The Flora and Fauna of a Basin in Central Florida Bay

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By

J. HAROLD HUDSON, DONALD M. ALLEN,

and

T. J. COSTELLO

Contribution No. 263, Bureau of Commercial Fisheries
Biological Laboratory, Galveston, Tex.

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By

J. HAROLD HUDSON, DONALD M. ALLEN,
and
T. J. COSTELLO, Fishery Biologists

Bureau of Commercial Fisheries
Tropical Atlantic Biological Laboratory
Miami, Florida 33149

ABSTRACT

One hundred ninety-six species of plants and animals are reported from a nursery area for pink shrimp, Penaeus duorarum duorarum, in a basin of central Florida Bay. Many of the organisms are benthic and associated with shallow beds of turtle grass, Thalassia testudinum. Although abrupt habitat variations may affect species distribution, the general distribution of organisms in the basin and bay defines environments influenced by different water masses.

INTRODUCTION

Florida Bay is at the southern tip of the Florida peninsula. The bay serves as a nursery ground for pink shrimp, Penaeus duorarum duorarum, before they move to the Tortugas shrimping grounds, northwest of Key West (Costello and Allen, 1966).

As part of an ecological study of the Tortugas pink shrimp population, we made a sampling survey of young pink shrimp and associated organisms in central Florida Bay (fig. 1). The incidence of certain plants and animals in the bay may help us detect environments that are suitable for young pink shrimp. With few exceptions, the plants and animals collected were identified to species and form the list contained in this preliminary report. Except in very general terms, we make no attempt to relate these organisms to the environment. Distribution, abundance, and ecology are left for a later report.

Past ecological studies in Florida Bay include those by Tabb and Manning (1961) and Tabb, Dubrow, and Manning (1962). Their work was confined to the northwestern section of the bay, whereas our report concerns central Florida Bay.

DESCRIPTION OF AREA

Detailed descriptions of the Florida Bay environment were given by Ginsburg (1956) and Gorsline (1963). This shallow bay has an extensive complex of mangrove keys and intersecting mudbanks covered with seagrasses. The network of banks and keys separates the bay into semienclosed basins, locally called "lakes," 40 to 300 cm. deep.

Porpoise Lake, which we selected for study, is a triangular-shaped basin in the east-central portion of the bay (fig. 1). It is bordered on the northwest by the Foxtrot Keys and on the north by Bob Allen Key (fig. 2). The lake has an area of about 10.4 km.^{2} and a maximum depth of 210 cm. Sediments in the lake and on surrounding banks are mainly carbonate mud mixed with varying amounts of shell fragments and plant detritus. The banks are carpeted with extensive beds of turtle grass, Thalassia testudinum, which extend into the lake but thin rapidly with increasing water depth. The fringe area between the Thalassia and the keys is narrow and covered intermittently with sparse patches of shoal grass, Diplanthera wrightii.

Numerous small channels cut through the enclosing banks to connect Porpoise Lake with surrounding lakes and, finally, the Atlantic Ocean and Gulf of Mexico. The depth of these channels varies from 80 to 245 cm., and they

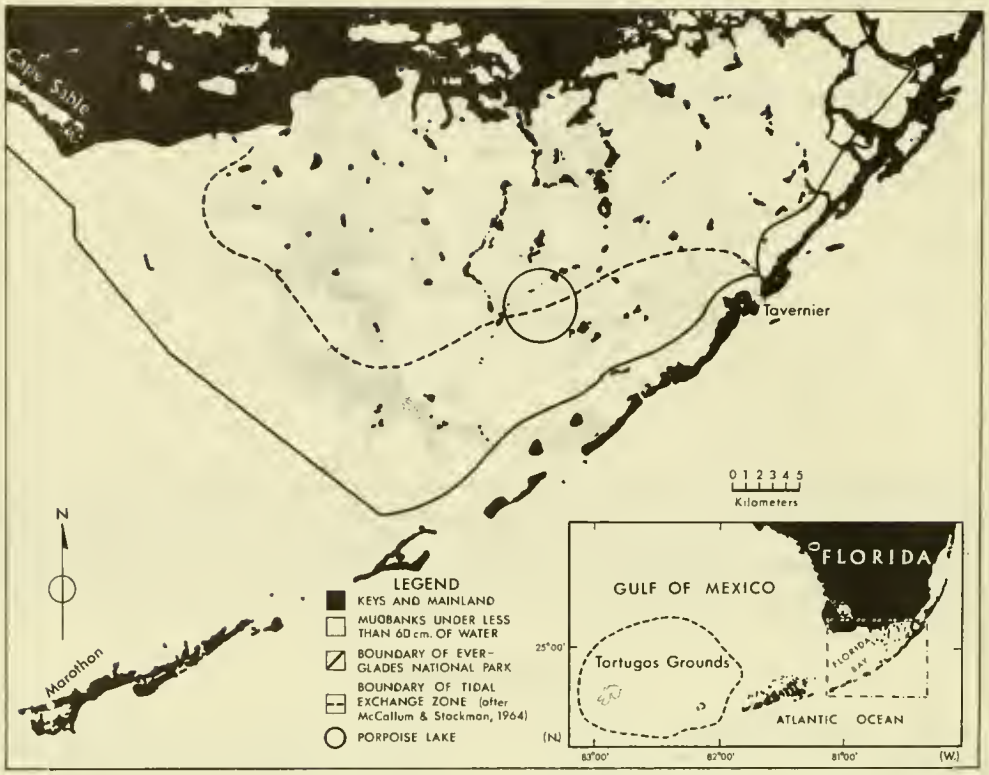

Figure 1.--Location of Porpoise Lake in Florida Bay.

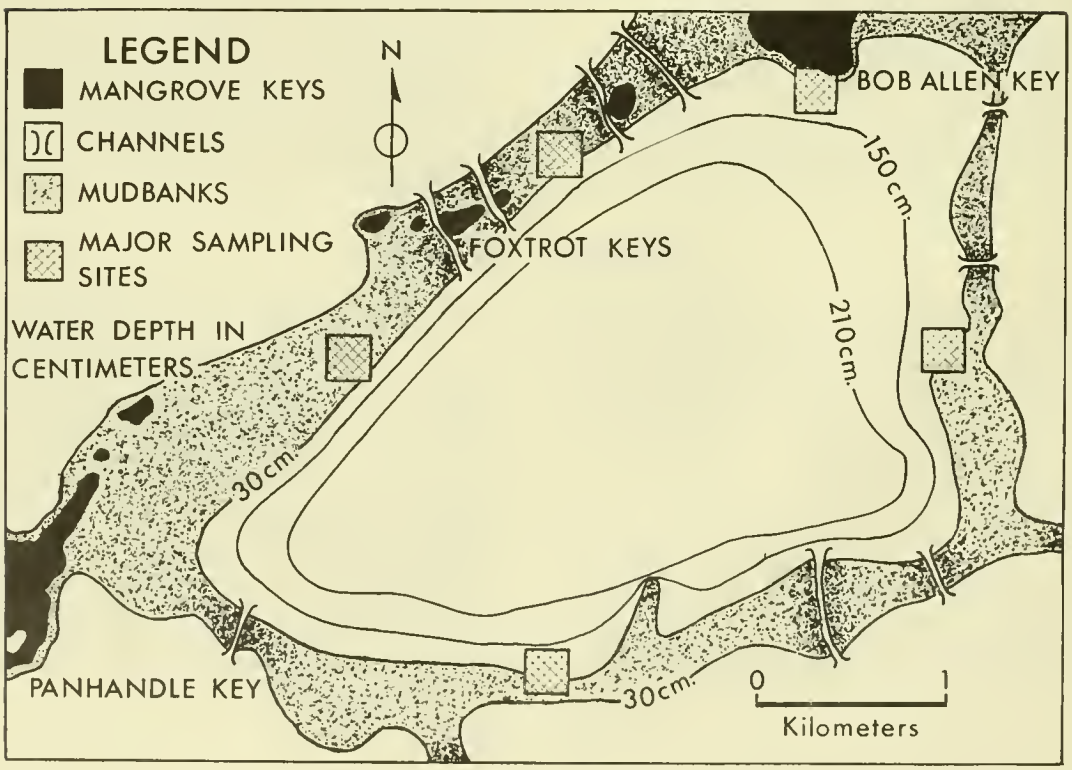

Figure 2.--Porpoise Lake, with surrounding banks and keys.

have an irregular floor of soft carbonate mud, with patches of bedrock exposed by scouring. Moderate to dense stands of Thalassia and Diplanthera cover the mud deltas at each end of the channels and, to some extent, the channels themselves where sediments are sufficiently deep to afford them attachment. Numerous "grass" ledges are formed along the channel banks where undercutting removes the soft sediments, leaving a dense mat of overhanging Thalassia rhizomes.

In addition to passing through the channels, water also is exchanged across the surfaces of the banks, but the dense cover of epiphyte-laden Thalassia restricts this flow and acts as an efficient baffle and filtering system. Although tidal water extends into the lake (McCallum and Stockman, 1964), poor flushing is indicated by abrupt differences in water clarity and salinity between the lake and the ocean water to the south. Strong winds and seasonal changes in ocean level cause the largest fluctuations in the lake's water level (Ginsburg, 1956). Maximum observed difference in lake level was 38 cm.

We measured salinities and temperatures of the lake water at monthly intervals from November 1964 to January 1968 (table 1). Highest salinity (49.6 p.p.t.) was recorded in July 1965; lowest salinity (27.8 p.p.t.), in September 1966. McCallum and Stockman (1964) reported that in Florida Bay, "...fluctuations in the amount of fresh-water runoff from the mainland produce seasonal and annual fluctuations in salinity." The lack of rainfall in the summer of 1965, and, conversely, the abundance of rainfall in the summer of 1966, were primarily responsible for the difference in the two salinity values. Surface temperature in the lake ranged from 32.2° C. in September 1965 to 16.6° C. in December 1966.

Table 1.--Salinity and temperature of surface waters in Porpoise Lake, November 1964 to January 1968

Month	1964		1965		1966		1967		1968	
	Salinity	Temperature	Salinity	Temperature	Salinity	Temperature	Salinity	Temperature	Salinity	Temperature
	p.p.t.	°C.	p.p.t.	°C.	p.p.t.	°C.	p.p.t.	°C.	p.p.t.	°C.
January	-[1]	-	-	-	39.8	20.5	31.9	22.8	33.7	17.6
February	-	-	-	-	40.0	17.5	29.0	23.2	-	-
March	-	-	40.0	24.9	40.8	19.8	35.2	23.9	-	-
April	-	-	41.3	-	43.1	21.5	37.3	31.6	-	-
May	-	-	45.8	27.3	41.4	27.2	41.7	29.0	-	-
June	-	-	44.3	27.6	36.2	25.0	39.4	31.0	-	-
July	-	-	49.6	31.3	33.1	31.0	39.9	31.5	-	-
August	-	-	46.3	30.2	31.5	30.9	41.3	28.5	-	-
September	-	-	48.6	32.2	27.8	32.0	41.0	29.1	-	-
October	-	-	44.4	27.0	28.7	27.4	35.2	27.2	-	-
November	39.0	24.9	41.3	27.6	29.0	24.3	34.2	27.2	-	-
December	-	24.9	40.3	20.6	30.0	16.6	32.4	26.5	-	-

[1] - = No data

METHODS

From April 1965 to January 1968 we collected samples each month in a Thalassia bed adjacent to Bob Allen Key (fig. 2). These samples were taken with a sled-mounted suction sampler (Allen and Hudson)[1] and a slednet.[2] The suction sampler captures both epifauna and infauna, whereas the slednet captures epifauna only. These devices also were used to sample in Thalassia beds on the east, south, and northwest banks of the lake. To supplement the catches made by the suction sampler and slednet, we used a pushnet (Allen and Inglis, 1958), beach seine, and castnet, together with hand collecting.

A bait-shrimp vessel with two roller-frame trawls (Woodburn, Eldred, Clark, Hutton, and Ingle, 1957) was used to sample the lake's biota at night. This method enabled us to investigate more thoroughly the large expanse of lake bottom and capture nocturnal species.

We used face mask and snorkel to examine the channels. The organisms were collected by hand, handnet, and hook and line.

Despite the variety of gear, we did not collect many species known to inhabit the lake. Also, we did not attempt to retain plants and animals less than 5 mm. long or wide.

PORPOISE LAKE SPECIES LIST

Scientific name	Common name
MARINE ALGAE	
Family Dasycladaceae	
Batophora oerstedi var. occidentalis (Harvey) Howe	---
Acetabularia crenulata Lamouroux	Venus wine glass
Family Valoniaceae	
Anadyomene stellata (Wulfen) C. Agardh	---
Cladophoropsis membranacea (C. Agardh) Børgesen	---
Cladophoropsis macromeres Taylor	---
Family Caulerpaceae	
Caulerpa paspaloides var. wurdemanni Weber-van Bosse	---
Caulerpa lanuginosa J. Agardh	---
Caulerpa cupressoides var. cupressoides (West) C. Agardh	---
Caulerpa sertularioides (Gmelin) Howe	---
Family Codiaceae	
Penicillus capitatus Lamarck	---
Penicillus dumetosus (Lamouroux) Blainville	---
Rhipocephalus phoenix (Ellis and Solander) Kützing	---
Udotea spinulosa Howe	---
Halimeda incrassata (Ellis) Lamouroux	---
Family Gracilariaceae	
Gracilaria sp.	---
Family Ceramiaceae	
Spyridia filamentosa (Wulfen) Harvey	---
Ceramium rubrum (Hudson) C. Agardh	---
Family Rhodomelaceae	
Laurencia poitei (Lamouroux) Howe	---
Digenia simplex (Wulfen) C. Agardh	---

[1] Donald M. Allen and J. Harold Hudson. 1969. A sled-mounted suction sampler for benthic organisms. Unpublished manuscript, 13 pp., filed at the Bureau of Commercial Fisheries Tropical Atlantic Biological Laboratory, Miami, Fla. 33149.

[2] A hand-pulled frame trawl, similar to that described by Pullen, Mock, and Ringo (1968).

SEA GRASSES

Family Hydrocharitaceae

Thalassia testudinum König	Turtle grass

Family Zosteraceae

Diplanthera wrightii (Ascherson) Ascherson	Shoal grass
Syringodium filiforme Kützing	Manatee grass

SPONGES

Family Chondrillidae

Chondrilla nucula Schmidt	Chickenliver sponge

Family Dysideidae

Dysidea fragilis (Montagu) Johnson	---

COELENTERATES

Family Rhizophysaliidae

Physalia physalis Linnaeus	Portuguese man-of-war

Family Chondrophoridae

Velella velella Linnaeus	By-the-wind sailor

Family Poritidae

Porites porites var. furcata Lamarck	Finger coral

Family Faviidae

Solenastrea hyades (Dana)	Knobby star coral

BRYOZOANS

Family Schizoporellidae

Schizoporella sp.	---

ANNELIDS

Family Polynoidae

Harmothoë aculeata Andrews	---

Family Hesionidae

Hesione picta Müller	---

Family Nereidae

Ceratonereis mirabilis Kinberg	---

Family Glyceridae

Glycera sp.	---

Family Dorvilleidae

Dorvillea rudolphii (delle Chiaje)	---

Family Spionidae

Prionospio heterobranchia Moore	---

Family Opheliidae

Armandia maculata (Webster)	Javelin worm

MOLLUSKS

Family Fissurellidae

Diodora cayenensis Lamarck	Cayenne keyhole limpet

Family Trochidae

Calliostoma jujubinum tampaense Conrad	Jujube top-shell
Tegula fasciata Born	Smooth Atlantic tegula

Family Turbinidae

Turbo castaneus Gmelin	Chestnut turban
Astraea phoebia Röding	Long-spined star-shell
Astraea tecta americana Gmelin	American star-shell

Family Modulidae

Modulus modulus Linnaeus	Atlantic modulus

Family Potamididae

Batillaria minima Gmelin	False cerith

Family Cerithidae

Cerithium muscarum Say	Fly-specked cerith

Family Calyptraeidae

Crepidula convexa Say	Convex slipper-shell
Crepidula plana Say	Eastern white slipper-shell

Family Muricidae

Murex cellulosus Conrad	Pitted murex
Muricopsis ostrearum Conrad	Mauve-mouth drill
Eupleura sulcidentata Dall	Sharp-ribbed drill

Family Columbellidae

Columbella rusticoides Heilprin	Rusty dove-shell

Family Melongenidae

Melongena corona Gmelin	Common crown conch
Busycon contrarium Conrad	Lightning whelk
Busycon spiratum Lamarck	Pear whelk

Family Nassariidae

Nassarius vibex Say	Common eastern nassa
Nassarius albus Say	Variable nassa

Family Fasciolariidae

Fasciolaria tulipa Linnaeus	True tulip
Fasciolaria hunteria Perry	Banded tulip

Family Olividae

Olivella minuta Link	Minute dwarf olive

Family Marginellidae

Prunum apicinum Menke	Common Atlantic marginella

Family Conidae	
Conus stearnsi Conrad	Stearn's cone
Family Turridae	
Cerodrillia thea Dall	Thea drillia
Family Bullidae	
Bulla striata Bruguière	Striate bubble
Family Atyidae	
Haminoea antillarum Orbigny	Antillean paper-bubble
Family Ischnochitonidae	
Ischnochiton papillosus C. B. Adams	Mesh-pitted chiton
Family Arcidae	
Arcopsis adamsi E. A. Smith	Adams' miniature ark
Family Mytilidae	
Brachidontes exustus Linnaeus	Scorched mussel
Family Pteriidae	
Pinctada radiata Leach	Atlantic pearl oyster
Family Pectinidae	
Argopecten irradians concentricus (Say)	Atlantic bay scallop
Family Limidae	
Lima pellucida C. B. Adams	Antillean lima
Family Carditidae	
Cardita floridana Conrad	Broad-ribbed cardita
Family Lucinidae	
Codakia orbiculata Montagu	Dwarf tiger lucina
Family Cardiidae	
Laevicardium mortoni Conrad	Morton's egg cockle
Family Veneridae	
Chione cancellata Linnaeus	Cross-barred venus
Anomalocardia cuneimeris Conrad	Pointed venus
Transennella cubaniana Orbigny	Cuban transennella
Transennella stimpsoni Dall	Stimpson's transennella
Family Tellinidae	
Tellina tampaensis Conrad	Tampa tellin
Tellina similis Sowerby	Candy stick tellin
Tellina lineata Turton	Rose petal tellin
Family Lyonsiidae	
Lyonsia hyalina floridana Conrad	Glassy lyonsia
Family Octopodidae	
Octopus joubini Robson	Joubin's octopus

HORSESHOE CRABS

Family Limulidae

Limulus polyphemus Linnaeus	Horseshoe crab

PYCNOGONIDS

Family Phoxichilidiidae

Anoplodactylus insignis (Hoek)	---
Anoplodactylus lentus Wilson	---
Anoplodactylus pectinus Hedgpeth	---

Family Ammotheidae

Nymphopsis duodorsospinosa Hilton	---

CRUSTACEANS

Family Balanidae

Balanus amphitrite niveus Darwin	---

Family Anthuridae

Cyathura polita (Stimpson)	---

Family Cirolanidae

Cirolana parva Hansen	---

Family Aegidae

Rocinela signata Schioedte and Meinert	---

Family Sphaeromidae

Paracerceis caudata (Say)	---
Cymodoce faxoni (Richardson)	---
Sphaeroma destructor Richardson	Putty bug

Family Idotheidae

Cleantis planicauda Benedict	---
Erichsonella floridana Benedict	---

Family Penaeidae

Penaeus duorarum duorarum Burkenroad	Pink shrimp

Family Palaemonidae

Leander paulensis Ortmann	---
Leander tenuicornis (Say)	---
Periclimenes americanus (Kingsley)	---
Periclimenes longicaudatus (Stimpson)	---

Family Alpheidae

Alpheus heterochaelis Say	Big-clawed snapping shrimp
Alpheus normanni Kingsley	Green snapping shrimp

Family Hippolytidae

Hippolyte pleuracantha (Stimpson)	---
Latreutes fucorum (Fabricius)	---
Thor sp.	---
Tozeuma carolinense Kingsley	Bayonet shrimp

Family Processidae

Processa sp.	---

Family Palinuridae

Panulirus argus (Latreille)	Spiny lobster

Family Paguridae

Pagurus bonairensis Schmitt	---

Family Diogenidae

Paguristes tortugae Schmitt	---
Petrochirus diogenes (Linnaeus)	---

Family Dromiidae

Dromidia antillensis Stimpson	---

Family Calappidae

Calappa sp.	---

Family Portunidae

Callinectes sapidus Rathbun	Blue crab
Callinectes ornatus Ordway	---
Portunus depressifrons (Stimpson)	---
Cronius ruber (Lamarck)	---

Family Xanthidae

Menippe mercenaria (Say)	Stone crab
Neopanope packardii (Kingsley)	---

Family Majidae

Libinia dubia H. Milne Edwards	---
Mithrax spinosissimus (Lamarck)	---
Pitho anisodon (von Martens)	---

ECHINODERMS

Family Echinasteridae

Echinaster sentus (Say)	---

Family Amphiuridae

Amphioplus abditus (Verrill)	---
Amphiodia pulchella (Lyman)	---

Family Ophiactidae

Ophiactis savignyi (Müller and Troschel)	---

Family Ophiotrichidae

Ophiothrix örstedii Lütken	---

Family Holothuriidae

Holothuria floridana Pourtalès	---

Family Diadematidae

Diadema antillarum (Philippi)	Long-spined sea urchin

CHAETOGNATHS

Family Sagittidae

Sagitta hispida Conant	Arrowworm

FISHES

Family Orectolobidae

Ginglymostoma cirratum (Bonnaterre)	Nurse shark

Family Carcharhinidae

Negaprion brevirostris (Poey)	Lemon shark

Family Sphyrnidae

Sphyrna tiburo (Linnaeus)	Bonnethead shark

Family Pristidae

Pristis pectinatus Latham	Smalltooth sawfish

Family Dasyatidae

Dasyatis americana Hildebrand and Schroeder	Southern stingray

Family Elopidae

Elops saurus Linnaeus	Ladyfish
Megalops atlantica Valenciennes	Tarpon

Family Albulidae

Albula vulpes (Linnaeus)	Bonefish

Family Clupeidae

Harengula pensacolae Goode and Bean	Scaled sardine
Opisthonema oglinum (LeSueur)	Atlantic thread herring

Family Engraulidae

Anchoa mitchilli (Valenciennes)	Bay anchovy
Anchoa lamprotaenia Hildebrand	Longnose anchovy

Family Synodontidae

Synodus foetens (Linnaeus)	Inshore lizardfish

Family Ariidae

Galeichthys felis (Linnaeus)	Sea catfish

Family Belonidae

Strongylura notata (Poey)	Redfin needlefish

Family Hemiramphidae

Chriodorus atherinoides Goode and Bean	Hardhead halfbeak
Hyporhamphus unifasciatus (Ranzani)	Halfbeak

Family Cyprinodontidae

Cyprinodon variegatus Lacépède	Sheepshead minnow
Lucania parva (Baird and Girard)	Rainwater killifish

Family Poeciliidae

Poecilia latipinna (LeSueur)	Sailfin molly

Family Syngnathidae	
Hippocampus zosterae Jordan and Gilbert	Dwarf seahorse
Syngnathus floridae (Jordan and Gilbert)	Dusky pipefish
Syngnathus scovelli (Evermann and Kendall)	Gulf pipefish
Micrognathus crinigerus (Bean and Dresel)	Fringed pipefish
Family Centropomidae	
Centropomus undecimalis (Bloch)	Snook
Family Serranidae	
Epinephelus itajara (Lichtenstein)	Jewfish
Mycteroperca microlepis (Goode and Bean)	Gag
Family Lutjanidae	
Lutjanus griseus (Linnaeus)	Gray snapper
Lutjanus synagris (Linnaeus)	Lane snapper
Lutjanus apodus (Walbaum)	Schoolmaster
Family Rachycentridae	
Rachycentron canadum (Linnaeus)	Cobia
Family Carangidae	
Caranx crysos (Mitchill)	Blue runner
Caranx hippos (Linnaeus)	Crevalle jack
Oligoplites saurus (Bloch and Schneider)	Leatherjacket
Family Gerridae	
Eucinostomus argenteus Baird and Girard	Spotfin mojarra
Eucinostomus gula (Quoy and Gaimard)	Silver jenny
Family Pomadasyidae	
Haemulon sciurus (Shaw)	Bluestriped grunt
Orthopristis chrysopterus (Linnaeus)	Pigfish
Family Sciaenidae	
Cynoscion nebulosus (Cuvier)	Spotted seatrout
Sciaenops ocellata (Linnaeus)	Red drum
Family Sparidae	
Archosargus probatocephalus (Walbaum)	Sheepshead
Lagodon rhomboides (Linnaeus)	Pinfish
Family Ephippidae	
Chaetodipterus faber (Broussonet)	Atlantic spadefish
Family Pomacentridae	
Abudefduf saxatilis (Linnaeus)	Sergeant major
Family Labridae	
Halichoeres bivittatus (Bloch)	Slippery dick
Family Gobiidae	
Gobiosoma robustum Ginsburg	Code goby
Microgobius microlepis Longley and Hildebrand	Banner goby
Microgobius gulosus (Girard)	Clown goby
Family Triglidae	
Prionotus pectoralis (Nichols and Breder)	Blackwing searobin

Family Clinidae

Chaenopsis ocellata Poey	Bluethroat pikeblenny
Paraclinus marmoratus (Steindachner)	Marbled blenny

Family Blenniidae

Blennius marmoreus Poey	Seaweed blenny

Family Sphyraenidae

Sphyraena barracuda (Walbaum)	Great barracuda

Family Mugilidae

Mugil curema Valenciennes	White mullet
Mugil cephalus Linnaeus	Striped mullet

Family Atherinidae

Membras martinica (Valenciennes)	Rough silverside
Allanetta harringtonensis (Goode)	Reef silverside

Family Soleidae

Achirus lineatus (Linnaeus)	Lined sole

Family Gobiesocidae

Gobiesox strumosus Cope	Skilletfish

Family Ostraciidae

Acanthostracion quadricornis (Linnaeus)	Cowfish

Family Tetraodontidae

Sphaeroides nephelus (Goode and Bean)	Southern puffer

Family Diodontidae

Chilomycterus schoepfi (Walbaum)	Striped burrfish

Family Batrachoididae

Opsanus beta (Goode and Bean)	Gulf toadfish

Family Callionymidae

Callionymus pauciradiatus Gill	Spotted dragonet

MARINE MAMMALS

Family Delphinidae

Tursiops truncatus Montague	Bottlenose dolphin

ECOLOGICAL CONSIDERATIONS

Our survey revealed 169 genera and 196 species of plants and animals in Porpoise Lake. Benthic forms made up 73 percent of the animals listed, and many of them are well-known associates of the seagrass community. The importance of seagrass beds as habitats for small marine animals has been stressed by Phillips (1960), Moore (1963), and Hoese and Jones (1963), among others. We found that young pink shrimp and many small benthic animals (annelids, mollusks, crustaceans, and fishes) were present throughout the year in shallow Thalassia beds bordering the lake. Species not usually found in these seagrass beds inhabited the channels transecting the banks of the lake. These species included the knobby star coral (Solenastrea hyades), the long-spined sea urchin (Diadema antillarum), the spiny lobster (Panulirus argus), and the schoolmaster (Lutjanus apodus). Although these species are common on the Atlantic side of the Florida Keys (Springer and McErlean, 1962; Turmel and

Swanson, 1964; Kissling, 1965), they are rare or absent in the channels of northwestern Florida Bay (Tabb and Manning, 1961).

Within the seagrass areas of Porpoise Lake that are superficially homogeneous, several animals had discontinuous distribution. The finger coral (Porites porites var. furcata), the American star-shell (Astraea tecta americana), and the long-spined star-shell (A. phoebia), were along the southern bank but not the northern bank of this basin. We did not see these species in central Florida Bay north of Porpoise Lake, nor did Tabb and Manning (1961) report them from northwestern Florida Bay. These species are common, however, on the Atlantic side of the Florida Keys (Voss and Voss, 1955; Kissling, 1965).

Ginsburg (1956) observed that organisms which inhabit the reef tract[3] paralleling the Atlantic side of the Florida Keys may be abundant in the outer or marginal zone of Florida Bay where there is tidal exchange with the reef tract and where salinities are near "normal." Furthermore, Turney (1964) found the distribution of mollusks in Florida Bay to be related primarily to water circulation, and he cited A. americana (A. tecta americana) as a characteristic species of the Atlantic margin of Florida Bay, an area of frequent exchange of water with the Atlantic Ocean. This tidal water extends into the southern portion of Porpoise Lake (McCallum and Stockman, 1964) and meets the slowly circulating waters of the inner bay which have fluctuating salinities and temperatures (Gorsline, 1963).

Different masses of water have dissimilar ecological effects and support distinctive populations of organisms (Phleger, 1964; Cerame-Vivas and Gray, 1966). Water movements in Florida Bay produce separate water masses that have unlike characteristics (Gorsline, 1963). Within Porpoise Lake, animal associates of the seagrass beds differ from those of the adjacent channels. These abrupt variations in fauna suggest the effects of extremely local habitats that cannot, necessarily, be attributed to different water masses. The general distribution of organisms in the lake and in Florida Bay, however, defines varied environments created or influenced by different water masses.

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[3] Ginsburg defined the reef tract as "the arcuate band-shaped area east, southeast, and south of the Keys between 0 and 300 feet."

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