

Gray's Reef National Marine Sanctuary Summary of Reef Fish Monitoring Program

Gray's Reef National Marine Sanctuary began a small scale long term monitoring program during the period 23 October, 1995 - 03 November 1995. The effort was the culmination of year long planning and coordination with a number of scientific groups. The program was initiated through advice and support from the National Undersea Research Program's Wilmington Center, the University of Georgia, the Florida Department of Environmental Protection, the National Marine Fisheries Service, Florida Key's National Marine Sanctuary and Flower Garden Banks National Marine Sanctuary.

A total of 114 SCUBA dives were completed by 18 separate individuals to implement the monitoring program. A total of 70 hours was spent on the bottom over an 8 day period. The majority of this time was required for station installation, preliminary sampling and development of station maps. This large scale effort to establish the permanent monitoring site will yield valuable returns as subsequent diving effort during routine sampling will be significantly reduced.

Study Site Description:

The area chosen for long term monitoring is a representative ledge feature in GRNMS with a characteristic ledge community of dense epifaunal cover and associated fish assemblages. Within the study areas 250 meter extent, ledge break relief ranges from 5' to 1' while water depth ranges from 53' at the ledge top to 64' in the sand below the ledge

32 permanent reference points were established by drilling 3/8" holes into the substrate and epoxying stainless steel rods (10 mm x 1 m) in the holes. The rods are marked with numbered plastic goat ear tags to allow subsequent identification.

Reference marker's were randomly located along the ledge top using a random number's between 20 and 50 with a unit equaling one foot. A dive team measured the distances and positioned the rods for permanent installation. A second dive team followed with a pneumatic drilling apparatus and underwater caulking system to complete the installation.

Six of the 32 stations cannot be considered random as they are part of 6 paired array's to serve as benthic video transect reference points and were located a pre determined distance away from the other member of the pair.

Survey Methods

Three in situ sampling techniques are being used to estimate abundance of the fish assemblage. These methods have been employed during 5 quarterly sampling efforts over the past 18 months.

Stationary Point Counts:

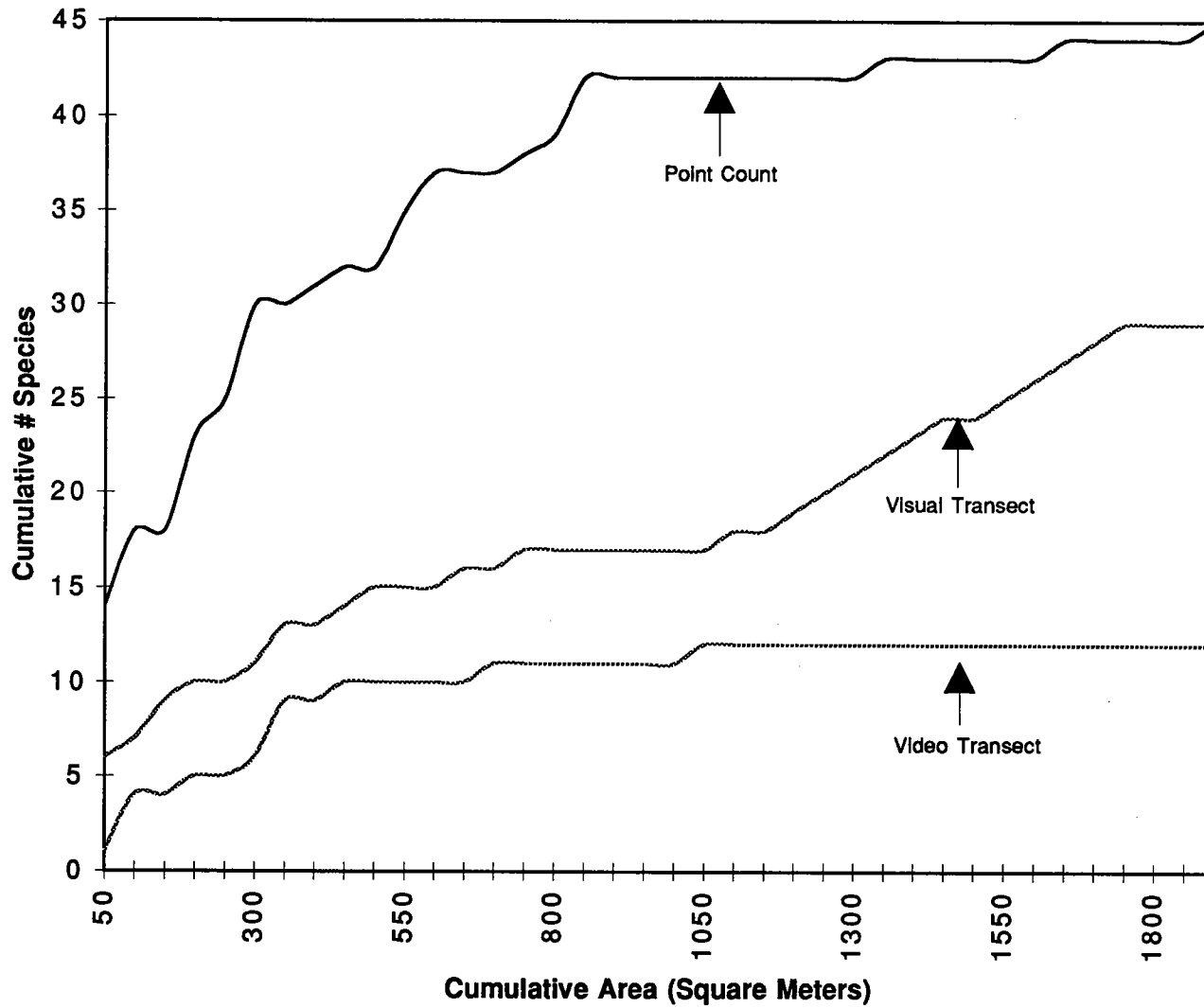
A modified version of the stationary sampling method (SS) (Bohnsack and Bannerot, 1983) developed during a research workshop at Gray's Reef National Marine Sanctuary by ten regional scientists (Nicholson, 1982) is used to sample the ichthyofauna. With this method each count is performed in an imaginary cylinder with 4 m radius yielding observations over 50 m² of bottom. The 26 randomly located permanent marker's will serve as reference points for repeated sampling.

APPENDIX A

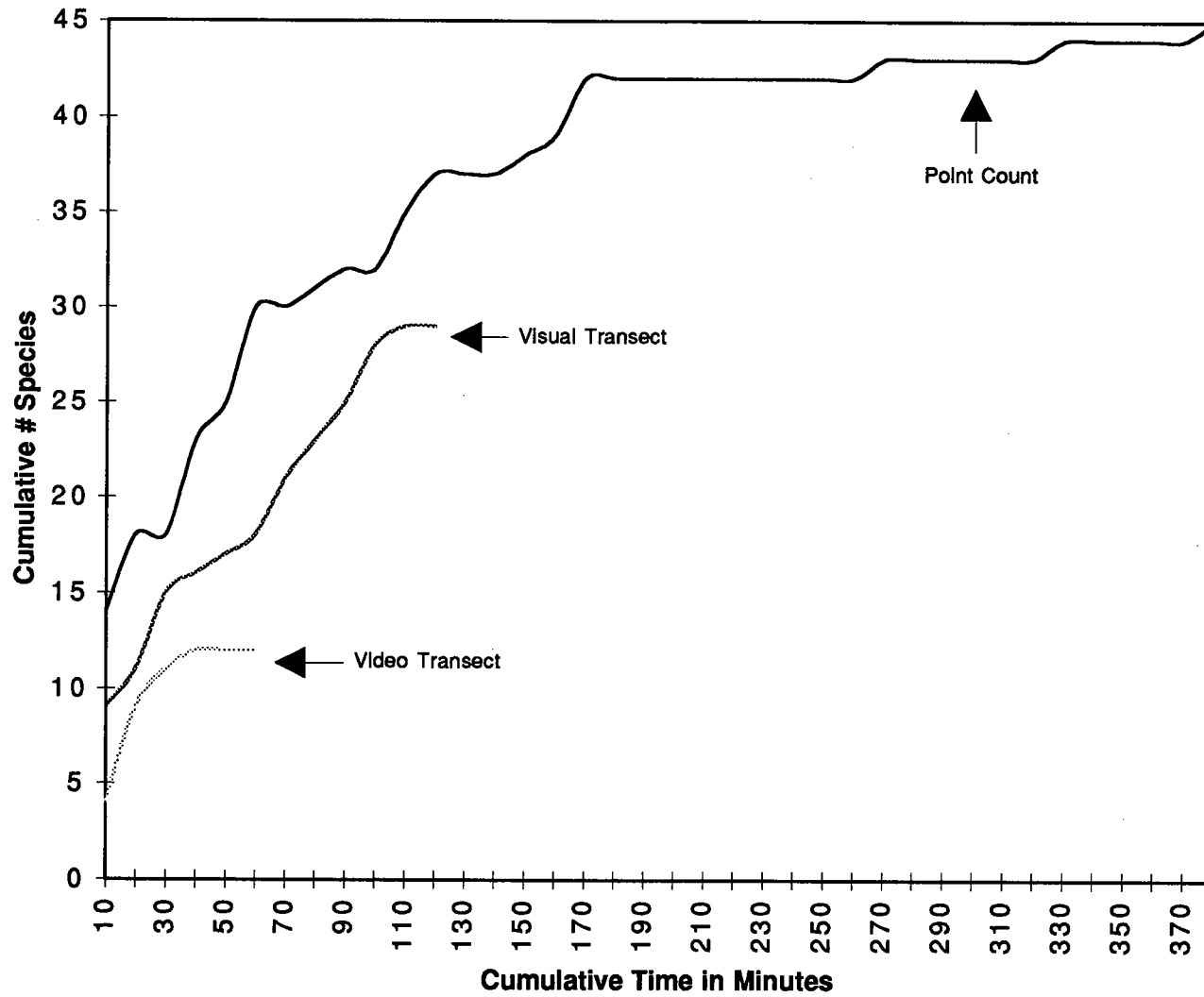
Curricula Vitae of Principal Investigators

Attachment 1: Species area curves for point count, visual transect, and video transect methods.

Sample area 1900 square meters for each method.



**Attachment 2: Species time curves for each sampling method.
Sample area is standardized to 1900 square meters for all methods.**



Attachment 3: Species Abundance, Proportionate Abundance, Ranked Abundance, and Density by Method.
The same approximate 1100 square meter area sampled with each method.

Species Name	Point C.	Transect	Video	Point C.	Transect	Video	Point C.	Transect	Video	Point C.	Transect	Video
	Total Abundance	Total Abundance	Total Abundance	Proportionate Abundance	Proportionate Abundance	Proportionate Abundance	Ranked Abundance	Ranked Abundance	Ranked Abundance	Density #/m2	Density #/m2	Density #/m2
<i>Acanthurus bahianus</i>	16	0	0	0.20	0.00	0.00	15	*	*	0.01	0.00	0.00
<i>Acanthurus chirugus</i>	20	14	13	0.24	1.07	3.00	12	7	2	0.02	0.01	0.01
<i>Apogon psuedomaculatus</i>	6	1	0	0.07	0.08	0.00	17	15	8	0.01	0.00	0.00
<i>Archosargus Probatocephalus</i>	1	0	3	0.01	0.00	1.00	29	*	*	0.00	0.00	0.00
<i>Balistes capriscus</i>	2	0	2	0.02	0.00	0.00	23	*	3	0.00	0.00	0.00
<i>Calamus leucosteus</i>	2	0	0	0.02	0.00	0.00	23	*	*	0.00	0.00	0.00
<i>Cantherhines pullus</i>	3	1	0	0.04	0.08	0.00	19	15	*	0.00	0.00	0.00
<i>Caranx bartholomaei</i>	19	0	0	0.23	0.00	0.00	12	*	*	0.02	0.00	0.00
<i>Caranx ruber</i>	27	10	4	0.33	0.76	1.00	10	9	3	0.02	0.01	0.00
<i>Centropristus striata</i>	24	7	1	0.29	0.53	0.00	10	10	10	0.02	0.01	0.00
<i>Chaetodipterus faber</i>	0	0	23	0.00	0.00	5.00	*	*	2	0.00	0.00	0.02
<i>Chaetodon ocellatus</i>	11	0	0	0.13	0.00	0.00	11	*	*	0.01	0.00	0.00
<i>Chaetodon sedentarius</i>	1	0	0	0.01	0.00	0.00	22	*	*	0.00	0.00	0.00
<i>Chilomycterus schoepfi</i>	0	1	0	0.00	0.08	0.00	*	15	*	0.00	0.00	0.00
<i>Decapterus macarellus</i>	1320	4	0	16.14	0.31	0.00	3	11	*	1.20	0.00	0.00
<i>Decapterus punctatus</i>	4112	0	224	50.28	0.00	47.00	1	*	1	3.74	0.00	0.20
<i>Diplodus holbrooki</i>	384	209	49	4.70	15.95	10.00	3	3	3	0.35	0.22	0.04
<i>Equetes umbrosus</i>	100	63	7	1.22	4.81	2.00	4	6	3	0.09	0.07	0.01
<i>Equetes acuminatus</i>	2	1	0	0.02	0.08	0.00	14	15	*	0.00	0.00	0.00
<i>Haemulon aurolineatum</i>	1401	571	144	17.13	43.59	30.00	1	1	2	1.27	0.59	0.13
<i>Halichoeres bivittatus</i>	405	275	7	4.95	20.99	1.00	1	2	5	0.37	0.29	0.01
<i>Halichoeres caudalis</i>	9	5	0	0.11	0.38	0.00	5	12	*	0.01	0.01	0.00
<i>Holocanthus bermudensis</i>	8	0	0	0.10	0.00	0.00	5	*	*	0.01	0.00	0.00
<i>Holocentrus ascensionis</i>	1	0	0	0.01	0.00	0.00	13	*	*	0.00	0.00	0.00
<i>Hypoleurochilus geminatus</i>	3	0	0	0.04	0.00	0.00	7	*	*	0.00	0.00	0.00
<i>Lactophrys quadricornis</i>	2	0	0	0.02	0.00	0.00	9	*	*	0.00	0.00	0.00
<i>Lutjanus griseus</i>	2	1	0	0.02	0.08	0.00	9	15	*	0.00	0.00	0.00
<i>Mycteroperca microlepis</i>	3	0	0	0.04	0.00	0.00	7	*	*	0.00	0.00	0.00
<i>Mycteroperca phenax</i>	3	1	0	0.04	0.08	0.00	7	15	*	0.00	0.00	0.00
<i>Ophioblennius atlanticus</i>	1	0	0	0.01	0.00	0.00	8	*	*	0.00	0.00	0.00
<i>Parablennius marmoratus</i>	5	0	0	0.06	0.00	0.00	5	*	*	0.00	0.00	0.00
<i>Rypticus maculatus</i>	1	0	0	0.01	0.00	0.00	7	*	*	0.00	0.00	0.00
<i>Seriola dumerili</i>	4	0	0	0.05	0.00	0.00	5	*	*	0.00	0.00	0.00
<i>Serranus subligarius</i>	133	64	2	1.63	4.89	0.00	1	5	6	0.12	0.07	0.00
<i>Sphoeroides dorsalis</i>	1	0	0	0.01	0.00	0.00	5	*	*	0.00	0.00	0.00
<i>Sphyræna barracuda</i>	19	2	1	0.23	0.15	0.00	3	13	7	0.02	0.00	0.00
<i>Stegastes partitus</i>	1	1	0	0.01	0.08	0.00	4	15	*	0.00	0.00	0.00
<i>Stegastes variabilis</i>	67	68	0	0.82	5.19	0.00	1	4	*	0.06	0.07	0.00
<i>Stenotomus chrysops</i>	56	11	0	0.68	0.84	0.00	1	8	*	0.05	0.01	0.00
<i>Synodus intermedius</i>	1	0	0	0.01	0.00	0.00	2	*	*	0.00	0.00	0.00
<i>Tautoga onitis</i>	2	0	0	0.02	0.00	0.00	1	*	*	0.00	0.00	0.00
Totals	8178	1310	480							7.43	1.36	0.44

760
5/2/10

Attachment 4: Point Count Data summary showing total abundance (A) and ranked abundance (RA)

	Nov-95	Apr-96	Jun-96	Nov-96	Apr-97	Nov-95	Apr-96	Jun-96	Nov-96	Apr-97
Species	A	A	A	A	A	RA	RA	RA	RA	RA
1 <i>Abudefduf saxatilis</i>	*	*	*	2	*	*	*	*	25	*
2 <i>Acanthurus bahianus</i>	16	*	*	1	*	15	*	*	30	*
3 <i>Acanthurus chirugus</i>	20	*	*	27	*	12	*	*	12	*
4 <i>Apogon psuedomaculatus</i>	6	*	*	*	*	19	*	*	*	*
5 <i>Archosargus probatocephalus</i>	1	31	11	6	149	32	5	18	19	5
6 <i>Balistes capricus</i>	2	*	*	*	*	26	*	*	*	*
7 <i>Calamus leucosteus</i>	2	*	*	3	4	26	*	*	21	13
8 <i>Cantherhines pullus</i>	3	*	*	*	*	22	*	*	*	*
9 <i>Caranx bartholomaei</i>	19	*	*	*	*	13	*	*	*	*
10 <i>Caranx ruber</i>	27	*	178	*	*	10	*	7	*	*
11 <i>Centropristus ocyurus</i>	*	*	*	15	1	*	*	*	16	17
12 <i>Centropristus striata</i>	24	13	58	53	30	11	7	8	10	7
13 <i>Chaetodon ocellatus</i>	11	*	*	2	*	16	*	*	25	*
14 <i>Chaetodon sedentarius</i>	1	*	*	*	*	32	*	*	*	*
15 <i>Chaetodipterus faber</i>	*	*	34	*	65	*	*	12	*	6
15 <i>Decapterus macarellus</i>	1320	*	4381	350	*	3	*	2	5	*
17 <i>Decapterus punctatus</i>	4112	*	16684	6025	*	1	*	1	1	*
18 <i>Diplectrum formosum</i>	*	*	*	3	*	*	*	*	21	*
19 <i>Diplodus holbrooki</i>	384	274	869	493	857	5	3	3	3	1
20 <i>Equetes umbrosus</i>	100	1	*	18	4	7	15	*	14	13
21 <i>Equetes acuminatus</i>	2	*	*	1	*	26	*	*	30	*
22 <i>Haemulon aurolineatum</i>	1401	729	654	4951	627	2	1	4	2	2
23 <i>Halichoeres bivittatus</i>	405	444	331	408	380	4	2	5	4	3
24 <i>Halichoeres caudalis</i>	9	3	6	14	3	17	9	20	17	15
25 <i>Holocanthus bermudensis</i>	8	1	*	37	18	18	15	*	11	8
26 <i>Holocentrus ascensionis</i>	1	*	*	1	*	32	*	*	30	*
27 <i>Hypleurochilus geminatus</i>	3	2	14	*	*	22	12	16	*	*
28 <i>Lactophrys quadricornis</i>	2	3	1	2	*	26	9	25	25	*
29 <i>Lutjanus griseus</i>	2	*	*	*	*	26	*	*	*	*
30 <i>Mycteroperca microlepis</i>	3	5	38	27	15	22	8	10	12	9
31 <i>Mycteroperca phenax</i>	3	2	5	16	14	22	12	22	15	10
32 <i>Ocyurus chrysurus</i>	*	*	*	3	*	*	*	*	21	*
33 <i>Ophioblennius atlanticus</i>	1	*	10	1	1	32	*	19	30	17
34 <i>Opsanus tau</i>	*	1	*	*	*	*	15	*	*	*
35 <i>Pagrus pagrus</i>	*	1	32	3	5	*	15	13	21	12
36 <i>Pagrus sp.</i>	*	*	*	6	*	*	*	*	19	*
37 <i>Parablennius marmoreus</i>	5	24	12	2	6	20	6	17	25	11
38 <i>Rhomoplites aurorubens</i>	*	*	6	*	*	*	*	20	*	*
39 <i>Rypticus maculatus</i>	1	*	*	1	*	32	*	*	30	*
40 <i>Scomberomorus cavalla</i>	*	*	29	*	*	*	*	14	*	*
41 <i>Seriola dumerili</i>	4	2	37	80	2	21	12	11	7	16
42 <i>Serranus subligarius</i>	133	198	196	148	170	6	4	6	6	4
43 <i>Sphoeroides dorsalis</i>	1	*	*	*	*	32	*	*	*	*
44 <i>Sphyraena barracuda</i>	19	*	48	9	*	13	*	9	18	*
45 <i>Starksia ocellata</i>	*	3	5	2	*	*	9	22	25	*
46 <i>Stegastes partitus</i>	1	*	4	69	*	32	*	24	8	*
47 <i>Stegastes variabilis</i>	67	*	17	0	1	8	*	15	38	17
48 <i>Stenotomus chrysops</i>	56	1	*	64	*	9	15	*	9	*
49 <i>Synodus foetens</i>	*	*	*	1	*	*	*	*	30	*
50 <i>Synodus intermedius</i>	1	*	*	1	*	32	*	*	30	*
51 <i>Tautoga onitis</i>	2	*	*	1	*	26	*	*	30	*
Totals	8178	1738	23658	12846	2352					
Total # Species	39	19	25	37	19					

KEY: A=abundance; RA=ranked abundance

Attachment 5: Transect Data summary showing total abundance (A) and ranked abundance (RA)

		Nov-95	Apr-96	Jun-96	Nov-96	Apr-97	Nov-95	Apr-96	Jun-96	Nov-96	Apr-97
Species	A	A	A	A	A	RA	RA	RA	RA	RA	
1 <i>Abudefduf saxatilis</i>	0	0	0	2	0	21	13	25	18	17	
2 <i>Acanthurus chirurgus</i>	14	0	0	9	0	7	13	25	11	17	
3 <i>Aluterus schoepfi</i>	0	0	0	1	0	21	13	25	23	17	
4 <i>Apogon psuedomaculatus</i>	1	0	0	0	1	14	13	25	25	12	
5 <i>Archosargus probatocephalus</i>	0	5	13	5	31	21	6	12	15	7	
6 <i>Calumus leucosteus</i>	0	0	0	0	1	21	13	25	25	12	
7 <i>Cantherhines pullus</i>	1	0	0	0	0	14	13	25	25	17	
8 <i>Caranx ruber</i>	10	0	29	0	0	8	13	10	25	17	
9 <i>Centropristus ocyurus</i>	0	0	0	0	1	21	13	25	25	12	
10 <i>Centropristus striata</i>	7	0	21	13	1	10	13	11	9	12	
11 <i>Chaetodipterus faber</i>	0	0	344	0	180	21	13	5	25	2	
12 <i>Chaetodon sedentarius</i>	0	0	1	0	0	21	13	23	25	17	
13 <i>Chilomycterus schoepfi</i>	1	0	0	0	0	14	13	25	25	17	
14 <i>Decapterus macarellus</i>	4	0	1940	150	0	12	13	1	3	17	
15 <i>Decapterus punctatus</i>	0	0	625	450	6000	21	13	3	2	1	
16 <i>Diplodus holbrooki</i>	209	30	187	0	137	3	4	6	25	3	
17 <i>Equetus acuminatus</i>	1	0	0	0	0	14	13	25	25	17	
18 <i>Equetus umbrosus</i>	63	26	90	26	16	6	5	8	7	8	
19 <i>Haemulon aurolineatum</i>	571	460	899	3010	136	1	1	2	1	4	
20 <i>Halichoeres bivittatus</i>	275	240	164	83	115	2	2	7	4	5	
21 <i>Halichoeres caudalis</i>	5	0	1	0	0	11	13	23	25	17	
22 <i>Holocanthus bermudensis</i>	0	1	2	7	5	21	10	21	13	9	
23 <i>Lactophrys qaudricornis</i>	0	0	3	2	0	21	13	20	18	17	
24 <i>Lutjanus griseus</i>	1	0	0	0	0	14	13	25	25	17	
25 <i>Mycteroperca microlepis</i>	0	2	10	5	3	21	9	14	15	11	
26 <i>Mycteroperca phenax</i>	1	4	4	2	4	14	8	17	18	10	
27 <i>Opsanus tau</i>	0	0	0	1	0	21	13	25	23	17	
28 <i>Pagrus pagrus</i>	0	1	2	2	0	21	10	21	18	17	
29 <i>Pagrus sp.</i>	8	0	600	39	0	9	13	4	6	17	
30 <i>Parablennius marmoreus</i>	0	5	0	3	0	21	6	25	17	17	
31 <i>Rhomoplites aurorubens</i>	0	0	7	0	0	21	13	15	25	17	
32 <i>Scomberomorus cavalla</i>	0	0	4	0	0	21	13	17	25	17	
33 <i>Seriola dumerili</i>	0	1	0	6	0	21	10	25	14	17	
34 <i>Serranus subligarius</i>	64	60	63	42	48	5	3	9	5	6	
35 <i>Sphoeroides maculatas</i>	0	0	0	2	0	21	13	25	18	17	
36 <i>Sphyaena barracuda</i>	0	0	11	11	0	21	13	13	10	17	
37 <i>Stegastes partitus</i>	1	0	5	9	0	14	13	16	11	17	
38 <i>Stegastes variabilis</i>	68	0	4	18	1	4	13	17	8	12	
39 <i>Stenotomus chrysops</i>	3	0	0	0	0	13	13	25	25	17	
Totals	1236	835	5009	3898	6680						
Total # Species	20	12	24	24	16						