Volunteer Reef Fish Monitoring in the Florida Keys National Marine Sanctuary: 2002 Update Report

Reef Environmental Education Foundation (REEF) staff and the REEF Advanced Assessment Team
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Survey Method

The Roving Diver Technique (RDT) is a non-point visual survey method designed to generate a comprehensive species list along with frequency and abundance estimates. During RDT surveys, a diver swims freely throughout a dive site and records every observed fish species. At the conclusion of each survey, the diver assigns 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.

This project supports a team of the most experienced surveyors at REEF, the Advanced Assessment Team (AAT), to annually survey 37 sites in the FKNMS, including 12 SPAs, three Research-Only Areas, the Western Sambo Ecological Reserve, 10 sites in the Tortugas Ecological Reserve area, and 11 comparison/reference sites. A minimum of six RDT surveys is conducted at each site. The 2002 field season was the sixth year that the AAT has monitored most of these sites and the ninth full year of REEF volunteer data collection in the Sanctuary.

During the 2002 field season, the REEF AAT conducted 449 RDT surveys at the 37 monitoring sites, documenting 275 fish species. These data were collected during a series of cruises in August and September, and complement the REEF Fish Survey Project, a continual volunteer monitoring project that involves REEF volunteers conducting RDT surveys during their regular diving activities in the Florida Keys. Through the end of 2002, REEF volunteers had contributed 11,610 surveys from over 350 sites in the FKNMS and documented 431 fish species.

Findings to Date

This report summarizes all REEF data collected at the 27 Marine Zone Monitoring Program sites in the FKNMS between 1994 and 2002 (does not include the 10 Dry Tortugas sites). Table 1 lists the sites, along with the level of protection (if any) implemented in 1997 and annual REEF survey effort. These data were used to evaluate change over time in abundance score, a weighted average of the abundance categories reported for each species combined with the non-sightings[1], for several species, including species that are targeted for recreational fishing (grouper, snapper, and hogfish) and collected by marine life collectors (angelfish). Sighting frequency is shown for grouper, rather than abundance score, because it is a more sensitive measure of change for species that, when sighted, only one or few individuals are seen.

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

Figure 1 shows sighting frequency over time at FPMZ and reference sites for three species of grouper (black grouper, *Mycteroperca bonaci*; Nassau grouper, *Epinephelus striatus*; and red grouper, *E. morio*). Black grouper has exhibited a significant increase throughout the Florida Keys between 1994 and 2002. In general, since sites were protected in 1997, black grouper have been seen with higher frequency in FPMZs than in reference areas. Two exceptions are Grecian Rocks and Cannon Patch, where black grouper have exhibited statistically significant (alpha = 0.10) decreases in abundance score during this time. Nassau grouper, a protected species in Florida, has shown slight increases over time and in 2002 reached an all time high of 22% sighting frequency at FPMZs since REEF data collection began. Red grouper, a relatively rare species, had increased at many sites in 1999 and 2000, but sighting frequency has decreased over the last two years.

The average abundances of four carnivore species (gray snapper, *Lutjanus griseus*; yellowtail snapper, *Ocyurus chrysurus*; schoolmaster, *L. apodus*; and hogfish, *Lachnolaimus maximus*) are shown in Figure 2. Data from all 27 sites are combined here because there was little difference between protected and unprotected sites. Yellowtail snapper and schoolmaster populations at these sites appear to be relatively stable between 1994 and 2002. Hogfish and gray snapper exhibited an increase in 1997.

The average abundances of four common angelfish species (Gray angelfish, *Pomacanthus arcuatus*; queen angelfish, *Holocanthus ciliarus*; French angelfish, *P. paru*; and rock beauty, *H. tricolor*) are shown in Figure 3. A dramatic decline in rock beauty has been seen, while the other angelfish populations have remained relatively stable. A potential cause of this decline is collecting for the aquarium industry; juvenile rock beauty is a popular fish for home aquaria. Using data on ornamental collection for Monroe County obtained from the Florida Fish and Wildlife Conservation Commission (FWC), the total number of rock beauty collected from 1990 – 2002 was evaluated. The number collected has decreased over the last decade, from a high of over 13,000 individuals in 1990 to 3,200 fish in 2002. Using REEF data from all sites in the FKNMS, the average abundance of rock beauty was calculated. A similar pattern in abundance to that seen at the 27 monitoring sites was seen when all sites were included. Figure 4 compares the FKNMS abundance with the number of individuals collected.

The yearly average abundance scores for four fished species (gray snapper, yellowtail snapper, schoolmaster, and black grouper) were compared among the three Sambo sites - Western Sambo Ecological Reserve, the largest no-take site in the main Florida Keys; Eastern Sambo Research-Only Area, a small area with permitted entry only; and Middle Sambo, an area between the two FPMZs that is open to exploitation. In general, the abundances of all four species were consistently higher at the FPMZs than at the open site and abundances at the Western Sambo Ecological Reserve were higher than at Eastern Sambo (Fig. 5).

Future Plans

The REEF AAT project in the FKNMS has ensured that annual data collection in the protected and reference areas by REEF experts occurs. While the initial 5-year project has been completed, REEF plans to continue this annual monitoring effort and completed another round of monitoring in 2002. REEF will also continue to enable all divers to participate in its volunteer Fish Survey Project in the FKNMS.

Table 1. REEF survey effort by location and by year. Effort includes all Species and Abundance RDT surveys conducted during daylight hours (after 7am and before 8pm) greater than 20 minutes in length.

		REEF Survey Effort								
Location	Protection	1994	1995	1996	1997	1998	1999	2000	2001	2002
Ball Buoy Reef	Open	0	0	0	7	5	14	13	14	8
Grecian Rocks	SPA	27	17	26	30	10	43	74	60	29
Carysfort Reef	SPA	17	18	0	8	10	21	23	17	41
Molasses Reef	SPA	31	28	20	47	84	125	85	214	309
Little Grecian	Open	1	10	3	13	7	10	15	10	7
South Carysfort Reef	SPA	0	12	14	6	7	15	14	12	7
Cannon Patch	Open	0	0	0	6	16	1	14	21	11
Pickles Reef	Open	1	1	1	25	15	12	36	23	31
Conch Reef	SPA	37	21	7	32	11	19	16	47	26
Hen and Chickens	SPA	23	8	8	19	15	12	12	22	17
Tennessee Reef Research	R-OA	34	0	0	16	9	9	8	12	8
Cheeca Rocks	SPA	0	0	0	17	11	9	6	13	9
Sombrero Reef	SPA	87	5	15	20	14	16	13	13	12
Samantha's Ledge	Open	38	0	6	13	11	12	15	13	10
Coffins Patch	SPA	35	0	5	6	28	11	10	14	9
Looe Key East	SPA	19	1	0	10	21	19	39	42	39
Looe Key Research	R-OA	18	0	0	6	8	13	9	12	10
Delta Shoals	Open	0	0	0	12	6	11	9	11	8
Newfound Harbor SPA	SPA	0	0	0	6	6	10	17	13	11
Newfound Harbor Open	Open	0	0	0	6	6	10	9	12	9
No Name Reef	Open	0	0	0	6	6	10	9	12	8
Western Sambo	ER	40	34	19	7	15	10	14	105	58
Eastern Sambo	SPA	25	18	0	12	9	8	11	20	11
Sand Key	SPA	15	45	11	14	17	11	13	29	42
Middle Sambo	Open	13	18	0	11	9	9	12	20	13
Pelican Shoals	Open	13	16	10	0	0	0	11	24	22
Western Dry Rocks	Open	1	0	0	19	19	16	11	37	22

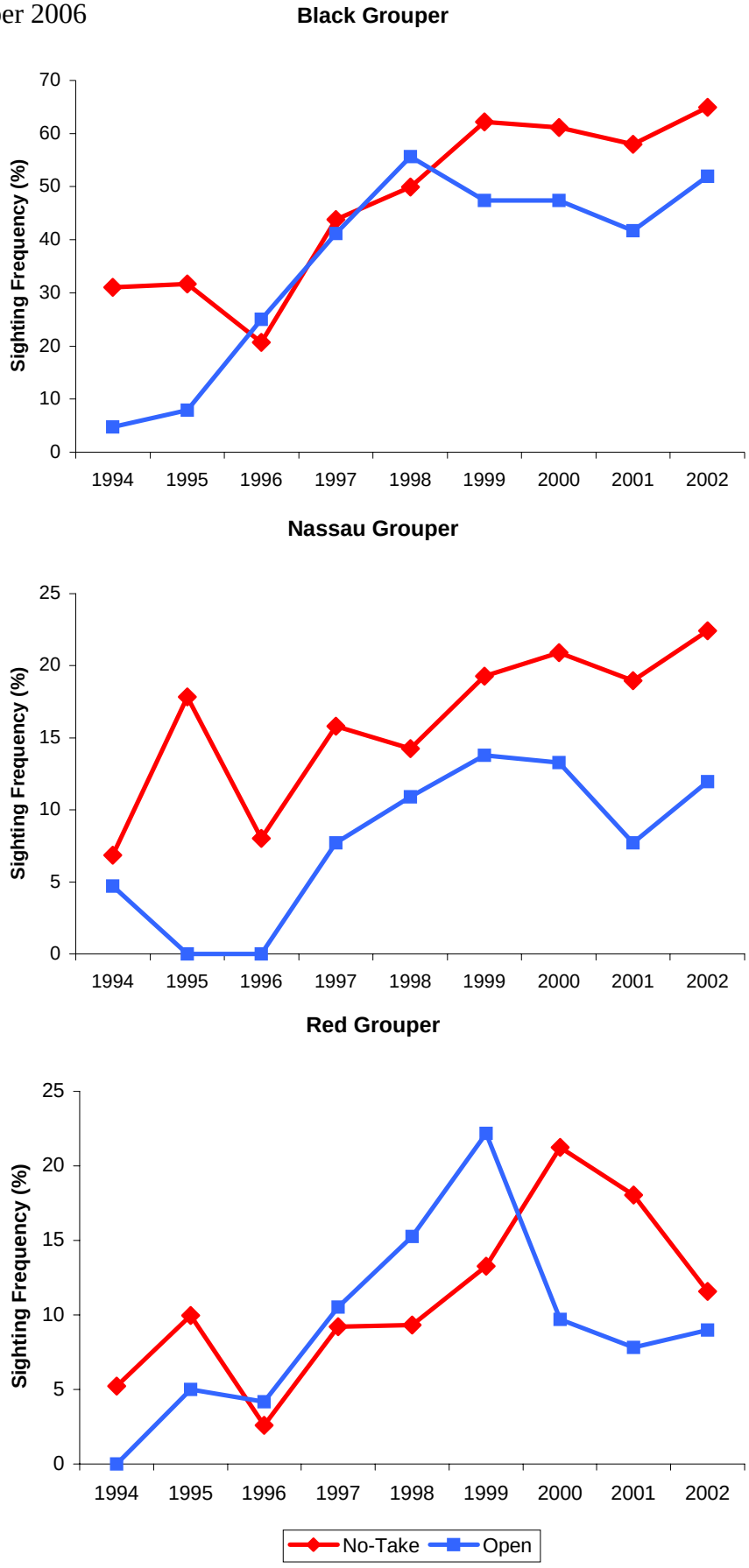

Figure 1. Sighting frequency over time for three species of grouper at 27 sites in the FKNMS; 16 FPMZs (implemented in 1997) and 11 reference sites.

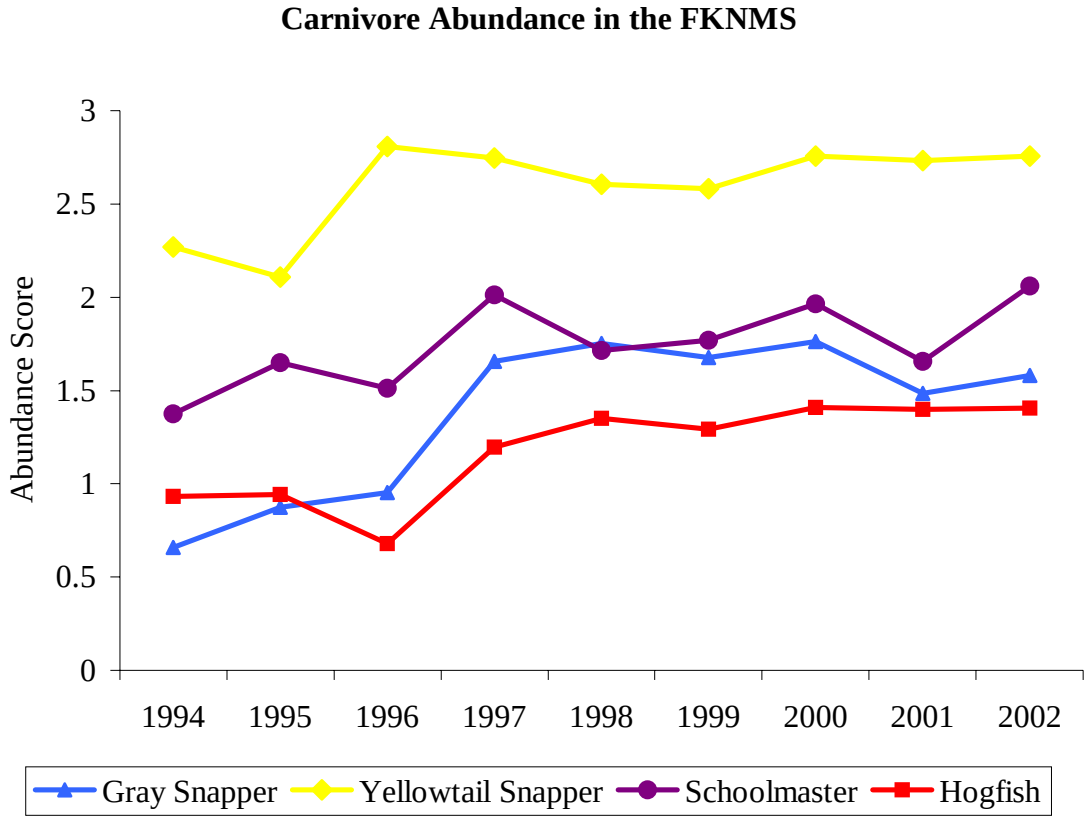

Figure 2. Average abundance over time of four carnivore species. Data are combined from 27 sites in the FKNMS; 16 FPMZs (implemented in 1997) and 11 reference sites.

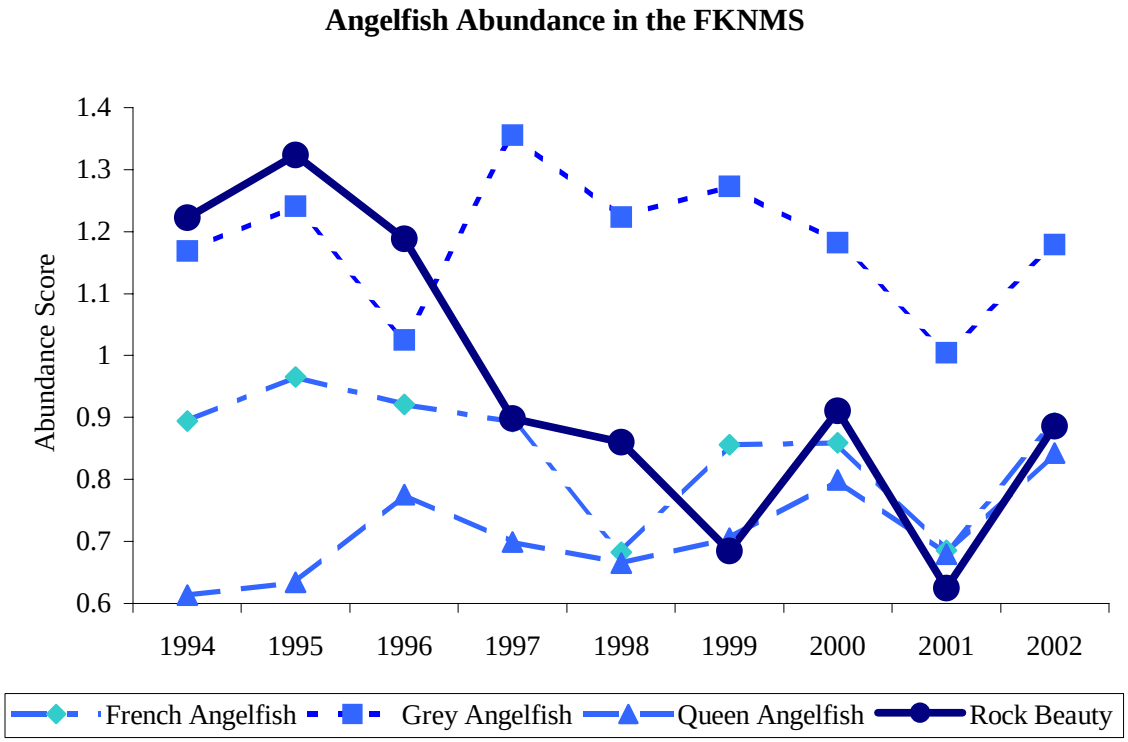

Figure 3. Abundance of four angelfish species at 27 sites in the FKNMS. Rock beauty, a species heavily targeted by marine life collectors for the aquarium industry, has exhibited significant declines between 1994 and 2002.

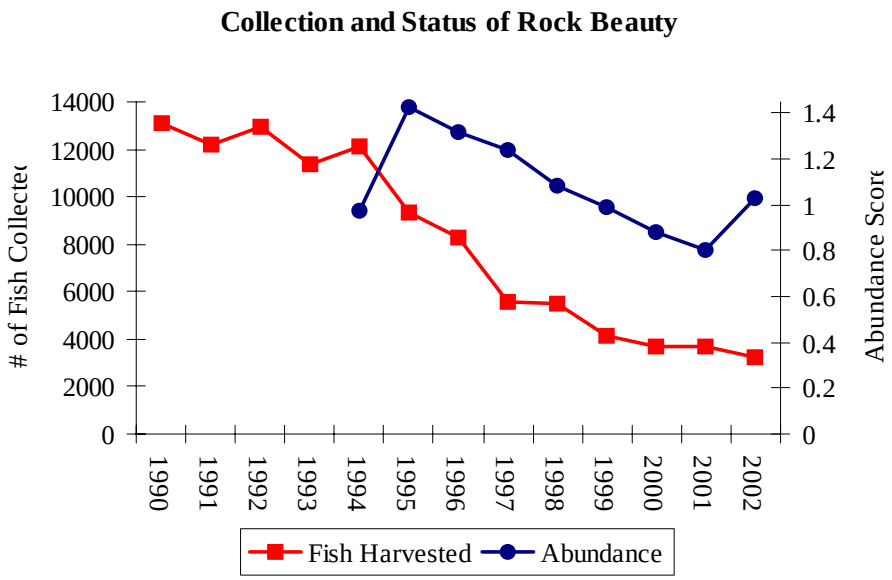

Figure 4. Rock beauty collection and population status. The number of fish collected is reported for all of Monroe County (FWC) and abundance score is based on REEF surveys conducted at all sites in the FKNMS.

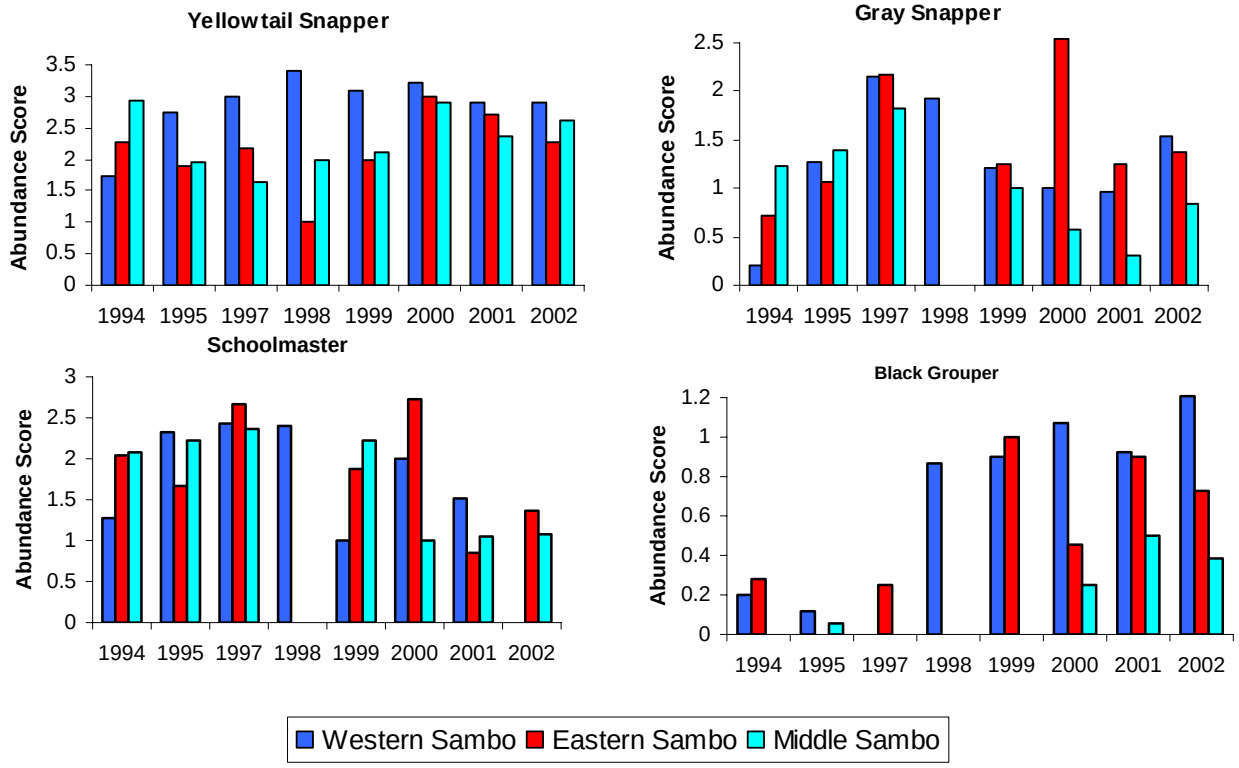

Figure 5. Yearly comparison in abundance of four fished species at the three Sambo sites. Western and Eastern Sambo were designated as no-take in 1997.