



Figure 1A. Lighthouse Atoll, Belize

Figure 1B. Bonaire, Netherlands Antilles

Figure 1. AGRRA surey sites at (A) Lighthouse Atoll, Belize and (B) off Bonaire

**ASSESSMENT TABLES FOR ABACO, BAHAMAS (FISH), LIGHTHOUSE
ATOLL, BELIZE (CORALS, ALGAE, FISHES), AND BONAIRE,
NETHERLANDS ANTILLES (CORALS, ALGAE, FISHES)**

BY

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INTRODUCTION

Rapid assessments using the AGRRA protocol were conducted at three locations within the wider Caribbean during 1999. The results are presented here only as a series of data tables similar in format to other papers in this volume and were only used in the regional synthesis (Kramer, this volume). All data tables were generated from the AGRRA Access database using queries to generate site means based on either transect values (fish density, coral cover, coral density, *Diadema* density) or individual coral values (coral mortality, diameter, condition), or quadrat values (relative abundance of algae and canopy height of macroalgae).

The location of the sites for Lighthouse Atoll and Bonaire are shown in figures 1A and 1B (see Figure 1 in Feingold et al., this volume, for the Abaco site locations). Tables 1-2 show results of the fish assessments collected in Abaco, Bahamas (for benthic results, see Feingold et al., this volume). Tables 3-6 show stony corals, algae, and fish results from Lighthouse Atoll, Belize. Tables 7-10 show stony corals, algae, and fish results from Bonaire, Netherlands Antilles.

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Table 1. Site information for AGRRA fish surveys in Abaco, Bahamas.

Site name	Reef type	Latitude (o' N)	Longitude (o' W)	Survey date	Depth (m)	% live stony coral cover (mean \pm sd) ¹	30 m fish transects (#)	AGRRA fishes	
								Density (#/100m ²) (mean \pm sd)	Species (#)
Sandy Cay, Forereef	Fore-reef slope	26 23.870	76 59.310	Aug 9 1999	3.5	22.5 \pm 11.5	11	113.7 \pm 43.8	17
Sandy Cay, Backreef	Back reef	26 23.869	76 59.311	Aug 9 1999	4	14.0 \pm 7.5	10	46.2 \pm 18.1	16
Elbow Cay, South-inner	Outer reef crest	26 31.610	76 57.420	Aug 11 1999	6	14.5 \pm 4.5	10	106.0 \pm 23.0	ND
Elbow Cay, Middle	Outer reef crest	26 32.420	76 56.770	Aug 11 1999	5.5	13.0 \pm 10.0	10	58.0 \pm 12.8	13
Elbow Cay, North	Outer reef crest	26 35.900	76 56.970	Aug 16 1999	8.5	7.0 \pm 3.5	10	79.2 \pm 21.0	14
Fowl Cay-shallow	Outer reef crest	26 38.230	77 02.310	Aug 13 1999	4	12.0 \pm 4.5	10	87.7 \pm 39.1	14
Storr's Reef	Outer reef crest	26 34.650	76 57.540	Aug 16 1999	4.0	14.5 \pm 7.5	10	93.8 \pm 23.8	15
Man O' War Cay, N. of S. Channel	Outer reef crest	26 36.200	76 58.990	Aug 12 1999	5.5	10.5 \pm 6.0	10	65.3 \pm 35.8	22
Man O' War Cay, S. of S. Channel	Outer reef crest	26 35.840	76 58.580	Aug 12 1999	3.5	15.0 \pm 5.5	10	71.7 \pm 27.3	23
Lynyard Cay, North	Spur and groove	26 21.450	76 58.610	Aug 15 1999	8.0	14.0 \pm 12.5	10	53.2 \pm 13.1	15
Lynyard Cay, South	Spur and groove	26 21.210	76 58.680	Aug 15 1999	8.5	13.0 \pm 6.0	10	68.7 \pm 25.3	15
Elbow Cay, South-outer	Shallow pinnacles	26 31.940	76 57.020	Aug 10 1999	4	18.0 \pm 5.5	9	103.9 \pm 41.6	18
Fowl Cay-deep	Deep pinnacles	26 38.400	77 02.360	Aug 13 1999	12.5	17.0 \pm 13.5	10	39.3 \pm 20.8	18

¹From Feingold et al. (this volume)

Table 2. Density (mean \pm standard deviation) of AGRRA fishes and macroalgal index, by site for Abaco, Bahamas.

Site name	Herbivores (#/100m ²)		Carnivores (#/100m ²)			Macroalgal index ¹
	Acanthuridae	Scaridae	Haemulidae	Lutjanidae	Serranidae	
Sandy Cay, Forereef	58.5 \pm 30.1	27.8 \pm 12.8	1.0 \pm 1.8	0.2 \pm 0.5	0	81
Sandy Cay, Backreef	27.8 \pm 8.3	12.3 \pm 7.9	0.7 \pm 1.2	0.5 \pm 1.1	0	64
Elbow Cay, South-inner	79.5 \pm 21.1	14.2 \pm 5.7	0.8 \pm 1.6	0.7 \pm 1.2	0	133
Elbow Cay, Middle	44.0 \pm 8.2	9.5 \pm 5.5	0	0.2 \pm 0.5	0	114
Elbow Cay, North	50.3 \pm 14.2	23.7 \pm 12.4	0	0.5 \pm 1.1	0	155
Fowl Cay-shallow	51.0 \pm 21.8	22.8 \pm 20.4	0.3 \pm 1.1	4.8 \pm 8.0	0.3 \pm 0.7	184
Storr's Reef	62.8 \pm 12.9	24.2 \pm 16.5	0	0.7 \pm 1.2	0.2 \pm 0.5	72
Man O' War Cay, N. of S. Channel	37.7 \pm 17.1	10.2 \pm 9.3	1.7 \pm 1.9	1.0 \pm 1.2	0.8 \pm 1.4	68
Man O' War Cay, S. of S. Channel	34.5 \pm 11.5	16.5 \pm 5.7	1.7 \pm 2.2	5.7 \pm 7.8	1.0 \pm 1.6	106
Lynyard Cay, North	35.0 \pm 9.4	13.2 \pm 9.2	0	1.3 \pm 1.5	2.0 \pm 1.3	124
Lynyard Cay, South	46.0 \pm 17.5	15.0 \pm 13.1	0.3 \pm 0.7	2.7 \pm 3.1	1.3 \pm 2.2	125
Elbow Cay, South-outer	84.8 \pm 42.0	10.6 \pm 4.6	0.4 \pm 0.7	1.3 \pm 2.2	0.2 \pm 0.6	130
Fowl Cay-deep	18.8 \pm 11.2	11.5 \pm 9.9	0	3.8 \pm 3.3	1.5 \pm 1.8	141

¹ Macroalgae Index = relative percent abundance x height; data from Feingold et al., this volume

Table 3. Site information for AGRRA stony coral and algal surveys in Lighthouse Atoll, Belize.

Site name	Reef type	Latitude (° N)	Longitude (° W)	Survey date	Depth (m)	Benthic transects (#)	≥25cm stony corals (#/10 m)	% live stony coral cover (mean ± sd)
Aquarium	Fore reef	17 13.558	87 36.300	9/6/1999	7.5	14	7.5 ± 1.5	16.0 ± 3.5
Babylon's Gardens	Fore reef	17 10.312	87 35.563	10/10/1999	9.5	8	9.0 ± 2.0	19.0 ± 6.0
Black Durgon	Fore reef	17 13.260	87 31.590	8/4/1999	8	12	8.5 ± 2.0	23.0 ± 8.0
Cathedral	Fore reef	17 13.311	87 36.483	9/11/1999	7.	12	8.5 ± 2.0	22.0 ± 4.5
Driftwood Reef	Fore reef	17 15.035	87 31.693	8/5/1999	9	14	7.0 ± 1.5	13.5 ± 6.5
Gotham City	Fore reef	17 11.253	87 35.371	10/12/1999	8.5	8	10.5 ± 2.0	20.5 ± 5.5
Long Caye Ridge	Fore reef	17 13.100	87 36.585	9/13/1999	7	11	9.2 ± 2.0	17.5 ± 3.5
Marie's Promenade	Fore reef	17 08.305	87 35.936	10/6/1999	9	8	8.5 ± 1.5	17.0 ± 6.0
Painted Wall	Fore reef	17 13.558	87 36.099	7/29/1999	4.5	10	10.5 ± 3.5	36.5 ± 16.0
Silver Caves	Fore reef	17 13.441	87 36.408	9/14/1999	7	10	10 ± 3.0	18.5 ± 4.0
Surge City	Fore reef	17 9.4069	87 35.661	9/14/1999	7	7	10.0 ± 1.5	16.5 ± 5.0

Table 4. Size and condition (mean ± standard deviation) of all stony corals (≥25 cm diameter), by site in Lighthouse Atoll.

Site name	Stony corals		Partial colony surface mortality (%)			Stony corals (%)		
	#	Diameter (cm)	Recent	Old	Total	Standing dead	Bleached	Diseased
Aquarium	108	39.0 ± 14.0	1.0 ± 6.0	22.0 ± 21.5	23.5 ± 22.5	0	9.5	2.5
Babylon's Gardens	73	39.5 ± 14.5	3.5 ± 12.0	22.5 ± 23.5	25.5 ± 26.0	0	27.5	2.5
Black Durgon	102	49.0 ± 36.5	5.0 ± 16.5	29.5 ± 27.5	34.5 ± 30.0	0	13.0	0
Cathedral	103	54.5 ± 29.5	2.5 ± 4.5	25.5 ± 24.5	28.0 ± 26.0	0	9.5	10.5
Driftwood Reef	98	40.0 ± 12.0	2.0 ± 7.0	23.0 ± 24.0	25.0 ± 22.5	1.0	8.5	1.5
Gotham City	84	40.5 ± 12.0	0.5 ± 2.5	25.5 ± 28.5	26.0 ± 29.0	1.0	12.0	2.5
Long Caye Ridge	101	46.0 ± 26.5	2.0 ± 5.5	24.5 ± 24.0	26.5 ± 25.5	0	5.5	15.0
Marie's Promenade	69	55.5 ± 59.5	0.5 ± 2.0	32.0 ± 29.0	32.5 ± 29.5	1.5	16.0	0
Painted Wall	105	51.0 ± 26.5	7.5 ± 12.0	24.0 ± 22.5	31.5 ± 26.0	0	7.5	1.0
Silver Caves	100	47.5 ± 25.0	3.5 ± 9.5	21.5 ± 24.5	25.0 ± 26.0	0	2.0	1.0
Surge City	70	44.5 ± 17.5	1.0 ± 2.0	24.0 ± 24.0	25.5 ± 24.0	1.5	4.0	0

*ND = no data

Table 5. Algal and density of stony coral recruits and *Diadema antillarum* (mean \pm st. dev.), by site in Lighthouse Atoll.

Site name	Quadrats (#)	Relative abundance (%)			Macroalgae		Coral recruits (#/0.0625m ²)	<i>Diadema</i> (#/10m)
		Macroalgae	Turf algae	Crustose coralline algae	Height (cm)	Index ¹		
Aquarium	60	21.0 \pm 15.5	52.0 \pm 11.0	27.0 \pm 10.5	2.5 \pm 1.0	46.5 \pm 20.5	0.5 \pm 0.3	0
Babylon's Gardens	56	20.5 \pm 17.0	45.0 \pm 16.0	34.5 \pm 17.0	1.5 \pm 1.0	29.0 \pm 11.0	0.2 \pm 0.3	0
Black Durgon	60	18.0 \pm 10.5	49.5 \pm 8.0	32.5 \pm 10.0	2.0 \pm 0.5	31.5 \pm 19.0	0.4 \pm 0.2	0
Cathedral	50	12.0 \pm 7.0	55.0 \pm 3.0	32.5 \pm 7.0	1.5 \pm 0.5	19.0 \pm 7.0	0.6 \pm 0.5	0
Driftwood Reef	50	15.0 \pm 12.0	57.0 \pm 7.5	28.0 \pm 11.0	2.0 \pm 1.0	31.5 \pm 16.5	0.4 \pm 0.3	0
Gotham City	56	20.0 \pm 15.0	47.0 \pm 21.5	33.5 \pm 21.5	1.5 \pm 1.0	28.0 \pm 7.5	0.3 \pm 0.2	0
Long Caye Ridge	55	11.0 \pm 7.0	57.0 \pm 3.5	32.0 \pm 7.5	2.0 \pm 1.0	22.5 \pm 7.5	0.9 \pm 0.3	0
Marie's Promenade	49	10.5 \pm 4.0	63.5 \pm 7.0	26.0 \pm 8.0	1.5 \pm 0.5	15.5 \pm 2.0	0.1 \pm 0.1	0
Painted Wall	40	33.0 \pm 14.0	39.5 \pm 10.5	28.0 \pm 13.5	3.0 \pm 1.0	97.0 \pm 32.5	0.4 \pm 0.3	0
Silver Caves	50	9.0 \pm 4.0	57.5 \pm 3.0	33.5 \pm 5.5	1.5 \pm 0.5	14.0 \pm 2.0	0.5 \pm 0.4	0
Surge City	49	15.0 \pm 10.0	54.0 \pm 13.5	31.0 \pm 15.0	1.5 \pm 0.5	22.5 \pm 7.5	0.1 \pm 0.1	0

Table 6. Density (mean \pm standard deviation) of AGRRA fishes by site in Lighthouse Atoll, Belize.

Site name	AGRRA fish			Herbivores (#/100m ² \pm sd)		Carnivores (#/100m ² \pm sd)		
	30 m fish transects (#)	Total Density #/100m ²	fish species (#)	Acanthurida e	Scaridae	Haemulidae	Lutjanidae	Serranidae
Aquarium	10	32.5 \pm 11.5	24	9.5 \pm 12.8	9.2 \pm 5.1	2.7 \pm 1.6	4.0 \pm 3.6	2.0 \pm 1.7
Babylon's Gardens	10	29.0 \pm 10.5	24	7.8 \pm 1.9	7.2 \pm 5.1	2.2 \pm 3.3	1.2 \pm 1.6	2.5 \pm 1.4
Black Durgon	10	64.0 \pm 29.5	22	3.0 \pm 3.4	5.8 \pm 5.8	3.2 \pm 2.7	3.0 \pm 3.4	1.2 \pm 1.6
Cathedral	10	27.5 \pm 13.0	24	4.2 \pm 3.4	9.3 \pm 7.3	3.5 \pm 4.0	2.5 \pm 3.6	3.5 \pm 2.1
Driftwood Reef	10	41.0 \pm 17.0	23	18.8 \pm 9.7	6.0 \pm 5.9	2.3 \pm 2.4	0.0 \pm 0.0	1.2 \pm 2.1
Gotham City	10	20.5 \pm 11.0	23	7.7 \pm 3.9	4.2 \pm 2.7	2.5 \pm 4.1	0.8 \pm 1.4	1.7 \pm 1.8
Long Caye Ridge	10	27.5 \pm 7.5	27	2.0 \pm 1.9	9.8 \pm 4.5	2.8 \pm 2.5	3.0 \pm 2.6	3.8 \pm 2.9
Marie's Promenade	10	32.5 \pm 10.5	23	9.0 \pm 3.4	4.3 \pm 4.3	1.8 \pm 1.2	1.3 \pm 3.2	0.5 \pm 0.8
Painted Wall	10	43.5 \pm 14.0	25	8.8 \pm 14.6	14.7 \pm 4.8	3.5 \pm 1.7	5.0 \pm 6.9	4.3 \pm 2.6
Silver Caves	10	25.0 \pm 5.5	24	3.7 \pm 2.5	8.2 \pm 4.2	3.3 \pm 1.4	1.5 \pm 2.5	2.2 \pm 1.4
Surge City	10	26.5 \pm 14.0	22	10.3 \pm 7.3	4.3 \pm 3.5	1.7 \pm 1.8	0.8 \pm 1.2	1.0 \pm 1.2

Table 7. Site information for AGRRA stony coral and algal surveys in Bonaire.

Site name	Reef type	Latitude (°' N)	Longitude (°' W)	Survey date	Depth (m)	Benthic transects (#)	≥25cm stony corals (#/10 m)	% live stony coral cover (mean ± sd)
Barcardera	Fore reef	12 12.030	68 18.500	Feb. 4 1999	9.5	11	11.5	42.5 ± 11.0
Carl's Jam	Fore reef	12 13.100	68 21.170	Feb. 5 1999	11.5	8	16.2	52.0 ± 14.0
Habitat	Fore reef	12 12.030	68 18.500	Feb. 2 1999	10	4	4.2	56.0 ± 47.5
Karpata	Fore reef	12 09.950	68 19.600	Feb. 4 1999	9	9	14	44.0 ± 8.5
Twin Peaks	Fore reef	12 15.500	68 25.650	Feb. 4 1999	9	11	11.8	47.0 ± 12.5
W. Klein	Fore reef	12 09.900	68 19.800	Feb. 3 1999	12	8	9.3	41.5 ± 9.5

Table 8. Size and condition (mean ± standard deviation) of all stony corals (≥25 cm diameter), by site in Bonaire.

Site name	Stony corals		Partial colony surface mortality (%)			Stony corals (%)		
	#	Diameter (cm)	Recent	Old	Total	Standing dead	Bleached	Diseased
Barcardera	130	63.5 ± 39.5	0.4 ± 1.2	38.1 ± 31.0	38.4 ± 31.2	1.5	15.4	4.8
Carl's Jam	130	65.0 ± 37.5	0.6 ± 2.1	30.0 ± 28.5	30.6 ± 28.5	1	21.5	2.3
Habitat	17	43.5 ± 19.5	0.4 ± 0.9	37.7 ± 23.9	38.1 ± 24.0	0	58.8	0
Karpata	127	70.5 ± 45.0	0.9 ± 2.2	30.4 ± 24.6	31.3 ± 25.3	2.5	31	7.1
Twin Peaks	127	95.0 ± 64.5	1.0 ± 4.3	32.0 ± 27.4	33.1 ± 27.8	3.0	33.9	8.5
W. Klein	83	54.0 ± 26.0	0.4 ± 1.5	22.7 ± 23.5	23.0 ± 23.7	3.5	21.3	4

Table 9. Algal characteristics, and density of stony coral recruits and of *Diadema antillarum* (mean \pm standard deviation), by site in Bonaire.

Site name	Quadrats (#)	Relative abundance (%)			Macroalgae		Coral recruits (#/0.0625m ²)	<i>Diadema</i> (#/10m)
		Macroalgae	Turf algae	Crustose coralline algae	Height (cm)	Index ¹		
Barcardera	51	15.0 \pm 21.0	65.5 \pm 29.0	19.0 \pm 23.5	0.6 \pm 0.2	8.5 \pm 6.0	0.2 \pm 0.2	0
Carl's Jam	37	18.5 \pm 17.0	54.0 \pm 22.5	27.5 \pm 14.5	1.1 \pm 1.1	13.5 \pm 5.5	0.2 \pm 0.6	0
Habitat	12	1.0 \pm 3.0	76.0 \pm 16.0	23.0 \pm 14.0	ND*	ND*	0.3 \pm 0.6	0
Karpata	42	15.0 \pm 21.0	61.0 \pm 24.0	24.0 \pm 18.5	0.7 \pm 0.3	11 \pm 11.5	0.1 \pm 0.2	0
Twin Peaks	49	12.5 \pm 20.0	43.5 \pm 20.5	43.5 \pm 20.5	0.8 \pm 0.3	10 \pm 11	0.1 \pm 0.2	0
W. Klein	15	15.5 \pm 13.0	64.5 \pm 20.0	20.0 \pm 11.5	0.9 \pm 0.2	14 \pm 13	0.3 \pm 0.3	0

¹ Macroalgae Index = relative percent abundance x height

Table 10. Density (mean \pm standard deviation) of AGRRA fishes by site in Bonaire.

Site name	AGRRA Fishes			Herbivores (#/100m ²)		Carnivores (#/100m ²)		
	30 m transects (#)	Total density (#/100m ²)	Species (#)	Acanthuridae	Scaridae	Haemulidae	Lutjanidae	Serranidae
Barcardera	12	43.8 \pm 12.5	27	1.8 \pm 2.4	27.0 \pm 8.0	2.0 \pm 2.8	3.7 \pm 3.5	3.2 \pm 2.5
Carl's Jam	12	18.8 \pm 12.8	20	1.5 \pm 1.8	10.8 \pm 8.1	0.2 \pm 0.5	2.0 \pm 3.5	1.2 \pm 1.8
Karpata	10	55.6 \pm 70	23	22.0 \pm 63.7	21.0 \pm 7.9	2.5 \pm 2.1	4.2 \pm 3.8	1.0 \pm 1.2
Twin Peaks	9	42.5 \pm 9.0	21	9.1 \pm 2.5	19.1 \pm 3.6	0.2 \pm 0.6	0.6 \pm 1.2	0.7 \pm 0.9