Fish and Benthic Monitoring Workshop Summary Report
May 29 – June 3, 2002
San Andres Island, Columbia

FINAL REPORT

Submitted by:

The Reef Environmental Education Foundation
and
The Ocean Conservancy

September 2002

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Document Contents

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<u>Workshop Overview</u>

Through a partnership between the Reef Environmental Education Foundation (REEF), The Ocean Conservancy (formally known as the Center for Marine Conservation), and NOAA's Coastal Zone Management (CZM) Program, a series of coral reef monitoring workshops are being coordinated in Caribbean U.S. Island Territories and other Caribbean nations. These week-long programs are targeted at local stakeholders, and participation is free of charge through CZM funding sponsorship. The workshops feature classroom and field training in taxonomic identification of local fishes, corals, algae, and key invertebrates and in the survey methodologies of two volunteer monitoring programs, REEF's Fish Survey Project and The Ocean Conservancy's <u>R</u>eef <u>E</u>cosystem <u>Con</u>dition Program (RECON). The purpose of the workshops are three-fold: 1) to enable a local corps of divers to provide on-going fish and benthic condition data for local reefs, 2) to collect a baseline of information on the fish populations of the area using a REEF Advanced Assessment Team, and 3) to establish long-term RECON survey sites and to collect baseline RECON data at these sites.

The first two training workshops were held in La Parguera, Puerto Rico in May 2001 and on St. Thomas in the US Virgin Islands in October 2001. The third workshop was held on San Andres Island, May 29-June 3, 2002. The San Andres Archipelago is a territory of Colombia located 200 km east of Nicaragua. It is one of the most isolated island regions in the Americas and is made up of three small inhabited islands -- San Andres, Old Providence, and Santa Catalina -- and several uninhabited cays.

Thirty-nine people participated in the San Andres workshop. Participants included dive industry staff, community members, fishermen, and scientists and staff from the local environmental agency (CORALINA) and the Old Providence Marine Life Park. Most were from San Andres, eight came in from the neighboring island of Old Providence.   The workshop was taught by 2 REEF staff and 2 RECON staff. In addition, two RECON certified instructors from Santa Marta, Colombia, assisted in RECON training and data collection. Seven members of REEF's Advanced Assessment Team (AAT), REEF's most experienced surveyors, also participated. The AAT conducted surveys in conjunction with the field training and were assisted the workshop leaders with field and classroom training.

Participants attended two evenings of classroom sessions, two 2-tank boat dive trips (conducing 2 REEF surveys and 2 RECON training dives), and took the RECON exam and the REEF Level 2 exam, the first of the novice experience level. The majority of the participants also conducted optional dives to conduct RECON surveys and additional REEF surveys. During the week, two REEF/RECON I classes and two REEF/RECON II classes were offered. Two local dive boats were chartered for the week (and an additional boat on two days to accommodate the extra survey divers at the end of the week) and the workshop staff dove four dives a day for 5 days.

Participants conducted approximately 34 RECON surveys and 45 REEF surveys. The REEF staff and AAT collected 130 Expert REEF fish surveys during the week and reported approximately 224 fish species. A total of 20 sites were visited (Figure 1).

Evaluation forms were distributed to all divers upon completion of the RECON exam and the Level 2 REEF exam. A summary of the evaluation and comments submitted is presented in an appendix to this report.

This workshop was coordinated with support from the local environmental management agency, CORALINA (www.coralina.org), as part of their MPA Project. The local CORALINA office was instrumental in recruiting the workshop participants, organizing the participants into the different sessions, and providing logistical support.
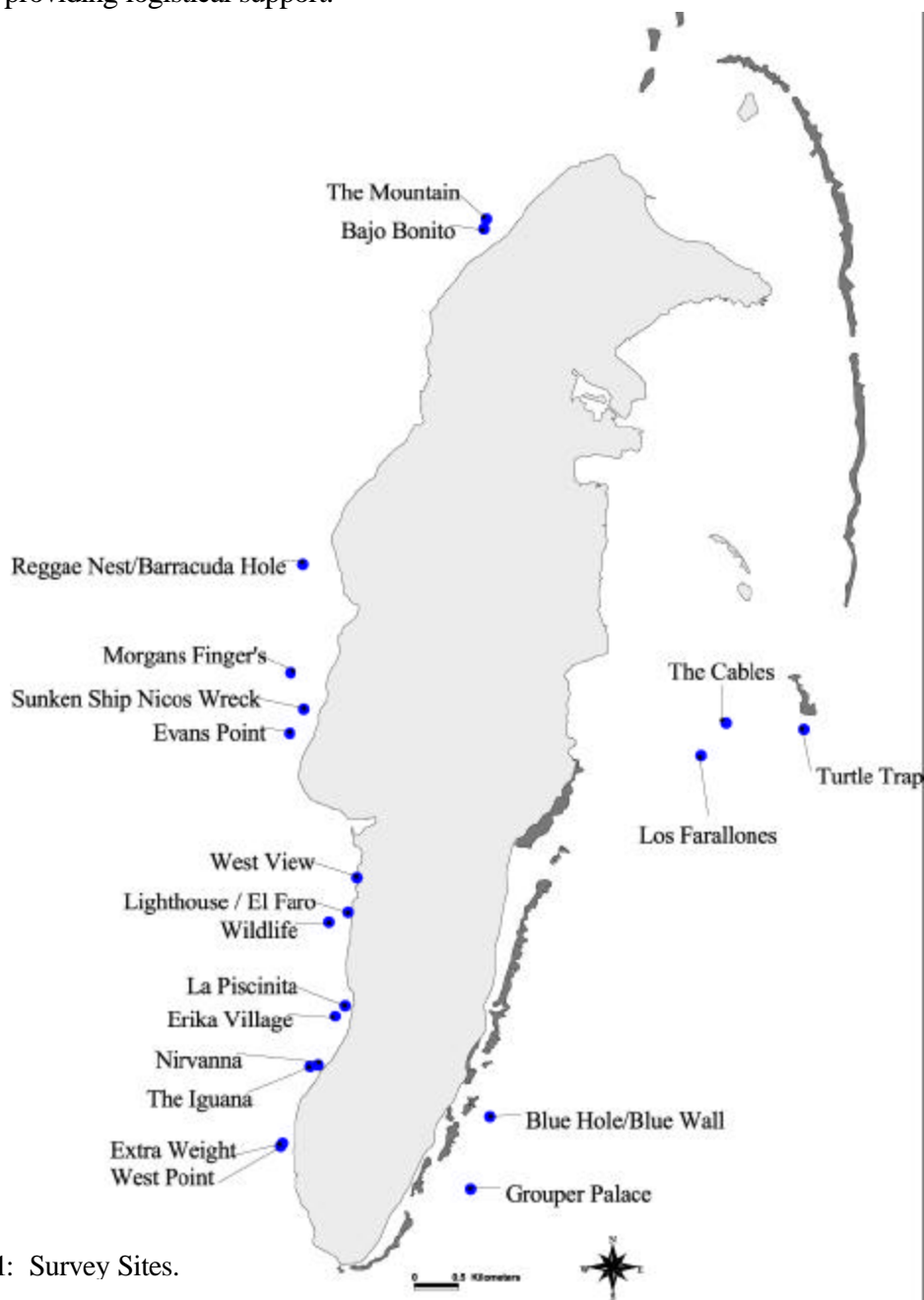

Figure 1: Survey Sites.

RECON Summary Report

One of the RECON program staff led the training workshop at San Andrés, Colombia, with assistance from a RECON certified instructor and two marine biologists from the Instituto de Investigaciones Marinas y Costeras (INVEMAR). Marine biologists on staff with CORALINA also provided additional assistance. The requirements to become a certified RECON diver include completion of two classroom sessions and two in-water training dives, conduct two RECON data collection surveys with a dive buddy and submit the survey data to The Ocean Conservancy, and pass a written examination with a score of 80% or higher. Due to the limited time frame of the workshop, the two RECON data collection dives were optional and therefore several divers did not have the time to complete the required surveys. Of the 39 people who participated in the workshop, 7 divers fulfilled all requirements to become certified RECON divers, 12 divers need only to complete one RECON survey and 15 diver needs to complete two RECON surveys to receive their RECON diver certification. CORALINA staff has agreed to ensure these divers are able to conduct the surveys required to achieve RECON certification.

For logistical reasons, seven dive sites were utilized as RECON survey sites during the workshop. Participants conducted a total of 34 RECON surveys (Table 1). (RECON surveys are conducted only at designated RECON survey sites. Sites are located within a narrow (~3 m/10 ft.) depth range, in one type of habitat, and are restricted to a maximum depth of 18 m/60 ft. for safety, and to give the diver enough time to complete the survey). Three of the kinds of RECON corals (mountainous star, great star and brain corals) were used during the surveys. All surveyed colonies were at least 25 cm in maximum diameter.

Table 1: The number of RECON surveys conducted and the number of colonies surveyed by workshop participants at each dive site.

Survey Site	# RECON Surveys Conducted (# Colonies Surveyed)			
	Mountainous Star	Great Star	Brains	Mustard Hill
Nirvana	4 (12)	4 (11)	6 (11)	0
Wildlife	0	2 (10)	3 (13)*	0
El Faro	0	1 (10)*	2 (5)	0
El Velerito	0	2 (13)	2 (10)	0
La Piscinita	2 (5)	0	0	0
Villa Erica	0	2 (4)	0	0
West Point	1 (6)	2 (4)	1 (6)	0

 *Survey conducted by an advanced RECON diver.

Five of the dive sites (Nirvana, Wildlife, El Faro, El Velerito and La Piscinita) will serve as interim RECON survey sites in San Andrés, Colombia, until the community management team can select permanent RECON survey sites. Survey site descriptions for each of these sites are included in an appendix to this report. The RECON sites at Nirvana (15-20 feet) and Wildlife (20-30 feet) are located at the seaward edges of two inner (nearshore) fore reefs. The El Faro (35-45 feet), El Velerito (35-45 feet) and La Piscinita (40-50 feet) survey sites are near the inner (landward) margins of three outer fore reefs (Note: El Velerito is the deep portion of the Nirvana site).

DATA

The sample sizes for individual health assessment for each species are low because several different kinds of corals were surveyed at each site to determine their relative suitability for study by RECON

divers. Moreover, novice observers are only able to survey two-three corals per dive (more experienced divers can easily assess ten corals per dive). Hence, the data presented below are preliminary and representative of the kinds of analyses that can be made with RECON survey results.

Data were analyzed for brain corals at the Nirvana and Wildlife survey sites and for great star corals at El Faro and El Velerito. Beginning RECON divers are required to work in buddy pairs, surveying the same colonies, as well as the same line and belt transects. Data for novice buddy pairs were averaged prior to further analysis. Advanced RECON divers may conduct independent RECON surveys.

Nirvana (15-20 feet) and Wildlife (20-30 feet)

Relative to the Wildlife reef (Figure 2), brain corals at the shallower Nirvana site were somewhat larger (size being measured as length x width), with a mean size that is one size class greater than that for the Wildlife site (.20m^2 versus .10 m^2, respectively). However, partial colony mortality, as a percentage of outermost colony surfaces, was essentially identical at both sites (Figure 3). Damselfish bites/algal gardens were seen on a couple of the Wildlife site corals, whereas parrotfish bites were seen at both sites (Figure 4). Long-spined sea urchins *(Diadema antillarum)*, a key herbivore, were relatively more abundant at the shallower Nirvana site. No spiny lobsters (*Panulirus spp.*) were found at either site, but small (<2 cm) stony corals were found on the surveyed corals at the Nirvana site (Figure 5).
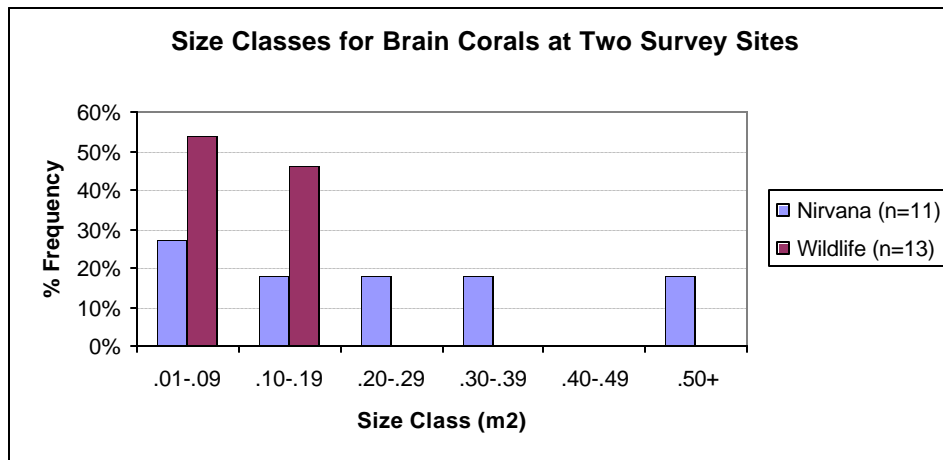

Figure 2: The percent frequency of brain coral colonies per size class at the Nirvana and Wildlife dive sites.
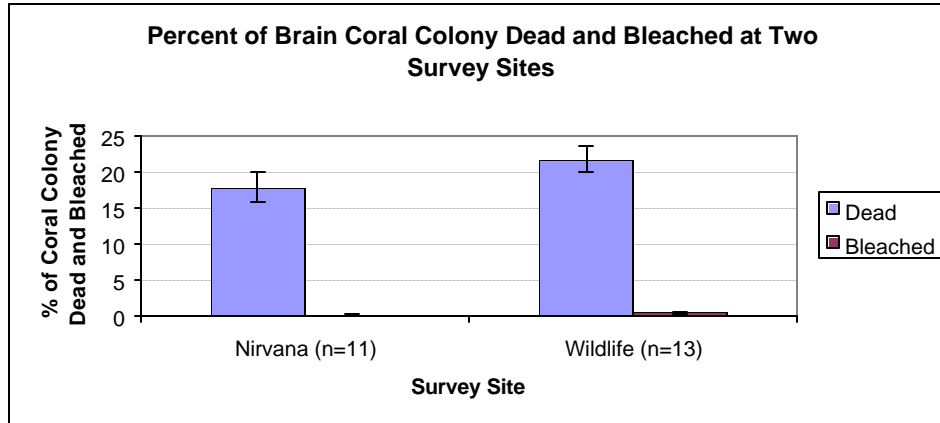
Percent of Brain Coral Colony Dead and Bleached at Two Survey Sites

Figure 3: Percent of brain coral colony dead and bleached (as mean $\pm$ standard error) at the Nirvana and Wildlife dive sites.

Percentage of Brain Coral Colonies with Polyps Being Killed By MECH, DAM, PAR, BBD, and OTHER
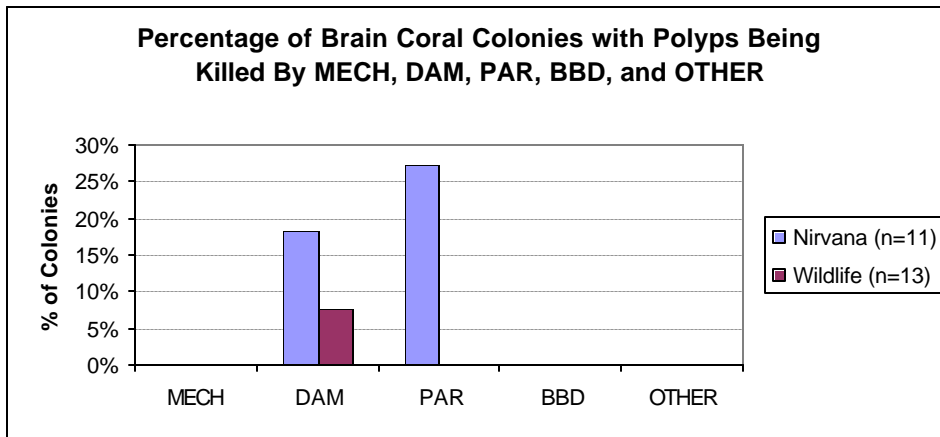

Figure 4: The percentage of brain coral colonies with polyps being killed by mechanical damagae (MECH); damselfish bites/algal gardens (DAM); parrotfish bites (PAR); black band disease (BBD); and other diseases, predation or competition (OTHER).
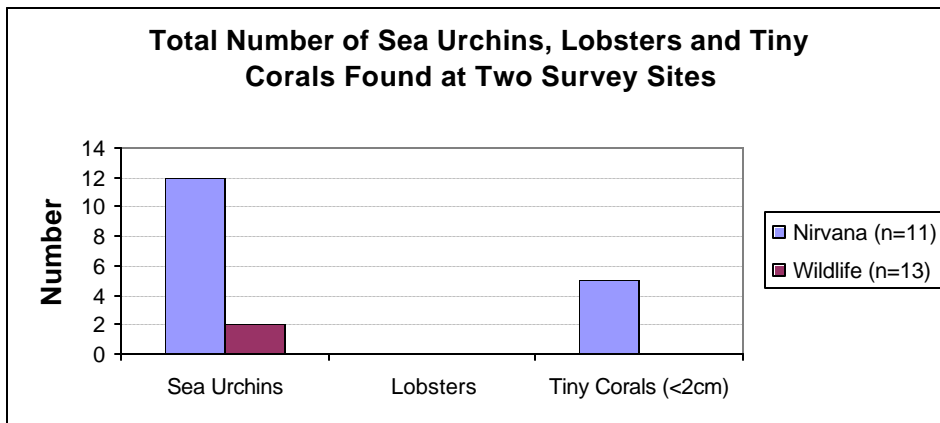
Total Number of Sea Urchins, Lobsters and Tiny Corals Found at Two Survey Sites

Figure 5: Total number of long-spined sea urchins *(Diadema antillarum)* and spiny lobsters (*Panulirus spp.*) found in crevices or at the base of the brain colonies surveyed, and tiny corals (<2 cm) found growing on dead areas of the brain colonies surveyed at the Nirvana and Wildlife dive sites.

El Faro (35-45 feet) and El Velerito (35-45 feet)
Great star corals at the El Faro and El Velerito dive sites showed identical mean sizes (.09m^2)
(Figure 6). The amount of partial colony mortality was twice as high at El Velerito than at El Faro
(22% versus 11%, respectively) (Figure 7). Damselfish bites/algal gardens were seen on a couple of
the El Faro site corals (18%), whereas none of the surveyed corals at the El Velerito site showed any
signs of freshly exposed skeletal areas or disease. A single long-spined sea urchin and several small
(<2 cm) stony corals were found at the El Velerito site (Figure 8).
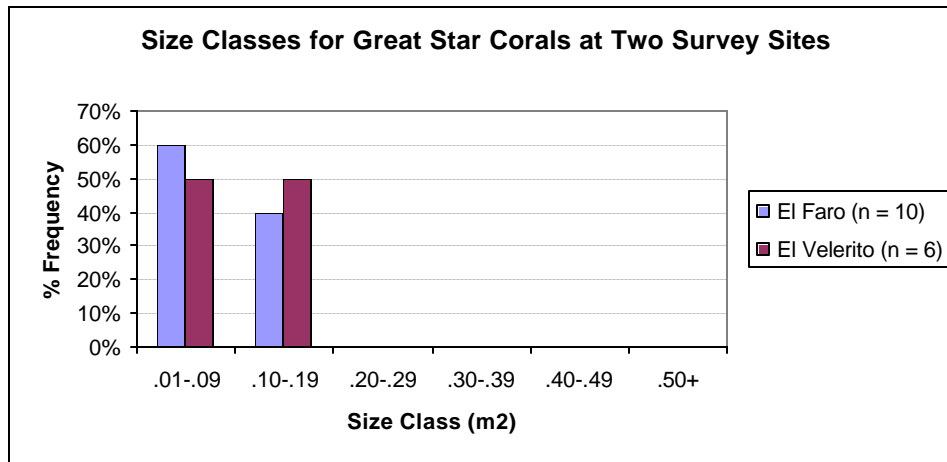

Figure 6: The number of great star coral colonies per size class at the El Faro and El Velerito dive sites.
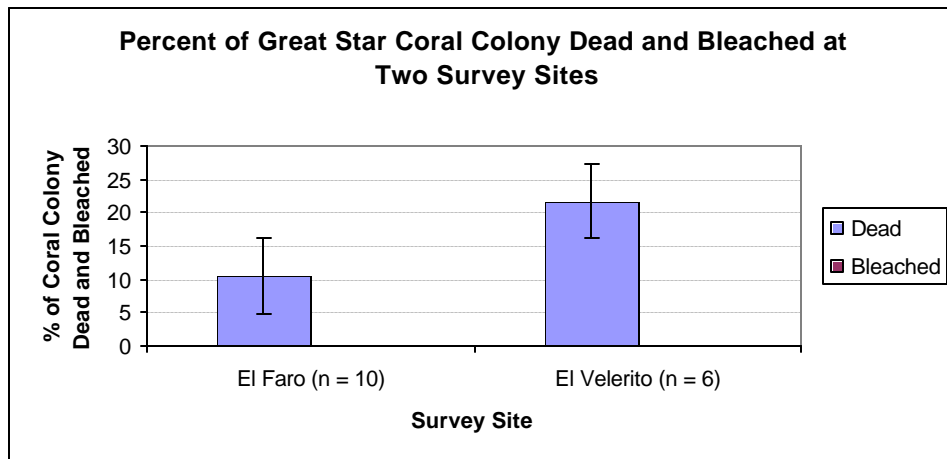

Figure 7: Percent of great star coral colony dead and bleached (as mean ± standard error) at the El Faro and El Velerito dive sites.
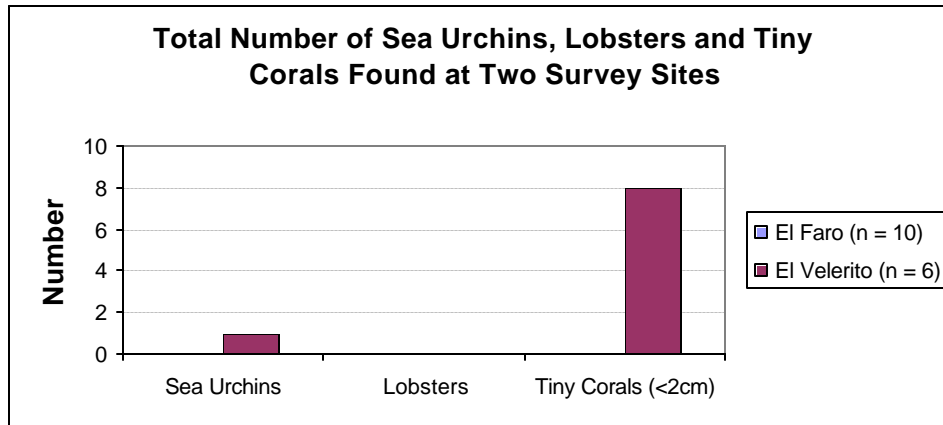
Total Number of Sea Urchins, Lobsters and Tiny Corals Found at Two Survey Sites

Legend: El Faro (n = 10); El Velerito (n = 6)

Figure 8: Total number of long-spined sea urchins *(Diadema antillarum)* and spiny lobsters (*Panulirus spp.)* found in crevices or at the base of the mountainous star colonies surveyed, and tiny corals (<2 cm) found growing on dead areas of the mountanous star colonies surveyed at the El Faro and El Velerito dive sites.

The cover of live stony corals was higher (33% versus 23%) on the two inner reefs than at the two outer coral communities (Figure 9). Mud/sand patches occupied proportionately more of the substratum at the outer reefs (10% versus 4%) and macroalgal coverage on solid substrata was slightly higher at the two outer coral communities (46% versus 40%). *Dictyota* was the most abundant of the macroalgae and *Halimeda* was the second most abundant, at all survey sites. The only human refuse recorded at the survey sites were fishing line (Wildlife, El Faro, El Velerito), a tire (Nirvana), and a can (El Velerito). In addition, free divers were seen spearfishing for octopus at the Wildlife survey site.
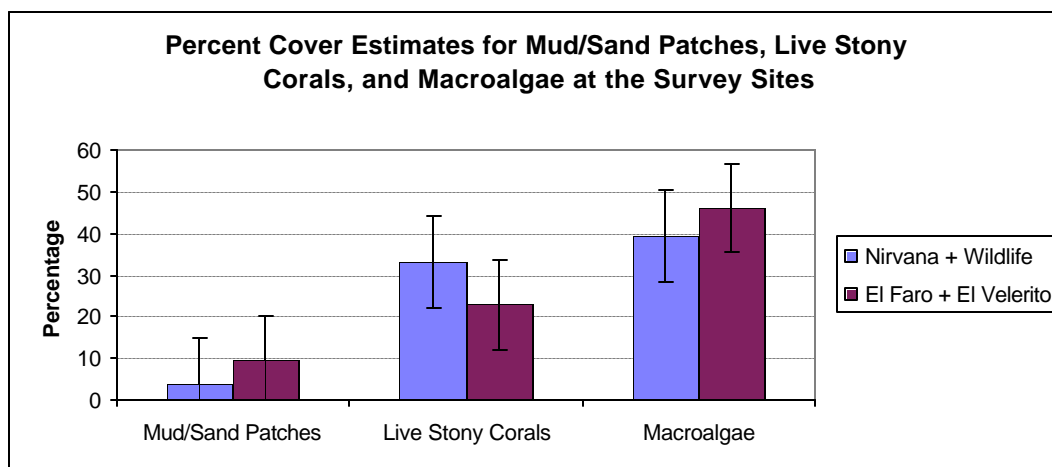
Percent Cover Estimates for Mud/Sand Patches, Live Stony Corals, and Macroalgae at the Survey Sites

Legend: Nirvana + Wildlife; El Faro + El Velerito

Figure 9: Percent cover estimates (as mean $\pm$ standard error) for mud/sand patches, live stony corals, and macroalgae at the inner reefs (Nirvana and Wildlife) and at the deeper outer reefs (El Faro and El Velerito).

In summary, this project enabled The Ocean Conservancy to expand RECON into a new area of the Caribbean helping to grow efforts to train volunteer divers to observe and record valuable information about current conditions at select coral reefs. CORALINA has expressed an interest in incorporating RECON into their community-based monitoring program. Although most of the community members and diving industry participants need additional remediation and review before this can become a reality, we are very optimistic that some of the biologists and some in the diving industry are willing to assist CORALINA in that endeavor.

REEF Summary Report

DATA
During the workshop, REEF surveys were conducted at 20 sites (Table 3, Figure 1). Twenty workshop participants submitted 45 REEF surveys. The REEF AAT and staff conducted 130 surveys and documented 224 fish species (see attached Survey Report; can also be accessed at http://www.reef.org/cgi-bin/batchrep.pl?region=TWA&file_name=saczm02.dat). These are the first REEF surveys conducted in this area.

Table 3: REEF AAT and staff survey effort.

REEF Zone Code	Site Name	AAT Survey Effort
	West Side	
83210016	The Mountain	3
83210001	Bajo Bonito	16
83210012	Reggae Nest/Barracuda Hole	6
83210010	Morgan's Fingers	4
83210013	Sunken Ship Nicos Wreck	3
83210004	Evan's Point	4
83210019	West View	6
83210007	Lighthouse/Faro	5
83210020	Wildlife	12
83210008	Little Swimming Pool/La Piscinita	6
83210003	Erika Village/Jax's Hole	4
83210011	Nirvana	10
83210015	The Iguana	3
83210005	Extra Weight/Lastre Extra	4
83210018	West Point	10
	East Side	
83210014	The Cables/Los Cables	10
83210009	Los Farallones	5
83210017	Turtle Trap/Trampa Tortuga	3
83210002	Blue Hole/Blue Wall	13
83210006	Grouper Palace	6

The coral reefs of San Andres support a moderate number of fish species. On average, surveyors documented 63 species per dive (max. 79 at Evan's Point, min. 47 at Turtle Trap). Unique sightings included snow bass (*Serranus chionaraia*), striped cardinalfish (*Apogon robbyi*), and yellowcheek basslet (*Gramma linki*). Noticeably scarce were grouper species.

A hierarchical cluster analysis was used to create a visual picture of similarity in assemblages among sites (Figure 10). The joint of each cluster corresponds to the x-axis; the smaller the distance the more similar the sites are in fish presence and relative abundance.
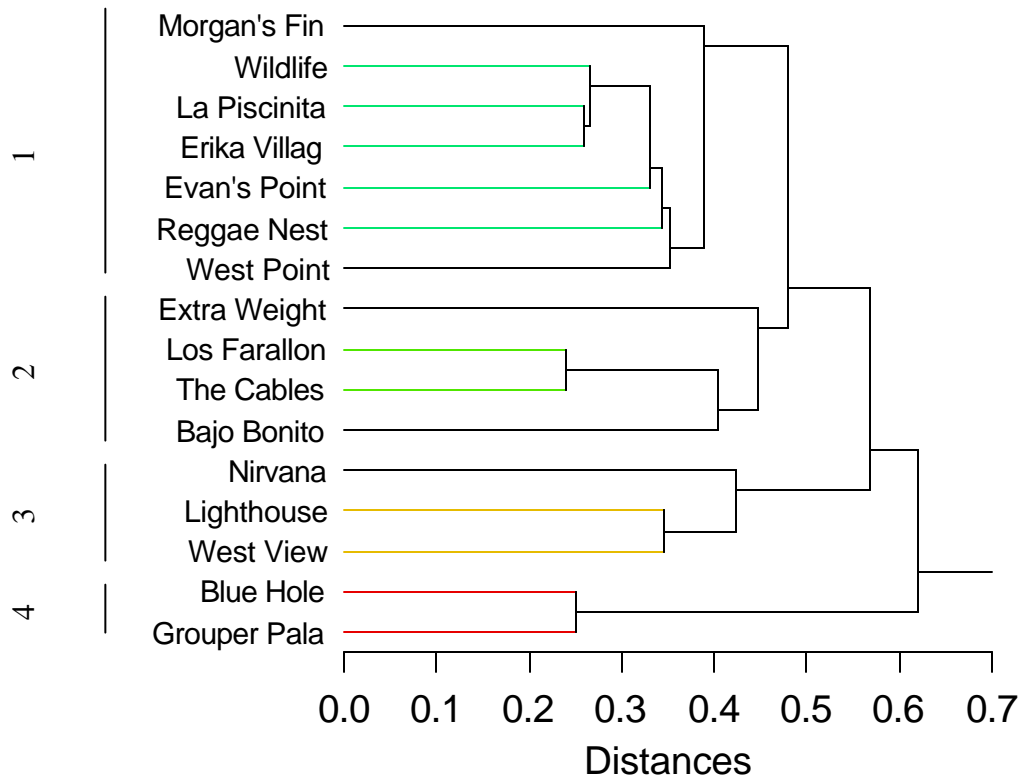

Figure 10: Cluster analysis results. The analysis used REEF's 2001 Advanced Assessment Team data, collected at 16 sites around San Andres Island (sites with more than 3 surveys were included). Analysis used rank of the abundance score. Distance of the clusters are 1-Gamma with average linkage. Only species that were seen with a percent sighting frequency of at least 20% (97 species) were included in the analysis.

The analysis resulted in four primary clusters, and sites tended to cluster primarily by location. Cluster 1 included most of the sites along the southwest side of the island. Cluster 2 included Bajo Bonito, Los Farallones, and the Cables, all sites that are relatively protected. Cluster 3 contained two sites along the southwest side that are close to shore and next to each other. Cluster 4 contained the two sites along the southeast side of the island. This type of graphical analysis can be useful in overall site characterization. In addition, shifts in fish assemblages over time due to management actions such as zones may result in changes in cluster affinities.

OUTREACH
In preparation for this workshop, REEF translated its existing Caribbean training materials into Spanish and printed a new version of the underwater survey paper to include Spanish and English common names. The Spanish names list was developed for REEF by Dr. Georgina Bustamante and is based on the published list in *Fishes of Cuba* by Claro, Lindeman, and Parenti.

In an effort to increase long-term local participation, REEF distributed six sets of the bilingual training materials at no cost. The materials included REEF's slide-based curriculum, 'Introduction

to Fish Identification for the Caribbean', and survey materials. Recipients included two dive shops on San Andres, one dive shop on Old Providence Island, the CORALINA offices on both islands, and the INVEMAR (Inventory and Monitoring agency) office in Santa Marta, Colombia. REEF also donated several fish, coral and creature identification books and CD-ROMs for the local resource library at CORALINA and the dive shops.

In conclusion, this project enabled REEF to strengthen and expand its volunteer program to an area that had not been previously surveyed by REEF members, while engaging local divers to participate in a meaningful activity. Data generated during the workshop and beyond will be a valuable addition to REEF's growing fish database, which currently contains over 40,000 surveys from the Caribbean region. By training local divers to conduct REEF surveys, this program has provided CORALINA with a trained group to continue monitoring fishes around the archipelago as part of the MPA Program.

Appendix 1 - RECON Training Evaluation Summary

Evaluation forms were distributed to all divers upon completion of the RECON exam and the Level 2 REEF exam. The input from the participants will help us to improve upon future workshops. Below is a summary of the evaluation along with comments submitted by the divers.

1. **In general, the workshop was:**
   [# Respondents = 28]
   Rating: 82% Excellent   18% Good   _____ Fair   _____ Poor   _____ N/A
   Comments:
   - I would like more sessions of training in coral and fish.
   - The course was interesting. I liked it very much.
   - Workshop should be done more often.
   - Is very important the assist personality in the course.
   - Well, I really thank you all for everything that you all gave to me. You make me learn a lot about the class of fish and corals.
   - Very compressed.
   - Well organized, good materials, good instructors – always smiling!
   - I learn more about what I see every day and didn't know – a new world of coral, seagrasses, and algae. Also about the different classes of fish and which one is intermediate, one them is in season, also their character and variance.
   - Thanks for the sacrifice you made to come here and train us to take care and to love our sea. Your preparation is excellent. Thank you.
   - A lot of very and important information.
   - I am very happy with the training because for my job is important and I can help to monitor the ocean.
   - Very clear and practical.
   - The course was very complete, Excellent and fast.

2. **What would you like to see done differently in future workshops?**
   [# Respondents = 24]
   - A projected developed to protect reef and coral in San Andres Island, Colombia.
   - Yes! I would love to, I learn a lot!
   - I will like that the course take more time, the longer the better, so that way we will do more trainings and also learn more.
   - That the theory class should be more so it doesn't become so weary.
   - I would like to see more people involved in future workshops.
   - To work the species with ecological context. To work the relations in the different groups that conform ecosystems coral reef.
   - That will give us jobs, a chance to protect and conserve our sea animals and sea corals.
   - Need a guidebook before the workshop.
   - More time in general. More time for RECON classes especially and probably make two groups depending on experience and knowledge.
   - Stay more time, and more materials to work with and the trainers must come back. Take advantage of good time to survey the barrier reef. It is impossible in one time and also survey the south and north keys.
   - More time – explain in more detail the different items. Everything was very fast.
   - It should be a little longer (1 week at least). Maybe videos. Night dives.

- Define the places with buoys because they are destroy the coral and they have to pick up the garbage out the sea.
- The possibility to continue an instructor workshop.
- Everything was really good!
- To dedicate more time in practice.
- No change.
- I would like to see workshops with the coral fish but at the night or to learn more about the mollusk.
- If you further explained the recognition of other species.
- To have more time for the coral, fish and algae.
- More time for classroom training.
- The course was very good and I learned about the behavior of marine life.

3. **How would you rate the training materials?**
   [# Respondents = 28]
   Rating: ___64%__ Excellent ___21%__ Good ___14%__ Fair _____ Poor _____ N/A
   Comments:
   - I would like to have some materials about fish and coral to work with in my free time.
   - The only problem was that the books and other materials for training did not arrive.
   - I think it would be better as a sheet than the book. It would be easier to recognize the fishes.
   - But I think theory part should be more illustrated.
   - I believe we need to get our own training materials to continue practice.
   - The materials help to the excellent learned.
   - Well, I could not complain about it.
   - Well. I can't use it.
   - The teachers were perfect and with good attitude, good disposition. Very professional, materials very good.
   - For someone who just got started, there should be a little bit more explanation.
   - We need you to send us more material.
   - Too bad that the rest of the books didn't arrive.
   - At the future course, you can sell the fish book to all students because after the training it is good idea to have reference materials.
   - One box remained in Bogotá Include the name in the identification of fish that is personal to the diver.
   - Need a little bit more material to practice with it.
   - More availability of books and aids to differentiate fish. Scientific names of the fish in the field guides.

4. Classroom Training Sessions:

[# Respondents = 28]

Rating: ___64%___ Excellent ___32%__ Good ___4%__ Fair _____ Poor _____ N/A

Comments:
- The instructors are very good; good training.
- The part of coral was very long and the classes must be early in the day.
- Some time it's too late, but great information!
- They should be a little longer in time (10 days or more).
- Only that it was a bit too extended.
- The instructors are excellent and they should come back again.
- Well, I could not complain about it.
- More space in the classroom.
- Too much to say in a little time.
- Thanks to our teachers!
- To have more room.
- More time and slower tempo is necessary to learn all the information that is given. The hall was very small but the instructors were excellent and professional.
- Excellent.

5. Training Dives:

[# Respondents = 28]

Rating: ___93%___ Excellent ___7%__ Good _____ Fair _____ Poor _____ N/A

Comments:
- Excellent! Please come back one more time.
- I learned a lot.
- It's better for understanding what you learn in class.
- Very interesting – something new.
- The teachers were excellent girls and they were so attentive with the students.
- I need more training in corals and algae.
- Thank you all. I learn a lot.
- I would like more comfortable boats.
- Probably have a one-to-one instruction/supervision underwater for inexperienced people (not frequent divers).
- Judy was very nice.
- It is always a privilege to dive with you guys. You taught me so much about the ocean.
- Got to know a lot more on some species.
- Dedicate more time.
- I learned a lot of background.
- I liked the training dives, was very easy and fun. I learned too much.

6. Survey Dives (optional):

[# Respondents = 28]

Rating: ___50%___ Excellent ___11%___ Good _____ Fair _____ Poor ___39%___ N/A

Comments:
- More surveys should be made in the northern and southern keys.
- Very important for the practice.
- A lit bit disorganized at first; too many people on one boat.
- They're needed in order to get the hang of the fish ID.

7. Examinations:

[# Respondents = 28]

Rating: ___50%___ Excellent ___14%___ Good ___4%___ Fair _____ Poor ___32%___ N/A

Comments:
- But we don't study kinds of family.
- Short and concise.

Additional Comments

[# Respondents = 15]
- I need to work more on it.
- Thank you!! It was great to have this course. I've learned to look to fishes. But (there is always a but) for other people it was too short and too fast.
- Before the start of the course, it would be nice to get better information especially by questions electronically. If a person is not able to pass by office and try to get in contact through telephone, keep the lines open – not all the time occupied.
- Thank you!
- One of the best parts of the workshop is that I get to meet more new friends. We also need more protection for our coral reefs all over the entire archipelago.
- All it was good. I think that the classrooms were a little uncomfortable – dark, warm.
- It was a shame that the rest of the materials were retained in customs. Maybe check next time the different options for sending the boxes but Colombian's customs are a mess anyway.
- It is very important for us to have you all here pretty soon. And also to consider the next time to stay some more time longer, next time take advise from the fishermen to have estimation of fish and reef barrier survey possible in the time is very good. Plenty diverse life, you won't regret it.
- Excellent staff that give the training course. Good sense of humor of staff.
- I've learned in these few days so much about the sea than in all my life. Please come back.
- We have to go to Providence to make RECON in the future, you well invited.
- Tons of gratitude with all of you for time and effort, great group.
- Very excellent course. I am thankful because I understand things that I did not know and that they instructed me.
- I thank the instructors for their collaboration and efficiency.
- I learned much and made many new friends.

Appendix 2 – REEF Data Summary

THE REEF ENVIRONMENTAL EDUCATION FOUNDATION

REEF HOME \ ABOUT REEF || DATA || MEMBER SERVICES || WEB RESOURCES || SEARCH

Tropical Western Atlantic Data
Field Survey and Special Project Summaries
REEF Trip Report For:
San Andres, Colombia AAT - 2002 (2002-05-29 - 2002-06-03)
Survey Members Participating:

Deena Wells	Les Wilk	Kris Wilk	Christy Semmens
Brice Semmens	Leslie Whaylen	Mark Kaehler	Jessica Armacost
Douglas Harder			

		Surveys				Bottom Time
		Expert		Novice		
Code	Site	SA	SO	SA	SO	(H:M)
83210001	Bajo Bonito	16	0	3	0	19:01
83210002	Blue Hole/Blue Wall	13	0	2	0	17:19
83210003	Erika Village/Jax?s Hole	4	0	1	0	5:31
83210004	Evan's Point	4	0	0	0	4:39
83210005	Extra Weight/Lastre Extra	4	0	0	0	4:24
83210006	Grouper Palace	6	0	1	0	7:43
83210007	Lighthouse/Faro	5	0	1	0	6:16
83210008	Little Swimming Pool/La Piscinita	6	0	1	0	6:44
83210009	Cables 2/Los Farallones	5	0	0	0	4:40
83210010	Morgan's Fingers	4	0	0	0	4:11
83210011	Nirvana	10	0	2	0	14:03
83210012	Reggae Nest/Barracuda Hole	6	0	1	0	6:27
83210013	Sunken Ship Nicos Wreck	3	0	1	0	4:31
83210014	The Cables/Los Cables	10	0	3	0	13:04
83210015	The Iguana	3	0	1	0	4:39
83210016	The Mountain	3	0	0	0	2:52
83210017	Turtle Trap/Trampa Tortuga	3	0	0	0	2:31
83210018	West Point	10	0	1	0	11:58
83210019	West View	6	0	0	0	7:50
83210020	Wildlife	12	0	2	0	14:11
TOTALS		**133**	**0**	**20**	**0**	**162:34**
		Total		**Expert**		**Novice**

Rank	SP#	Common Name	SF%	DEN	SF%	DEN	SF%	DEN
1	042	Blue Chromis	99.3%	3.6	99.2%	3.7	100%	3.4
2	213	Bluehead	98%	3.4	99.2%	3.4	90%	3.5
3	152	Redband Parrotfish	98%	2.8	97.7%	2.8	100%	2.6
4	108	French Grunt	98%	2.1	98.4%	2.1	95%	2
5	048	Bicolor Damselfish	97.3%	3.4	96.9%	3.4	100%	3.3
6	220	Yellowhead Wrasse	97.3%	2.9	97.7%	3	95%	2.5
7	204	Blue Tang	97.3%	2.5	96.9%	2.5	100%	2.3
8	206	Ocean Surgeonfish	96.7%	2.5	96.2%	2.5	100%	2.4
9	031	Foureye Butterflyfish	96.7%	2.1	96.2%	2.1	100%	2.2
10	133	Bar Jack	96%	2	96.2%	2	95%	2
11	095	Graysby	95.4%	2	96.2%	2	90%	2
12	010	Fairy Basslet	93.4%	2.6	96.2%	2.6	75%	2.5
13	043	Brown Chromis	92.8%	3.3	91.7%	3.3	100%	3.5
14	149	Princess Parrotfish	92.8%	2.6	91.7%	2.6	100%	2.4
15	077	Yellow Goatfish	88.8%	2.4	90.9%	2.5	75%	2.2
16	155	Stoplight Parrotfish	88.8%	2.3	91.7%	2.3	70%	1.8
17	093	Coney	88.8%	1.8	90.9%	1.8	75%	1.6
18	131	Spanish Hogfish	88.2%	1.9	89.4%	1.9	80%	1.7
19	214	Clown Wrasse	85.6%	2.2	89.4%	2.2	60%	2.2
20	081	Goldspot Goby	81.6%	2.3	78.9%	2.4	100%	1.9
21	198	Blackbar Soldierfish	81.6%	2.1	85.7%	2.1	55%	2
22	167	Sharpnose Puffer	81.6%	1.7	84.2%	1.8	65%	1.4
23	196	Schoolmaster	81%	1.9	81.9%	1.9	75%	1.9
24	201	Longspine Squirrelfish	81%	1.7	82.7%	1.8	70%	1.7
25	006	Rock Beauty	77.7%	1.8	81.2%	1.8	55%	2
26	215	Creole Wrasse	75.8%	3.1	78.1%	3.2	60%	2.5
27	163	Balloonfish	74.5%	1.7	75.1%	1.7	70%	1.9
28	030	Banded Butterflyfish	73.2%	1.7	72.9%	1.7	75%	1.8
29	105	Bluestriped Grunt	72.5%	1.6	73.6%	1.6	65%	1.8
30	181	Harlequin Bass	71.8%	1.7	75.9%	1.8	45%	1.6
31	053	Threespot Damselfish	71.2%	2.6	71.4%	2.7	70%	2.4
32	051	Longfin Damselfish	69.9%	2.1	72.1%	2.1	55%	2
33	207	Black Durgon	68.6%	2.2	68.4%	2.2	70%	2.4
34	047	Beaugregory	68.6%	2	73.6%	2	35%	1.7
35	197	Yellowtail Snapper	67.9%	1.7	66.1%	1.8	80%	1.6
36	079	Bridled Goby	66.6%	2.3	63.9%	2.3	85%	1.8
37	054	Yellowtail Damselfish	66.6%	1.7	68.4%	1.8	55%	1.7
38	239	Trumpetfish	62%	1.6	66.1%	1.7	35%	1.1
39	238	Sand Tilefish	61.4%	1.6	63.9%	1.6	45%	1.7
40	076	Spotted Goatfish	60.7%	1.6	64.6%	1.6	35%	1.7

41	050	Dusky Damselfish	60.1%	2	57.8%	2	75%	2.2
42	090	Yellowline Goby	59.4%	2.1	68.4%	2.1		
43	194	Mahogany Snapper	59.4%	1.7	60.9%	1.7	50%	2.1
44	156	Striped Parrotfish	58.1%	2.1	59.3%	2.1	50%	2
45	005	Queen Angelfish	58.1%	1.5	60.9%	1.5	40%	1.6
46	200	Longjaw Squirrelfish	56.8%	1.7	58.6%	1.7	45%	1.4
47	052	Sergeant Major	56.2%	2.5	54.8%	2.6	65%	2.2
48	083	Masked Goby/Glass Goby	55.5%	2.8	62.4%	2.8	10%	2
49	154	Redtail Parrotfish	54.2%	1.7	51.1%	1.6	75%	1.8
50	027	Smooth Trunkfish	53.5%	1.3	54.8%	1.3	45%	1.2
51	147	Greenblotch Parrotfish	52.2%	1.9	57.1%	1.9	20%	2
52	019	Saddled Blenny	50.3%	2.2	49.6%	2.3	55%	2
53	119	Black Hamlet	50.3%	1.6	52.6%	1.6	35%	1.2
54	121	Butter Hamlet	49.6%	1.5	50.3%	1.5	45%	1.4
55	118	Barred Hamlet	49.6%	1.4	50.3%	1.5	45%	1.2
56	017	Redlip Blenny	48.3%	1.9	47.3%	1.9	55%	1.9
57	218	Slippery Dick	45.7%	2	41.3%	2	75%	1.9
58	173	Green Razorfish	43.1%	2.1	41.3%	2.1	55%	2
59	418	Broadstripe Goby	41.1%	2.3	39.8%	2.3	50%	2.6
60	175	Rosy Razorfish	39.8%	2.3	39%	2.4	45%	1.7
61	082	Hovering Goby	39.8%	1.8	41.3%	1.8	30%	1.8
62	069	Orangespotted Filefish	39.2%	1.3	41.3%	1.3	25%	1
63	228	Yellowhead Jawfish	37.9%	2	40.6%	2	20%	2.2
64	150	Queen Parrotfish	37.2%	1.6	39.8%	1.6	20%	1.5
65	205	Doctorfish	36.6%	1.7	41.3%	1.7	5%	2
66	020	Sailfin Blenny	34.6%	2.1	36%	2.1	25%	2.2
67	004	Gray Angelfish	34.6%	1.1	34.5%	1.1	35%	1.1
68	153	Yellowtail (Redfin) Parrotfish	33.9%	1.7	33.8%	1.8	35%	1.7
69	336	Roughhead Blenny	33.9%	1.6	33%	1.6	40%	1.7
70	045	Sunshinefish	33.3%	2.9	35.3%	3	20%	2.5
71	221	Bermuda Chub/Yellow Chub	33.3%	2	33%	2	35%	2
72	113	Smallmouth Grunt	32.6%	2	34.5%	2	20%	2.2
73	203	Squirrelfish	31.3%	1.6	27.8%	1.5	55%	1.6
74	419	Cleaning Goby	30.7%	2.2	33.8%	2.2	10%	2
75	034	Spotfin Butterflyfish	30.7%	1.6	32.3%	1.6	20%	1.7
76	035	Barred Cardinalfish	30%	2	30.8%	2	25%	2
77	124	Masked Hamlet	30%	1.4	33%	1.4	10%	1.5
78	025	Honeycomb Cowfish	29.4%	1.1	29.3%	1.1	30%	1.3
79	106	Caesar Grunt	28.7%	1.9	27.8%	1.9	35%	1.7
80	117	White Grunt	28.7%	1.3	27.8%	1.3	35%	1.2
81	060	Brown Garden Eel	26.7%	3	27%	3	25%	2.8

82	216	Puddingwife	26.7%	1.5	28.5%	1.5	15%	2
83	039	Flamefish	26.1%	2	27.8%	2.1	15%	1
84	059	Spotted Drum	26.1%	1.2	28.5%	1.2	10%	1
85	338	Spinyhead Blenny	25.4%	1.6	27%	1.6	15%	2
86	160	Saucereye Porgy	24.8%	1.3	21.8%	1.3	45%	1.3
87	226	Redspotted Hawkfish	24.8%	1.2	27%	1.2	10%	1
88	075	Peacock Flounder	23.5%	1.2	24%	1.3	20%	1
89	217	Rainbow Wrasse	22.2%	1.7	23.3%	1.8	15%	1
90	036	Belted Cardinalfish	21.5%	1.9	24%	1.9	5%	2
91	199	Dusky Squirrelfish	21.5%	1.7	23.3%	1.7	10%	2.5
92	225	Flying Gurnard	21.5%	1.5	22.5%	1.4	15%	2
93	185	Tobaccofish	20.9%	1.6	21.8%	1.6	15%	2
94	234	Greater Soapfish	20.9%	1.1	23.3%	1.1	5%	2
95	431	Sharknose Goby	19.6%	2.1	22.5%	2.1		
96	032	Longsnout Butterflyfish	19.6%	1.4	18%	1.4	30%	1.1
97	003	French Angelfish	19.6%	1.3	20.3%	1.2	15%	1.3
98	009	Blackcap Basslet	18.9%	3	19.5%	3	15%	3.3
99	080	Colon Goby	18.9%	1.9	6.7%	1.8	100%	2
100	125	Shy Hamlet	18.3%	1.2	21%	1.2		
101	145	Bluelip Parrotfish	17.6%	1.9	18%	1.9	15%	1.6
102	337	Secretary Blenny	16.9%	1.5	19.5%	1.5		
103	360	Sawcheek Cardinalfish	15.6%	2.2	15%	2.2	20%	2
104	170	Southern Stingray	15.6%	1.1	16.5%	1.1	10%	1
105	012	Glasseye Snapper	15%	1.4	17.2%	1.4		
106	429	Rusty Goby	15%	1.3	17.2%	1.3		
107	148	Midnight Parrotfish	15%	1.1	16.5%	1.1	5%	1
108	086	Pallid Goby	14.3%	1.6	16.5%	1.6		
109	072	Whitespotted Filefish	14.3%	1.1	16.5%	1.1		
110	361	Sponge Cardinalfish	13.7%	1.1	15.7%	1.1		
111	182	Lantern Bass	13%	1.6	13.5%	1.6	10%	2
112	110	White Margate	13%	1.5	14.2%	1.5	5%	2
113	622	Triplefin species	12.4%	1.3	13.5%	1.3	5%	1
114	062	Goldentail Moray	12.4%	1	13.5%	1	5%	1
115	129	Hybrid Hamlet	11.7%	1.3	9%	1.4	30%	1.1
116	070	Scrawled Filefish	11.7%	1.1	12%	1.1	10%	1
117	071	Slender Filefish	11.7%	1	11.2%	1	15%	1.3
118	229	Yellowfin Mojarra	11.1%	2	12%	2	5%	3
119	313	Pearl Blenny	10.4%	1.7	12%	1.7		
120	178	Spotted Scorpionfish	10.4%	1.1	11.2%	1.2	5%	1
121	195	Mutton Snapper	10.4%	1	11.2%	1	5%	1

122	236	Glassy Sweeper	9.8%	2.3	11.2%	2.3		
123	041	Whitestar Cardinalfish	9.8%	1.8	11.2%	1.8		
124	028	Spotted Trunkfish	9.8%	1.3	9.7%	1.3	10%	1.5
125	230	Sand Diver	9.8%	1	11.2%	1		
126	049	Cocoa Damselfish	9.1%	1.5	10.5%	1.5		
127	166	Porcupinefish	9.1%	1.1	9%	1.1	10%	1
128	066	Spotted Moray	9.1%	1	9.7%	1	5%	1
129	008	Southern Sennet	8.4%	3.6	9%	3.7	5%	3
130	023	Boga	8.4%	2.9	9.7%	2.9		
131	111	Porkfish	8.4%	1.4	7.5%	1.3	15%	2
132	127	Yellowbelly Hamlet	8.4%	1.2	9.7%	1.2		
133	102	Tiger Grouper	8.4%	1.2	9%	1.1	5%	2
134	126	Tan Hamlet	8.4%	1.1	9.7%	1.1		
135	040	Twospot Cardinalfish	7.8%	2.3	9%	2.3		
136	087	Peppermint Goby	7.8%	1.4	9%	1.4		
137	007	Great Barracuda	7.8%	1.2	9%	1.2		
138	013	Arrow Blenny	7.8%	1.1	9%	1.1		
139	341	Yellowface Pikeblenny	7.8%	1	8.2%	1	5%	1
140	112	Sailors Choice	7.1%	2.2	8.2%	2.2		
141	330	Palehead Blenny	7.1%	1.6	7.5%	1.6	5%	2
142	365	Red Clingfish	7.1%	1.5	7.5%	1.5	5%	2
143	212	Blackear Wrasse	7.1%	1.5	7.5%	1.6	5%	1
144	189	Blackfin Snapper	7.1%	1	6.7%	1.1	10%	1
145	457	Mackerel Scad	6.5%	2.2	6.7%	2.1	5%	3
146	568	Cardinal Soldierfish	6.5%	1.4	7.5%	1.4		
147	184	Sand Perch	6.5%	1.4	7.5%	1.4		
148	319	Darkheaded Blenny	6.5%	1.1	7.5%	1.1		
149	326	Goldline Blenny	5.8%	1.8	6%	1.7	5%	3
150	123	Indigo Hamlet	5.8%	1.3	6.7%	1.3		
151	191	Dog Snapper	5.8%	1	5.2%	1	10%	1
152	209	Ocean Triggerfish	5.2%	2.3	6%	2.3		
153	038	Dusky Cardinalfish	5.2%	2.2	6%	2.2		
154	351	Bridle Cardinalfish	5.2%	2.1	3.7%	2.2	15%	2
155	613	Semiscaled Goby	5.2%	1.6	6%	1.6		
156	603	Tusked Goby	5.2%	1.6	6%	1.6		
157	183	Peppermint Basslet	5.2%	1.2	6%	1.2		
158	100	Rock Hind	5.2%	1.2	5.2%	1.2	5%	1
159	065	Sharptail Eel	5.2%	1	4.5%	1	10%	1

160	165	Bridled Burrfish	5.2%	1	5.2%	1	5%	1
161	540	Snow Bass	4.5%	1.4	4.5%	1.3	5%	2
162	426	Nineline Goby	4.5%	1.2	4.5%	1.1	5%	2
163	469	Bluestriped Lizardfish	4.5%	1.2	5.2%	1.2		
164	073	Eyed Flounder	4.5%	1	0.7%	1	30%	1
165	128	Yellowtail Hamlet	3.9%	1.1	4.5%	1.1		
166	231	Sharksucker	3.9%	1	4.5%	1		
167	063	Green Moray	3.9%	1	3.7%	1	5%	1
168	462	Banded Jawfish	3.2%	1.8	3.7%	1.8		
169	305	Yellowcheek Basslet	3.2%	1.4	3.7%	1.4		
170	222	Bluespotted Cornetfish	3.2%	1	3%	1	5%	1
171	522	Striped Cardinalfish	2.6%	2	0.7%	2	15%	2
172	193	Lane Snapper	2.6%	1.5	3%	1.5		
173	345	Redeye Triplefin	2.6%	1.5	3%	1.5		
174	192	Gray Snapper	2.6%	1.5	3%	1.5		
175	164	Bandtail Puffer	2.6%	1	3%	1		
176	518	Starksia Blenny (unidentified)	2.6%	1	3%	1		
177	435	Tiger Goby	2.6%	1	3%	1		
178	015	Hairy Blenny	2.6%	1	3%	1		
179	099	Red Hind	2.6%	1	3%	1		
180	388	Goldspotted Eel	1.9%	2	2.2%	2		
181	114	Spanish Grunt	1.9%	1.6	2.2%	1.6		
182	141	Yellow Jack	1.9%	1.6	2.2%	1.6		
183	018	Rosy Blenny	1.9%	1.6	1.5%	2	5%	1
184	130	Hogfish	1.9%	1.3	1.5%	1	5%	2
185	146	Bucktooth Parrotfish	1.9%	1.3	2.2%	1.3		
186	346	Roughhead Triplefin	1.9%	1.3	2.2%	1.3		
187	116	Tomtate	1.9%	1.3	2.2%	1.3		
188	464	Mottled Jawfish	1.9%	1.3	1.5%	1.5	5%	1
189	343	Lofty Triplefin	1.9%	1	2.2%	1		
190	323	Downy Blenny	1.9%	1	2.2%	1		
191	029	Trunkfish	1.9%	1	2.2%	1		
192	097	Nassau Grouper	1.9%	1	2.2%	1		
193	064	Purplemouth Moray	1.9%	1	2.2%	1		
194	471	Red Lizardfish	1.9%	1	2.2%	1		
195	134	Blue Runner	1.3%	2	1.5%	2		
196	157	Jolthead Porgy	1.3%	1.5	1.5%	1.5		

197	202	Reef Squirrelfish	1.3%	1.5	0.7%	1	5%	2
198	151	Rainbow Parrotfish	1.3%	1	1.5%	1		
199	067	Viper Moray	1.3%	1	1.5%	1		
200	223	Lancer Dragonet	1.3%	1	0.7%	1	5%	1
201	026	Scrawled Cowfish	1.3%	1	1.5%	1		
202	109	Black Margate	1.3%	1	1.5%	1		
203	657	Loggerhead Sea Turtle	1.3%	1	1.5%	1		
204	647	Smootheye blenny	1.3%	1	1.5%	1		
205	526	Medusa Blenny	1.3%	1	1.5%	1		
206	056	Highhat	1.3%	1	1.5%	1		
207	463	Dusky Jawfish	1.3%	1			10%	1
208	656	Hawksbill Sea Turtle	1.3%	1	1.5%	1		
209	551	Glass Blenny	1.3%	1	0.7%	1	5%	1
210	427	Orangespotted Goby	1.3%	1	1.5%	1		
211	061	Chain Moray	1.3%	1	0.7%	1	5%	1
212	324	Dusky Blenny	0.6%	4	0.7%	4		
213	024	Bonnetmouth	0.6%	3	0.7%	3		
214	459	Redtail Scad	0.6%	2	0.7%	2		
215	107	Cottonwick	0.6%	1	0.7%	1		
216	002	Cherubfish	0.6%	1			5%	1
217	132	Spotfin Hogfish	0.6%	1	0.7%	1		
218	600	Black Snapper	0.6%	1			5%	1
219	335	Ringed Blenny	0.6%	1	0.7%	1		
220	329	Mimic Blenny	0.6%	1	0.7%	1		
221	057	Jackknife-Fish	0.6%	1	0.7%	1		
222	227	Houndfish	0.6%	1	0.7%	1		
223	219	Yellowcheek Wrasse	0.6%	1	0.7%	1		
224	304	Threeline Basslet	0.6%	1	0.7%	1		
		Total Species	**224**		**221**		**145**	

Contact REEF

Heading out for a dive.

Reviewing data sheets.

More diving.

REEF Advanced Assessment Team.

Reviewing after class.

Filling out REEF scansheets.

Appendix 3 - RECON Site Descriptions

CONTENTS-
El Faro

(El Velerito, La Piscinita, Nirvana, Wildlife available from lmonk@oceanconservancyva.org at The Ocean Conservancy)

RECON Survey Site Description

DRAFT

Reef Condition Monitoring Program

recon

The Ocean Conservancy

Name:_____ RECON ID #:_____

Dive Site Name(s):_____ Date: Month _____ Day _____ Year _____

Geographic Location:_____

Mooring Buoy: ☐ yes ☐ no   Mooring Buoy (name/#) - if applicable:_____

Survey Depth Range:_____–_____ ☐ m ☐ ft   Check all that apply: ☐ Boat Dive ☐ Shore Dive

Latitude: ___ ___° ___ ___.___ ___ ___N   Longitude: ___ ___° ___ ___.___ ___ ___W   GPS? ☐ yes ☐ no

Identify any Chart(s) or Aerial Photos used for site Location or Description:_____

_____

RECON Survey Site ID# (To be entered by RECON Program Team only.):_____

Check ANY that apply:

Orientation: ☐ windward ☐ leeward ☐ other (specify)_____

Reef Type: ☐ patch ☐ fringing ☐ barrier ☐ atoll ☐ bank (specify kind)_____

Location: ☐ nearshore ☐ mid-shelf ☐ shelf edge

Zone: ☐ lagoonal ☐ back reef ☐ reef flat ☐ fore reef ☐ other (specify)_____ ☐ NA

Inclination: ☐ platform (<30°) ☐ slope (~30–60°) ☐ wall (>60°)

Habitat: ☐ scattered corals ☐ coral field ☐ bommie ☐ pinnacle ☐ spur & groove
☐ other (name/describe) _____

Relief: ☐ low (<1 m / <3 ft) ☐ intermediate (~1-2 m / 3-6 ft) ☐ high (>2 m / >6 ft)

Bottom: ☐ mud ☐ sand ☐ rubble ☐ carbonate hardbottom ☐ bedrock

A. Check the relative abundance (as rare, uncommon, fairly common, very common) for each of the following stony and fire corals, if present at the survey site. Leave blank if absent.

B. Select the kind of stony coral that will be easiest to survey as the 1st choice.

C. If more than one kind of stony coral is suitable for survey, select the second easiest as the 2nd choice.

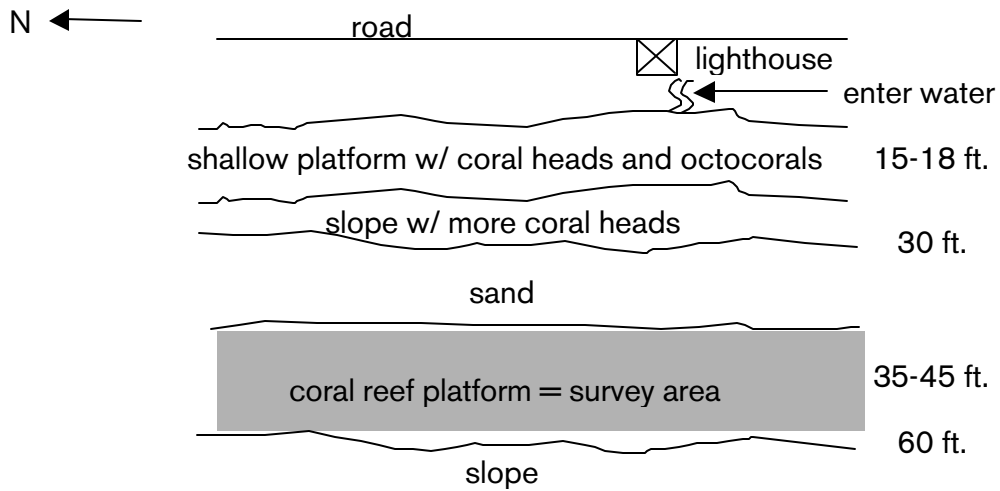|	A.				B.	C.
	Rare	Uncommon	Farily Common	Very Common	1st Choice for RECON Surveys	2nd Choice for RECON Surveys
lobed star (*Montastraea annularis = M. annularis* f. *annularis*)					■	■
mountainous star (*Montastraea faveolata = M. annularis* f. *faveolata*)						
boulder star (*Montastraea franksi = M. annularis* f. *franksi*)					■	■
great star (*Montastraea cavernosa*)						
elkhorn (*Acropora palmata*)					■	■
staghorn (*Acropora cervicornis*)						
brains (e.g., *Colpophyllia natans*, *Diploria strigosa*, *Diploria labyrinthiformis*)						
mustard hill (*Porites astreoides*)						
massive starlet (*Siderastrea siderea*)					■	■
blade fire (*Millepora complanata*)					■	■

Comments/Other Observations:

Directions to the survey site (include depth):

Sketch the dive site. Clearly show the survey site area and delineate north:

Plan view (horizontal). Refer to an aerial photo if you have one. Include approximate scale and depth intervals; notable features; locations of any spurs, pinnacles, bommies or patches; sand grooves or channels; mooring buoy(s) if any; dominant wind direction; dominant current direction(s) and strength(s); approximate horizontal visibility.

Plan view (horizontal): El Faro (Lighthouse)

N ◄─────

road

⊠ lighthouse

◄───── enter water

shallow platform w/ coral heads and octocorals   15-18 ft.

slope w/ more coral heads   30 ft.

sand

coral reef platform = survey area   35-45 ft.

60 ft.

slope

Profile (vertical). Include approximate scale and depth intervals; notable features; relief; approximate vertical visibility.

Profile (vertical): El Faro (Lighthouse)

15-18 ft.   coral heads

30 ft.

35-45 ft.   60 ft.

sand

reef survey area