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Report

To

The Florida Power and Light Company

TITLE

**SURVEY OF THE BIOTA OF CARD SOUND**

by

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## SURVEY OF THE BIOTA OF CARD SOUND

### ABSTRACT

A brief study of the ecology of Card Sound was made in March-May, 1969. The first phase, the examination of aerial photographs and a diving survey, was used to plan a more thorough study of the area. The second phase of the study included hydrographic observations, trawling and plankton tows to provide more detailed examination of the species present and their relative abundance.

Card Sound had relatively few areas of deep sediments and the sediments in general were relatively coarse suggesting low abundance of microscopic species which require this type of substrate. Salinity, temperature and dissolved oxygen were consistent in surface and bottom samples from all areas in the Sound. These measurements suggest that the waters in the Sound are rather well mixed.

Six arbitrary zones were examined and the abundance of populations which contribute to the productivity of the area were studied.

Based on these observations, which have recorded estimates of the number of species present and the abundance of individuals, Card Sound appears to be an area of relatively low standing crop compared with other south Florida ecosystems such as Whitewater Bay, Coot Bay, Florida Bay and the middle portions of Biscayne Bay.

### INTRODUCTION

The purposes of this short term study (March-May, 1969) were: 1) to map Card Sound showing the principal ecological zones and (2) to give estimates of relative abundance of the more obvious and ecologically important plants and animals. The results of the survey form the basis to make judgments on the relative productivity of the Sound.

Preliminary observations based on field counts of plants and animals and by the use of color aerial photographs were presented in a report dated April 1969. The present report incorporates all material from the preliminary report and in addition gives:

1. Identification of plants and animals requiring laboratory examination
2. Relative abundance of plants and animals
3. Relative abundance of plankton
4. A salinity profile
5. A dissolved oxygen profile
6. The depth and composition of bottom sediments

This report provides greater detail on the ecological zones in Card Sound outlined in the earlier report. The sampling gear and techniques used were the same as those used in other studies conducted in the past in Florida Bay, Whitewater Bay and Coot Bay by Tabb *et al.* (1962) in

middle Biscayne Bay by Roessler (1965) and those currently being carried out in South Biscayne Bay thus permitting comparisons of standing crop between the several areas.

Card Sound was arbitrarily divided in several zones and the important biological populations in each area were identified and counted. These zones are as follows: the mangrove community, the shallows from Broad Creek to Angelfish Creek, the shallow submerged rim bordering the Sound, the deep basin of the eastern Sound, the deep basin of the western Sound, the plankton community and the exploited populations. Each of these zones is described below. Little information is available on the productivity of the mangrove community, the plankton populations, and the exploited populations.

## METHODS

Four observation trips were made in Card Sound. On the first three trips work was done in areas where the water was sufficiently clear to enable water buckets to be used to see the larger plants and animals on the bottom. One man observed from each side of the boat as it drifted or was propelled slowly ahead. Stations were chosen to provide adequate coverage of what appeared to be the principal communities based on water depth, bottom type and current flow patterns. The number of stations was arrived at by determining the extent of variation of the biota. Spot observations were made between stations to attempt to locate the boundaries of the bottom communities.

During the first three trips the east side of the Sound (east of a line drawn from about the inland ship channel south to Morant Point) was not clear enough to see organisms on the bottom from the boat using water buckets. Thus on the fourth trip a series of dives were made to observe the biota. One diver-biologist, Mr. Terry Davis, Florida Atlantic Ocean Sciences Institute, used Scuba gear and Mr. Robert Work, Institute of Marine Sciences, University of Miami, used snorkel gear. Each diver spent about 10 minutes at each station moving about on the bottom to cover as much area as possible. This procedure does not permit as broad a coverage of the bottom as was achieved by using water buckets, but on the east side of the Sound the bottom sediments and biota are rather uniform and the numbers of species and individuals are new. This homogeneity reduced the sampling frequency necessary to obtain reliable estimates. The station lists appended to this report are based on field identifications by Davis and Work and compiled by the latter.

To supplement the observations by buckets and diving and to provide observations on the inshore mangrove areas, USCGS aerial color photographs 64W (C) 7438 and from 64W (C) 7405 to 7410 and 64W (C) 7305 to 7345 were studied. These photographs were taken in 1964 with a scale of 1" = 40,000 feet and are valuable in providing general features of the Sound. The water was clear at the time the photographs were taken, and excellent details of plant distribution and some of the animals were obtained along the inshore shallows as well as on the bottom of the Sound. Although these photographs are about 5 years old, the principal shore line and bottom features as well as the mangrove areas have not changed much between then and the present time.

In the second phase of this survey collections of the larger plants and animals were made using an otter trawl with 3/4-inch stretched mesh cod end and a 10-foot mouth. In keeping with standard techniques used in other studies conducted by Institute of Marine Science's personnel the time of towing was 2 minutes. The contents of the net were placed in a wash tub and sorted on the boat. All specimens which could be identified in the field were counted and recorded; the remainder preserved for laboratory identification and counts. The plankton was sampled using two conical nets hauled simultaneously for 7 minutes. One net had an opening of 12 inches in diameter with a mesh of 300  $\mu$  and the second net had an opening of 20 inches with a mesh of

35  $\mu$ . In these nets the plankton accumulates in a bottle attached to the apex of the net. The volume of water filtered during each tow was measured using flow meters mounted in the mouth of the net.

All samples collected during the present survey were obtained during **day** light hours. In other ecological studies made in Florida, night samples generally contained more fish and non-sessile invertebrates than did day samples (Tabb, Dubrow and Manning, 1962; Roessler, 1965). This is in part due to the ability of some faster swimming fish with acute vision to avoid a net and to the nocturnal behavior of some species. From the standpoint of judging the relative standing crop in Card Sound our daylight samples can be compared with other areas where similar daylight samples were obtained.

The collection made by trawling is an important adjunct to the visual observations in the first phase of this study in that the collections provide in most cases specific identification and estimates of the relative abundance of organisms. Forty stations were sampled in the Sound. At each station duplicate tows were made in an attempt to obtain a basis for estimating sampling variability. Some of the duplicate tows differ substantially in the occurrence of species and also in number of individuals of certain species sought. This indicates the need for much more intensive sampling in order to provide truly representative samples of biological population in the area. For the most part, however, the duplicate tows are similar enough to satisfy the objectives of this study.

Samples of sediments to be used to determine bottom types were obtained diving and collecting a small jar of bottom material. The sample was capped by the diver and upon reaching the laboratory was oven dried, rinsed and redried. Each sample was then run through seven seines with openings varying from 0.062 to 2 mm.

For sediment depth a diver probed the bottom with a metal rod of about 4-inch in diameter until hard rock was reached. The depth of the overburden was marked on the rod and tabulated. At each station a series of probes was made to obtain a representative depth for each area.

Samples of water for salinity determination were collected at the surface and just off the bottom using a Niskin sampler. The Goldberg refractometer manufactured by American Optical Company which provides accuracy of  $\pm 0.5$  ppt in the range of salinities found in Card Sound was used to measure the salinity.

The temperature of the water and the amount of dissolved oxygen was determined by a Yellow Springs Instrument Co., Model 54 Oxygen meter.

The field sampling schedule is shown in Table 1.

#### GENERAL DESCRIPTION OF CARD SOUND

Card Sound is approximately 3 miles wide by 5 miles long. It has nearly uniform depth of about 10 feet at mean low water in the mid basin. It is bounded on the north by Cutter Bank and by Card Bank on the south (Figure 1). Depths of water over both banks are only a few feet at mean low water. Water current studies should be carried out with all possible speed to provide an estimate of exchange with adjacent Biscayne Bay, Barnes Sound, Little Card Sound and the Straits of Florida. Current studies were not a part of this study since Florida Power and Light has retained the services of hydrographers from the University of Florida to carry out this work.

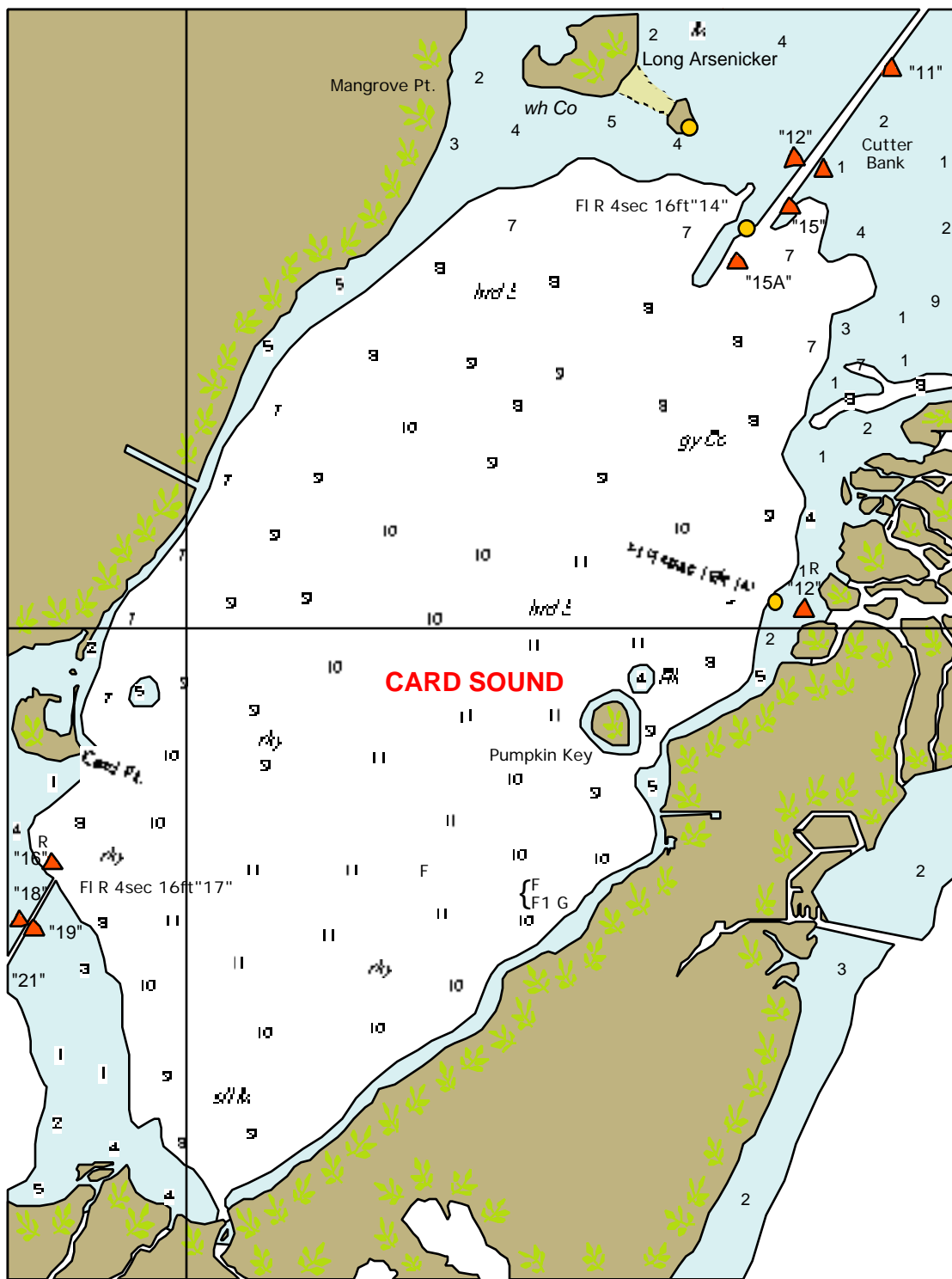


Figure 1. Chart of Card Sound showing general hydrographic features. Broad Creek enters the Sound in the northeast corner where depths of 8 feet are shown. Angelfish Creek is just south of Broad Creek at Marker R"12". Depth in feet from USGS Chart No. 1249. [INLAND ROADS AND DEPTH CONTOURS ON THE EAST SIDE OF THE KEYS NOT SHOWN.

Table 1. Schedule of field trips to Card Sound February - May, 1969.

February 22	Observations by water buckets
March 8	Observations by water buckets
March 11	Observations by water buckets
March 20	Observations by diving
April 9	Trawling - Northeastern Card Sound
April 11	Trawling - Southeastern Card Sound
April 17	Trawling - Southwestern Card Sound
April 22	Trawling - Off Model Land Company Canal
April 24	Trawling - Northwestern Card Sound
May 13	Plankton
May 17	Temperature, Salinity, Dissolved Oxygen and sediment depth
May 20	Temperature, Salinity, Dissolved Oxygen and sediment depth

#### Depth of Sediments

The depth of sediments were determined at 32 stations (Figure 2). They varied considerably from station to station. The greatest depths occurred just south of East Arsenicker Key and at three stations in the southern part of the Sound (Stations H15, H32, H29). The stations near Model Land Company Canal (H4, H5, H6, H11, H12 and H13) showed very small deposits of sediments.

#### Particle Size of Sediments

Samples for analyses of particle size of sediments were obtained at 7 stations (Figure 3). The stations at the south end of Card Sound (S3, S4) in the northeast corner near Broad Creek (S7) show the highest percentage of fine sediments, that is, less than 0.125 mm (Table 2). This probably reflects deposition of sediments from the creeks in the southern end of the sound and material being brought in from the reef tracts outside the Keys through Broad Creek. Station S2 off Model Land Company Canal contains relatively few sediments and shows the greatest percentage in the 0.35-0.50 mm range.

The percentage of fine sediments (less than 0.062 mm) is well below those found by Tabb, Dubrow and Manning (1962) in Coot Bay (78%, 38%, 82%), Whitewater Bay (43%) and near Flamingo (58%). The presence of larger sediments in general suggests a less productive environment than the other bays listed.

#### Temperature

The surface and bottom temperature was remarkably constant at each station and also among stations. The range of surface temperature readings from 25.9 to 30.1 °C and the range of bottom stations was 25.3 to 30.1 °C (Table 3).

#### Dissolved Oxygen

The range of dissolved oxygen in the surface water was 5.6 to 6.5 (Table 3). Saturation values at the temperatures and salinities observed during these collections are about 6 ppm. There was close agreement between face and bottom oxygen values.

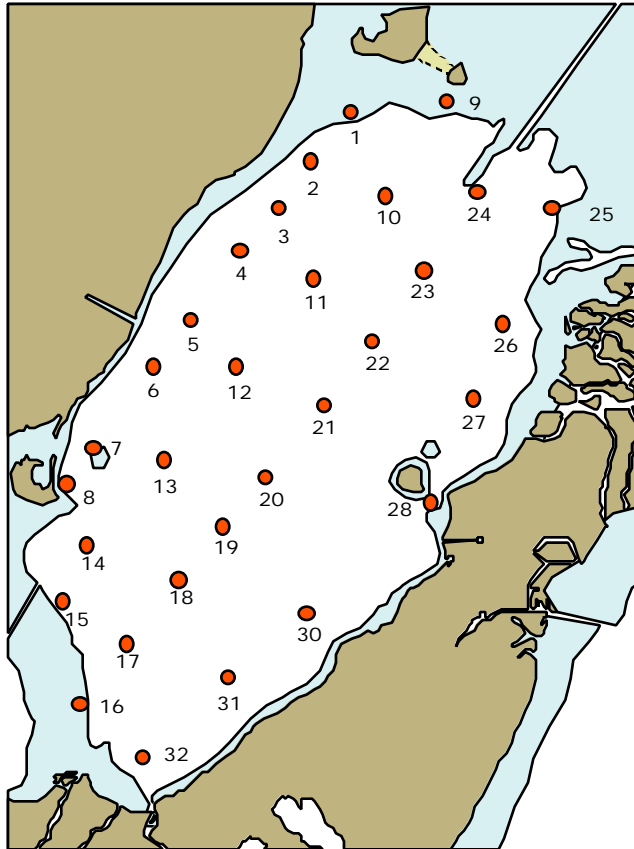


Figure 2. Stations (H1 – H32) where dissolved oxygen, temperature, salinity and sediment depths were measured.

### Salinity

Similar to dissolved oxygen and temperature, salinity was relatively constant at about 33 ppt at all stations and depths sampled (Table 3).

### BIOLOGICAL POPULATIONS

Card Sound was sampled by visual observations at the stations shown Figure 4 and by trawling at the stations shown in Figures 5 and 6. The areas were arbitrarily divided into "communities" or zones on the basis of types of organisms.

#### Mangrove Community

The role that mangroves play in cycling organic material in an ecosystem is important. Estimates have recently been made (Heald, 1969) suggesting that about 3 metric tons of organic matter per acre per year are produced by mangroves, chiefly the red mangrove (*Rhizophora mangle*). Thus the amount of mangroves in region is one measure of its biological productivity.



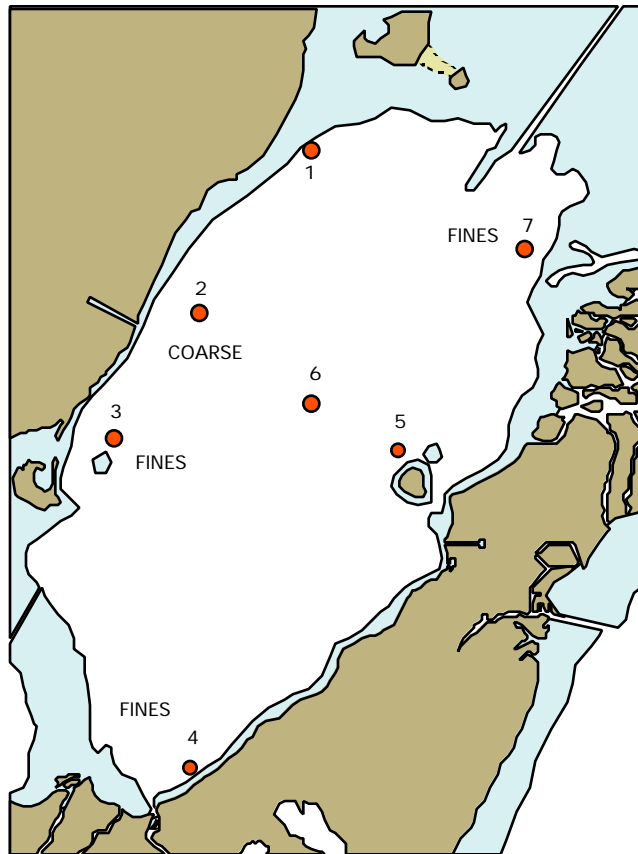


Figure 3. Stations where collections were made for the determination of sediment(s) particle size.

The zone of red mangrove trees was narrow along the west side of the Sound. From Card Point north to about the Model Land Canal the band of red mangroves was somewhat wider than to the north. The shoreline was indented with many muddy bays and flats bordered by mangroves that were flooded on most high tides and probably contribute considerable organic matter to the Sound. North of the Model Land Company Canal to about Mangrove Point the mangroves were found in a very narrow intertidal zone. A sand barrier was located close behind the shoreline. This mangrove area is probably flooded only on the higher high tides at which time organic matter is added to the Sound from this area. From about Morant Point to about Jew Point on the south end of the Sound there was a large stand of mangroves, and from about Jew Point north along the east shore of the Sound to about Broad Creek there were few of these trees. The northern part of Key Largo is high ground and the area was bounded by rocky coast. Near Broad and Angelfish Creeks the stands of mangroves were extensive. Long Arsenicker Key and East Arsenicker Key were flooded at high tides. There were heavy stands of mangroves on these islands. Pumpkin Key is a high rocky island, similar for the most part to Key Largo, and red mangroves do not occur there.

In general the Card Sound shoreline area was deficient in productive mangrove areas.

Table 2. Sediment particle size for seven samples taken in Card Sound. Weights and percent of the samples are given.

Station number		1	2	3	4	5	6	7
>2	Wt.(g)	0.71	2.05	6.68	7.48	19.87	3.58	2.03
	%	0.4666	1.109	10.129	12.756	12.069	2.236	2.859
1-2	Wt. (g)	3.36	14.97	3.05	4.83	25.04	18.06	2.48
	%	2.208	8.099	4.625	8.237	15.209	11.279	3.492
0.5-1	Wt. (g)	13.72	45.74	7.08	9.82	37.25	43.43	5.72
	%	9.017	24.747	10.735	16.746	22.625	27.123	8.055
0.35-0.5	Wt. (g)	12.81	25.28	6.83	5.74	23.75	17.21	6.41
	%	8.419	13.677	10.356	9.789	14.425	10.748	9.027
0.125-0.35	Wt.(g)	118.37	83.94	25.870	18.31	45.27	61.02	31.52
	%	77.798	45.414	39.227	31.224	27.496	38.109	44.388
0.062-0.125	Wt.(g)	1.52	4.31	7.71	3.81	4.84	5.11	7.92
	%	0.999	2.332	11.691	6.497	2.940	3.191	11.153
<0.062	Wt.(g)	1.66	8.54	8.73	8.65	8.62	11.71	14.93
	%	1.091	4.620	13.237	14.751	5.236	7.313	21.025

Table 3. Summary of water depth, temperature, salinity, dissolved oxygen and sediment depth data- obtained in Card Sound, Florida on 17 and 20 May 1969.

Station	Depth in meters	Date	Temperature in °Celsius	Salinity in ppt.	Dissolved oxygen in ppm	Sediment depth in cm.
1	0	17 May	27.0	33.7	5.7	110
	0.75		26.8	33.7	5.6	
2	0		27.1	34.5	6.1	6
	2.00		27.0	33.7	6.0	
3	0		27.2	33.7	6.2	7
	2.50		27.0	34.5	6.1	
4	0		27.4	33.7	6.3	6
	2.80		27.2	33.7	6.1	
5	0		27.1	33.7	6.2	8
	2.70		27.1	33.7	6.1	
6	0		27.3	33.7	6.2	9
	2.80		27.2	33.7	6.1	
7	0		28.0	33.7	6.1	59
	3.00		27.8	33.7	6.1	
8	0		27.4	33.7	6.1	65
	2.50		27.1	33.7	5.9	
9	0	20 May	25.9	32.1	6.5	85
	1.25		25.3	32.1	6.4	
10	0		27.0	32.1	6.5	10
	3.00		27.2	32.9	6.1	
11	0		27.2	32.9	6.2	2
	3.00		27.8	32.9	6.0	
12	0		27.0	32.9	6.3	6
	2.90		27.0	33.7	6.0	
13	0		27.9	33.7	6.0	32
	2.90		28.1	33.7	5.8	
14	0		27.0	33.7	5.9	13
	2.60		27.2	34.5	5.8	
15	0	20 May	28.0	33.7	6.2	133
	1.50		27.9	33.7	6.1	
16	0		28.0	33.7	6.2	61
	1.80		28.0	33.7	6.2	

Table 3. Summary of water depth, temperature, salinity, dissolved oxygen and sediment depth data- obtained in Card Sound, Florida on 17 and 20 May 1969 (cont.).

Station	Depth in meters	Date	Temperature in °Celsius	Salinity in ppt.	Dissolved oxygen in ppm	Sediment depth in cm.
17	0		27.8	33.7	6.4	17
	3.40		27.8	33.7	6.3	
18	0		28.0	33.7	6.4	37
	3.60		27.9	33.7	6.3	
19	0		28.0	33.7	6.2	17
	3.50		28.2	33.7	6.2	
20	0		28.1	33.7	6.2	4
	3.00		28.3	33.7	6.0	
21	0		28.0	33.7		62
	3.20		27.9	33.7		
22	0		28.0	32.9		10
	2.60		28.2	33.7		
23	0		28.1	33.7		36
	2.50		28.3	33.7		
24	0		28.0	33.7		10
	2.00		28.0	32.9		
25	0		28.1	32.9		111
	1.80		28.2	32.9		
26	0		27.7	32.9		64
	2.60		28.0	32.9		
27	0		28.1	33.7		13
	3.10		27.8	33.7		
28	0		28.4	33.7		34
	2.40		28.0	33.7		
29	0		28.4	33.7		194
	3.50		27.5	33.7		
30	0	20 May	27.9	32.1		50
	3.60		27.5	33.7		
31	0		27.5	32.1		105
	3.00		27.2	33.7		
32	0		27.7	32.1		250+
	1.00		27.6	32.1		

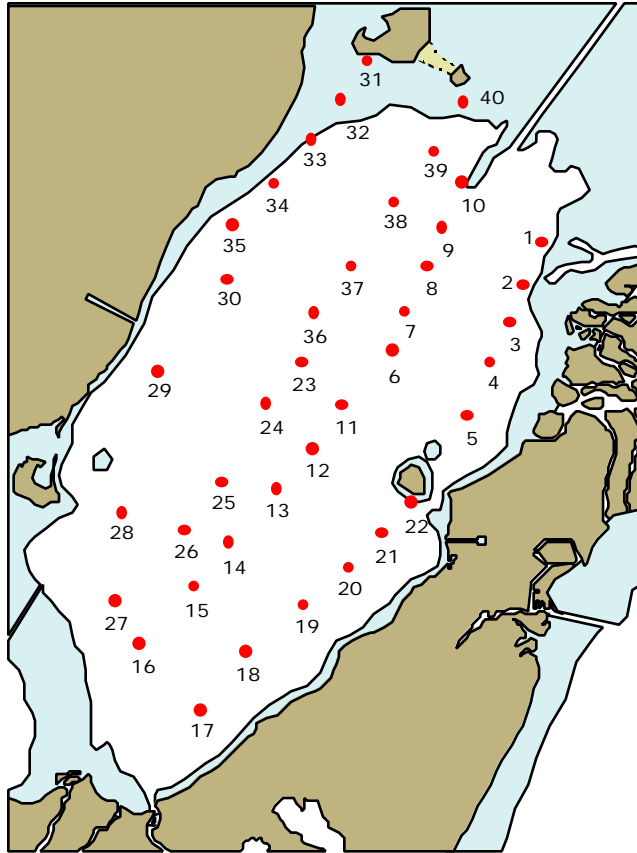


Figure 4. Sampling stations in Card Sound. Stations A through R were sampled using water buckets. At Stations S through BB underwater observations were made. Lines indicate continuous observations and uniformity of major organisms. [PART OF THIS CAPTION PROBABLY APPLIED TO FIGURE 5.]

#### Broad Creek to Angelfish Creek

In the area between Broad Creek and Angelfish Creek numerous channels connect the Sound with the ocean. Broad Creek and Angelfish Creek are the most important of these channels. In this small area there is apparently good tidal range between the Sound and the outside waters. This bank and the deep finger channels serve as feeding places for a variety of fishes including tarpon, snapper, grunt, snook and bonefish. *Thalassia* varied from dense to sparse, depending on the amount of sediment. Few corals and sponges were present.

The trawl samples collected in this area (Stations T1-T4) were characterized by abundant algae, relatively few corals, modest numbers of molluscs and no sponges. The fine sediments which cover the bottom in this area do not permit sessile bottom forms such as corals and sponges to attach.

#### Shallow Rim of the Sound

In general *Thalassia* occurred all around the sub-tidal edge of Card Sound, becoming most extensive in the southeast corner near Station E (Figure 4). Across Card Bank *Thalassia* was

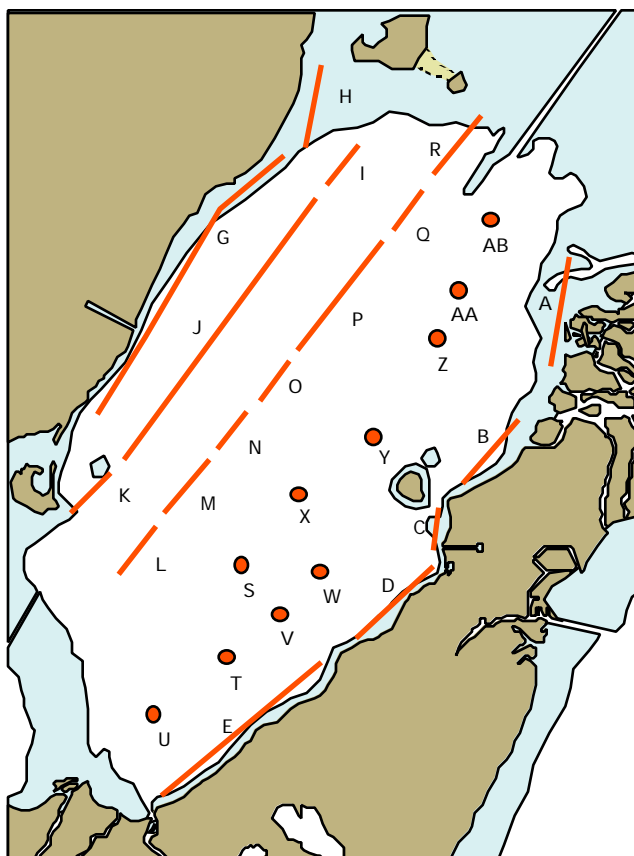


Figure 5. Trawling (T) stations.

patchy with some fairly extensive open sandy areas. The west side of the Sound was nearly uniform except for area around the mouth of the Model Land Canal. Just north of the mouth of the Model Land Company Canal there was a large area of clean sand which appeared to have undergone scouring.

Trawl samples around the rim of the Sound (stations T31, 32 and 40) showed that most species present in the Sound occur in the shallow narrow band surrounding the basin. The *Thalassia* which varies from patchy to very dense grows in pockets of sediment between the firm bottom which provides suitable substrate for the many species of sessile organism found there. Soft and hard corals, sea urchins and molluscs all were abundant in this shallow area.

#### Deep Basin - Eastern Sound

This area included the deep portion of the Sound, from the edge of the Keys to about half-way across the Sound. The bottom was characteristically muddy with some shell fragments and scattered patches of algae and sponges. The water clarity was reduced in this area and this required diving to observe organisms on the bottom. The soft calcium carbonate bottom material is easily stirred up by wind and tidal turbulence and forms an inadequate substrate for many species of invertebrates found in other areas of the Sound with hard sand bottom. At the northern stations (AA and AB) large mounds of sand, apparently thrown up by burrowing crabs or polychaete worms, were observed.

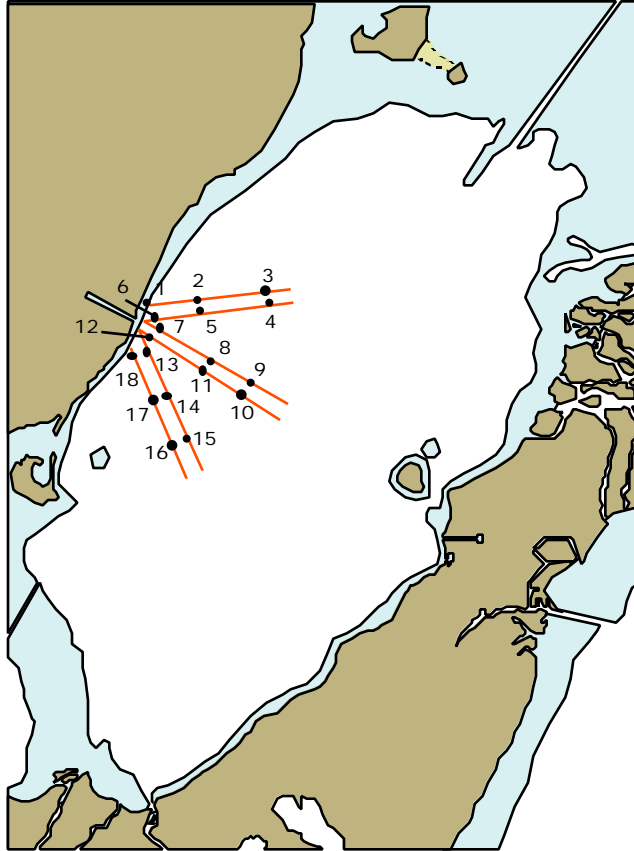


Figure 6. Trawling stations (ML) off mouth of Model Land Company Canal.

Collections by trawl in this portion of the Sound were variable in numbers of individual species present. From about Wednesday Point to Jew Point (Station T17, 18, 19, 21) no plants or animals were taken in the trawl. The station near the center of the Sound and just south of Cutter Bank (Station T8-10) had algae. No corals were found to the south of Pumpkin Key on the east side of the Sound at Stations T11-22.

In general the east side of the Sound has few of the bottom dwelling forms which can be readily collected in trawls but burrowing animals may be abundant.

#### Deep Basin - Western Sound

This area was west of the line from the Intracoastal waterway to Morant Point. The bottom was firm and consisted of sand and shell fragments. This area was richer than the eastern portion of the Sound, especially in species that require hard substrate, as determined by field observations.

The western side of the Sound was trawled at 15 stations and with an intensive pattern of three stations on each of six lines radiating out from the mouth of the Model Land Company Canal. Algae, sponges and molluscs were abundant with molluscs being most abundant at Station T33-39. The algae was fairly dense off the mouth of the canal.

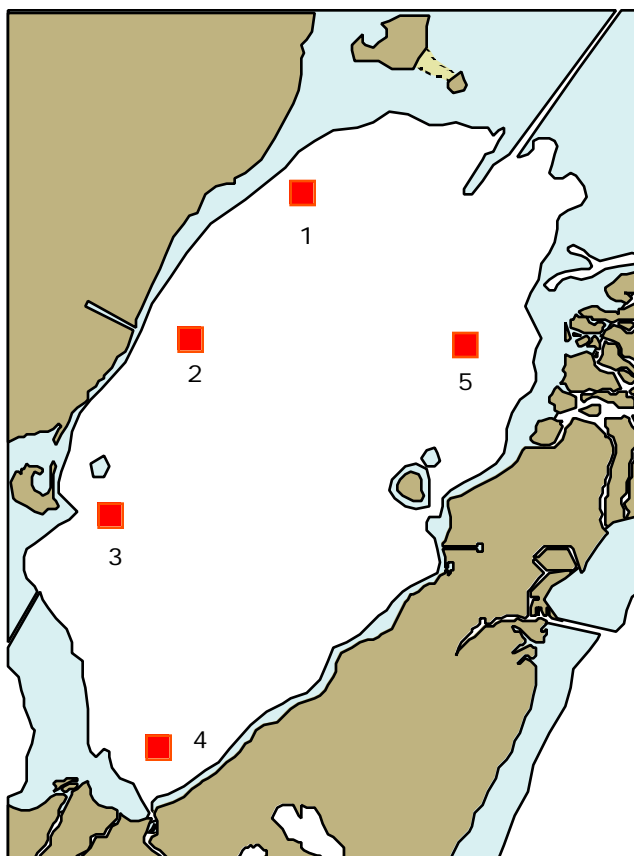


Figure 7. Plankton (P) stations.

#### Plankton

Another method of evaluating standing crop of an area is to measure the abundance of microscopic drifting plants and animals. Using fine mesh nets towed in a standard manner it is possible to obtain volumetric samples which can be compared with other areas within the Sound and with the results other studies in south Florida. The many sources of variability of abundance inherent in these populations include seasonal changes, day-night ranges and the very patchy areal distribution of the populations. Despite these difficulties the samples taken in Card Sound (Figure 7) reflect in a general way the standing crop of the area. The amount of plankton collected adjusted for the volume of water filtered was consistently small in all areas.

#### Exploited Populations

Although only a few fish and shellfish were observed during our partial survey, some species of sport and commercial value are sufficiently abundant to support fisheries. During the four visits there were a number anglers fishing from the bank at the exit of the Model Land Canal. Only few anglers were fishing along the west side of the Sound from small skiffs. The grass flats near Broad and Angelfish Creeks presumably serve as feeding areas for bonefish during certain seasons of the year, since this area has long been used by the anglers from the Key Largo Anglers Club.



Trap lines set for stone crabs were observed on both sides of the Inland Waterway in the deep basin.

Bait shrimpers have been fishing in Card Sound recently and making good catches. three bait shrimp boats were tied up on the Old Card Sound road near the west end of the bridge which is presently under construction. Pink shrimp, *Penaeus duorarum*, have been reported from Card Sound by Salomon, Allen and Costello (1968).

During one trip four sponge fishermen were working on Cutler Bank south of Long Arsenicker and Mangrove Point. Several others were seen working an area of shallow water near Wednesday Point.

Another species of commercial value taken in our trawls included scallop (*Aequipecten irradians*). They were abundant at only a few stations and due to the season all were immature. Small specimens of the fishes *Haemulon* sp. and *Lutjanus griseus* were captured. Most of these fishes are capable of evading the type of trawl used in this study.

## DISCUSSION

While we used the same type of sampling gear in Card Sound as in other ecological surveys in south Florida there are limitations to making direct comparisons of productivity between areas.

Counts of the numbers of species and number of individuals when used to compare the productivity between areas can be misleading when the size of the animals is not taken into account. The total weight of living matter in the area (biomass) provides a basis for absolute productivity and comparisons between areas. However, these figures are difficult and time consuming to obtain and were not possible under the limitations of the present study.

Sampling only during daylight hours and for only a few months provides results which are not readily comparable with other year round studies and those with day and night sampling.

In general the trawl samples taken in Card Sound were characterized by relatively few specimens of each major animal phylum and with representatives of only a few phyla at each station. The area with the heaviest plant growth, largest numbers of animal species and numbers of individuals is the rim surrounding the Sound. This is very narrow on the east and west sides of the Sound and broadens into banks on the north (Cutter Bank) and southwest (Card Bank). These banks which form a large part of the area adjacent to the Sound are productive. The large amount of *Thalassia* growing in these shallow waters which apparently has good exchange with water to the north or south is an important feature contributing to the productivity of the banks.

Considering the basin which constitutes the majority of the area the number of species taken in the otter trawl were with few exceptions low. For example Roessler (1965) found 41 species of fishes in trawl hauls and we found 12 species. Tabb *et al.* (1962) summarizes studies at Soldier Key where 116 species of invertebrates were found and in Florida Bay 239. The total we found in Card Sound was about 50 species. The relatively few species and low abundance of individuals that were found, with only a few exceptions in the 58 stations sampled indicated that our trawling samples were representative of the general level of standing crops in Card Sound.

On the basis of these data from Card Sound and experience gained in other ecological surveys we conclude that this Sound has a low rate of organic productivity.

## LITERATURE CITED

Heald, Eric J.

1969. The production of organic detritus in a south Florida estuary. A dissertation for the degree Doctor of Philosophy, University of Miami. 110 pp.

Roessler, Martin

1965. An analysis of the variability of fish populations taken by otter trawl in Biscayne Bay, Florida. Transactions of the American Fisheries Society 94(4): 311-318.

Tabb, Durbin C., David L. Dubrow and Raymond B. Manning

1962. The ecology of northern Florida Bay and adjacent estuaries. State of Florida Board of Conservation Technical Series No. 39, 81 pp.

Saloman, Carl H., Donald M. Allen and Thomas J. Costello

1968. Distribution of three species of shrimp (genus *Penaeus*) in waters contiguous to southern Florida. Bulletin of Marine Science 18(2): 343-350.

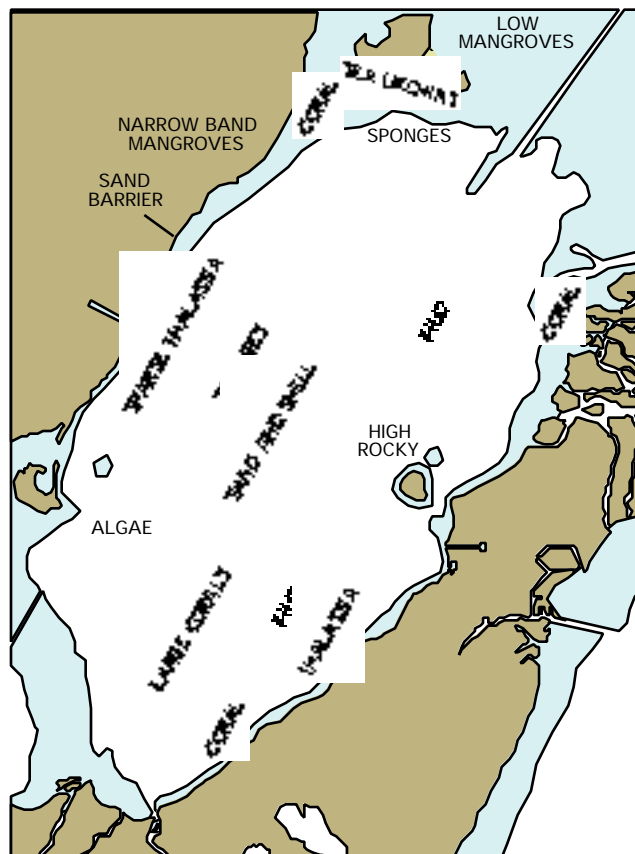


Figure 8. Generalized map showing important ecological zones in Card Sound. [NOT REFERENCED IN THE TEXT.]

## Appendix I

### Details of Animals and Plants Observed

The following is a description of the biota observed while diving or with glass bottom buckets along the transects A-AB shown in Figure 4.

#### Station A

The bottom was generally covered with *Thalassia*. *Thalassia* varied in density from sparse to dense in patches and became thicker near the southern portion of Station A. Finger channels cut into the bottom in places. The fauna was richer at the more northerly portion of Station A. The coral *Porites* was moderately abundant in shallow water (1-2 feet at low water). Sponges were fairly common but widely scattered among the *Thalassia*. Large widely scattered clumps of the calcareous alga *Halimeda* were present. Alcyonarians were absent.

The corals observed were: *Porites* sp., *Solenastrea* sp., the sponges: *Cinachyra* sp., *Geodia gibberosa*, *Ircinia fasciculata*, *Ircinia strobilina*, *Neopetrosia longleyi*, *Haliclona subtriangularis*, *Haliclona viridis*.

Animals observed in the clumps of *Porites* or *Halimeda* included numerous small crabs (mostly small spider crabs of the genus *Mithrax*); a few teribellid polychaete worms, and the polychaete *Hesione picta*; numerous brittle stars (mostly *Ophiothrix* sp. and *Ophionereis reticulata*). The following animals were observed in the *Thalassia*: the sea urchins *Lytechinus variegatus* (common) and *Tripneustes ventricosus* (rare); the sea cucumbers *Ludwigothuria floridana* and *L. mexicana* (uncommon).

#### Station B

The northern portion of Station B drops into water of about 8 to 9 feet. The bottom was sandy or covered with sparse growth of *Thalassia*. A few, widely scattered sponges (*Spheciospongia* and *Ircinia*) occurred, with the sea urchin *Lytechinus variegatus* fairly common.

Towards the southern limits of Station B the abundance of plants and animals gradually decreased and a bottom of deeply pitted "peat-like" substrate with no visible animals was found.

#### Station C

This short stretch had sandy-mud bottom covered with a moderate to thick growth of *Thalassia* just offshore. Along the shoreline, where the bottom was rocky, there were heavy growths of algae, including *Batophora*, *Digenia* and several species of *Caulerpa*.

The following corals were observed in scattered colonies: *Solenastrea* sp., *Siderastrea* sp. The sponges: *Spheciospongia vesparia*, *Geodia gibberosa*, and *Cinachyra* sp. were found.

At the south end of Station C in the vicinity of a marina, the bottom was dredged and had few visible animals.

#### Station D

This station was similar to C, except that the algal coating on the rocky shoreline is thicker.

Towards the southern end of this station the bottom was coarser sand with fairly thick covering of *Thalassia*. The *Thalassia* had a heavy covering of epiphytic algae on its blades. Near the shoreline the flora and fauna were essentially the same as in the northern portion of this station, except that sponges appeared to be more numerous and included in addition to those of Station C, *Ircinia strobilina*, *I. fasciculata* and the fire sponge, *Tedania ignis*.

In addition to the algae of Station C, the alga *Udotea* was present here.

#### Station E

Station E was similar to the southern end of Station D, except at its southern end. Alcyonarians become prominent as one moved into this area. In addition to the fauna and flora of Station D, the following were present in Station E: alcyonarians: *Pterogorgia anceps* and unidentified species of the family *Plexauridae* (very common); stinging coral, *Millepora*; an unidentified bryozoan, and the gastropod *Astraea tecta americana*. The growth of coral and sponges was heavier than at Station D.

Towards the south end of Station E just off Jew Point, the bottom offshore became "peat-like", with some sparse *Thalassia*, while the inshore bottom had an alga growth. No alcyonarians occurred and only one species of sponge was observed (*Tedania ignis*).

#### Station F

This station was the same as the first half of Station E. Half-way to the intracoastal marker "19" there were more open sandy areas, but there was still considerable *Thalassia* in patches. The alga *Udotea* and the sea urchin *Lytechinus* were fairly common. The sponge *Dysidea etheria* became more abundant, as did the bryozoan. Some dead shells of *Laevicardium laevigatum* (egg cockle) were observed. This station changed very little at the west end.

#### Station G

Rather sparse growth of *Thalassia* occurred along the entire stretch except near the Model Land Company Canal. There were also some scattered *Porites* coral and the fire sponge *Tedania ignis*. In the shallower water there was a fairly heavy growth of algae (mostly *Digenia*, *Batophora*, *Laurencia*) and scattered areas of *Acetabularia* and *Penicillus*. Just north of the canal there was a short distance of barren bottom, with very sparse *Thalassia* in some spots. This station continues essentially the same all the way to Station H.

#### Station H

The habitat was generally the same as Station G except that while *Porites* exists only in scattered colonies in G it was more abundant in H. A few more sponges appeared intermittently (*Ircinia fasciculata*, *Sphaciospongia vesparia* and *Geodia gibberosa*). A few anemones were observed in the area (they appeared to be *Phymanthus* sp.) just before the top of Long Arsenicker Key, many sea urchins (*Lytechinus*) appeared on sandy-silt bottom covered with moderate growth of *Thalassia*. The same algae occurred as in Station G. One larger spider crab was observed.

#### Station I

At this station the bottom consisted of open sand over hard substrate, with scattered patches of alcyonarians and sponges and small amounts of corals. The sponges were *Ircinia campana*, *Ircinia strobilina*, *Ircinia fasciculata*, *Geodia gibberosa*, *Haliclona subtriangularis*, *Haliclona variabilis*, *Tedania ignis*, *Cinachyra* sp., *Haliclona viridis*, *Sphaciospongia vesparia*; the

alcyonarians included *Pseudopterogorgia acerosa*, *Pterogorgia anceps* and several species of plexaurids. The corals are *Porites* sp., *Solenastrea* sp., and *Macina aereolata* (rare). One anemone, *Condylactic gigantea*, occurred.

Throughout the area there are widely scattered "rolling" patches of algae, mostly entangled *Laurencia*.

#### Station J

This station was similar to Station I except that no specimens of the alcyonarian *Pseudopterogorgia acerosa* were seen. Sparse *Thalassia* covered a good portion of the bottom here. In addition to the list for Station I there were scattered specimens of the sea urchin *Lytechinus variegatus*, the algae *Penicillus* and *Acetabularia* and other unidentified genera. Egg masses of the snail *Natica* and dead shells of the pelecypod *Trachycardium* were seen.

In this area (off the canal mouth and about half way between there and the north end of the station) there were areas of muddy water.

#### Station X

The habitat was the same as Station J except that the sponges and alcyonarians were much more abundant. A ray was observed, and numerous crab pots were in the area.

#### Stations L-P

These stations were combined because all were essentially the same as Station J. Scattered patches of the same alcyonarians, sponges, and corals were sometimes fairly heavy, but were more often sparse. Open sandy bottom occurred with intermittent sparse *Thalassia*.

#### Station Q

This area seemed to have deeper sand between sparse hard bottom patches of alcyonarians, sponges, and corals (of the same species as before). Numerous mounds were seen around small holes over the bottom. A few dead shells of *Atrina rigida* were seen. Some sparse *Thalassia* occurred.

#### Station R

This station was near Fast Arsenicker Island and the concentration of sponges, corals, and alcyonarians became greater in scattered patches. The alcyonarian *Pseudopterogorgia acerosa* reappeared. All other species were the same as those at Station J.

#### Station S

At this station sparse *Thalassia* occurred over sand with scattered "rolling" patches of algae (mostly *Laurencia*) and very widely scattered individuals of the following species of sponges: *Ircinia fasciculata*, *Spheciospongia vesparia*, *Ircinia strobilina*, and *Tedania ignis*.

The corals *Porites* and *Solenastrea*, occurred in sparse colonies.

#### Station T

At this station the bottom was a very soft grey, mud-sand-silt-shell fragment mixture, supporting little life except for a very small amount of the alga *Caulerpa prolifera*. Very

numerous holes approximately 1 to 2 inches in diameter occurred in the bottom. No mounds were seen at the entrances to the holes (these may be stomatopod burrows).

#### Station U

In this station the bottom was the same as at T except that very few scattered individuals of sponges were loosely attached in the muddy bottom. Sponges were mostly *Spheciospongia vesparia*. Holes were present as at the previous station.

#### Station V

The habitat was essentially unchanged from Station U. One extremely large specimen of the pen shell, *Atrina rigida*, was seen.

#### Station W

This station had slightly clearer water than at V. Two lines of crab pots were near this station. A moderate covering of *Thalassia* occurred on muddy-sand bottom; however, there was obviously hard substrate just beneath the layer of muddy-sand since a number of attached sponges and some corals were present.

The algae included: *Penicillus*, *Laurencia*, *Caulerpa* and *Udotea*; corals: *Solenastrea*; sponges: *Ircinia campana*, *Ircinia fasciculata*, *Spheciospongia vesparia*.

#### Station X

At this station sparse *Thalassia* occurred over sandy-mud and fine shell fragment bottom. Many sea urchins (*Lytechinus*) occurred while none were observed at the previous five stations.

Very few widely scattered sponges (*Ircinia fasciculata*, *Spheciospongia vesparia* and *Tedania ignis*) were noted.

Several colonies of the coral *Solenastrea* were observed. One egg mass (sand collar) of the snail *Natica* was observed.

#### Station Y

This station had the same type of bottom as that of Station U, and similar holes in the bottom. There were patches of firmer bottom with some sparse *Thalassia* patches, and in these many sea urchins (*Lytechinus*) were found. Sponges were rare and only *Ircinia fasciculata* was seen. One living example of the clam *Chione cancellata* was taken.

#### Station Z

This station had a sandy-mud bottom with sparse to moderate covering of *Thalassia*. Many specimens of the sea urchin *Lytechinus* were seen. The only species of sponge observed was *Tedania ignis* and this was rare. A few scattered large clumps of the calcareous alga *Halimeda* were seen.

#### Station AA

At this station sparse *Thalassia* occurred over sandy mud bottom. Numerous large mounds of sand with small holes in the center were observed. Many sea urchins *Lytechinus* occurred. Some calcareous algae, *Halimeda* were seen.

Scattered sponges (*Ircinia fasciculata* and *Ircinia strobilina*, *Tedania ignis*, *Geodia gibberosa*) occurred.

Scattered corals (*Porites* and *Solenastrea*) were observed, and some specimens of the rose coral, *Manicina acrobat*, were present.

One species of alcyonarian (*Pterogorgia anceps*) was seen and a few large, living examples of the pen shell, *Atrina rigida*, were observed.

#### Station AB

This station had a very soft bottom with moderate *Thalassia* covering and a few sea urchins (*Lytechinus*). Some mounds as at Station AA were, observed. One sponge was taken, *Haliclona variabilis*.

Appendix II  
List of all plants and animals observed

Algae

<i>Penicillus</i> sp.	<i>Batophora oerstedii</i>
<i>Laurencia</i> sp.	<i>Digenia</i> sp.
<i>Caulerpa</i> sp.	<i>Acetabularia crenulata</i>
<i>Udotea</i> sp.	<i>Halimeda</i> sp.

Spermatophytes

*Thalassia testudinum* (turtle grass)  
*Rhizophora mangle* (red mangrove)

Coelenterata

<i>Solenastrea</i>	<i>Pterogorgia anceps</i>
<i>Porites</i>	<i>Millepora</i> (stinging coral)
<i>Manicina</i>	<i>Phymanthus</i> (sea anemones)
<i>Siderastrea</i>	
<i>Pseudopterogorgia acerosa</i>	

Porifera

<i>Cinachyra</i>	<i>Tedania ignis</i> (fire sponge)
<i>Geodia</i>	<i>Dysidea etheria</i>
<i>Ircinia fasciculata</i>	<i>Haliclona subtriangularis</i>
<i>Ircinia strobilina</i>	<i>Haliclona viridis</i>
<i>Neopetrosia longleyi</i>	<i>Spheciospongia vesparia</i>

Polychaetes

*Hesionella picta*

Echinodermata

*Ophiothrix* (brittle star)  
*Ophionereis reticulata* (brittle star)  
*Lytechinus variegatus* (sea urchin)  
*Tripneustes ventricosus* (sea urchin)  
*Ludwigotharia floridana* (sea-cucumber)  
*Ludwigotharia mexicana* (sea cucumber)

Molluscs

*Astraea tecta americana*  
*Trachycardium*  
*Atrina rigida*  
*Natica*



### Appendix III

A list of specimens found at trawl Stations in Card Sound, Florida, April 1969. (The number indicates the number of specimens caught in a 2-minute tow with a 10-foot otter trawl.)

#### T1A

<u>Algae:</u>	<i>Caulerpa microphysa</i> <i>Acetabularia crenulata</i> <i>Halimeda incrassata</i> <i>Anadyomene stellata</i> <i>Caulerpa paspaloides</i>
<u>Corals:</u>	<i>Porites porites</i> - 2 <i>Manicina areolata</i> - 2
<u>Crustacea:</u>	<i>Macrocoeloma trispinosum</i> - 1 <i>Pitho anisodon</i> - 1 <i>Pagurus bonairensis</i> - 1
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 8 <i>Ophiactis savignyi</i> - 1
<u>Fishes:</u>	<i>Chilomycterus schoepfi</i> - 1 <i>Bothus ocellatus</i> - 2
<u>Molluscs:</u>	<i>Bittium varium</i> - 1 <i>Brachidontes exustus</i> - 1 <i>Cerithium muscarum</i> - 1 <i>Crepidula</i> sp. - 1

#### T1B

<u>Algae:</u>	<i>Caulerpa</i> sp. <i>Halimeda</i> sp. <i>Acetabularia</i> sp.
<u>Corals:</u> -	<i>Porites</i> sp. <i>Manicina areolata</i> - 1
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 1

#### T2A

<u>Algae:</u>	<i>Dictyosphaeria cavernosa</i> <i>Laurencia</i> sp. <i>Halimeda incrassata</i>
<u>Crustacea:</u>	<i>Thor</i> sp. - 1
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 19
<u>Molluscs:</u>	<i>Crepidula aculeata</i> - 2

Polychaetes: *Hesione picta* - 1

Sponges: *Ircinia fasciculata* - 2  
*Ircinia campana* - 2  
*Haliclona variabilis* - 1  
*Haliclona viridis* - 1

#### T2B

Algae: *Halimeda monile* - 1

Coral: *Porites* sp.

Crustacea: *Pagurus bonaiensis* - 2

Echinoderms: *Lytechinus variegatus* - 2

Fishes: *Monacanthus ciliatus* - 1

Molluscs: *Cerithium muscarum* - 2  
*Modulus modulus* - 1

#### T3A

Algae: *Laurencia obtusa*  
*Udotea conglutinata*

Crustacea: *Pagurus bonaiensis* - 3  
*Macrocoeloma trispinosum* - 1

Echinoderms: *Lytechinus variegatus* - 14

Fishes: *Synodus foetens* - 1

Molluscs: *Cerithium muscarum* - 1  
*Modulus modulus* - 3  
*Vermicularia* sp.

#### T3B

Algae: *Laurencia* sp.

Echinoderms: *Lytechinus variegatus* - 19

Molluscs: *Crepidula* sp. - 1

Sponges: *Verongia longissima* - 1  
*Haliclona variabilis* - 1  
*Tethys* sp. - 1

T4A

Echinoderms:     *Lytechinus variegatus*- 2

Molluscs:         *Modulus modiolus* – 2

Sponges:           *Ircinia fasciculata* - 1  
                         *Haliclona subtriangularis* -1  
                         *Haliclona viridis* - 1  
                         *Haliclona variabilis* – 2

T4B

Crustacea:         *Mithrax hispidus* - 1  
                         *Synalpheus minus* - 5

Echinoderms:     *Lytechinus variegatus* - 23

Fishes:             *Monacanthus hispidus* - 1

Molluscs:         *Codakia orbiculata* - 1

Sponges:           *Ircinia fasciculata* - 2  
                         *Chondrilla nucula*

T5A

Echinoderms:     *Lytechinus variegatus* - 6

Sponges:           *Haliclona variabilis* - 1  
                         *Halichondria melanadocia* – 1

T5B

Ctenophores:     Numerous unidentified specimens

Fishes:             *Lagodon rhomboides* – 2

T6A

Echinoderms:     *Lytechinus variegatus* - 11

Sponges:           *Ircinia fasciculata* - 4  
                         *Ircinia strobilina* - 1  
                         *Dysidea etheria* - 1  
                         *Verongia longissima* - 2  
                         *Haliclona variabilis* - 9

T6B

Echinoderms:     *Lytechinus variegatus* – 15

Sponges:           *Ircinia fasciculata* - 2

*Verongia longissima* - 2  
*Haliclona molitba* - 1  
*Tedania ignis* - 1  
*Chondrilla nucula* - 7

T7A

Crustacea: *Pagurus bonairensis* - 2

Echinoderms: *Lytechinus variegatus* - 6

Molluscs: *Astraea tecta americana* - 5  
*Modulus modulus* - 1  
*Cerithium muscarum* - 2

Sponges: *Ircinia fasciculata* - 1  
*Chondrilla nucula*

T7B

Crustacea: *Macrocoeloma trispinosum* - 2  
*Paguristes tortugae* - 1

Echinoderms: *Lytechinus variegatus* - 19

Fishes: *Acanthostracion quadricornis* - 2

Molluscs: *Brachidontes exustus* - 2  
*Modiolus americanus*

Sponges: *Ircinia fasciculata* - 5  
*Spongia* sp. - 1  
*Verongia longissima* - 3  
*Haliclona subtriangularis* - 1  
*Haliclona permollis*  
*Chondrilla nucula*

T8A

Algae: *Penicillus capitatus*  
*Laurencia* sp.  
*Udotea conglutinata*  
*Halimeda incrassata*  
*Anadyomene stellata*  
*Hypoglossum involvens*  
*Sargassum filipendula*  
*Caulerpa cupressoides*

Crustacea: *Mysid* - 1  
*Pagurus bonairensis* - 8  
*Menippe mercenaria* - 1  
*Macrocoeloma trispinosum* - 1

Echinoderms: *Lytechinus variegatus* - 1

Molluscs:        *Astraea tecta americana* - 1  
                      *Cerithium muscarum* - 2  
                      *Columbella rusticoidea* - 3  
                      *Modulus modulus* - 28  
                      *Calliostoma jujubinum* - 1  
                      *Aequipecten muscosus* - 1  
                      *Chione cancellata* - 3  
                      *Astraea phoebia* - 1  
                      *Nassarius albus* - 1

Fishes:            *Monacanthus hispidus* - 1

Sponges:        *Spongia graminea* - 1  
                      *Haliclona variabilis* - 4  
                      *Tedania ignis* - 1  
                      *Geodia gibberosa* - 1

#### T8B

Algae:            *Batophora oerstedii*  
                      *Laurencia* sp.

Crustacea:        *Pagurus bonaiensis* - 4

Fishes:            *Paralichthys albigutta* - 1  
                      *Monacanthus hispidus* - 1

Molluscs:        *Astraea phoebia* - 1  
                      *Modulus modulus* - 16  
                      *Columbella rusticoidea* - 1  
                      *Brachidontes exustus* 2  
                      *Cerithium muscarum* - 1  
                      *Chione cancellata* - 1  
                      *Diadora cayenensis* - 1  
                      *Crepidula* sp.  
                      *Conus jaspideus* - 1

Sponges:        *Ircinia fasciculata* - 1

#### T9A

Crustacea:        *Macrocoeloma camptocerum* - 1  
                      *Pagurus bonaiensis* - 2

Echinoderms:    *Lytechinus variegatus* - 1

Fishes:            *Acanthostracion quadricornis* - 1

Sponges:        *Haliclona subtriangularis* - 1  
                      *Tedania ignis* - 5  
                      *Cryptotethya crypta* - 1

T9B

<u>Algae:</u>	<i>Penicillus capitatus</i> <i>Halimeda monile</i> <i>Laurencia</i> sp.
<u>Echinoderms:</u>	<i>Ophiothrix oerstedii</i> - 1
<u>Fishes:</u>	<i>Acanthostracion quadricornis</i> - 1
<u>Molluscs:</u>	<i>Aequipecten irradians</i> - 1 <i>Bittium varium</i> - 6 <i>Trachidontes exustus</i> - 12 <i>Bulla umbilicata</i> - 1 <i>Columbella rusticoidea</i> - - 1 <i>Modulus modulus</i> - 1 <i>Vermicularia</i> sp. - 3
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 5 <i>Ircinia strobilina</i> - 1 <i>Tedania ignis</i> - 1

T10A

<u>Algae:</u>	<i>Udotea conglutinata</i> <i>Halimeda incrassata</i>
<u>Crustacea:</u>	<i>Pagurus bonairensis</i> - 3
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 7
<u>Molluscs:</u>	<i>Brachidontes exustus</i> - 1 <i>Columbella rusticoidea</i> - 1 <i>Modulus modulus</i> - 4 <i>Vermicularia</i> sp. <i>Astraea phoebia</i> - 1
<u>Alcyonarians:</u>	<i>Pseudopterogorgia acerosa</i> - 3 <i>Pterogorgia anceps</i> - 6
<u>Algae:</u>	<i>Udotea conglutinata</i> <i>Valonia macrophysa</i> <i>Caulerpa paspaloides</i> <i>Laurencia</i> sp.
<u>Crustacea:</u>	<i>Tozeuma carolinensis</i> - 1 <i>Pagurus bonairensis</i> - 4
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 2
<u>Molluscs:</u>	<i>Astraea phoebia</i> - 1 <i>Cerithium muscarum</i> - 3 <i>Modiolus americanus</i> - 1

	<i>Modulus modulus</i> - 4
<u>Sponges:</u>	<i>Verongia longissima</i> - 1
T11A	
<u>Crustacea:</u>	<i>Macrocoeloma camptocerum</i> - 3 <i>Pagurus bonairensis</i> - 1
<u>Coelenterates:</u>	<i>Millepora</i>
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 1
<u>Fishes:</u>	<i>Synodus foetens</i>
<u>Molluscs:</u>	<i>Crepidula</i> sp. - 1 <i>Vermicularia</i> sp. - 1
<u>Sponges:</u>	<i>Ircinia fasciculata</i> <i>Chondrilla nucula</i> <i>Neopetrosia longleyi</i> <i>Haliclona molitba</i>
<u>Corals:</u>	<i>Siderastrea</i> - 1
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 10
<u>Fishes:</u>	<i>Chilomycterus schoepfi</i> - 1 <i>Acanthostracion quadricornis</i> - 1 <i>Monacanthus ciliatus</i>
<u>Sponges:</u>	<i>Neopetrosia longleyi</i> - 2 <i>Ircinia fasciculata</i> - 3 <i>Verongia longissima</i> - 2 <i>Haliclona molitba</i> - 1 <i>Spheciospongia vesparia</i> - 2 <i>Chondrilla nucula</i> - 8
<u>Algae:</u>	<i>Halimeda opuntia</i> <i>Laurencia</i> sp. <i>Halimeda incrassata</i>
<u>Coral:</u>	<i>Porites porites</i> - 1
<u>Crustaceans:</u>	<i>Pelia mutica</i> - 4 <i>Macrocoeloma camptocerum</i> <i>Neopanope packardii</i> - 2 <i>Pagurus bonairensis</i> - 1 <i>Thor</i> sp. - 2
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 6 <i>Echinaster sentus</i> - 1 <i>Ophiopsila riisei</i> - 3

*Ophiothrix oerstedii* - 7

Molluscs: *Aequipecten irradians* - 6  
*Brachidontes exustus* - 21  
*Modiolus americanus* - 2  
*Rissoina chesneli* - 1  
*Caecum* sp. - 3

Sponges: *Verongia longissima* - 3  
*Spongia graminea* - 4  
*Vesparia* sp. - 1  
*Ircinia fasciculata* - 2  
*Chondrilla nucula* - 11  
*Neopetrosa longleyi* - 3

#### T12B

Algae: *Halimeda tuna*  
*Laurencia* sp.  
*Halimeda* sp.

Crustacea: *Macrocoeloma camptocerum* - 1  
*Pelia mutica*

Fishes: *Acanthostracion quadricornis* - 1

Molluscs: *Aequipecten irradians* - 1

Sponges: *Verongia longissima*  
*Ircinia fasciculata* - 2  
*Neopetrosa longleyi* - 1  
*Chondrilla nucula* - 34

#### T13A

Algae: *Laurencia* sp.

Crustacea: *Thor* sp. - 1  
*Neopanope packardii* - 2

Fishes: *Monacanthus ciliatus* - 1

Molluscs: *Aequipecten irradians* - 2  
*Bittium varium* - 5  
*Brachidontes exustus* - 2  
*Cerithium muscarum* - 71  
*Columbella rusticoidea* - 1  
*Modulus modiolus* - 1  
*Astraea phoebia* - 1  
*Caecum* - 2  
*Chitons* misc. - 1

Sponges: *Ircinia fasciculata*



*Dysidea etheria*

T13B

Algae: *Sargassum filipendula*  
*Laurencia* sp.

Crustacea: *Thor* sp. - 1  
*Pilumnus pannosus* - 1

Fishes: *Acanthostracion quadricornis* - 7  
*Opsanus beta* - 1  
*Eucinostomus gula* - 1

Molluscs: *Aequipecten irradians* - 2  
*Bittium varium* - 1  
*Brachidontes exustus* - 2  
*Vermicularia* sp. - 3  
*Nudibranchs* misc. - 1

Sponges: *Spheciospongia vesparia* - 1  
*Chondrilla nucula* - 1  
*Spongia graminea* - 1  
*Ircinia fasciculata* - 1

T14A

Algae: *Penicillus capitatus*  
*Sargassum filipendula*  
*Laurencia* sp. - 1

Crustacea: *Panulirus argus* - 6  
*Neopanope packardii* - 1  
*Thor* sp. - 1

Fishes: *Eucinostomus gula* - 1  
*Monacanthus ciliatus* - 1

Molluscs: *Aequipecten irradians* - 4  
*Bittium varium* - 2  
*Lima pellucida* - 1  
*Chitons* misc. - 1  
*Nudibranchs* misc.

T14B

Algae: *Penicillus capitatus*  
*Laurencia* sp.

Crustacea: *Panulirus argus* - 1  
*Periclimenes americanus* - 1  
*Periclimenes longicanudatus* - 1  
*Thor* sp. - 15

*Neopanope packardii* - 3  
*Pagurus bonairensis* - 25

Fishes: *Lagodon rhomboides* - 1

Molluscs: *Aequipecten irradians* - 22  
*Bittium varium* - 35  
*Brachidontes exustus* - 4  
*Columbella* (juveniles) - 1  
*Columbella rusticoidea* - 5  
*Lima pellucida* - 1  
*Pinctada imbricata*  
*Vermicularia fargoi* - 4  
*Lyropecten antillarum* - 1  
*Caecum* sp. - 21

Sponges: *Chondrilla nucula* - 6

T15A

No catch

T15B

No catch

T16A

Algae: *Sargassum filipendula*  
*Halimeda incrassata*  
*Anadyomene stellata*

Crustacea: *Thor* sp. - 1

Fishes: *Bothus ocellatus* - 1

Molluscs: *Aequipecten irradians* - 1  
*Barbatia cancellaria* - 1  
*Arca zebra* - 1

T16B

Algae: *Sargassum filipendula*  
*Anadyomene stellata*  
*Hypoglossum involvens*

Crustacea: *Pagurapseudes* sp.

Echinoderms: *Lytechinus variegatus* - 1

Fishes: *Acanthostracion quadricornis* - 1  
*Paralichthys albigutta* - 1

T17A

No catch

T17B

Fishes: *Bothus ocellatus* - 1

T18A

Algae: *Sargassum* sp.  
*Laurencia* sp.  
*Caulerpa prolifera*  
*Sargassum filipendula*  
*Halimeda incrassata*  
*Laurencia* sp.

Crustacea: *Periclimenes americanus* - 1  
*Thor* sp. - 2  
*Neopanope packardii* - 1  
*Pagurus bonairensis* - 2

Molluscs: *Aequipecten irradians* - 21  
*Anachis pulchella* - 3  
*Brachidontes exustus* - 1  
*Columbella* (Juveniles) - 2  
*Cantharus multangulus* (juveniles) - 1  
*Lima pellucida* - 1  
*Marginella denticulata* - 1  
*Mitrella lunata* - 1  
*Modiolus americanus* 2

T18B

Algae: *Laurencia* sp.

Fishes: *Hippocampus erectus* - 1  
*Bothus ocellatus* - 1

T19A

Fishes: *Acanthostracion quadricornis* - 3

T19B

Crustacea: *Pagurus bonairensis* - 2

Fishes: *Acanthostracion quadricornis* - 2  
*Bothus ocellatus* - 1

T20A

Algae: *Halimeda incrassata*  
*Laurencia* sp.

Molluscs: *Aeguipecten irradians* - 11  
*Bittium varium* - 4  
*Brachidontes exustus* - 2  
*Columbella rusticoidea* - 1  
*Modiolus americanus* - 2  
*Vermicularia fargo* - 1  
*Caecum* spp. - 17  
*Bivalve* - unidentified - 1

T20B

Algae: *Laurencia* sp.

T21A

No catch

T21B

No catch

T22A

Algae: *Halimeda opuntia*  
*Anadyomene stellata*  
*Dictyosphaeria cavernosa*

Fishes: *Eucinostomus gula* - 2  
*Bothus ocellatus* - 1

Molluscs: *Brachidontes exustus* - 1  
*Cerithium muscarum* - 1  
*Lima pellucida* - 1  
*Vermicularia fargo* - 2

T22B

Sponges: *Verongia longissima*  
*Haliclona molitba* - 1

T23A

Algae: *Laurencia* sp.  
*Sargassum* sp.  
*Halimeda* sp.

Crustacea: *Pagurus bonairensis* - 1  
*Macrocoeloma camptocerum* - 1

Fishes: *Chilomycterus schoepfi* - 1

T23B

<u>Algae:</u>	<i>Laurencia</i> sp. <i>Halimeda</i> sp.
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 2 <i>Ophioderma</i> sp. - 2 <i>Ophiothrix</i> sp. - 2
<u>Fishes:</u>	<i>Monacanthus</i> sp. 1
<u>Molluscs:</u>	<i>Spurilla</i> sp. - 2 <i>Vermicularia</i> sp. - 1
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 2 (plus fragments) <i>Spongia graminea</i> - 1 <i>Haliclona molitba</i> - fragments <i>Geodia gibberosa</i> - 1 covered with <i>Haliclona viridis</i> <i>Chondrilla nucula</i> - 2

T24A

<u>Algae:</u>	<i>Valonia macrophysa</i> <i>Batophora oerstedii</i> <i>Halimeda incrassata</i> <i>Laurencia</i> sp. <i>Halimeda opuntia</i> <i>Anadyomene stellata</i> <i>Dictyosphaeria cavernosa</i>
<u>Corals:</u>	<i>Solenastrea</i> sp. - 3 (large, dead heads riddled with <i>Cliona</i> sp.)
<u>Fishes:</u>	<i>Chilomycterus schoepfi</i> - 3
<u>Molluscs:</u>	<i>Vermicularia</i> sp. - 2
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 4 <i>Ircinia strobilina</i> - 1 <i>Spongia</i> sp. - 2 <i>Spongia graminea</i> - 1 <i>Verongia longissima</i> - 2 <i>Haliclona subtriangularis</i> - 1 <i>Haliclona molitba</i> - 11 <i>Tethys</i> sp. - 1

T24B

<u>Algae:</u>	<i>Valonia</i> <i>Cladophora</i> sp. <i>Halimeda opuntia</i> <i>Dictyosphaeria cavernosa</i> <i>Laurencia</i> sp.
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<u>Corals:</u>	<i>Solenastrea</i> - 3 heads
<u>Crustacea:</u>	<i>Paguristes puncticeps</i> - 1 <i>Neopanope packardii</i> <i>Neopanope texana</i> - 1
<u>Echinoderms:</u>	<i>Leptosynapta parvipatina</i> - 1 <i>Ophiactis savignyi</i> - 1 <i>Lytechinus variegatus</i> - 1
<u>Molluscs:</u>	<i>Arca imbricata</i> - 1 <i>Astraea tecta americana</i> - 1 <i>Brachidontes exustus</i> - 1 <i>Vermicularia</i> sp. - 2
<u>Sponges:</u>	<i>Spongia graminea</i> - 1 <i>Dysidea etheria</i> - 1 <i>Geodia gibberosa</i> - 3 covered with <i>Haliclona viridis</i> <i>Callyspongia vaginalis</i> - 1 <i>Haliclona subtriangularis</i> - 1 <i>Haliclona molitba</i> - 1 <i>Chondrilla nucula</i> - 3

#### T25A

<u>Algae:</u>	<i>Acetabularia crenulata</i> <i>Digenia simplex</i> <i>Halimeda opuntia</i> <i>Dictyosphaeria cavernosa</i>
<u>Anemones:</u>	<i>Condylactis gigantea</i> - 1
<u>Crustacea:</u>	<i>Pitho quadridentata</i> - 1
<u>Corals:</u>	<i>Solenastrea</i> - 1 large dead head
<u>Echinoderms:</u>	<i>Leptosynapta parvipatina</i> - 6 <i>Lytechinus variegatus</i> - 1
<u>Sponges:</u>	<i>Spongia graminea</i> - 1 <i>Ircinia fasciculata</i> - 2 <i>Dysidea etheria</i> - 2 <i>Haliclona molitba</i> - fragments <i>Haliclona variabilis</i> - 1 <i>Chondrilla nucula</i> - fragments

T25B

<u>Algae:</u>	<i>Halimeda opuntia</i> <i>Dictyosphaeria cavernosa</i> <i>Laurencia</i> sp.
<u>Crustacea:</u>	<i>Alpheus normanni</i> - 1
<u>Echinoderms:</u>	<i>Leptosynapta parvipatina</i> - 2
<u>Molluscs:</u>	<i>Aequipecten irradians</i> - 1 <i>Bittium varium</i> - 1 <i>Brachidontes exustus</i> - 14 <i>Lima pellucida</i> - 1 <i>Vermicularia</i> sp. - 1
<u>Sponges:</u>	<i>Ircinia fasciculata</i> . - 2 <i>Verongia longissima</i> - 4 <i>Haliclona variabilis</i> - fragments <i>Haliclona molitba</i> - 4 <i>Geodia gibberosa</i> - 1 covered with <i>Haliclona viridis</i> <i>Chondrilla nucula</i> - 20 small

T26A

<u>Algae:</u>	<i>Laurencia</i> <i>Caulerpa racemosa</i>
<u>Crustacea:</u>	<i>Macrocoeloma trispinosum</i> - 1 <i>Panopeus</i> sp. - 1
<u>Fishes:</u>	<i>Acanthostracion quadricornis</i> - 2 <i>Opsanus beta</i> - 1
<u>Molluscs:</u>	<i>Aequipecten irradians</i> - 1 <i>Vermicularia</i> sp. - 1
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 8 <i>Verongia longissima</i> - 2 <i>Dysidea etheria</i> - 2 <i>Chondrilla nucula</i> - 10 small

T26B

<u>Algae:</u>	<i>Caulerpa microphysa</i> <i>Penicillus capitatus</i> <i>Anadyomene stellata</i> <i>Valonia macrophysa</i> <i>Digenia simplex</i> <i>Halimeda opuntia</i> <i>Dictyosphaeria cavernosa</i> <i>Laurencia</i> sp.
<u>Crustacea:</u>	<i>Thor</i> sp. <i>Macrocoeloma camptocerum</i>

	<i>Epialtus dilatatus</i>
	<i>Pilumnus pannosus</i>
	<i>Neopanope packardii</i>
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 2
	<i>Ophiothrix oerstedii</i> - 1
<u>Molluscs:</u>	<i>Aequipecten irradians</i> - 1
	<i>Bittium varium</i> - 1
	<i>Lima pellucida</i> - 1
	<i>Rissoina chesneli</i> - 2
	<i>Vermicularia</i> sp. - 3
<u>Sponges:</u>	<i>Spongia graminea</i> - 3
	<i>Ircinia strobilina</i> - 1
	<i>Haliclona. subtriangularis</i> - 1
	<i>Haliclona molitba</i> - 1
	<i>Halichondria melanadocia</i> - 1
	<i>Tedania ignis</i> - 2
	<i>Spheciospongia vesparia</i> - 2
	<i>Placospongia melobesiodes</i> - 1
	<i>Chondrilla nucula</i> - 3
	<i>Unidentified red sponges</i> - 5

#### T27A

<u>Algae:</u>	<i>Digenia simplex</i>
	<i>Valonia macrophysa</i>
	<i>Laurencia. sp.</i>
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 2
	<i>Ophiostigma isacanthum</i> - 2
	<i>Ophiothrix oerstedii</i> - 1
<u>Molluscs:</u>	<i>Brachidontes exustus</i> - 1
	<i>Vermicularia</i> sp. - 2
	<i>Caecum</i> sp. - 1
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 3
	<i>Hippiospongia lachne</i> - 1
	<i>Verongia longissima</i> - 1
	<i>Haliclona subtriangularis</i> - 1
	<i>Cryptotethys crypta</i> - 1

#### T27B

<u>Algae:</u>	<i>Valonia macrophysa</i>
	<i>Digenia simplex</i>
	<i>Laurencia</i> sp.
<u>Crustacea:</u>	<i>Macrocoeloma trispinosum</i> - 1
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 1
<u>Molluscs:</u>	<i>Americardia media</i> - 1



Sponges:            *Ircinia fasciculata* - 14  
                          *Ircinia campana* - 1  
                          *Verongia longissima* - 10  
                          *Haliclona subtriangularis* - 1  
                          *Halichondria melanadocia* - 6  
                          *Tedania ignis* - 1  
                          *Geodia gibberosa* - 1

#### T28A

Algae:                *Cladophora* sp. - 1  
                          *Halimeda incrassata* - 1  
                          *Sargassum filipendula* - 1  
                          *Dictyosphaeria cavernosa* - 1  
                          *Anadyomene stellata* - 1  
                          *Laurencia* sp. - 1

Alcyonarians:    *Pseudopterogorgia acerosa* - 1

Crustacea:         *Pagurapseudes* sp. - 2

Echinoderms:    *Ophiopsila riisei* - 1  
                          *Ophiostigma isacanthum* - 1

Fishes:             *Acanthostracion quadricornis* 2

Molluscs:         *Aequipecten irradians* - 1  
                          *Bittium varium* - 5  
                          *Brachidontes exustus* - 1  
                          *Lima pellucida* - 3  
                          *Rissoina chesneli* - 8  
                          *Vermicularia* sp. - 2  
                          *Rissoina cancellata* - 1

Sponges:            *Ircinia fasciculata* - 2

#### T28B

Algae:                *Laurencia* sp.  
                          *Acetabularia crenulata*

Corals:             *Solenastrea* - 1

Echinoderms:    *Lytechinus variegatus* - 1

Molluscs:         *Astraea tecta americana* - 1

Sponges:            *Haliclona subtriangularis* - 1  
                          *Haliclona variabilis* - 1

#### T29A

Algae:                *Caulerpa paspaloides*  
                          *Laurencia* sp.

Crustacea:        *Neopanope packardii* - 1  
                       *Panulirus argus* - 1 juvenile

Echinoderms:    *Lytechinus variegatus* - 1

Sponges:        *Spongia graminea* - 1  
                       *Verongia longissima* - 1  
                       *Haliclona subtriangularis* - 1  
                       *Haliclona variabilis* - fragments

#### T29B

Algae:            *Dictyosphaeria cavernosa*  
                       *Cladophora* sp.  
                       *Batophora oerstedii*  
                       *Halimeda incrassata*  
                       *Anadyomene stellata*  
                       *Laurencia* sp.

Coral:            *Millepora* sp.

Crustacea:        *Pagurapseudes* sp. - 2

Echinoderms:    *Ophiactis savignyi* - 1  
                       *Lytechinus variegatus* - 2

Molluscs:        *Bittium varium* - 2  
                       *Vermicularia* sp. - 5

Sponges:        *Haliclona variabilis* - 1  
                       *Myriastr*a sp. - 2

#### T30A

Algae:            *Laurencia* sp.

Echinoderms:    *Lytechinus variegatus* - 1  
                       *Actinopygia agassizi* - 1

Sponges:        *Spongia graminea*  
                       *Dysidea etheria*  
                       *Haliclona variabilis* - 1

#### T30B

Algae:            *Cladophora* sp.  
                       *Laurencia* sp.

Fishes:           *Acanthostracion quadricornis* - 1

Crustacea:        *Callinectes ornatus* - 1

Molluscs:        *Vermicularia* sp. - 1

Sponges:            *Ircinia campana* - 1  
                         *Spongia graminea* - 1  
                         *Spongia cheiris* - 1

#### T31A

Algae:                *Acetabularia crenulata*  
                         *Valonia macrophysa*  
                         *Anadyomene stellata*  
                         *Batophora oerstedii*  
                         *Laurencia* sp.  
                         *Sargassum* sp.

Alcyonarians:    *Pterogorgia anceps* - 1

Corals:             *Millepora* - fragments

Crustacea:         *Pycnogonid* - 1  
                         *Neopanope packardii* - 4  
                         *Thor* sp. - 3  
                         *Pagurus bonairensis* - 4  
                         *Pagurus tortugae* - 3

Echinoderms:    *Leptosynapta parvipatina* - 2  
                         *Ophiactis savignyi* - 3

Fishes:             *Achirus lineatus* - 1

Molluscs:           *Aeguipecten irradians* - 2  
                         *Bittium varium* - 21  
                         *Brachidontes exustus* - 3  
                         *Cerithium muscarum* - 4  
                         *Diodora cayenensis* - 1  
                         *Lima pellucida* - 3  
                         *Tricolia affinis* - 1  
                         *Vermicularia* sp. - 1  
                         *Astraea tecta americana* - 1  
                         *Aeguipecten irradians* - 2 juveniles

Sponges:            *Haliclona permollis*

#### T31B

Algae:                *Valonia macrophysa*  
                         *Hypoglossum involvens*  
                         *Laurencia* sp.  
                         *Batophora oerstedii*  
                         *Anadyomene stellata*  
                         *Halimeda monile*

Corals:             *Millepora* - fragments

Crustacea:         *Pagurus bonairensis* - 7  
                         *Thor* sp. - 2  
                         *Paguristes tortugae* - 2

<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 1 <i>Ophiactis savignyi</i> - 1
<u>Fishes:</u>	<i>Lagodon rhomboides</i> - 1 <i>Micrognathus crinigeres</i> - 1
<u>Molluscs:</u>	<i>Turbo castaneus</i> - 1 <i>Aeguipecten irradians</i> - 1 <i>Bittium varium</i> - 134 <i>Brachidontes exustus</i> - 19 <i>Cerithium muscarum</i> - 14 <i>Columbella</i> (juvenile) - 1 <i>Lima pellucida</i> - 1 <i>Mitrella lunata</i> - 1 <i>Modiolus americanus</i> - 1 <i>Pusia gemmata</i> - 2 <i>Rissoina chesneli</i> - 1 <i>Tricolia affinis</i> - 3 <i>Triphora nigrocincta</i> - 1 <i>Caecum</i> sp. - 19
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 1 <i>Dysidea etheria</i> - 1 <i>Chondrilla nucula</i> - fragments <i>Haliclona permollis</i> - fragments

#### T32A

<u>Algae:</u>	<i>Valonia macrophysa</i> <i>Anadyomene stellata</i> <i>Laurencia</i> sp. <i>Batophora</i> sp.
<u>Corals:</u>	<i>Millepora</i> - fragments
<u>Crustacea:</u>	<i>Panulirus argus</i> - 2 <i>Libinia dubia</i> - 1 <i>Thor</i> sp. - 1 <i>Epialtus dilatatus</i> - 1 <i>Periclimenes americanus</i> - 1
<u>Alcyonarians:</u>	<i>Pseudopterogorgia acerosa</i> - 2
<u>Echinoderms:</u>	<i>Leptosynapta parvipatina</i> - 3
<u>Fishes:</u>	<i>Acanthostracion quadricornis</i> - 2 <i>Chilomycterus schoepfi</i> 2
<u>Molluscs:</u>	<i>Bittium varium</i> - 11 <i>Brachidontes exustus</i> - 4 <i>Caecum</i> - 3 <i>Nudibranchs misc.</i> - 1 <i>Columbella mercatoria</i> - 4

Sponges: *Ircinia fasciculata* - 1  
*Chondrilla nucula* - 3

T32B

Algae: *Valonia macrophysa*  
*Dictyosphaeria cavernosa*  
*Laurencia* sp.  
*Batophora oerstedii*  
*Anadyomene stellata*  
*Acetabularia crenulata*

Corals: *Millepora fragments*

Alcyonarians: *Pseudopterogorgia acerosa* - 2  
*Plexaurid* - 1

Crustacea: *Panulirus argus* - 1  
*Epialtus dilatatus* - 1  
*Pagurus bonairensis* - 2  
*Pagurapseudes* sp. - 1

Echinoderms: *Lytechinus variegatus* - 1

Fishes: *Acanthostracion quadricornis* - 1

Molluscs: *Aeguipecten irradians* - 1  
*Bittium varium* - 8  
*Brachidontes exustus* - 2  
*Cerithium muscarum* 3  
*Lima pellucida* - 1  
*Rissiona chesneli* - 2  
*Vermicularia* sp. - 1  
*Lucapina sowerbii* - 1

Sponges: *Spongia graminea* - 5  
*Ircinia fasciculata* - 1  
*Spongia cheiris* - 1  
*Dysidea etheria* - 1  
*Geodia gibberosa* - 2 with *Haliclona viridis*

T33A

Algae: *Dictyosphaeria cavernosa*  
*Valonia macrophysa*  
*Laurencia* sp.

Bryozoan: *Unidentified* sp. - 1

Corals: *Millepora* - fragments

Crustacea: *Pilumnus pannosus* - 1  
*Epialtus dilatatus* - 2  
*Pelia mutica* - 1  
*Paguristes tortugae* - 4

Echinoderms:     *Lytechinus variegatus* - 3

Molluscs:        *Bittium varium* - 2  
                          *Brachidontes exustus* - 11  
                          *Caecum* - 1  
                          *Bulla* sp. - 1

Sponges:         *Spongia graminea* - 1  
                          *Dysidea etheria* - 2  
                          *Ircinia fasciculata* - 1  
                          *Haliclona permollis* - 4  
                          *Haliclona viridis* - 1  
                          *Spheciospongia vesparia* - 1

### T33B

Algae:             *Cladophora* sp.  
                          *Laurencia* sp.  
                          *Anadyomene stellata*

Corals:           *Millepora* - large colony and fragments

Echinoderms:   *Lytechinus variegatus* - 2  
                          *Leptosynapta parvipatina* - 3  
                          *Ophiactis savignyi* - 1  
                          *Ophiothrix oerstedii* - 2

Molluscs:        *Aequipecten irradians* - 1  
                          *Bittium varium* - 8  
                          *Brachidontes exustus* - 3  
                          *Cerithium muscarum* - 5  
                          *Crepidula* sp. - 1  
                          *Marginella denticulata* - 1  
                          *Persicula lavalleana* - 1  
                          *Rissoina chesneli* - 1  
                          *Vermicularia* sp. - 1  
                          *Caecum* sp. - 3  
                          *Nudibranchs misc.* - 1  
                          *Chitons misc.* - 1

Sponges:         *Ircinia strobilina* - 1  
                          *Spongia graminea* - 1  
                          *Ircinia fasciculata* - 1  
                          *Dysidea etheria* - 2  
                          *Cryptotethys crypta* - 1

### T34A

Algae:             *Dictyosphaeria cavernosa*  
                          *Anadyomene stellata*  
                          *Batophora oerstedii*  
                          *Laurencia* sp.  
                          *Jania* sp.

Corals: *Millepora* - fragments

Alcyonarians: *Pseudopterogorgia* - 1

Crustacea: *Neopanope packardii* - 1  
*Paguristes tortugae* - 2  
*Pagurus bonairensis* - 3

Echinoderms: *Ophiothrix oerstedii* - 1

Fishes: *Acanthostracion quadricornis* - 1

Molluscs: *Aequipecten irradians* - 1  
*Brachidontes exustus* - 1  
*Cerithium muscarum* - 2  
*Columbella rusticoidea* - 1

Sponges: *Ircinia fasciculata* - 1

#### T34B

Algae: *Laurencia* sp.  
*Batophora oerstedii*  
*Anadyomene stellata*

Corals: *Millepora* - fragments

Echinoderms: *Ophiactis savignyi* - 1  
*Ophiopsila riisei* - 1

Fishes: *Acanthostracion quadricornis* - 5

Molluscs: *Bittium varium* - 4  
*Brachidontes exustus* - 3  
*Caecum* sp. - 2

Sponges: *Spongia graminea* - 1  
*Ircinia fasciculata* - 1  
*Cinachyra cavernosa* - 1

#### T35A

Algae: *Laurencia* sp.  
*Batophora* sp.

Alcyonarians: *Muricea* sp. - 1

Corals: *Millepora* - fragments

Crustacea: *Macrocoeloma camptocerum* - 1  
*Pagurus bonairensis* - 1  
*Paguristes tortugae* - 1

Fishes: *Acanthostracion quadricornis* - 1  
*Lagodon rhomboides* - 1

Molluscs: *Bittium varium* - 1  
*Rissoina chesneli* - 1  
*Vermicularia* sp. - 1

Sponges: *Spongia cheiris* - 1  
*Ircinia fasciculata* - 2  
*Dysidea etheria* - fragments  
*Haliclona permollis* - fragments  
*Haliclona molitba* - fragments  
*Haliclona subtriangularis* - 1  
*Haliclona viridis* - 1

#### T35B

Algae: *Laurencia* sp.  
*Batophora* sp.

Crustaceans: *Pitho anisodon* - 1  
*Pagurapseudes* sp. - 3  
*Portunus spinimanus* - 1  
*Neopanope packardii* - 7  
*Pagurus tortugae* - 2  
*Pagurus bonairensis* - 10

Echinoderms: *Lytechinus variegatus* - 7

Fishes: *Paralichthys albagutta* - 1  
*Opsanus beta* - 1  
*Micrognathus crinigerus*

Molluscs: *Pinctada imbricata* - 2  
*Aequipecten irradians* - 11  
*Bittium varium* - 34  
*Cerithium muscarum* 5  
*Columbella (juvenile)* - 2  
*Marginella denticulata* - 2  
*Modulus modulus* - 1  
*Rissoina chesneli* - 1  
*Caecum* sp. - 18  
Eggs -  
*Nudibranchs misc.* - 1  
*Crassispira leucocyma* - 1  
*Rissoina cancellata* - 1  
*Marginella avenacea* - 1

Sponges: *Halichondria melanadocia* - 1  
*Spheciospongia vesparia* - 1  
*Chondrilla nucula* - 1  
*Tedania ignis* - 2

#### T36A

Algae: *Halimeda opuntia*  
*Cladophora* sp.



	<i>Acetabularia crenulata</i> <i>Valonia macrophysa</i> <i>Batophora oerstedii</i> <i>Laurencia</i> sp. <i>Dictyosphaera</i> sp.
<u>Anemones:</u>	<i>Condylactis gigantea</i> - 1
<u>Ascidians:</u>	Unidentified compound <i>ascidians</i>
<u>Corals:</u>	<i>Millepora</i> <i>Solenastrea</i> - 1 large dead head
<u>Crustaceans:</u>	<i>Panulirus argus</i> - 1 <i>Periclimenes americanus</i> - 1 <i>Mithrax hispidus</i> - 1
<u>Echinoderms:</u>	<i>Leptosynapta parvipatina</i> - 2 <i>Lytechinus variegatus</i> - 1 <i>Ophiopsila riisei</i> - 1
<u>Fishes:</u>	<i>Hippocampus erectus</i> - 1
<u>Molluscs:</u>	<i>Astraea tecta americana</i> - 1 <i>Lima pellucida</i> - 1 <i>Modiolus americanus</i> - 1 <i>Vernicularia</i> sp. - 6 <i>Anachis pulchella</i> - 1
<u>Polychaetes:</u>	<i>Sabellids</i> - on dead coral head
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 3 <i>Haliclona subtriangularis</i> - fragments <i>Halichondria melanadocia</i> - 1 <i>Geodia gibberosa</i> - 1 with <i>Haliclona viridis</i> <i>Chondrilla nucula</i> - 4

#### T36B

<u>Algae:</u>	<i>Jania</i> sp. <i>Laurencia</i> sp. <i>Batophora oerstedii</i> <i>Acetabularia crenulata</i> <i>Halimeda incrassata</i> <i>Anadyomene stellata</i> <i>Valonia</i> sp.
<u>Corals:</u>	<i>Solenastrea</i> - 1 dead head
<u>Crustacea:</u>	<i>Thor</i> sp. - 1 <i>Epialtus dilatatus</i> - 1
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 1
<u>Fishes:</u>	<i>Eucinostomus gula</i> - 1

*Acanthostracion quadricornis* - 1  
*Hippocampus erectus* - 1

Molluscs: *Cerithium muscarum* - 2  
*Vermicularia* sp. - 1  
*Caecum* - 1  
*Nudibranchs* misc. - 1

Sponges: *Ircinia strobilina* - 1

#### T37A

Algae: *Halimeda opuntia*  
*Valonia macrophysa*  
*Laurencia* sp.

Corals: *Millepora* - fragments  
*Solenastrea* - 1 dead head

Crustacea: *Thor* sp. - 1  
*Pagurus bonairensis* - 2  
*Mysid* - 1

Echinoderms: *Ophiactis savignyi* 2

Molluscs: *Bittium varium* - 5  
*Cerithium muscarum* - 1  
*Pusia gemmata* - 1  
*Rissoina chesneli* - 1  
*Vermicularia* sp. - 5  
*Caecum* - 10  
*Arca umbonata* - 1  
*Nudibranch* - 1  
*Murex florifer* - 1  
*Chitons* misc. - 1  
Bivalve (unidentified) - 1

Sponges: *Spongia graminea* - 2  
*Dysidea etheria* - 1  
*Ircinia strobilina* - 1  
*Cinachyra cavernosa* - 1

#### T37B

Algae: *Spyridia* sp.  
*Laurencia* sp.  
*Halimeda incrassata*

Echinoderms: *Leptosynapta parvipatina* - 2

Molluscs: *Aequipecten irradians* - 1  
*Bittium varium* - 1  
*Columbella (juveniles)* - 1  
*Vermicularia* sp. - 2

# T38A

<u>Algae:</u>	<i>Halimeda opuntia</i> <i>Halimeda incrassata</i> <i>Laurencia</i> sp.
<u>Corals:</u>	<i>Millepora</i> - fragments
<u>Crustacea:</u>	<i>Periclimenes americanus</i> - 1 <i>Thor</i> sp. - 3 <i>Pagurus bonairensis</i> - 1
<u>Echinoderms:</u>	<i>Leptosynapta parvipatina</i> - 1 <i>Ophiactis savignyi</i> - 2
<u>Fishes:</u>	<i>Chilomycterus schoepfi</i> - 1 <i>Acanthostracion quadricornis</i> - 2
<u>Molluscs:</u>	<i>Nudibranchs</i> - 3 unidentified (with eggs) <i>Aequipecten irradians</i> - 2 <i>Lima pellucida</i> - 1 <i>Vermicularia</i> sp. - 2
<u>Polychaetes:</u>	<i>Hesione picta</i> - 1
<u>Sponges:</u>	<i>Ircinia fasciculata</i> - 2 <i>Anthosigmella varians</i> - 1 <i>Spheciospongia vesparia</i> - 1 <i>Geodia gibberosa</i> - 1 covered with <i>Haliclona viridis</i> , <i>Haliclona permollis</i> and <i>Dysidea etheria</i> <i>Tedania ignis</i> - 1

# T38B

<u>Algae:</u>	<i>Dictyosphaeria cavernosa</i> <i>Cladophora</i> sp. <i>Laurencia</i> sp. <i>Batophora oerstedii</i> <i>Halimeda incrassata</i> <i>Halimeda opuntia</i>
<u>Alcyonarians:</u>	<i>Pterogorgia anceps</i> - 2
<u>Crustacea:</u>	<i>Mysids</i> - 8 <i>Periclimenes americanus</i> - 1 <i>Alpheus normanni</i> - 1
<u>Echinoderms:</u>	<i>Lytechinus variegatus</i> - 1
<u>Molluscs:</u>	<i>Pteria colymbus</i> - 1 <i>Aequipecten irradians</i> - 1 <i>Triphora nigrocincta</i> - 1 <i>Vermicularia</i> sp. - 4 <i>Teinostoma</i> sp. - 7

Sponges:            *Ircinia fasciculata* - 1  
                         *Ircinia strobilina* - 1 (large)

T39A

Algae:                *Batophora oerstedii*  
                         *Laurencia*

Alcyonarians:    *Pterogorgia anceps* - 1

Corals:              *Millepora* - fragments

Crustacea:          *Mysid* - 1  
                         *Thor* sp. - 2  
                         *Neopanope packardii* - 2

Echinoderms:    *Lytechinus variegatus* - 1

Fishes:             *Acanthostracion quadricornis* - 1

Molluscs:          *Pteria colymbus*  
                         *Aequipecten irradians* - 1  
                         *Brachidontes exustus* - 1  
                         *Modulus modulus* - 1

Sponges:            *Ircinia fasciculata* - 1  
                         *Haliclona molitba* - 1

T39B

Algae:                *Caulerpa microphysa*  
                         *Laurencia* sp.  
                         *Batophora oerstedii*  
                         *Anadyomene stellata*

Corals:              *Millepora* - fragments

Crustaceans:       *Alpheus normanni* - 1  
                         *Thor* sp. - 1

Fishes:             *Acanthostracion quadricornis* - 1

Molluscs:          *Bittium varium* - 1  
                         *Lima pellucida* - 2  
                         *Vermicularia* sp. - 1

Sponges:            *Ircinia fasciculata* - 3  
                         *Geodia gibberosa* - 1 with *Haliclona viridis*

T40A

Algae:                *Halimeda incrassata*  
                         *Anadyomene stellata*  
                         *Batophora oerstedii*  
                         *Laurencia*

Crustacea:      *Thor* sp. - 2  
                       *Pagurus bonairensis* - 1

Echinoderms:      *Leptosynapta parvipatina* - 3

Molluscs:      *Cerithium muscarum* - 1  
                       *Lima pellucida* - 1  
                       *Vermicularia* sp. - 1  
                       *Caecum* - 1

Sponges:      *Dysidea etheria* - 1  
                       *Tedania ignis* - 1

#### T40B

Algae:      *Hypoglossum involvens*  
                       *Laurencia* sp.  
                       *Batophora oerstedii*  
                       *Acetabularia crenulata*  
                       *Halimeda incrassata*  
                       *Anadyomene stellata*

Crustacea:      *Paguristes tortugae* - 1

Fishes:      *Acanthostracion quadricornis* - 1

Molluscs:      *Astraea tecta americana* - 1  
                       *Diodora cayenensis* - 1  
                       *Caecum* sp. - 1

Sponges:      *Ircinia fasciculata* - 2  
                       *Ircinia strobilina* - 1  
                       *Tedania ignis* - 1  
                       *Geodia gibberosa* - 1 with *Haliclona permollis* and *Haliclona viridis*

#### T-ML1

Algae:      *Laurencia* sp.

Fishes:      *Lactophrys* sp. - 1  
                       *Sphaeroides testudineus* - 1

Molluscs:      *Cantharus multangulus* - 1

#### T-ML2

Algae:      *Halimeda incrassata*  
                       *Laurencia* sp.  
                       *Anadyomene stellata*  
                       *Batophora oerstedii*  
                       *Cladophora* sp.

Alcyonarians:      *Pterogorgia anceps* 1

Bryzoan: Unidentified sp. - 1

Coral: *Millepora* - fragments

Echinoderms: *Lytechinus variegatus* - 1  
*Ophioctis savignyi* - 1  
*Ophiothrix oerstedii* - 1

Molluscs: *Brachidontes exustus* - 1  
*Vermicularia* sp. - 2

Sponges: *Ircinia campana* - 1  
*Spongia cheiris* - 1  
*Haliclona variabilis* - 2 fragments  
*Haliclona subtriangularis* - 1  
*Geodia gibberosa* - 1 with *Haliclona viridis*

#### T-ML3

Algae: *Anadyomene stellata*  
*Batophora oerstedii*  
*Cladophora* sp.  
*Laurencia* sp.  
*Caulerpa racemosa*

Alcyonarians: *Pterogorgia anceps* - 2

Corals: *Millepora* - fragments

Echinoderms: *Lytechinus variegatus* - 1

Molluscs: *Crepidula aculeata* - 1

Sponges: *Ircinia fasciculata* - 1  
*Dysidea etheria* - 1  
*Haliclona permollis* - 2

#### T-ML4

Algae: *Acetabularia crenulata*  
*Laurencia* sp.  
*Dictyosphaeria cavernosa*  
*Batophora oerstedii*  
*Valonia macrophysa*  
*Halimeda* sp.

Alcyonarians: *Muricea* sp. - 1

Corals: *Millepora* - fragments

Fishes: *Acanthostracion quadricornis* - 1

Sponges: *Ircinia fasciculata* - 1

#### T-ML5

Algae: *Laurencia*

Alcyonarians: *Plexaurella nutans* - 1  
*Pterogorgia anceps* - 1

Corals: *Porites* sp. - 1  
*Millepora* - fragments

Echinoderms: *Lytechinus variegatus* - 3

Fishes: *Banded goby* - 1

Molluscs: *Lucapina suffusa* - 1  
*Aeguipecten irradians* - 2  
*Vermicularia* sp. - 2

Sponges: *Ircinia campana* - 1  
*Ircinia fasciculata*, - 1  
*Verongia longissima* - 1  
*Halichondria melanadocia* 1  
*Geodia gibberosa* - 2 with *Haliclona viridis*

#### T-ML6

Algae: *Acetabularia crenulata*  
*Laurencia* sp.  
*Dictyosphaeria cavernosa*  
*Anadyomene stellata*  
*Cladophora* sp.  
*Caulerpa microphysa*

Alcyonarians: *Pterogorgia anceps* - 1

Corals: *Millepora* - fragments

Echinoderms: *Ophiopsila riisei* - 3  
*Ophiostigma isacanthum* - 1

Molluscs: *Aeguipecten irradians* - 1  
*Lima pellucida* - 7  
*Rissoina chesneli* - 1  
*Vermicularia* sp. - 1  
*Nudibranchs misc.* - 1  
*Caecum* sp. - 1

Sponges: *Ircinia fasciculata* 3  
*Geodia gibberosa* - 1 covered with *Dysidea etheria*  
*Tethya* sp. - 2  
*Myriastras* sp.

#### T-ML7

Algae: *Digenia simplex*  
*Dictyosphaeria cavernosa*

*Caulerpa paspaloides*  
*Cladophora* sp.  
*Laurencia* sp.

Coral: *Millepora* - fragments

Echinoderms: *Lytechinus variegatus* - 2

Fishes: *Chilomycterus schoepfi* - 1  
*Acanthostracion quadricornis* - 1  
*Lagodon rhomboides* - 1

Molluscs: *Aequipecten irradians* - 1

Sponges: *Spongia graminea* - 2  
*Ircinia fasciculata* - 1  
*Halichondria melanadocia* - 1  
*Chondrilla nucula*

#### T-ML8

Algae: *Laurencia* sp.  
*Acetabularia* sp.

Alcyonarians: *Pterogorgia anceps* - 1  
Unidentified sp. - 1

Corals: *Millepora* - fragments

Crustacea: *Pagurus bonairensis* - 3

Fishes: *Acanthostracion quadricornis*

Molluscs: *Pteria colymbus*

Sponges: *Haliclona permollis* - 1

Turtles: *Hawksbill* - 1 seen

#### T-ML9

Algae: *Jania* sp.  
*Spyridia* sp.  
*Udotea conglutinata*  
*Hypoglossum involvens*  
*Digenia simplex*  
*Halimeda incrassata*  
*Laurencia* sp.  
*Anadyomene stellata*  
*Batophora oerstedii*

Alcyonarians: fragments

Corals: *Millepora* - fragments



Crustacea: *Pagurus bonairensis* - 1

Echinoderms: *Leptosynapta parvipatina* - 1

Molluscs: *Brachidontes exustus* - 1  
*Cerithium muscarum* - 1

Sponges: *Dysidea etheria* - 1

#### T-ML10

Algae: *Acetabularia crenulata*  
*Laurencia* sp.  
*Dictyosphaeria cavernosa*

Alcyonarians: *Unidentified* - 2

Corals: *Millepora* - fragments

Fishes: *Lagodon rhomboides*

Molluscs: *Astraea tecta americana* - 2  
*Columbella rusticoidea* - 1  
*Americardia media* - 1  
*Arca imbricata* - 1

#### T-ML11

Algae: *Laurencia* sp.  
*Acetabularia* sp.

Alcyonarians: *Pterogorgia anceps* fragment

Corals: *Millepora* - fragments

#### T-ML12

Algae: *Laurencia* sp.

Alcyonarians: *Muricea* sp.

Fishes: *Acanthostracion quadricornis* - 2  
*Haemulon* sp. - 1

Sponges: *Ircinia fasciculata* - 2  
*Haliclona permollis* - 1  
*Halichondria melanadocia* - 1  
*Chondrilla nucula* - 1

#### T-ML13

Algae: *Halimeda incrassata* - 1  
*Laurencia* - 1  
*Anadyomene stellata* - 1  
*Valonia macrophysa* - 1

Alcyonarian: 1

Crustacea: *Pagurus bonairensis* - 1

Fishes: *Haemulon plumieri* - 1

Molluscs: *Modulus modulus* - 4

#### T-ML14

Algae: *Cladophora* sp.  
*Laurencia* sp.  
*Batophora oerstedii*  
*Halimeda incrassata*  
*Acetabularia crenulata*  
*Halimeda opunta*  
*Anadyomene stellata*  
*Valonia macrophysa*  
*Dictyosphaeria cavernosa*

Echinoderms: *Leptosynapta parvipatina* - 8  
*Ophiostigma isacanthum* - 2  
*Ophiothrix oerstedii* - 1

Fishes: *Acanthostracion quadricornis* - 2

Molluscs: *Aequipecten irradians* - 2  
*Bittium varium* - 5  
*Brachidontes exustus* - 2  
*Lima pellucida* - 1  
*Vermicularia* sp. - 1  
*Nudibranch* - 1  
*Chiton* - 1  
*Modulus modulus* - 2  
*Columbella rusticoidea* - 1

Sponges: *Haliclona molitba*

#### T-ML15

Algae: *Laurencia* sp.  
*Dictyosphaera* sp.

Molluscs: *Modulus modulus* - 4  
*Arca imbricata* - 1

Sponges: *Ircinia strobilina* - 1  
*Chondrilla nucula* - 2

#### T-ML16

Algae: *Laurencia* sp.  
*Dictyosphaeria* sp.  
*Acetabularia* sp.  
*Halimeda* sp.

Fishes: *Acanthostracion quadricornis* - 1

Sponges: *Ircinia fasciculata* - 1

#### T-ML17

Algae: *Cladophora* sp.  
*Laurencia* sp.  
*Batophora oerstedii*  
*Acetabularia crenulata*  
*Halimeda opuntia*  
*Dictyosphaeria* sp.

Corals: *Millepora* - fragment

Crustacea: *Pitho anisodon* - 1

Echinoderms: *Lytechinus variegatus* - 1  
*Ophiostigma-isacanthum* - 1

Fishes: *Haemulon plumieri*

Molluscs: *Aequipecten irradians* - 1  
*Lima pellucida* - 2

Sponges: *Spongia graminea* - 1  
*Ircinia fasciculata* - 2  
*Dysidea etheria* - 1  
*Haliclona subtriangularis* - 1  
*Haliclona permollis* - 1  
*Geodia gibberosa* - 1 with *Haliclona viridis*

#### T-ML18

Algae: *Cladophora* sp.  
*Laurencia* sp.  
*Valonia macrophysa*  
*Dictyosphaeria cavernosa*  
*Sargassum* sp.

Alcyonarians: 1 unidentified

Corals: *Siderastrea siderea* - 1

Crustacea: *Pitho anisodon* - 1  
*Pagurus bonairensis* - 2  
*Paguristes tortugae* - 1

Echinoderms: *Lytechinus variegatus* - 1  
*Leptosynapta parvipatina* - 2  
*Ophiopsila riisei* - 3  
*Ophiothrix oerstedii* 1

Molluscs: *Cantharus multangulus* - 1

*Bittium varium* - 3  
*Brachidontes exustus* - 1

Sponges:

*Verongia longissima* - 1  
*Haliclona permollis* - 1