35
<u>olisthostomus</u>	R	32-35	26-41	40-51	20-41	17-48
<u>Erotelis</u>	N					
<u>smaragdus</u>	R					
<u>Eucinostomus</u>	N	19	21	1	54	18
<u>argenteus</u>	R	25-57	29-70	26	19-41	27-62
<u>Eucinostomus</u>	N	210±	48	123±	52	200±
<u>gula</u>	R	22-68	31-51	12-57	22-48	12-58
<u>Eucinostomus</u>	N					
<u>melanopterus</u>	R					
<u>Eugerres</u>	N	12				
<u>plumieri</u>	R	22-40				
<u>Evorthodus</u>	N	1				
<u>lyricus</u>	R	30				
<u>Fistularia</u>	N					
<u>tabacaria</u>	R					

TABLE 62.--Continued

DEC	1961 JAN	FEB	MAR	APR	MAY	JUN
26	29	12	5	30	21	29
31.9	28.8	28.8	34.2	35.4	35.9	33.1
18.5	20.0	19.0	25.0	28.0	28.0	29.0
	1 12					
					1 54	
1 37		15 40-54	1 51			
145 31-55	131 32-54	110 26-53	1 41		6 25-34	1 29
8 41-45	9 34-52	31 36-58	3 39-43			
6 27-46	57 26-52	465± 24-53	180 27-53			3 21-41
4 23-52				1 35	1 50	
				2 22-32	1 32	
					1 14	



TABLE 62.--Physical data and monthly occurrence of fishes at Station No. 4. N = number of specimens; R = size range, standard lengths in millimeters

		1960 JUL	AUG	SEP	OCT	NOV
Date		24	3	4	30	26
Salinity ‰		10.5	7.3	11.6	17.8	24.1
Temperature ° C.		33.0	31.0	28.5	28.0	24.5
<u>Achirus</u>	N		1			1
<u>lineatus</u>	R		16			21
<u>Albula</u>	N					
<u>vulpes</u>	R					
<u>Anchoa</u>	N					
<u>cubana</u>	R					
<u>Anchoa</u>	N					300+
<u>lamprotaenia</u>	R					20-48
<u>Anchoa</u>	N					172
<u>lyolepis</u>	R					29-47
<u>Anchoa</u>	N		223	4	162	
<u>mitschilli</u>	R		26-50	30-33	23-45	
<u>Archosargus</u>	N		1			
<u>probatocephalus</u>	R		256			
<u>Bairdiella</u>	N	11	1			
<u>chrysur</u>	R	56-80	75			
<u>Bathygobius</u>	N	3		1		2
<u>soporator</u>	R	37-61		45		30-53
<u>Bothus</u>	N					
<u>ocellatus</u>	R					
<u>Calamus</u>	N					
<u>arctifrons</u>	R					
<u>Caranx</u>	N					1
<u>bartholomaei</u>	R					25

lyolepis and A. lamprotaenia which appear to move into the river above Station 3 from the Intracoastal Waterway during the winter, even though both are generally considered to be warm water species.

Greater similarities can be seen between this part of the river and the St. Lucie estuary, than with Florida Bay, which has a number of faunal peculiarities. As might be expected in an area of varying temperatures and salinities, the majority of the species are typical of north temperate faunas, and only a few tropical forms stray into the river during periods of high salinities.

In contrast to upper east coast and Gulf coast estuaries, few marshes are present in the Loxahatchee River, and marsh grasses are restricted to the edges of the river. Fundulus grandis was the only cyprinodont found in this part of the river and was the only member of its family, with the exception of two specimens of Lucania goodei, found with marine species. It was never abundant. Cyprinodon variegatus, Fundulus similis, Floridichthys carpio, and Lucania parva, all typical marsh fishes, are unknown in the area. Fundulus confluentus, typical of marshes of the Gulf coast, is confined to fresh water habitats in south Florida. The restriction of some cyprinodonts to fresh water and the absence of others is probably due to the lack of suitable habitat and the abundance of gerrids, especially Eucinostomus argenteus, throughout the area.

Greater numbers of tropical reef forms, especially chaetodontids and gobiids would probably occur in the inlet if more rock were available, and temperature and salinity conditions more stable. Turbidity may also influence conditions, especially after northeast storms when thick layers of silt are found on the rocks of the jetty.

#### The River

The number of species diminishes westward from the railroad bridge towards the headwaters of the river. Seventy-seven species were found at Station 4, 55 at Station 5, and 50 at Station 6. The decrease of species along a decreasing salinity gradient was demonstrated by Gunter (op. cit.: 184-185).

This part of the river serves as a nursery ground for many marine game fishes, the most common of which are Centropomus undecimalis, Caranx hippos, Sphyraena barracuda, Micropogon undulatus, Cynoscion nebulosus, Archosargus probatocephalus, Trachinotus falcatus, and Lutjanus griseus. Many of these species spawn offshore or in the inlet, and the young find their way into the river. In addition, the river possesses numerous forage fishes (e.g. Eucinostomus, Anchoa) and species of commercial importance (e.g. Mugil, Diapterus, Eugerres). The seasonal occurrence and growth of some of these species are shown in Tables 62, 63, and 64. A rather unexpected seasonal occurrence was found for Anchoa



TABLE 61.--Continued

		1960	JUL	AUG	SEP	OCT
		JUL	JUL	AUG	SEP	OCT
<u>Syngnathus</u> <u>scovelli</u>	N	3	16	10	7	2
	R	52-82	52-79	49-69	39-78	49-57
<u>Synodus</u> <u>foetens</u>	N	21	5	5	4	
	R	72-153	67-121	104-140	57-68	
<u>Trachinotus</u> <u>falcatus</u>	N					
	R					
<u>Ulaema</u> <u>lefroyi</u>	N					
	R					

<sup>a</sup>Disc width.

<sup>b</sup>Length from coronet to tip of extended tail.

<sup>c</sup>Juveniles too small for specific identification.

TABLE 61.--Continued

NOV	DEC	1961 JAN	FEB	APR	MAY	JUN
	1 10					
1 82	1 19	1 182				2 30-70
		1 13	1 27			4 11-26
1 140	7 124-164	5 117-161	4 133-145	1 152	1 153	4 148-162
3 27-100	3 157-280			5 33-67	5 17-24	9 19-64
			1 35			
	3 13-21	7 10-28	3 15-33		1 31	10 25-41
	1 230		4 104-260	9 23-62	2 20-37	
		3 26-30				
	2 40-50					
			1 110		4 45-85	11 50-118
	1 97	8 69-84	1 118			
17 65-141	15 121-152	24 62-153	32 42-135	11 56-112	9 52-223	10 86-131

TABLE 61.---Continued

		1960	JUL	AUG	SEP	OCT
<u>Sparisoma</u>	N		11	3		16
<u>rubripinne</u>	R		28-68	47-68		24-58
<u>Sphaeroides</u> <sup>c</sup>	N					
<u>sp.</u>	R					
<u>Sphaeroides</u>	N	2	1	1	2	1
<u>nephelus</u>	R	59-94	99	179	17-42	28
<u>Sphaeroides</u>	N	3	1			
<u>spengleri</u>	R	42-45	54			
<u>Sphaeroides</u>	N	10	5	6	4	1
<u>testudineus</u>	R	112-161	120-135	126-157	129-141	141
<u>Sphyraena</u>	N	6	33	33		1
<u>barracuda</u>	R	15-47	17-91	17-85		81
<u>Sphyraena</u>	N					
<u>borealis</u>	R					
<u>Stephanolepis</u>	N	5	1	1		
<u>hispidus</u>	R	28-53	46	27		
<u>Strongylura</u>	N					2
<u>marina</u>	R					58-89
<u>Strongylura</u>	N	12	16	11		3
<u>notata</u>	R	85-206	104-270	75-173		95-111
<u>Symphurus</u>	N					
<u>plagiusa</u>	R					
<u>Syngnathus</u>	N					
<u>dunckeri</u>	R					
<u>Syngnathus</u>	N	3		1		
<u>floridae</u>	R	75-99		111		
<u>Syngnathus</u>	N					
<u>fuscus</u>	R					
<u>Syngnathus</u>	N	10	5	2	9	15
<u>louisianae</u>	R	104-183	97-123	95-106	93-107	77-167

TABLE 61.--Continued

NOV	DEC	1961 JAN	FEB	APR	MAY	JUN
				3 21-28	2 25-32	81 24-88
		1 42				
	1 32			1 115	1 67	
		2 34-48				
						5 15-18
3 36-56			1 75			1 21
					2 32-48	
			1 13			
	6 133-143	1 143	1 138	1 151		
2 20-21	1 24				4 17-31	11 17-30
					1 36	1 47



TABLE 61.--Continued

		1960	JUL	AUG	SEP	OCT
		JUL	JUL	AUG	SEP	OCT
<u>Opisthonema</u>	N		46	6	20	
<u>oglinum</u>	R		42-82	35-60	34-47	
<u>Orthopristsis</u>	N	27	6			
<u>chrysopterus</u>	R	39-79	51-90			
<u>Paralichthys</u>	N					
<u>albigutta</u>	R					
<u>Prionotus</u>	N					1
<u>scitulus</u>	R					55
<u>Prionotus</u>	N				1	
<u>tributus</u>	R				19	
<u>Sardinella</u>	N			2	4	
<u>anchovia</u>	R			30-32	44-50	
<u>Scarus</u>	N	6	31	34	5	1
<u>croicensis</u>	R	13-21	16-31	14-34	18-31	18
<u>Scarus</u>	N	1				
<u>guacamaia</u>	R	49				
<u>Scorpaena</u>	N	1	2	4	3	2
<u>brasiliensis</u>	R	32	44-48	22-43	19-46	42-50
<u>Scorpaena</u>	N	3	1			
<u>grandicornis</u>	R	28-55	31			
<u>Scorpaena</u>	N					
<u>plumieri</u>	R					
<u>Selene</u>	N				2	
<u>vomer</u>	R				168-172	
<u>Sparisoma</u> <sup>c</sup>	N	9	5	10	7	
<u>sp.</u>	R	23-49	16-20	16-22	22-38	
<u>Sparisoma</u>	N			1		
<u>chrysopterus</u>	R			48		
<u>Sparisoma</u>	N	9	12	6	1	3
<u>radians</u>	R	31-67	48-64	27-55	46	43-75

TABLE 61.--Continued

NOV	DEC	1961 JAN	FEB	APR	MAY	JUN
4 46-59	5 37-68			3 33-42		49 15-65
2 35-56		1 50				
15 24-41	34 27-74		1 35			9 34-46
	1 36					
						23 12-39
3 20	1 23	4 18-22	105 19-25			
	1 108			1 25		
			2 336-346			
3 15-45				1 23		5 22-70
						6
					15-43	

TABLE 61.--Continued

		1960 JUL	JUL	AUG	SEP	OCT
<u>Lepidochir</u>	N			3		
<u>havana</u>	R			13-58		
<u>Lutjanus</u>	N	5	10	7	17	16
<u>analis</u>	R	62-115	19-137	16-37	23-34	30-57
<u>Lutjanus</u>	N	1	2	2	10	2
<u>apodus</u>	R	18	21-27	19-34	15-30	25-47
<u>Lutjanus</u>	N	1	10	16	32	4
<u>griseus</u>	R	70	14-21	15-128	14-77	33-43
<u>Lutjanus</u>	N	4	80	50	72	70
<u>synagris</u>	R	21-90	22-42	28-119	25-68	18-61
<u>Microgobius</u>	N	2				
<u>gulosus</u>	R	18-19				
<u>Microgobius</u>	N		2	2		
<u>microlepis</u>	R		18-19	23-24		
<u>Micropogon</u>	N					
<u>undulatus</u>	R					
<u>Monacanthus</u>	N	10	17	28	2	
<u>ciliatus</u>	R	13-44	13-33	17-42	35-47	
<u>Mugil</u>	N					
<u>cephalus</u>	R					
<u>Mugil</u>	N					
<u>curema</u>	R					
<u>Myliobatis<sup>a</sup></u>	N					
<u>freminvillei</u>	R					
<u>Nicholsina</u>	N	16	11	9	7	5
<u>usta</u>	R	16-44	16-108	21-47	27-41	37-51
<u>Ocyurus</u>	N	2	11	8	3	
<u>chrysurus</u>	R	30-34	20-37	13-36	27-31	
<u>Oligoplites</u>	N		1			
<u>saurus</u>	R		99			

TABLE 61.--Continued

NOV	DEC	1961 JAN	FEB	APR	MAY	JUN
1 61						20 21-32
						90 18-31
	1 81					
1 30	1 26	2 22-23		3 13-27		1 29
1 16						
			4 7-8	1 9	2 6-8	2 6-7
13 70-125	22 16-97	92 15-91	150 14-101	40 25-105	5 30-38	13 53-93
		4 22-23	40 14-31			

TABLE 61.--Continued

		1960	JUL	AUG	SEP	OCT
<u>Haemulon</u>	N		21	78	39	
<u>parrai</u>	R		17-32	16-36	22-57	
<u>Haemulon</u>	N		18	49	27	1
<u>plumieri</u>	R		19-47	20-37	23-43	32
<u>Halichoeres</u>	N	1	1			
<u>bivittatus</u>	R	23	34			
<u>Harengula</u>	N		500+	265+	99	
<u>pensacolae</u>	R		22-70	26-46	23-57	
<u>Hippocampus</u> <sup>b</sup>	N	1	1			
<u>erectus</u>	R	35	43			
<u>Hippocampus</u> <sup>b</sup>	N	1				
<u>obtusus</u>	R	42				
<u>Hippocampus</u> <sup>b</sup>	N	1	1	7		
<u>zosteræ</u>	R	-	26	15-37		
<u>Hypleurochilus</u>	N					
<u>aequipinnis</u>	R					
<u>Hypoplectrus</u>	N		1	3		
<u>unicolor</u>	R		41	32-34		
<u>Jenkinsia</u>	N					
<u>sp.</u>	R				7	
					34-45	
<u>Lactophrys</u> <sup>c</sup>	N					
<u>sp.</u>	R					
<u>Lactophrys</u>	N	1	1	2	5	
<u>quadricornis</u>	R	92	112	13-144	8-11	
<u>Lactophrys</u>	N	1	1	1	6	
<u>trigonus</u>	R	21	21	30	6-11	
<u>Lagodon</u>	N	204	130	37	19	3
<u>rhomboides</u>	R	29-64	41-77	45-82	57-83	78-85
<u>Leiostomus</u>	N					
<u>xanthurus</u>	R					



TABLE 61.--Continued

		1960	JUL	AUG	SEP	OCT
<u>Cynoscion</u>	N					
<u>nebulosus</u>	R		3 32-54	2 22-58		
<u>Dasyatis a</u>	N					
<u>sabina</u>	R					
<u>Diapterus</u>	N					
<u>olisthostomus</u>	R		12 30-37		1 40	
<u>Doratonotus</u>	N					
<u>megalepis</u>	R		1 16		1 19	
<u>Elagatis</u>	N					
<u>bipinnulatus</u>	R					
<u>Eucinostomus</u>	N	61	158	93	12	14
<u>argenteus</u>	R	33-80	11-82	12-84	21-49	33-57
<u>Eucinostomus</u>	N	104	62	148	66	92
<u>gula</u>	R	12-78	23-73	16-87	16-79	21-49
<u>Eucinostomus</u>	N		1			
<u>melanopterus</u>	R		66			
<u>Galeichthys</u>	N					
<u>felis</u>	R		1 268			
<u>Gerres</u>	N	1				
<u>cinereus</u>	R	145				
<u>Gobiesox</u>	N					
<u>strumosus</u>	R					
<u>Gobionellus</u>	N					
<u>boleosoma</u>	R					
<u>Gobionellus</u>	N	1				
<u>stigmaturus</u>	R	22				
<u>Haemulon</u>	N		1	1		
<u>aurolineatum</u>	R		19	28		
<u>Haemulon</u>	N		1	10		
<u>flavolineatum</u>	R		17	18-27		

TABLE 61.--Continued

NOV	DEC	1961 JAN	FEB	APR	MAY	JUN
	1 22					
		1 22	1 40	3 20-32	1 41	3 32-55
						1 64
			1 16			
				3 15-17	4 25-28	
	17 49-59					
	1 36	13 22-68		1 67	7 32-85	1 43
						15 19-25
					1 28	7 26-44



TABLE 61.--Continued

		1960	JUL	AUG	SEP	OCT
		JUL	JUL			
<u>Bothus</u>	N					
<u>sp.</u>	R					
<u>Bothus</u>	N		2	2	1	1
<u>ocellatus</u>	R		32-35	33	39	65
<u>Calamus</u>	N	1				
<u>arctifrons</u>	R	37				
<u>Callionymus</u>	N			1		
<u>pauciradiatus</u>	R			27		
<u>Caranx</u>	N					
<u>bartholomaei</u>	R					
<u>Caranx</u>	N				2	
<u>latus</u>	R				42-46	
<u>Centropomus</u>	N					
<u>undecimalis</u>	R					
<u>Centropristes</u>	N	1		2		
<u>philadelphicus</u>	R	51		58-60		
<u>Centropristes</u>	N		2			
<u>striatus</u>	R		51-55			
<u>Chaetodipterus</u>	N			2	1	
<u>faber</u>	R			10	15	
<u>Chilomycterus</u>	N	1		1		
<u>schoepfi</u>	R	12		169		
<u>Chloroscombrus</u>	N					
<u>chrysurus</u>	R					
<u>Citharichthys</u>	N		2			
<u>spilopterus</u>	R		76-78			
<u>Coryphopterus</u>	N	3	29	75	5	
<u>glaucofraenum</u>	R	16-19	19-28	18-28	26-28	
<u>Cryptotomus</u>	N		6	2	4	1
<u>roseus</u>	R		15-35	31-33	20-25	32

TABLE 62.--Continued

DEC	1961 JAN	FEB	MAR	APR	MAY	JUN
	4 110-124				2 15-17	
						1 57
				1 20	2 16-24	
20 14-43	4 20-65	2 18-43	5 31-60		3 65-68	1 92
					5 18-44	
				1 260	1 ?	
34 23-47	10 34-54		1 43	1 49		
1 43						
69 13-51	50 19-61	54 12-55	22 23-58	111 14-66	74 18-65	28 15-71
79 23-56	37 17-55	34 20-54	26 20-90	7 42-53	24 17-57	30 18-45
					3 25-44	3 54-69
						1 219
		1 106		1 171		

TABLE 62.--Continued

		1960				
		JUL	AUG	SEP	OCT	NOV
<u>Galeichthys</u>	N					
<u>felis</u>	R					
<u>Gobionellus</u>	N	2	2		1	1
<u>boleosoma</u>	R	22-26	26-27		16-18	18
<u>Gobiosoma</u>	N					
<u>robustum</u>	R					
<u>Haemulon</u>	N			10		
<u>parrai</u>	R			47-60		
<u>Haemulon</u>	N			1		
<u>sciurus</u>	R			72		
<u>Haemulon</u>	N				1	
<u>pensacolae</u>	R				51	
<u>Hippocampus</u> <sup>b</sup>	N					
<u>erectus</u>	R					
<u>Histrio</u>	N					
<u>histrio</u>	R					
<u>Lactophrys</u>	N					
<u>sp.</u>	R					
<u>Lagodon</u>	N	128	24	3		7
<u>rhomboides</u>	R	40-87	44-76	54-61		56-75
<u>Leiostomus</u>	N					
<u>xanthurus</u>	R					
<u>Lutjanus</u>	N			47		
<u>analis</u>	R			29-50		
<u>Lutjanus</u>	N					
<u>apodus</u>	R					
<u>Lutjanus</u>	N				1	1
<u>cyanopterus</u>	R				30	45
<u>Lutjanus</u>	N	23	30	50	6	16
<u>griseus</u>	R	12-44	13-161	13-53	18-35	32-73

TABLE 62.---Continued

DEC	1961 JAN	FEB	MAR	APR	MAY	JUN
						2 253-264
5 18-21	9 27	3 18-25	10 21-26			
1 24						
						37 38-45
					1 66	
				1 19		
				1 7	4 8-11	
5 12-16	49 16-30	71 19-34	117 17-41	32 24-66	39 16-76	1 36
61 19-24	60 22-44	96 25-45	89 35-60			
1 42				1 38	11 20-27	22 29-63
				1 14		
	1 210					5 13-27

TABLE 62.--Continued

		1960				
		JUL	AUG	SEP	OCT	NOV
<u>Lutjanus</u>	N				1	
<u>synagris</u>	R				21	
<u>Megalops</u>	N					
<u>atlanticus</u>	R					
<u>Microgobius</u>	N	82	33	5	6	1
<u>gulosus</u>	R	16-32	20-29	26-33	20-33	34
<u>Micropogon</u>	N					
<u>undulatus</u>	R					
<u>Mugil</u>	N					2
<u>cephalus</u>	R					21
<u>Mugil</u>	N					
<u>curema</u>	R					
<u>Oligoplites</u>	N			2		
<u>saurus</u>	R			17-28		
<u>Opisthonema</u>	N			11		
<u>oglinum</u>	R			26-38		
<u>Orthopristis</u>	N	31	1			
<u>chrysopterus</u>	R	48-72	61			
<u>Paralichthys</u>	N					
<u>albigutta</u>	R					
<u>Prionotus</u>	N					
<u>scitulus</u>	R					
<u>Prionotus</u>	N			2		
<u>tribulus</u>	R			17-18		
<u>Psenes</u>	N					
<u>cyanophrys</u>	R					
<u>Sardinella</u>	N					1
<u>anchovia</u>	R					29
<u>Scarus</u>	N					
<u>croicensis</u>	R					

TABLE 62.--Continued

DEC	1961 JAN	FEB	MAR	APR	MAY	JUN
	1 45					
1 26	1 35	1 21	1 34			1 24
	4 27-34					
96 20-25	300 21-36	208 20-29	11 24-27			
					1 18	
	4 128-143					
	1 43	1 43				57 33-47
				9 26-47	5 28-46	18 32-44
				1 54		
1 46						
					1 28	
						12 43-62
					1 16	

TABLE 62.---Continued

		1960	AUG	SEP	OCT	NOV
		JUL				
<u>Sciaenops</u>	N					
<u>ocellatus</u>	R					
<u>Scorpaena</u>	N	1				
<u>grandicornis</u>	R	65				
<u>Selene</u>	N					
<u>vomer</u>	R					
<u>Sparisoma</u>	N					
<u>rubripinne</u>	R					
<u>Sphaeroides</u> <sup>c</sup>	N					
<u>sp.</u>	R					
<u>Sphaeroides</u>	N			2		
<u>nephelus</u>	R			20-24		
<u>Sphaeroides</u>	N					
<u>spengleri</u>	R					
<u>Sphaeroides</u>	N	11	3	8	19	15
<u>testudineus</u>	R	59-128	91-128	85-154	9-128	86-154
<u>Spyraena</u>	N	26	27	66	12	16
<u>barracuda</u>	R	21-168	21-72	18-113	17-140	29-106
<u>Stephanolepis</u>	N			2		
<u>hispidus</u>	R			15-23		
<u>Strongylura</u>	N	1			3	
<u>marina</u>	R	102			99-124	
<u>Strongylura</u>	N	2	1			
<u>notata</u>	R	146-185	163			
<u>Symphurus</u>	N					
<u>plaguisa</u>	R					
<u>Syngnathus</u>	N					
<u>floridae</u>	R					
<u>Syngnathus</u>	N					
<u>fuscus</u>	R					

TABLE 62.--Continued

DEC	1961 JAN	FEB	MAR	APR	MAY	JUN
1 29				3 21-41	2 26-28	
	15 105-145			17 116-152	2 146-216	
					2 25-31	
2 10-11				1 43		1 39
1 26	1 14	2 19-25		7 22-41		
37 10-118	6 79-113	3 88-98	11 100-139	6 41-117	4 74-137	3 82-131
1 34					3 20	4 73-108
1 13					1 15	
				1 51		
					1 97	
	2 31-41					
					2 111-136	
1 52						



TABLE 62.--Continued

		1960	AUG	SEP	OCT	NOV
		JUL				
<u>Syngnathus</u>	N	3	1	10	1	
<u>louisianae</u>	R	121-137	129	68-94	111	
<u>Syngnathus</u>	R	65	25	13		
<u>scovelli</u>	R	45-71	55-71	45-73		
<u>Synodus</u>	N		1	1	3	6
<u>foetens</u>	R		38	34	39-60	51-77
<u>Trachinotus</u>	N		2			
<u>falcatus</u>	R		9-15			

<sup>a</sup>Disc width.

<sup>b</sup>Length from coronet to tip of extended tail.

<sup>c</sup>Juveniles too small for specific identification.

TABLE 62.--Continued

DEC	1961 JAN	FEB	MAR	APR	MAY	JUN
7 68-100	4 73-100	1 118	1 60	2 104-136	3 72-168	4 92-144
1 46	1 57	1 54	4 43-61	7 51-62	15 31-71	5 54-71
1 35		1 42	2 30-51	6 33-77	24 31-108	9 37-108
			1 15	3 13-19		

TABLE 63.-- Physical data and monthly occurrence of fishes at Station No. 5. N = number of specimens; R = size range, standard lengths in millimeters

		1960 AUG	AUG	OCT	DEC
Date		7	28	30	31
Salinity ‰		19.6	4.5	9.7	30.8
Temperature ° C.		34.0	30.0	26.0	22.0
<u>Achirus</u>	N				1
<u>lineatus</u>	R				13
<u>Anchoa</u>	N				40-44
<u>cubana</u>	R				
<u>Anchoa</u>	N	17	1		79
<u>lamprotaenia</u>	R	31-35	30		29-51
<u>Anchoa</u>	N				1
<u>lyolepis</u>	R				51
<u>Anchoa</u>	N	183	150±		253
<u>mitchilli</u>	R	29-50	31-45		26-51
<u>Archosargus</u>	N	3			
<u>probatocephalus</u>	R	41-47			
<u>Bairdiella</u>	N	6			
<u>chrysur</u>	R	48-79			
<u>Bathygobius</u>	N	2			
<u>soporator</u>	R	26-41			
<u>Blennius</u>	N		1		
<u>nicholsi</u>	R		17		
<u>Caranx</u>	N				
<u>hippos</u>	R				
<u>Caranx</u>	N		1		
<u>latus</u>	R		44		
<u>Centropomus</u>	N			1	
<u>undecimalis</u>	R			17	

TABLE 63.---Continued

1961 JAN	FEB	MAR	APR	MAY	JUN
29	12	5	30	21	29
34.4	18.0	34.6	35.9	36.0	22.5
20.5	18.25	24.0	28.0	28.0	30.0
5 44-52	4 50-58	3 49-51			
15 28-47	1 35				4 38-43
46 31-56	8 35-54	4 40-47			
315 22-55	285+ 25-55	200+ 26-55			81 32-48
		1 59		1 16	2 19-26
1 113				1 18	2 54-57

TABLE 63.--Continued

		1960 AUG	AUG	OCT	DEC
<u>Chaetodipterus</u>	N		1		
<u>faber</u>	R		12		
<u>Chilomycterus</u>	N				
<u>schoepfi</u>	R				
<u>Citharichthys</u>	N				
<u>spilopterus</u>	R				
<u>Cynoscion</u>	N	1	3		
<u>nebulosus</u>	R	90	17-44		
<u>Diapterus</u>	N	51	36	13	
<u>olisthostomus</u>	R	30-42	38-49	18-38	
<u>Diplectrum</u>	N				
<u>bivittatum</u>	R				
<u>Eucinostomus</u>	N	3	16	12	33
<u>argenteus</u>	R	27-45	14-50	14-34	15-52
<u>Eucinostomus</u>	N	153	300+	178±	20
<u>gula</u>	R	26-58	15-56	10-40	18-45
<u>Eugerres</u>	N	34	7		
<u>plumieri</u>	R	30-45	34-48		
<u>Evorthodus</u>	N	2	2		
<u>lyricus</u>	R	36-52	20-47		
<u>Gerres</u>	N	1			
<u>cinerus</u>	R	29			
<u>Gobionellus</u>	N		6		3
<u>boleosoma</u>	R		13-22		20-21
<u>Haemulon</u>	N	2	36		
<u>parrai</u>	R	42-53	31-49		
<u>Harengula</u>	N	29-34			
<u>pensacolae</u>	R				
<u>Lactophrys</u> <sup>a</sup>	N				
<u>sp.</u>	R				

TABLE 63.---Continued

1961 JAN	FEB	MAR	APR	MAY	JUN
			2 22-37	5 13-53	1 31
20 19-48	5 27-48				
				4 14-19	2 20-27
	1 31	1 34			1 59
				1 51	
20 15-55	25 17-47	21 23-81	92 14-69	69 16-60	9 26-64
29 22-51	36 18-49	56 33-89	26 43-87	25 16-60	43 26-64
					2 29-32
18 13-24	12 18-24	1 22			1 24
					52 27-47
					400± 30-51
				1 10	

TABLE 63.--Continued

		1960 AUG	AUG	OCT	DEC
<u>Lagodon</u>	N	44	25		
<u>rhomboides</u>	R	48-87	51-83		
<u>Leiostomus</u>	N				2
<u>xanthurus</u>	R				13-15
<u>Lepidochir</u>	N				
<u>havana</u>	R				
<u>Lutjanus</u>	N	3	17		
<u>analis</u>	R	16-58	22-42		
<u>Lutjanus</u>	N	43	96	2	
<u>griseus</u>	R	17-60	14-47	29-4	
<u>Lutjanus</u>	N	1			
<u>jocu</u>	R	45			
<u>Microgobius</u>	N	1	10	3	
<u>gulosus</u>	R	32	?	19-24	
<u>Mugil</u>	N				169
<u>cephalus</u>	R				18-25
<u>Mugil</u>	N		6		
<u>curema</u>	R		17-76		
<u>Oligoplites</u>	N	1	15		
<u>saurus</u>	R	23	18-41		
<u>Oostethus</u>	N			1	
<u>lineatus</u>	R			63	
<u>Orthopristis</u>	N	3	1		
<u>chrysopterus</u>	R	56-70	72		
<u>Paralichthys</u>	N				
<u>albigutta</u>	R				
<u>Sardinella</u>	N				
<u>anchovia</u>	R				
<u>Scarus</u>	N				
<u>croicensis</u>	R				

TABLE 63.--Continued

1961 JAN	FEB	MAR	APR	MAY	JUN
53 15-27	49 16-32	66 14-107	56 20-132	26 30-77	13 28-81
86 23-43	34 27-43		1 84		
				1 22	
		2 20-26	4 19-41	2 21-55	4 28-60
3 178-201			2 159-167	1 92	1 33
	1 28				3 22-25
223 20-26	435 19-28	133 19-27		1 173	
					1 17
					4 28-54
		2 18-34			61 30-72
		1 23			
			2 25-27		
				2 12-16	



TABLE 63.--Continued

		1960 AUG	AUG	OCT	DEC
<u>Selene</u> <u>vomer</u>	N R				
<u>Sphaeroides</u> <u>sp.</u>	N R				2 13-16
<u>Sphaeroides</u> <u>spengleri</u>	N R			1 13	
<u>Sphaeroides</u> <u>testudineus</u>	N R	3 96-110	3 88-137	5 8-125	11 64-120
<u>Sphyraena</u> <u>barracuda</u>	N R	9 48-122	33 27-139		
<u>Stephanolepis</u> <u>hispidus</u>	N R				
<u>Strongylura</u> <u>marina</u>	N R		1 58		
<u>Syngnathus</u> <u>floridae</u>	N R				
<u>Syngnathus</u> <u>louisianae</u>	N R	10 58-89	1 61		2 64-67
<u>Syngnathus</u> <u>scovelli</u>	N R	15 47-76	28 48-77	1 40	
<u>Synodus</u> <u>foetens</u>	N R				
<u>Trachinotus</u> <u>falcatus</u>	N R		1 14		
<u>Trachinotus</u> <u>glaucus</u>	N R				

<sup>a</sup>Juveniles too small for specific identification.

TABLE 63.--Continued

1961 JAN	FEB	MAR	APR	MAY	JUN
4 104-148	1 146		1 178		
				1 10	
1 23			2 30-32		
16 78-124	4 73-98	3 31-126	4 102-129	5 70-142	5 15-134
			1 42	15 77	7 28-134
1 11	1 20				
			11 86		
			1 77	1 111	2 156-290
				1 85	
2 100-129	1 171	2 77-115	3 68-81	2 55-136	2 111-119
		2 49-53	1 70	7 46-61	13 45-69
2 33-143		1 31	3 66-89	4 82-93	1 54
				8 10-43	2 26-38
			1 11		

TABLE 64.--Physical data and monthly occurrence of fishes at Station No. 6. N = number of specimens; R = size range, standard lengths in millimeters

		1960				
		JUL	AUG	OCT	NOV	DEC
Date		7	7	23	25	26
Salinity ‰		7.7	10.2	2.0	16.6	24.2
Temperature ° C.		32.0	33.0	27.0	24.0	18.0
<u>Achirus</u>	N					
<u>lineatus</u>	R				2	
					10-18	
<u>Anchoa</u>	N	1				
<u>hepsetus</u>	R	41				
<u>Anchoa</u>	N					
<u>lamprotaenia</u>	R					
<u>Anchoa</u>	N	32	39	84		111
<u>mitchilli</u>	R	30-38	26-39	28-39		22-44
<u>Archosargus</u>	N					
<u>probatocephalus</u>	R					
<u>Albula</u>	N				1	
<u>vulpes</u>	R				23	
<u>Bathygobius</u>	N					1
<u>soporator</u>	R					65
<u>Caranx</u>	N		1			6
<u>hippos</u>	R		57			91-147
<u>Caranx</u>	N		1			
<u>latus</u>	R		60			
<u>Centropomus</u>	N		1			
<u>pectinatus</u>	R		112			
<u>Centropomus</u>	N				7	2
<u>undecimalis</u>	R				37-57	165-202
<u>Citharichthys</u>	N				5	21
<u>spilopterus</u>	R				17-20	14-51

TABLE 64.--Continued

1961 JAN	FEB	FEB	MAR	MAY
2	11	11	6	28
31.0	19.7	21.0	25.9	26.8
21.0	19.0	19.0	25.0	28.0

1  
?97  
27-5022  
26-381  
841  
371  
243  
43-651  
1151  
596  
24-1482  
38-4610  
21-486  
26-585  
30-68

TABLE 64.--Continued

1961 JAN	FEB	FEB	MAR	MAY
54 17-77	5 27-33	120 22-78	9 33-53	
44 12-58	78 12-58	51 16-51	49 21-67	24 26-60
	4 37-43			
1 143		22 21-42		
			1 150	
		62 19-37		
19 13-33	13 19-28	2 15-21	6 21-28	
	8 21-26		5 18-32	1 48
4 21-25	75 15-44	5 29-36	112 29-53	
1 49				

TABLE 64.---Continued

		1960				
		JUL	AUG	OCT	NOV	DEC
<u>Diapterus</u>	N	37	240	27	87	54
<u>olisthostomus</u>	R	16-24	32-45	23-33	17-49	17-47
<u>Elops</u>	N			1		
<u>saurus</u>	R			253		
<u>Eucinostomus</u>	N	400±	136		167	100±
<u>argenteus</u>	R	13-79	14-72		13-54	11-50
<u>Eucinostomus</u>	N		13		2	2
<u>gula</u>	R		39-53		45-53	39-43
<u>Eugerres</u>	N	150	58			1
<u>plumieri</u>	R	16-55	27-58			207
<u>Evorthodus</u>	N	1				
<u>lyricus</u>	R	40				
<u>Fundulus</u>	N		2			
<u>grandis</u>	R		56			
<u>Galeichthys</u>	N			3		
<u>felis</u>	R			205-223		
<u>Gambusia</u>	N			6	1	2
<u>affinis</u>	R			12-23	30	24-26
<u>Gobionellus</u>	N		1		1	
<u>boleosoma</u>	R		30		26	
<u>Lagodon</u>	N	12				1
<u>rhomboides</u>	R	45-68				15
<u>Leiostomus</u>	N				1	15
<u>xanthurus</u>	R				163	9-21
<u>Lepisosteus</u>	N				1	
<u>platyrhincus</u>	R				300	
<u>Lutjanus</u>	N	1	5	4	1	1
<u>griseus</u>	R	36	21-45	56-90	41	50
<u>Lutjanus</u>	N			1		1
<u>locu</u>	R			76		35

TABLE 64.--Continued

		1960 JUL	AUG	OCT	NOV	DEC
<u>Menidia</u>	N	9			1	1
<u>beryllina</u>	R	36-47			32	-
<u>Microgobius</u>	N	20	3			1
<u>gulosus</u>	R	13-33	13-31			33
<u>Mugil</u>	N	4		1	16	250
<u>cephalus</u>	R	43-88		185	18-23	20-27
<u>Mugil</u>	N	5	1	1	6	
<u>curema</u>	R	46-50	17	166	17-23	
<u>Oligoplites</u>	N	1				
<u>saurus</u>	R	52				
<u>Oostethus</u>	N					2
<u>lineatus</u>	R					105-113
<u>Paralichthys</u>	N				1	
<u>lethostigma</u>	R				394	
<u>Poecilia</u>	N					
<u>latipinna</u>	R					
<u>Prionotus</u>	N					1
<u>scitulus</u>	R					16
<u>Prionotus</u>	N					
<u>tribulus</u>	R					
<u>Sciaenops</u>	N				3	1
<u>ocellata</u>	R				15-38	23
<u>Sphaeroides</u> <sup>a</sup>	N				1	1
<u>sp.</u>	R				6	12
<u>Sphaeroides</u>	N					
<u>nephelus</u>	R					
<u>Sphaeroides</u>	N	6	3		6	13
<u>testudineus</u>	R	66-116	50-105		10-105	12-122
<u>Strongylura</u>	N	3			1	
<u>marina</u>	R	166-217			123	

TABLE 64.--Continued

1961 JAN	FEB	FEB	MAR	MAY
				3 -
20 20-23	184 21-30	131 23-41	282 18-39	6 41-56
		9 23-32	1 128	1 26
1 109				1 69
	1 38			
8 27-52	7 36-69			
	2 14-24			2 9-12
	12 19-101		12 28-106	1 37
1 166				17 14-116



TABLE 64.--Continued

		1960	AUG	OCT	NOV	DEC
		JUL				
<u>Strongylura</u>	N	3				
<u>notata</u>	R	237-314				
<u>Symphurus</u>	N					1
<u>plagiusa</u>	R					42
<u>Syngnathus</u>	N				1	
<u>floridae</u>	R				71	
<u>Syngnathus</u>	N	1			1	2
<u>louisianae</u>	R	104			71	83-132
<u>Syngnathus</u>	N	9	8		1	
<u>scovelli</u>	R	42-63	36-67		49	
<u>Synodus</u>	N					
<u>foetens</u>	R					
<u>Trachinotus</u>	N					
<u>falcatus</u>	R					

<sup>a</sup> Juveniles too small for specific identification.

TABLE 64.--Continued

1961 JAN	FEB	FEB	MAR	MAY
1 50			1 116	
	1 137			
			1 52	
			2 28-33	3 43-71
				4 12-25

Competition between gerrids and cyprinodonts to the point that there is no overlap of their ranges has not been proposed previously to explain the paucity of cyprinodonts in brackish waters in south Florida. Evidence to support this explanation is largely circumstantial. On the northern Gulf coast where gerrids are not abundant, cyprinodonts are common in salt water. Farther south at Cedar Key, Kilby (1955: 221) noted that there was a negative correlation between the occurrence of Eucinostomus argenteus and Cyprinodon variegatus and Fundulus confluentus. In south Florida, E. argenteus penetrates much farther into fresh water than it does in the north, and is often accompanied by Eugerres and Diapterus.

#### The Fresh Water Areas

Thirty-two species of fresh water fishes were found in the area. These species are typical of the small south Florida canals and flatwoods ponds. However, the addition of Cyprinodon hubbsi and Fundulus notti lineatus to the south Florida fauna can be considered significant.

As mentioned earlier, there is little mixing of typical fresh water and marine species. Special Collection 6 was the only occasion when numerous species of fresh and salt water fishes were found together, and then the fresh water fishes were not abundant. On a few occasions, Gambusia and Poecilia were found in salt water but always near a source

of fresh water. Gars, Anguilla, gizzard shad, and one small bluegill were the only other species collected in salt water.

### Physical Factors

The effects of temperature, salinity, and other abiotic environmental factors on the faunal composition have only been partially discussed.

#### Temperature

The role of temperature in limiting numbers of species is well known and has been discussed earlier. The temperature conditions of this part of the Florida east coast are tempered by the nearby Gulf Stream. Its effect in maintaining stable temperature conditions is especially noticeable in the Intracoastal Waterway. Extremes of temperature beyond the tolerance limits of local species are unknown in recent years.

#### Salinity

The effect of decreased salinity on species numbers has been discussed earlier and is evident when Tables 61 through 64 are compared.

It should be noted that salinity-frequency of occurrence tables such as used by Gunter (1945: 126), Kilby (1955: 243), and Gunter and Hall (1963a: 237) may not accurately depict the salinity preference of a species. For such tables to be valid, an equal number of collections would have to be made

in each salinity range, using the same gear in an identical manner, and all specimens should be recorded. These criteria were not met in the previously mentioned papers. Gunter (op. cit.: 127) did provide some data on the type of gear used and the number of collections made in each salinity range; however, it is apparent that the data from his collections were lumped. The division of the salinity range into units of 5 ‰ has no biological significance and in some instances may be misleading.

#### Turbidity

Turbidity is probably not a problem for most species except in some areas (notably the inlet) during storms.

## SUMMARY

An annotated list of 267 species representing 169 genera and 78 families found in the Jupiter Inlet - Loxahatchee River area is given, including notes on their spawning, ecology, and seasonal occurrence.

The first continental records of Hippocampus obtusus and Citharichthys arenaceus are reported, as well as the first authenticated records of Mustelis canis, Myliobatis freminvillei and Gobiosoma ginsburgi in Florida.

Ranges of 45 species are extended, and others redefined. The distribution patterns of these species suggests that a faunal boundary exists in the Jupiter area.

Within the study area four ecological areas are recognized: the ocean beach, the Inlet-Intracoastal Waterway area, the river, and areas of fresh water.

The beaches were found to be relatively depauperate.

Tropical forms were found to occur seasonally in the Inlet-Intracoastal Waterway area where temperatures and salinities are relatively stable. Seasonal occurrence was similar to that in the Florida Keys.

Comparisons of the occurrence of fishes in the less stable river habitats is provided. This population was found to be typically north temperate.

Records of 32 fresh water fishes are listed. They are typically widespread in southern Florida with the exception of Cyprinodon hubbsi and Fundulus notti lineolatus. Little intermingling of fresh and salt water species was found.

Lack of suitable habitat and competition with gerrids are proposed as explanations for the paucity of cyprinodonts in the brackish waters of south Florida.

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