Volunteer Reef Fish Monitoring in the Dry Tortugas National Park
2001 Final Summary Report
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Researchers

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Background and Park Zoning

The Reef Environmental Education Foundation (REEF) is a 501 (c)(3) non-profit organization dedicated to protecting the marine environment. REEF implements the Fish Survey Project, an ongoing effort that enables volunteer divers to collect fish sighting information during recreational dives. The project originated in 1993, and to date has gathered more than 42,000 surveys throughout the Caribbean, Gulf of Mexico, west coast of the US and Canada, the tropical eastern Pacific, and Hawaii. The focus of the Fish Survey Project is on training divers to collect fish data, and then managing this information, including annual reporting and website display. In the Fall of 2001, REEF was contracted by the National Park Service to conduct fish surveys at 18 sites within the Dry Tortugas National Park.

The Dry Tortugas are a cluster of seven islands and are located approximately 70 miles west of Key West, Florida. The majority of the Park consists of water, with two permanent land facilities – the historic Fort Jefferson on Garden Key and a collection of buildings and lighthouse on Loggerhead Key. In 1935, the Fort and surrounding waters were set aside as a National Monument. The area was redesignated as Dry Tortugas National Park (DTNP) in 1992 to protect both the historical and natural features. In 2001, an updated management plan and environmental impact statement for the DTNP was approved.

As part of the new plan, four types of management zones will be implemented. The Historic Preservation/Adaptive Use (HPAU) zone surrounds Ft. Jefferson and is the focus of the greatest visitor use. The Natural/Cultural (NCA) zone focuses effort on improving natural resource quality while providing opportunities for mixed uses, including swimming, diving, and recreational fishing. The Research Natural Area (RNA) zone provides for the protection of outstanding marine and terrestrial habitats. The use of anchors and all harvest are prohibited in the RNA. Special Protection (SP) zones protect sensitive areas that require protection from human impact, such as sea turtle and bird nesting areas. Boundaries for the SP zones may be adjusted at particular times of the year. Activities that are banned from all DTNP waters include commercial fishing, spear fishing, and the harvest of conch and lobster.

Also in 2001, the Florida Keys National Marine Sanctuary (FKNMS), which has jurisdiction over the deeper waters that surround the Dry Tortugas, implemented the Dry

Tortugas Ecological Reserve. This reserve prohibits all harvest and represents the largest no-take area in United States. The creation of the RNA within the DTNP will complement the Ecological Reserve.

The primary objective of the REEF AAT project in the National Park was to establish a baseline of information on fish assemblages at 18 sites within the DTNP in order to assist the park in the evaluation of the efficacy of the management zones once they are implemented. In addition to providing useful information, the involvement of volunteers in the assessment of park resources will improve constituent building and encourage a sense of ownership in DTNP resources by the public. This project complements a similar zone monitoring program that REEF has conducted since 1997 within the FKNMS (REEF 2000). As part of this effort, ten Dry Tortugas sites are surveyed annually.

Survey Method

Data were collected using the visual census method developed specifically for REEF's volunteer program. The Roving Diver Technique (RDT; Schmitt and Sullivan 1996) is a non-point visual survey method specifically designed to generate a comprehensive species list along with frequency and abundance estimates. During RDT surveys, divers swim freely throughout a dive site and record every observed fish species. At the conclusion of each survey, divers assign each recorded species one of four $\log_{10}$ abundance categories [single (1); few (2-10), many (11-100), and abundant (>100)]. Following the dive, each surveyor records the species data along with survey time, depth, temperature, and other environmental information on a REEF scansheet. The scansheets are returned to REEF, and the data are loaded into the REEF database that is publicly-accessible on the Internet at http://www.reef.org.

Results

This project supported a team of REEF's most experienced surveyors, the Advanced Assessment Team (AAT), to survey 18 sites in the Dry Tortugas National Park (DTNP), including 8 sites within the Natural/Cultural Area (NCA), 8 sites within the Research Natural Area (RNA), and 2 sites within the Historic Preservation/ Adaptive Use (HPAU) Zone (Figure 1). Figures 1b and 1c show the sites in reference to the bathymetry and benthic habitat categories (FKNMS 2000). Six RDT surveys were conducted at each site in November 2001 (Table 1). Average survey time was 51 minutes. Species richness at each site is given in Table 1, and ranged from 45 species at Slippery Shoal to 99 species at Fish Dip and at Playmate Den.

The REEF DTNP 2001 data are summarized in a report available on the Internet (http://www.reef.org/cgi-bin/batchrep.pl?region=TWA&file_name=dtnp0111.dat) and is attached as an Appendix. A total of 180 species were documented. The sighting frequency and density score[1] for each species are given in the summary report. The raw data were submitted to the DTNP and are available upon request.

[1] Density Score = $[(n_S x1)+(n_F x2)+(n_M x3)+(n_A x4)] / (n_S + n_F + n_M + n_A)$, where n is the number of times each abundance category was assigned

The 2001 AAT data were used to conduct assemblage-level comparisons among the sites. A cluster diagram, based on rank abundance score[2] data for a sub-set of species (those seen in at least 20% of all surveys; 73 species), was produced to evaluate the similarity in the assemblages. This provided a visual picture of the similarity of fish assemblages among sites (Figure 2). Several of the sites clustered together by geographic proximity. For example, Butter and Milk-O are within a few kilometers of each other and Pulaski, Chris' Ledge, and Dolphin Gully are all along the northeastern reef track. Other sites clustered by reef type and/or rugosity. For example, Mel's Groove, Marker #1, and Eggs are all on reef edges near deep water drop-offs. Harvey's Corner and Hammerhead point are both barren, sloping drop-off areas. Slippery Shoal was an outlier in the cluster, and was the only location that was a shallow, gorgonian-dominated reef. Species richness at Slippery Shoal was also significantly lower than at any of the other sites (Table 1).

Data collected during this project complement REEF's long-term zone monitoring project funded by the FKNMS and REEF's Fish Survey Project, a continual volunteer monitoring project that involves REEF volunteers conducting RDT surveys during their regular diving activities in the Dry Tortugas and elsewhere. To date (between 1994 and 2001), these two activities have contributed 1,007 RDT surveys at 66 sites in the Dry Tortugas area. Approximately 600 of these surveys were conducted within the DTNP (Figure 3).

A subset of the entire REEF DTNP dataset was used to evaluate the current status of six species (red grouper, *Epinephelus morio*; black grouper, *Mycteroperca bonaci*; Nassau grouper, *E. striatus*, gray snapper, *Lutjanus griseus*; white grunt, *Haemulon plumierii*; and bluestriped grunt, *H. sciurus*). Data from sites that had a minimum of 10 surveys in REEF's DTNP database were included (17 sites; note that not all the 2001 AAT sites were included in this subset). Total survey effort is given in the table within Figures 4 and 5. Average sighting frequency (%SF) of the three grouper species was calculated for the 17 sites and the results are shown graphically in Figure 4. The Abundance Score[2] was calculated for the grunt and snapper species (Figure 5). Percent sighting frequency was used in the grouper analysis because it is a more sensitive measure of change for species that, when sighted, only one or few individuals are seen.

It is important to point out that Figures 4 and 5 provide a summary of the populations' status at each of the sites, and that the temporal frequency of the sampling effort is uneven among sites. While some sites have had multiple surveys conducted each year during the time frame (1994-2001), others have only been surveyed once. Nevertheless, these data can provide a baseline of information that can assist in the evaluation of trends over time.

Both black and red grouper were documented in most of the locations and with fairly high sighting frequency (average %SF for both species was approximately 45%). Nassau grouper were absent from several sites, and was not seen frequently at the remainder of the sites. In general, black grouper were recorded in higher frequency at sites in the western portion of the park and at Pulaski Shoal. Red grouper sighting frequency was

[2] Abundance Score = Density Score * % Sighting Frequency

variable throughout the park, but tended to be higher in areas with relatively low black grouper sighting frequency.

Both gray snapper and white grunt were documented at low to moderate relative abundances throughout the park. Bluestriped grunt were generally low in abundance at all sites surveyed except for the seagrass area adjacent to Fort Jefferson. Similar to black grouper, gray snapper tended to be in higher relative abundance at sties in the western portion of the park.

Factors driving the distribution and abundance of the grouper, snapper, and grunt shown in Figures 4 and 5 most likely include a combination of differences in harvest pressure and habitat preferences. These relationships can be further evaluated by incorporating the REEF data into a GIS with habitat and other variables.

The 2001 REEF AAT project provided a baseline of information within 18 sites that are inside and outside of the proposed no-take zones. Once the zones are implemented, REEF would like to continue this annual monitoring effort within the DTNP in order to assist in the evaluation of the zones. The AAT project ensures that annual data collection within the zones and surrounding areas by REEF experts occurs, enabling detailed analyses. REEF is continuing to collect data at particular sites within the DTNP and in the FKNMS portion of the Dry Tortugas as part of the FKNMS ongoing project, and these data can be used in concert with the DTNP project in the larger effort that REEF is conducting with NOAA's Biogeography Office. This effort includes using the REEF database and the FKNMS Benthic Habitat database to investigate fish-habitat interactions, mapping species distributions in the FKNMS and DTNP (Jeffrey et al. 2001), and evaluating the effect of management zones by analyzing shifts in assemblage composition and feeding guilds over time.

Literature Cited

FKNMS 2000. Florida Keys National Marine Sanctuary Zone Monitoring Program: project locator maps, project metadata, and associated files. CD-ROM. January 2000. Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, St. Petersburg, Florida.

Jeffrey, C.F.G., C. Pattengill-Semmens, S. Gittings, and M.E. Monaco. 2001. Distribution and sighting frequency of reef fishes in the Florida Keys National Marine Sanctuary. Marine Sanctuaries Conservation Series MSD-01-1. US Dept. of Commerce, NOAA, Silver Spring, MD. 51 pp. http://www.sanctuaries.nos.noaa.gov/special/reef_fish/MSD_01_1.PDF

REEF 2000. Volunteer Reef Fish Monitoring in the Florida Keys National Marine Sanctuary – REEF Zone Monitoring Annual Report. http://www.reef.org/data/2000aatreport.pdf

Schmitt, E. F. and Sullivan, K. M. 1996. Analysis of a volunteer method for collecting fish presence and abundance data in the Florida Keys. Bulletin of Marine Science 59(2), 404-416.

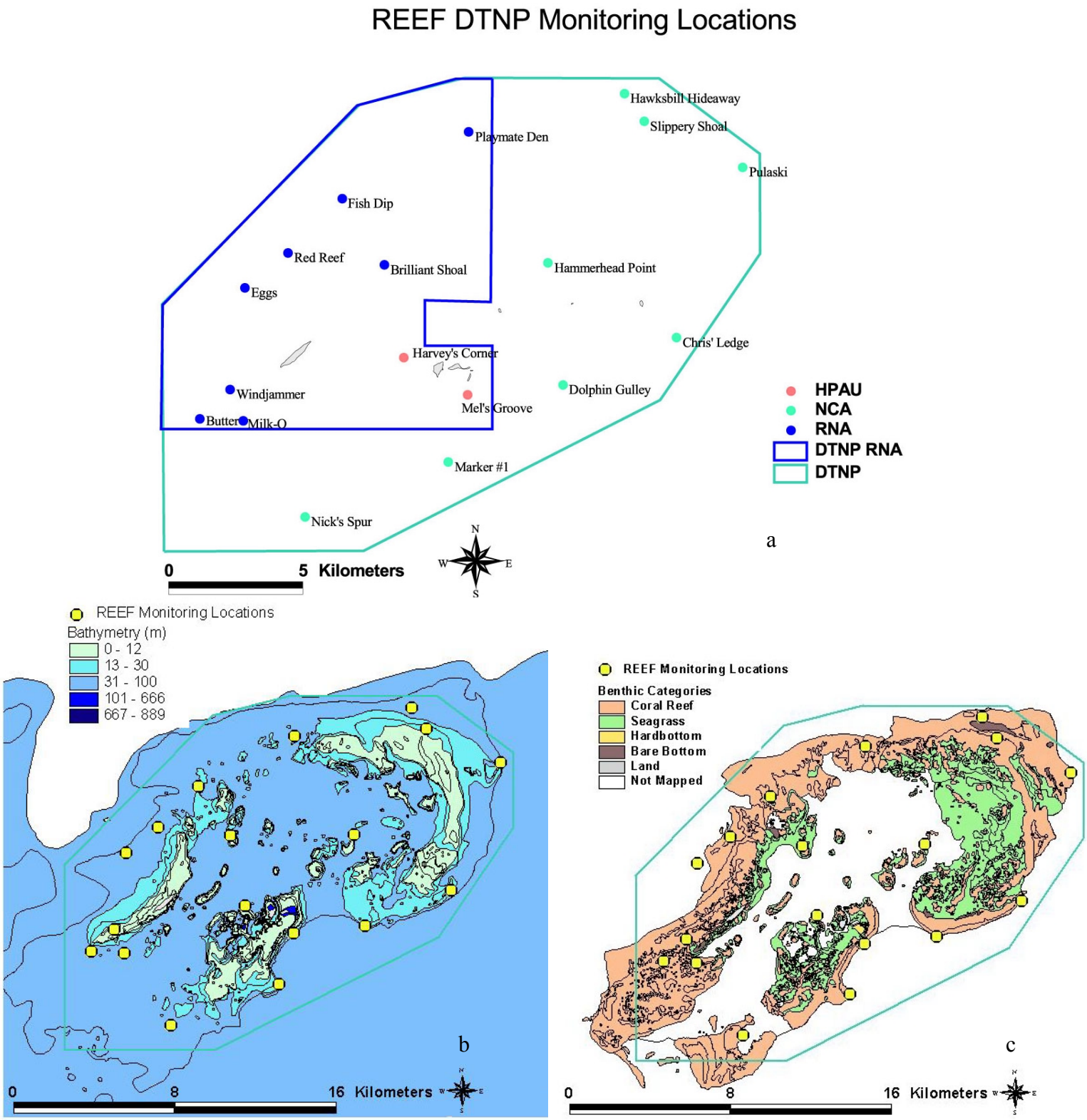


Figure 1. REEF Dry Tortugas National Park Monitoring Locations. 1a. Locations with site names and zone designations; 1b. Locations overlaid on bathymetry; 1c. Locations overlaid on benthic habitat categories.

Bathymetry and benthic shape files from FKNMS 2000.

Table 1. REEF 2001 Dry Tortugas National Park monitoring locations, survey effort, date, and species richness.

Site	Latitude	Longitude	REEF Geographic Code	Survey Date	Survey Effort	Species Richness
Pulaski	24.69550	-82.77133	34100005	11/10/2001	6	89
Chris' Ledge	24.63850	-82.79350	34100057	11/10/2001	6	85
Hammerhead Point	24.66350	-82.83650	34100058	11/10/2001	6	74
Windjammer	24.62117	-82.94300	34100015	11/11/2001	6	90
Red Reef	24.66683	-82.92350	34100059	11/11/2001	6	88
Milk-O	24.61067	-82.93850	34100060	11/12/2001	6	92
Butter	24.61133	-82.95317	34100061	11/12/2001	6	97
Eggs	24.65517	-82.93800	34100062	11/12/2001	6	93
Fish Dip	24.68500	-82.90550	34100063	11/12/2001	6	99
Dolphin Gulley	24.62267	-82.83150	34100064	11/13/2001	6	88
Mel's Groove	24.61933	-82.86350	34100065	11/13/2001	6	95
Marker #1	24.59683	-82.86983	34100066	11/13/2001	6	94
Nick's Spur	24.57850	-82.91783	34100067	11/13/2001	6	78
Harvey's Corner	24.63183	-82.88483	34100068	11/14/2001	6	72
Brilliant Shoal	24.66283	-82.89133	34100069	11/14/2001	6	84
Playmate Den	24.70733	-82.86300	34100070	11/14/2001	6	99
Hawksbill Hideaway	24.72017	-82.81100	34100071	11/14/2001	6	77
Slippery Shoal	24.71083	-82.80433	34100072	11/14/2001	6	45

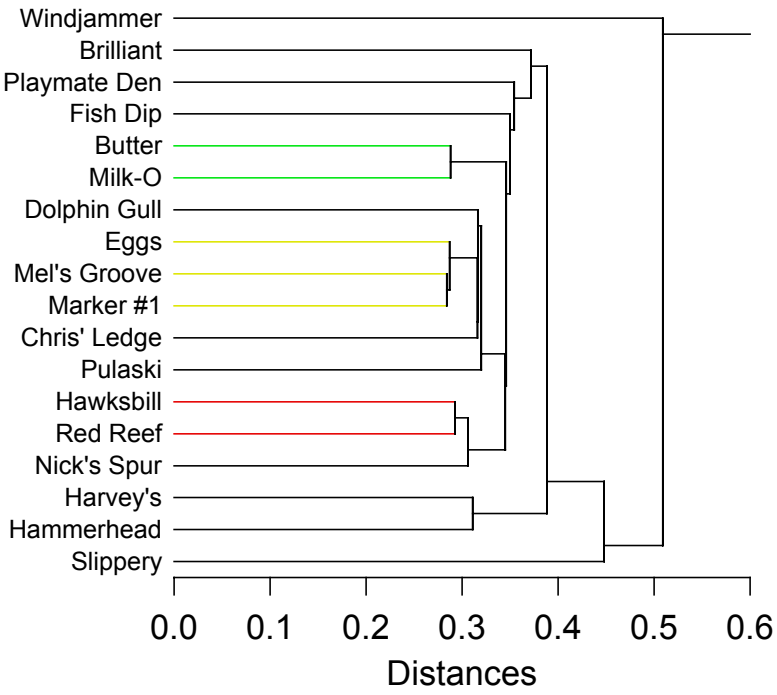


Figure 2. Cluster analysis results. The analysis used REEF's 2001 Advanced Assessment Team data, collected at 18 sites in the Dry Tortugas National Park. Analysis used rank of the abundance score. Distance of the clusters are 1-Gamma. Only species that were seen with a %SF of at least 20% (73 species) were included in the analysis. Sites tended to cluster together by geographic proximity (current influences) and benthic rugosity.

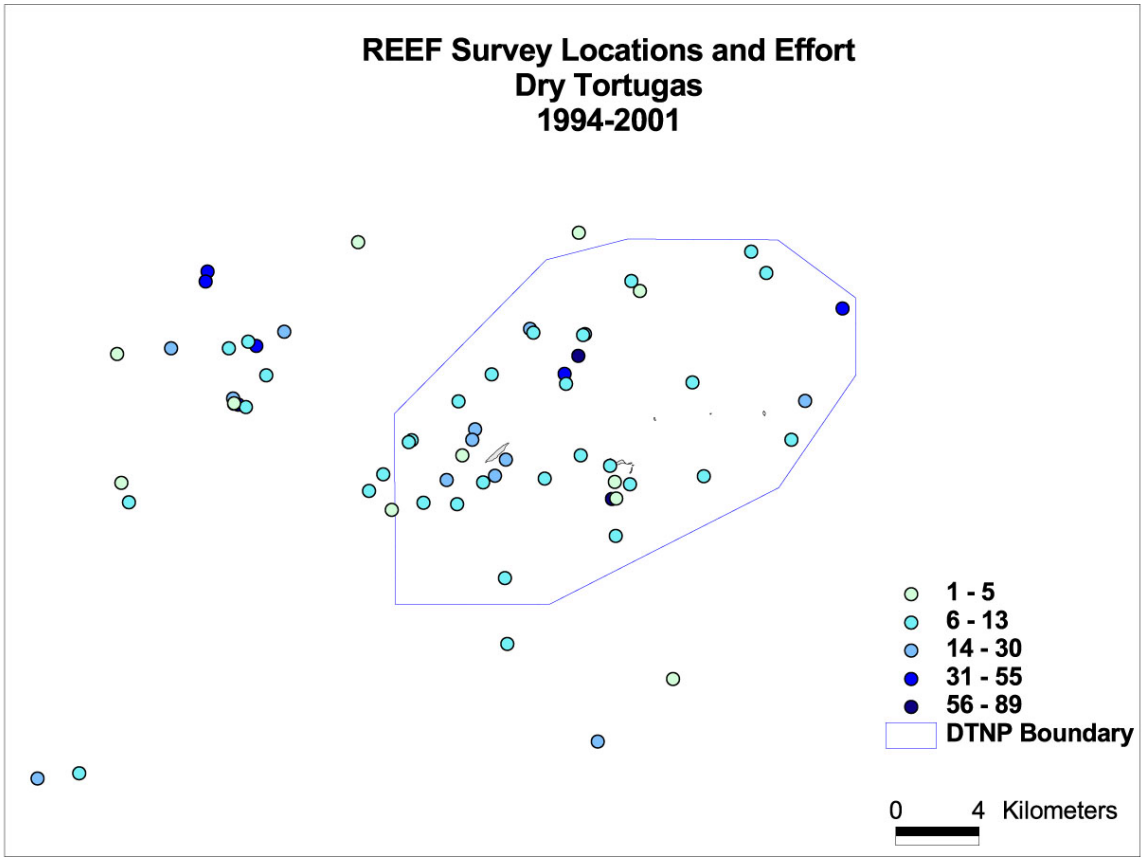
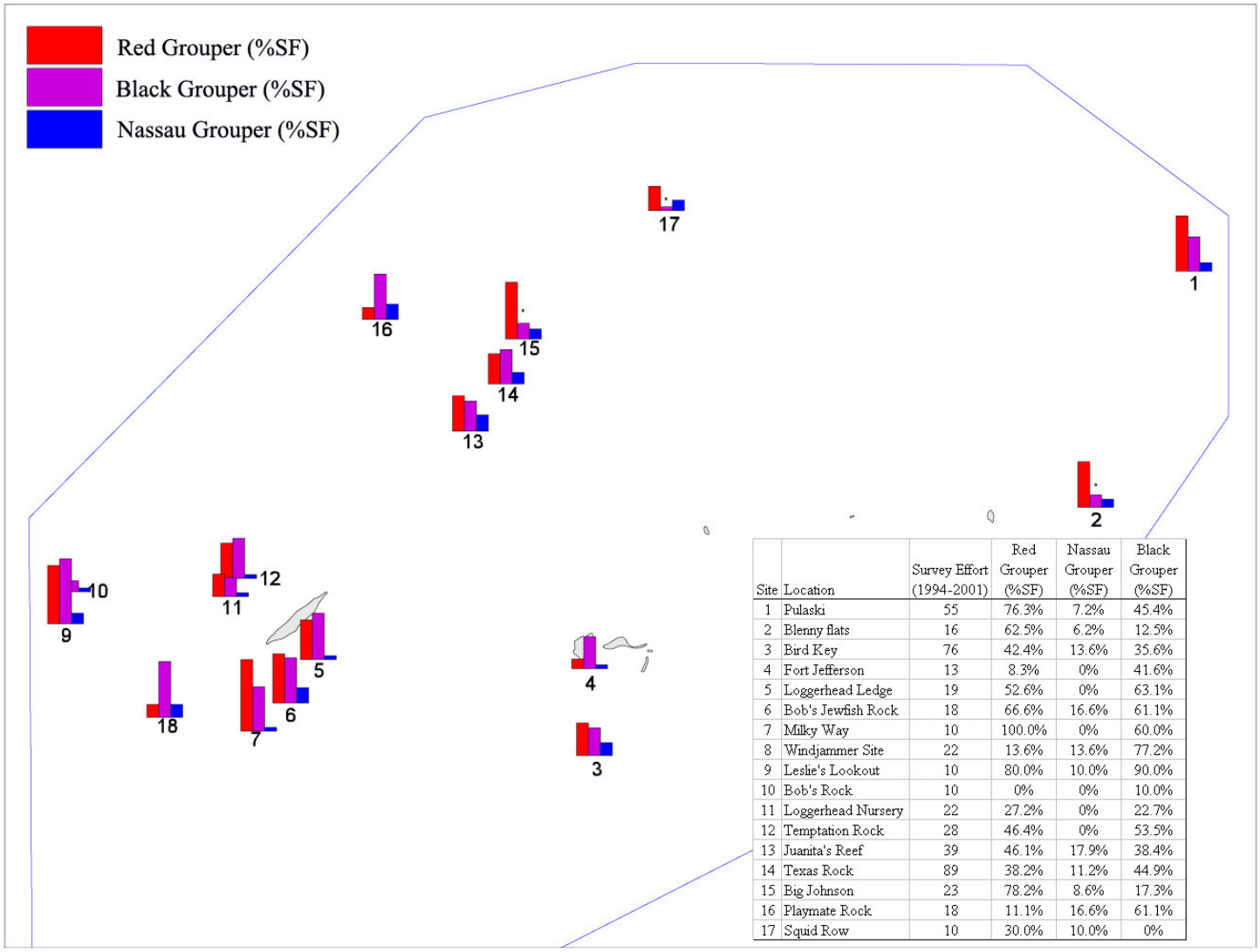
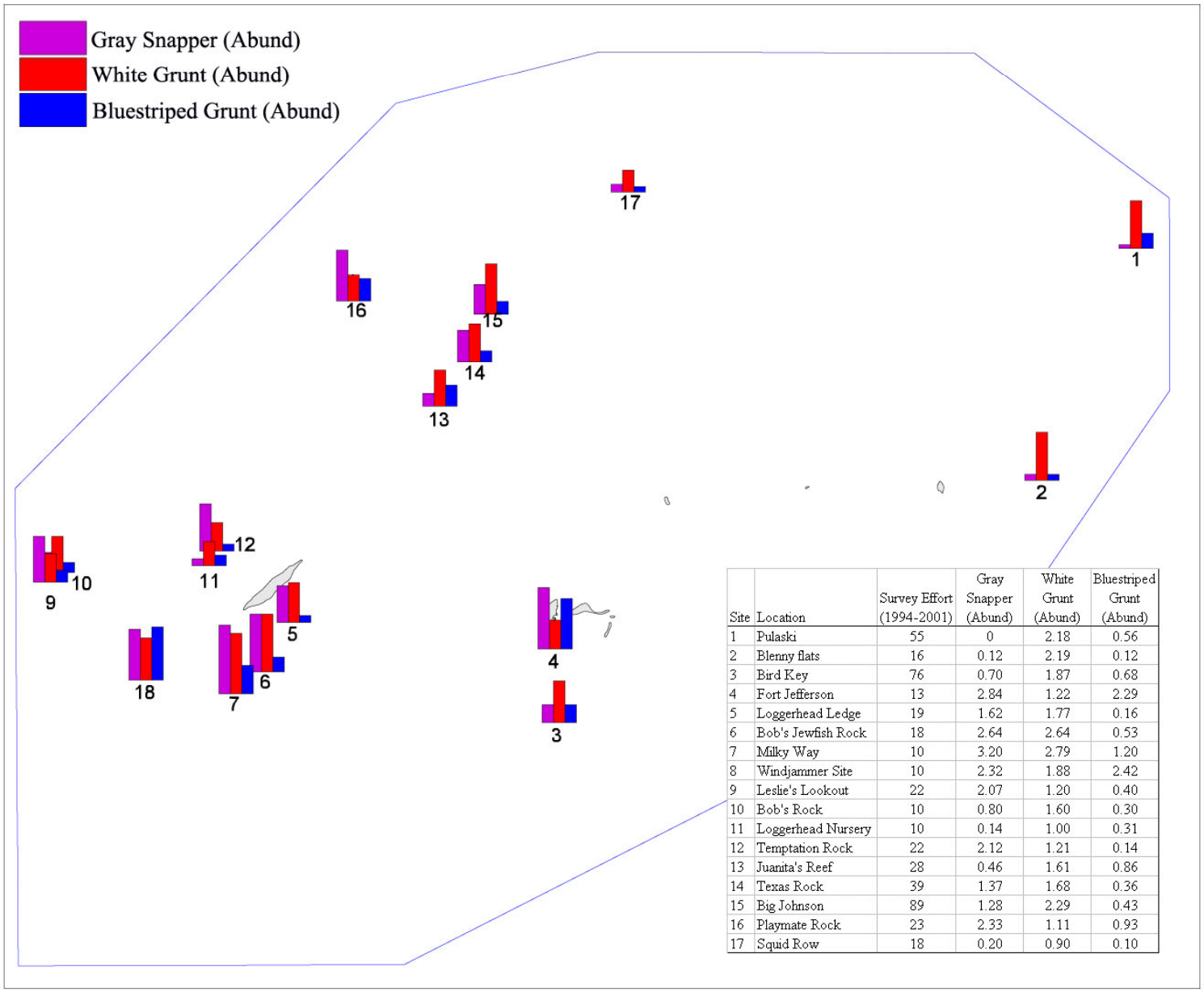


Figure 3. REEF Survey Locations and Effort in the Dry Tortugas area from 1994 through 2001. A total of 1,007 RDT surveys have been conducted at 66 sites in the Dry Tortugas area, and approximately 600 of these surveys were conducted within the DTNP.



Site	Location	Survey Effort (1994-2001)	Red Grouper (%SF)	Nassau Grouper (%SF)	Black Grouper (%SF)
1	Pulaski	55	76.3%	7.2%	45.4%
2	Blenny flats	16	62.5%	6.2%	12.5%
3	Bird Key	76	42.4%	13.6%	35.6%
4	Fort Jefferson	13	8.3%	0%	41.6%
5	Loggerhead Ledge	19	52.6%	0%	63.1%
6	Bob's Jewfish Rock	18	66.6%	16.6%	61.1%
7	Milky Way	10	100.0%	0%	60.0%
8	Windjammer Site	22	13.6%	13.6%	77.2%
9	Leslie's Lookout	10	80.0%	10.0%	90.0%
10	Bob's Rock	10	0%	0%	10.0%
11	Loggerhead Nursery	22	27.2%	0%	22.7%
12	Temptation Rock	28	46.4%	0%	53.5%
13	Juanita's Reef	39	46.1%	17.9%	38.4%
14	Texas Rock	89	38.2%	11.2%	44.9%
15	Big Johnson	23	78.2%	8.6%	17.3%
16	Playmate Rock	18	11.1%	16.6%	61.1%
17	Squid Row	10	30.0%	10.0%	0%

Figure 4. Sighting frequency of three grouper species at 17 sites in the DTNP, based on RDT data collected between 1994 and 2001.



Site	Location	Survey Effort (1994-2001)	Gray Snapper (Abund)	White Grunt (Abund)	Bluestriped Grunt (Abund)
1	Pulaski	55	0	2.18	0.56
2	Blenny flats	16	0.12	2.19	0.12
3	Bird Key	76	0.70	1.87	0.68
4	Fort Jefferson	13	2.84	1.22	2.29
5	Loggerhead Ledge	19	1.62	1.77	0.16
6	Bob's Jewfish Rock	18	2.64	2.64	0.53
7	Milky Way	10	3.20	2.79	1.20
8	Windjammer Site	10	2.32	1.88	2.42
9	Leslie's Lookout	22	2.07	1.20	0.40
10	Bob's Rock	10	0.80	1.60	0.30
11	Loggerhead Nursery	10	0.14	1.00	0.31
12	Temptation Rock	22	2.12	1.21	0.14
13	Juanita's Reef	28	0.46	1.61	0.86
14	Texas Rock	39	1.37	1.68	0.36
15	Big Johnson	89	1.28	2.29	0.43
16	Playmate Rock	23	2.33	1.11	0.93
17	Squid Row	18	0.20	0.90	0.10

Figure 4. Abundance score values of two grunt and one snapper species at 17 sites in the DTNP, based on RDT data collected between 1994 and 2001.

Tropical Western Atlantic Data

Field Survey and Special Project Summaries

REEF Trip Report For:
Dry Tortugas National Park, Nov 10-14, 2001
(2001-11-10 - 2001-11-14)

Survey Members Participating:

Brenda Hitt
Laddie Akins
Dave Grenda
Clint Whitaker
Ann Outlaw
Carol Whitaker

		Surveys				Bottom Time
		Expert		Novice		
Code	Site	SA	SO	SA	SO	(H:M)
34100005	Pulaski	6	0	0	0	5:30
34100015	Windjammer Site (French Wreck)	6	0	0	0	5:43
34100057	Chris' Ledge	6	0	0	0	5:34
34100058	Hammerhead Point	6	0	0	0	5:19
34100059	Red Reef	6	0	0	0	6:13
34100060	Milk-O	6	0	0	0	6:23
34100061	Butter	6	0	0	0	6:06
34100062	Eggs	6	0	0	0	5:36
34100063	Fish Dip	6	0	0	0	5:31
34100064	Dolphin Gulley	6	0	0	0	5:47
34100065	Mel's Groove	6	0	0	0	5:55
34100066	Marker #1	6	0	0	0	5:40
34100067	Nick's Spur	6	0	0	0	5:52
34100068	Harvey's Corner	6	0	0	0	5:32
34100069	Brilliant Shoal	6	0	0	0	5:49
34100070	Playmate Den	6	0	0	0	5:50
34100071	Hawksbill Hideaway	6	0	0	0	5:35
34100072	Slippery Shoal	6	0	0	0	4:52

TOTALS			108	0	0	0	102:47	
			Total		Expert		Novice	
Rank	SP#	Common Name	SF%	DEN	SF%	DEN	SF%	DEN
1	156	Striped Parrotfish	99%	3.4	99%	3.4		
2	213	Bluehead	99%	3	99%	3		
3	117	White Grunt	99%	2.8	99%	2.8		
4	197	Yellowtail Snapper	98.1%	3	98.1%	3		
5	019	Saddled Blenny	98.1%	2.2	98.1%	2.2		
6	218	Slippery Dick	97.2%	2.9	97.2%	2.9		
7	204	Blue Tang	97.2%	2.6	97.2%	2.6		
8	152	Redband Parrotfish	96.2%	2.5	96.2%	2.5		
9	121	Butter Hamlet	96.2%	2.4	96.2%	2.4		
10	155	Stoplight Parrotfish	95.3%	2.3	95.3%	2.3		
11	049	Cocoa Damselfish	94.4%	3	94.4%	3		
12	034	Spotfin Butterflyfish	92.5%	2	92.5%	2		
13	098	Red Grouper	91.6%	1.7	91.6%	1.7		
14	220	Yellowhead Wrasse	90.7%	2.6	90.7%	2.6		
15	084	Neon Goby	89.8%	2.1	89.8%	2.1		
16	118	Barred Hamlet	89.8%	1.9	89.8%	1.9		
17	120	Blue Hamlet	87.9%	2.2	87.9%	2.2		
18	053	Threespot Damselfish	87%	2.6	87%	2.6		
19	079	Bridled Goby	86.1%	2.3	86.1%	2.3		
20	048	Bicolor Damselfish	83.3%	2.5	83.3%	2.5		
21	083	Masked Goby/Glass Goby	82.4%	3.6	82.4%	3.6		
22	130	Hogfish	78.7%	1.8	78.7%	1.8		
23	047	Beaugregory	77.7%	2.1	77.7%	2.1		
24	001	Blue Angelfish	75.9%	1.8	75.9%	1.8		
25	091	Black Grouper	74%	1.6	74%	1.6		
26	004	Gray Angelfish	71.2%	1.7	71.2%	1.7		
27	228	Yellowhead Jawfish	70.3%	2.2	70.3%	2.2		
28	044	Purple Reeffish	68.5%	3	68.5%	3		
29	111	Porkfish	67.5%	2.1	67.5%	2.1		
30	497	Knobbed Porgy	65.7%	1.7	65.7%	1.7		
31	205	Doctorfish	64.8%	1.8	64.8%	1.8		
32	192	Gray Snapper	63.8%	2.7	63.8%	2.7		
33	206	Ocean Surgeonfish	63.8%	2	63.8%	2		
34	147	Greenblotch Parrotfish	63.8%	2	63.8%	2		

35	119	Black Hamlet	63.8%	1.6	63.8%	1.6
36	031	Foureye Butterflyfish	60.1%	1.8	60.1%	1.8
37	126	Tan Hamlet	60.1%	1.5	60.1%	1.5
38	133	Bar Jack	59.2%	2.7	59.2%	2.7
39	167	Sharpnose Puffer	59.2%	1.8	59.2%	1.8
40	145	Bluelip Parrotfish	56.4%	1.8	56.4%	1.8
41	052	Sergeant Major	53.7%	2.5	53.7%	2.5
42	214	Clown Wrasse	50.9%	1.8	50.9%	1.8
43	438	Yellowprow Goby	50.9%	1.6	50.9%	1.6
44	108	French Grunt	49%	2.6	49%	2.6
45	076	Spotted Goatfish	47.2%	1.7	47.2%	1.7
46	095	Graysby	47.2%	1.5	47.2%	1.5
47	101	Scamp	47.2%	1.5	47.2%	1.5
48	105	Bluestriped Grunt	46.2%	2.1	46.2%	2.1
49	005	Queen Angelfish	42.5%	1.4	42.5%	1.4
50	080	Colon Goby	40.7%	1.7	40.7%	1.7
51	131	Spanish Hogfish	37.9%	1.5	37.9%	1.5
52	033	Reef Butterflyfish	37%	1.6	37%	1.6
53	181	Harlequin Bass	35.1%	1.7	35.1%	1.7
54	221	Bermuda Chub/Yellow Chub	33.3%	2.4	33.3%	2.4
55	054	Yellowtail Damselfish	32.4%	1.8	32.4%	1.8
56	216	Puddingwife	32.4%	1.5	32.4%	1.5
57	114	Spanish Grunt	30.5%	1.6	30.5%	1.6
58	081	Goldspot Goby	29.6%	1.6	29.6%	1.6
59	003	French Angelfish	28.7%	1.4	28.7%	1.4
60	007	Great Barracuda	28.7%	1.3	28.7%	1.3
61	116	Tomtate	27.7%	2.8	27.7%	2.8
62	129	Hybrid Hamlet	27.7%	1.6	27.7%	1.6
63	154	Redtail Parrotfish	27.7%	1.6	27.7%	1.6
64	018	Rosy Blenny	27.7%	1.6	27.7%	1.6
65	195	Mutton Snapper	27.7%	1.2	27.7%	1.2
66	160	Saucereye Porgy	26.8%	1.5	26.8%	1.5
67	336	Roughhead Blenny	26.8%	1.4	26.8%	1.4
68	078	Blue Goby	25.9%	1.8	25.9%	1.8
69	153	Yellowtail (Redfin) Parrotfish	22.2%	1.6	22.2%	1.6
70	150	Queen Parrotfish	22.2%	1.5	22.2%	1.5
71	035	Barred Cardinalfish	22.2%	1.5	22.2%	1.5

72	021	Seaweed Blenny	22.2%	1.3	22.2%	1.3
73	086	Pallid Goby	20.3%	1.6	20.3%	1.6
74	042	Blue Chromis	19.4%	1.8	19.4%	1.8
75	203	Squirrelfish	19.4%	1.4	19.4%	1.4
76	136	Greater Amberjack	18.5%	1.9	18.5%	1.9
77	185	Tobaccofish	18.5%	1.5	18.5%	1.5
78	142	Cero	18.5%	1.2	18.5%	1.2
79	196	Schoolmaster	17.5%	2.5	17.5%	2.5
80	050	Dusky Damselfish	17.5%	1.8	17.5%	1.8
81	144	Blue Parrotfish	17.5%	1.7	17.5%	1.7
82	051	Longfin Damselfish	17.5%	1.6	17.5%	1.6
83	425	Leopard Goby	17.5%	1.5	17.5%	1.5
84	230	Sand Diver	17.5%	1.4	17.5%	1.4
85	045	Sunshinefish	16.6%	2.2	16.6%	2.2
86	209	Ocean Triggerfish	16.6%	1.2	16.6%	1.2
87	231	Sharksucker	16.6%	1.1	16.6%	1.1
88	077	Yellow Goatfish	15.7%	2.1	15.7%	2.1
89	343	Lofty Triplefin	15.7%	1.4	15.7%	1.4
90	046	Yellowtail Reeffish	15.7%	1.2	15.7%	1.2
91	148	Midnight Parrotfish	14.8%	1.7	14.8%	1.7
92	106	Caesar Grunt	13.8%	2.4	13.8%	2.4
93	319	Darkheaded Blenny	13.8%	1.2	13.8%	1.2
94	239	Trumpetfish	13.8%	1.1	13.8%	1.1
95	215	Creole Wrasse	12%	2.8	12%	2.8
96	141	Yellow Jack	12%	1.8	12%	1.8
97	082	Hovering Goby	12%	1.4	12%	1.4
98	027	Smooth Trunkfish	12%	1	12%	1
99	201	Longspine Squirrelfish	11.1%	1.5	11.1%	1.5
100	134	Blue Runner	10.1%	2.2	10.1%	2.2
101	069	Orangespotted Filefish	10.1%	1.2	10.1%	1.2
102	166	Porcupinefish	10.1%	1.1	10.1%	1.1
103	066	Spotted Moray	10.1%	1	10.1%	1
104	043	Brown Chromis	9.2%	2.2	9.2%	2.2
105	039	Flamefish	9.2%	1.3	9.2%	1.3
106	137	Horse-Eye Jack	8.3%	1.7	8.3%	1.7
107	110	White Margate	8.3%	1.4	8.3%	1.4
108	331	Papillose Blenny	8.3%	1.2	8.3%	1.2

109	592	Townsend Angelfish	8.3%	1.1	8.3%	1.1
110	028	Spotted Trunkfish	8.3%	1	8.3%	1
111	059	Spotted Drum	7.4%	1.2	7.4%	1.2
112	187	Nurse Shark	7.4%	1	7.4%	1
113	097	Nassau Grouper	7.4%	1	7.4%	1
114	096	Goliath Grouper (Jewfish)	7.4%	1	7.4%	1
115	112	Sailors Choice	6.4%	2.4	6.4%	2.4
116	057	Jackknife-Fish	6.4%	1.5	6.4%	1.5
117	030	Banded Butterflyfish	6.4%	1.5	6.4%	1.5
118	146	Bucktooth Parrotfish	5.5%	1.6	5.5%	1.6
119	173	Green Razorfish	5.5%	1.5	5.5%	1.5
120	017	Redlip Blenny	5.5%	1.3	5.5%	1.3
121	006	Rock Beauty	5.5%	1.1	5.5%	1.1
122	104	Yellowmouth Grouper	5.5%	1.1	5.5%	1.1
123	345	Redeye Triplefin	5.5%	1.1	5.5%	1.1
124	191	Dog Snapper	5.5%	1	5.5%	1
125	071	Slender Filefish	5.5%	1	5.5%	1
126	235	Atlantic Spadefish	4.6%	1.8	4.6%	1.8
127	056	Highhat	4.6%	1.4	4.6%	1.4
128	463	Dusky Jawfish	4.6%	1.4	4.6%	1.4
129	311	Barred Blenny	4.6%	1.4	4.6%	1.4
130	164	Bandtail Puffer	4.6%	1.2	4.6%	1.2
131	502	Silver Porgy	3.7%	2	3.7%	2
132	058	Reef Croaker	3.7%	2	3.7%	2
133	194	Mahogany Snapper	3.7%	1.7	3.7%	1.7
134	339	Wrasse Blenny	3.7%	1.2	3.7%	1.2
135	361	Sponge Cardinalfish	3.7%	1.2	3.7%	1.2
136	175	Rosy Razorfish	3.7%	1.2	3.7%	1.2
137	072	Whitespotted Filefish	3.7%	1	3.7%	1
138	158	Littlehead Porgy	3.7%	1	3.7%	1
139	102	Tiger Grouper	3.7%	1	3.7%	1
140	219	Yellowcheek Wrasse	3.7%	1	3.7%	1
141	178	Spotted Scorpionfish	3.7%	1	3.7%	1
142	323	Downy Blenny	3.7%	1	3.7%	1
143	656	Hawksbill Sea Turtle	3.7%	1	3.7%	1
144	404	Ballyhoo	2.7%	3	2.7%	3
145	212	Blackear Wrasse	2.7%	1.3	2.7%	1.3

146	184	Sand Perch	2.7%	1	2.7%	1	
147	603	Tusked Goby	2.7%	1	2.7%	1	
148	041	Whitestar Cardinalfish	2.7%	1	2.7%	1	
149	026	Scrawled Cowfish	2.7%	1	2.7%	1	
150	543	Wrasse Bass	2.7%	1	2.7%	1	
151	170	Southern Stingray	2.7%	1	2.7%	1	
152	094	Gag	2.7%	1	2.7%	1	
153	103	Yellowfin Grouper	2.7%	1	2.7%	1	
154	182	Lantern Bass	2.7%	1	2.7%	1	
155	023	Boga	1.8%	3.5	1.8%	3.5	
156	149	Princess Parrotfish	1.8%	2	1.8%	2	
157	234	Greater Soapfish	1.8%	1.5	1.8%	1.5	
158	157	Jolthead Porgy	1.8%	1.5	1.8%	1.5	
159	427	Orangespotted Goby	1.8%	1.5	1.8%	1.5	
160	171	Spotted Eagle Ray	1.8%	1	1.8%	1	
161	062	Goldentail Moray	1.8%	1	1.8%	1	
162	093	Coney	1.8%	1	1.8%	1	
163	183	Peppermint Basslet	1.8%	1	1.8%	1	
164	139	Permit	1.8%	1	1.8%	1	
165	070	Scrawled Filefish	1.8%	1	1.8%	1	
166	193	Lane Snapper	1.8%	1	1.8%	1	
167	200	Longjaw Squirrelfish	1.8%	1	1.8%	1	
168	099	Red Hind	1.8%	1	1.8%	1	
169	238	Sand Tilefish	1.8%	1	1.8%	1	
170	199	Dusky Squirrelfish	0.9%	2	0.9%	2	
171	469	Bluestriped Lizardfish	0.9%	1	0.9%	1	
172	210	Queen Triggerfish	0.9%	1	0.9%	1	
173	132	Spotfin Hogfish	0.9%	1	0.9%	1	
174	100	Rock Hind	0.9%	1	0.9%	1	
175	322	Dwarf Blenny	0.9%	1	0.9%	1	
176	449	Almaco Jack	0.9%	1	0.9%	1	
177	548	Great Hammerhead	0.9%	1	0.9%	1	
178	162	Sheepshead Porgy	0.9%	1	0.9%	1	
179	040	Twospot Cardinalfish	0.9%	1	0.9%	1	
180	523	Whitefin Sharksucker	0.9%	1	0.9%	1	
		Total Species	**180**		**180**		**0**