Fish and Benthic Monitoring Workshop Summary Report
October 1 - 9, 2002
Cabo Rojo, Puerto Rico

FINAL REPORT

Submitted by:

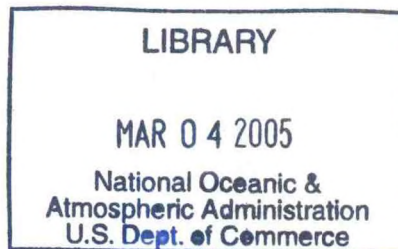The Reef Environmental Education Foundation
and
The Ocean Conservancy

March 2003

Fish and Benthic Monitoring Workshop Summary Report
October 1 - 9, 2002
Cabo Rojo, Puerto Rico
FINAL REPORT

Document Contents

Fish and Benthic Monitoring Workshop Summary Report
October 1- 9, 2002
Cabjo Rojo, Puerto Rico

Workshop Overview

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 Reef Ecosystem Condition 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.

Previous training workshops have been held in La Parguera, Puerto Rico (May 2001), St. Thomas, USVI (October 2001), and San Andres Island, Colombia (May 2002). The fourth workshop was held on the western side of Puerto Rico in October 2002. Training activities were conducted in Joyuda and diving was based out of Cabo Rojo.

Nine local divers participated in the workshop. Participants included dive industry staff, community members, fishermen, and staff from local environmental organizations and government agencies. The workshop was taught by 2 REEF staff and 4 RECON staff. Six 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 assisted the workshop leaders with field and classroom training. Although participation was lower than anticipated, the smaller group enabled the instructors to provide individual attention to each of the participants. Each participant was also able to conduct several dives in addition to their training dives, which allowed them to hone their skills and become confident in their surveying abilities.

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 levels. All 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. A local dive boat was chartered for the week and the workshop staff dove four dives a day for 5 days.

Participants conducted approximately 57 RECON surveys and 25 REEF surveys. The REEF staff and AAT collected 116 Expert REEF fish surveys during the week and reported approximately 202 fish species. A total of 16 sites were visited during the workshop (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.

At the conclusion of the workshop, both organizations stayed on to conduct independent survey efforts from October 7 - 9th. A group of local divers and RECON staff conducted surveys along the western coast of the island. This effort allowed The Ocean Conservancy to establish several RECON survey site descriptions and utilize local RECON divers to collect a baseline of data from those sites. A total of 30 RECON surveys were conducted. The 6 REEF AAT divers and one local diver conducted a 3-day trip to Mona Island, which is approximately 40 miles west of the main island of Puerto Rico. A total of 48 surveys were conducted and 169 fish species were documented.
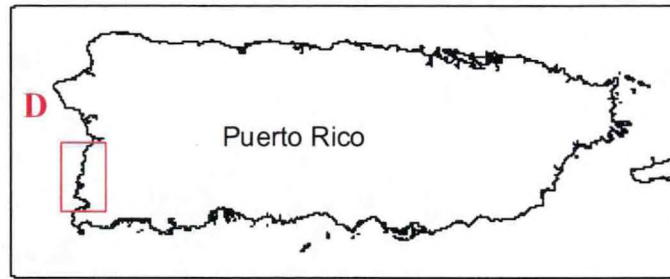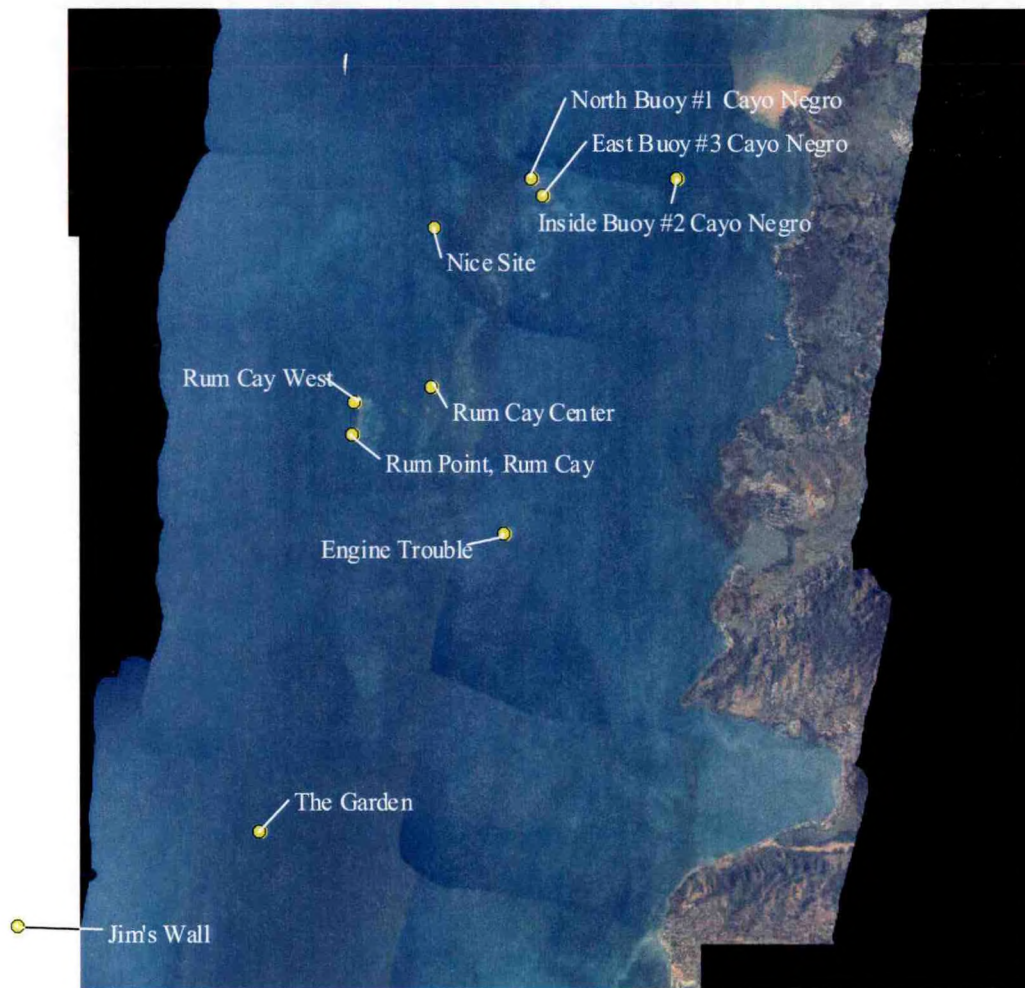
Figure 1a. Reference map of survey areas.

Figure 1b. Map of survey sites along west coast of Puerto Rico (red box in figure 1a).
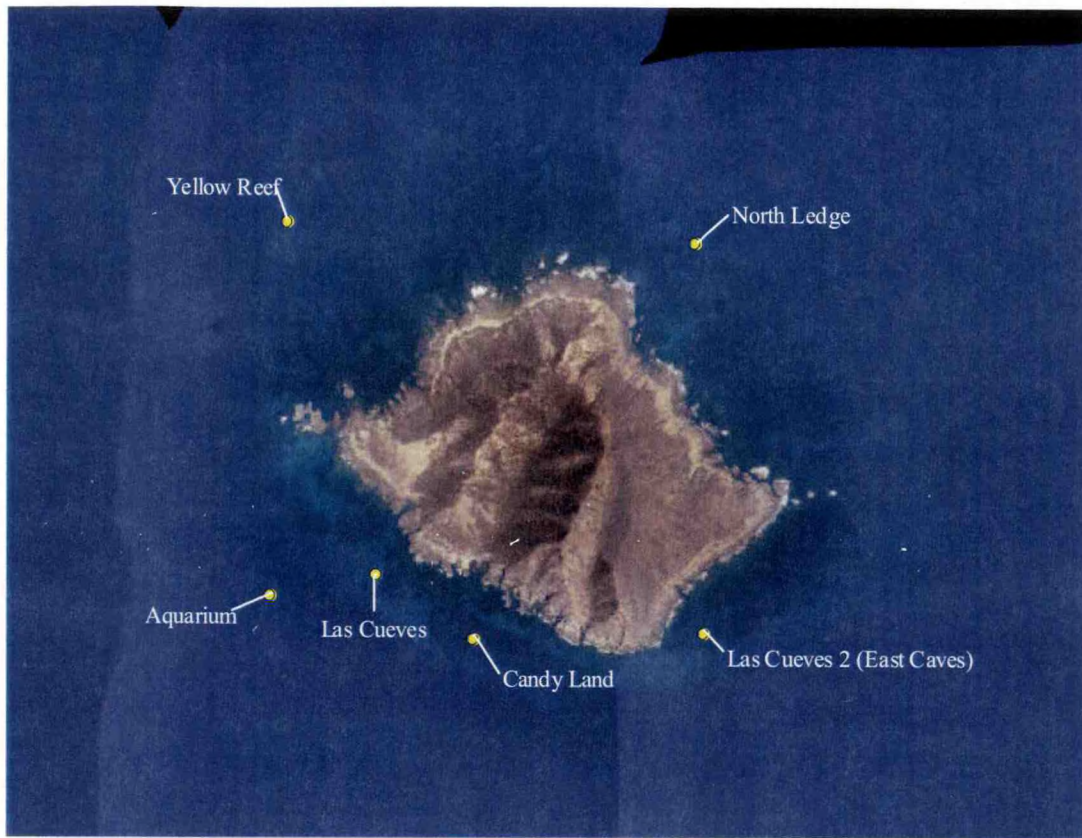
Figure 1c. Map of survey sites around Desecheo Island. The island is located approximately 14 miles off the coast of Rincon ('D' in Figure 1a).

RECON Summary Report

Two RECON program staff led the training workshop at Cabo Rojo, Puerto Rico, with assistance from two RECON-certified instructors. The requirements to become a certified RECON diver include completion of two classroom sessions and two in-water training dives, conducting two RECON data collection surveys with a dive buddy, submitting the survey data to The Ocean Conservancy, and passing a written examination with a score of 80% or higher. Greater availability of boat space, due to a lower number of participants than in past workshops, allowed most participants to complete the optional RECON data collection surveys required for RECON certification. Of the nine people who participated in the workshop, six fulfilled all requirements to become certified RECON divers, one needs only to complete one RECON survey and two need to do two surveys to receive their RECON diver certification. The local RECON-certified instructor has agreed to coordinate future RECON surveys and to allow these divers to conduct the surveys required to achieve RECON certification under his guidance.

Immediately following the workshop, program staff led a separate individual RECON data collection effort in Cabo Rojo. Participants included two RECON instructors, an advanced RECON diver and one of the workshop participants, who received additional training, passed the Level 2 examination and was certified as a new RECON instructor. Data for the joint training workshop and the individual data collection effort are combined in this report.

Fifteen dive sites were utilized as RECON survey sites during the workshop. Participants conducted a total of 87 RECON surveys, of which 65 were at 10 survey sites off Cabo Rojo and 22 at five sites off Desecheo Island (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). All four of the corals suitable for RECON surveys (mountainous star, great star, brain and mustard hill corals) were used during the surveys. All surveyed colonies were at least 25 cm in maximum diameter.

With the assistance of the local RECON instructors, two dive sites each off Cabo Rojo (Cayo Ron and El Negro Norte) and off Desecheo Island (Candyland and Las Cuevas) were chosen to be the initial RECON survey sites on the southwestern coast of Puerto Rico. Survey site descriptions for each of these sites are included in an appendix to this report. The Cayo Ron and El Negro Norte sites are mid-shelf bank reefs at depths of 20-30 and 15-25 feet, respectively. Candyland and Las Cuevas are narrow fringing reefs with coral fields at depths of 40-50 and 35-45 feet, respectively.

The offshore reefs were very attractive, in part because the water was so clear. However, we were concerned at the presence of yellow-blotch disease in *Montastraea* (star corals) and the high cost to local divers of transport to these sites. The mid-shelf reefs were turbid and less attractive visually but we were pleasantly surprised to discover what appeared to be relatively high coral cover in some areas.

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.

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
Cabo Rojo:				
Cayo Ron	24 (88)	0	0	0
El Negro Norte	6 (10)	0	0	0
El Negro	0	0	3 (16)*	2 (10)
Ike	0	0	2 (5)	0
The Star	0	5 (24)*	0	0
Los Caminos	0	0	5 (30)*	0
El Observatorio	5 (28)*	0	0	0
Cuevario	5 (28)*	0	0	0
1980	4 (27)*	0	0	0
026	4 (30)*	0	0	0
Desecheo Island:				
Candyland	4 (17)	0	0	0
Las Cuevas	11 (29)	2 (8)	1 (10)*	0
Yellow Reef	0	1 (10)*	0	0
Ledge	0	0	1 (5)*	0
Caves 2	0	0	2 (10)	0

*Includes survey(s) conducted by an advanced RECON diver.

RECON Data Summary

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 surveys.) Given the small sample sizes at some sites, the data for mountainous star corals in each habitat type were provisionally combined and comparisons between the two mid-shelf reefs (Cayo Ron and El Negro Norte) and the two offshore reefs (Candyland and Las Cuevas) that have been chosen for further study are presented below. The designation of two survey sites in each habitat will allow within-habitat comparisons to be made when larger sample sizes are available in the future.

Individual Colonies

Relative to those on the mid-shelf (Figure 2), the offshore mountainous star corals were significantly different in surface area [? = 0.05, Mann-Whitney non-parametric two-tailed rank test]. Surprisingly the offshore corals have a higher proportion of both small and large colonies with 63% of the corals falling within the two smallest and 20% within the two largest size classes.
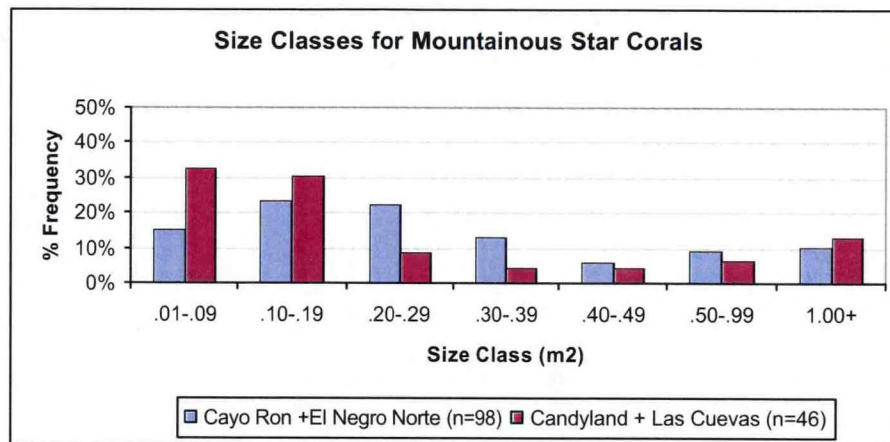
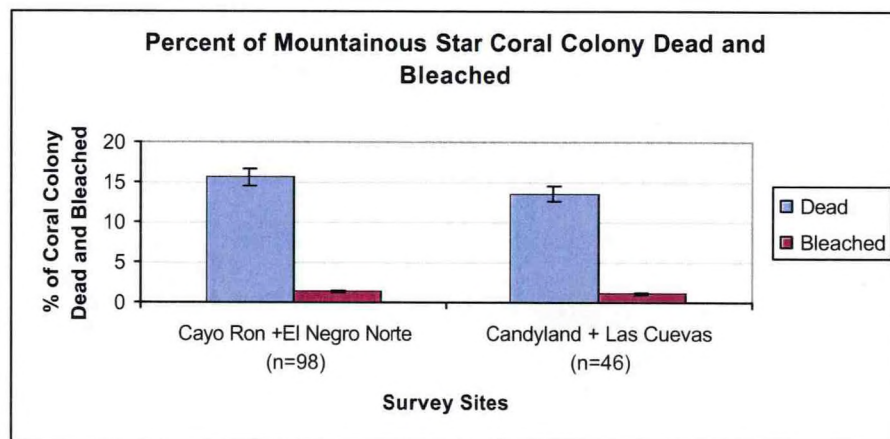Figure 2: The percent frequency of mountainous star coral colonies per size class at the Cabo Rojo (Cayo Ron and El Negro Norte) and Desecheo Island (Candyland and Las Cuevas) dive sites. (Size is measured as maxumum length ($2r_1$) and maximum width ($2r_2$); area is calcuated as $?r_1r_2$.)

However, partial colony mortality, as a percentage of outermost colony surfaces, was essentially identical in both habitats (Figure 3).

Figure 3: Percent of mountainous star coral colony dead and bleached (as mean $\pm$ standard error) at the Cabo Rojo (Cayo Ron and El Negro Norte) and Desecheo Island (Candyland and Las Cuevas) dive sites.

One incident of mechanical damage was seen at each of the mid-shelf reef sites. About a fifth of the colonies in each habitat (20% and 17%, respecitvely) had damselfish bites and or established damselfish algal gardens. Whereas parrotfish bites were seen on 4% of the offshore corals (Las Cuevas only), black-band disease was seen at 4% of the mid-shelf corals (Cayo Ron only). Both the mid-shelf and offshore habitats showed evidence of yellow-blotch disease (9% and 13%, respectively) and predation by the short coral snail, *Coralliophila abbreviata* (2% and 4%, respectively) (Figure 4).
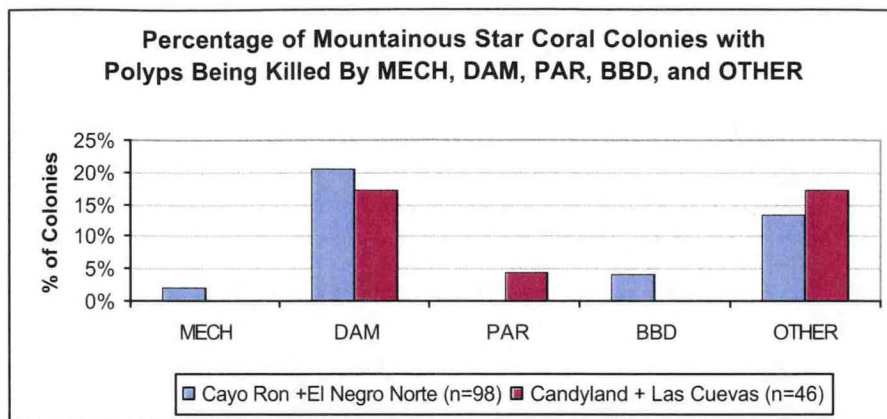
Figure 4: The percentage of mountainous star coral colonies with polyps being killed by mechanical damagae (MECH); damselfish bites/algal gardens (DAM); parrotfish bites (PAR); black band disease (BBD); and other diseases, predation or competition (OTHER).

Long-spined sea urchins *(Diadema antillarum)*, a key herbivore, were observed at a density of approximately .10 per m² at both habitats. Only one spiny lobster *(Panulirus)* was found at one of the mid-shelf sites (Cayo Ron), but several small (<2 cm) stony corals were found on the surveyed corals at both habitats (Figure 5).
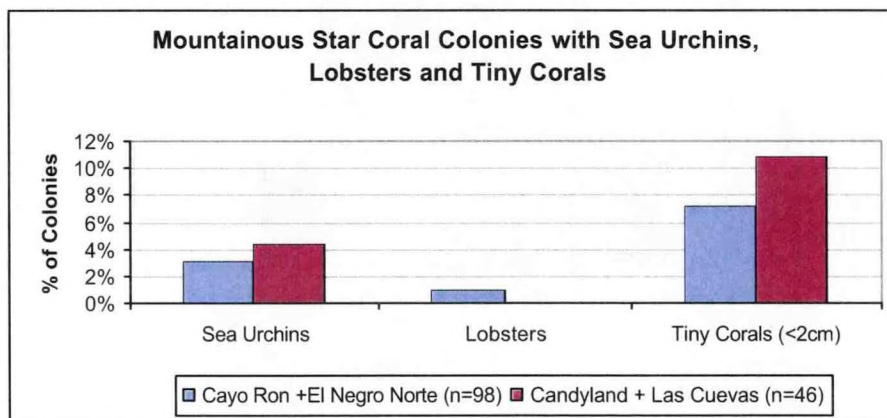
Figure 5: Total number of long-spined sea urchins *(Diadema antillarum)* and spiny lobsters *(Panulirus spp.)* found in crevices or at the base of the mountainous star colonies surveyed, and tiny corals (<2 cm) found growing on dead areas of the mountainous star colonies surveyed at the Cabo Rojo (Cayo Ron and El Negro Norte) and Desecheo Island (Candyland and Las Cuevas) dive sites.

10-m Line Transects

The cover of live stony corals was somewhat higher ($34 \pm 16\%$ versus $23 \pm 16\%$) on the two mid-shelf reefs than at the two offshore coral communities (Figure 6). Mud/sand patches occupied relatively equal amounts of the substratum at both locations (8.5%) with macroalgal coverage on solid substrata being slightly higher at the two offshore habitats ($29 \pm 11\%$ versus $21 \pm 15\%$).

Percent Cover Estimates for Mud/Sand Patches, Live Stony Corals, and Macroalgae
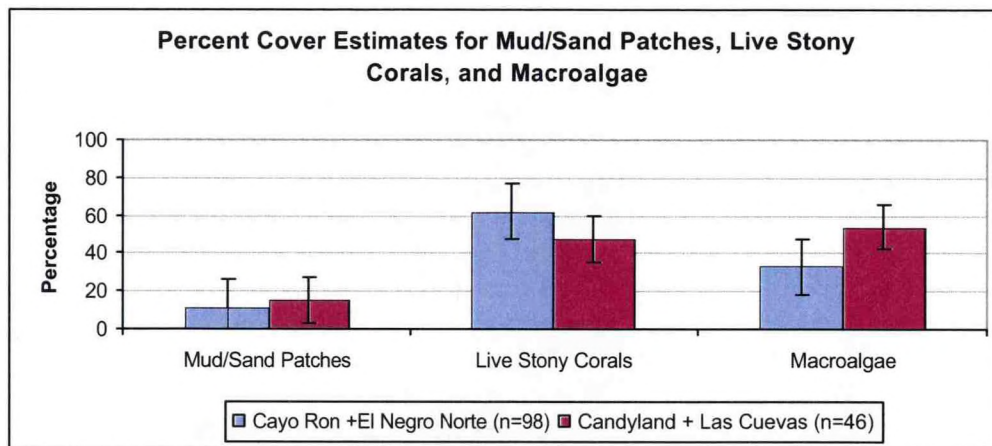
Figure 6: Percent cover estimates (as mean ± standard error) for mud/sand patches, live stony corals, and macroalgae at the mid-shelf reefs (Cayo Ron and El Negro Norte, n = 15) and at the offshore reefs (Candyland and Las Cuevas, n = 7).

20-m² Belt Transects

Halimeda and *Dictyota* were respectively the most abundant, and second most abundant, genera of macroalgae in the mid-shelf reefs. *Dictyota* was the most abundant and *Lobophora* the second most abundant genus at the offshore survey sites. The only human refuse recorded, boat wreckage, fishing line and a sneaker, were found at the offshore survey sites.

Summary

The Ocean Conservancy has successfully trained local volunteer divers who are anxious to expand RECON monitoring to new sites that have been identified off the southwest coast of Puerto Rico. A local environmental organization, Sociedad Ambiente Marino, whose president is also a certified RECON instructor, has officially adopted RECON into its volunteer efforts. Their commitment to train future RECON divers and to conduct surveys, along with the demonstrated interest of key diving operations in the Cabo Rojo area, adds considerable momentum to our on-going efforts to build a database of information for the reefs of Puerto Rico.

The Ocean Conservancy is currently in the process of developing a monitoring plan for the RECON Program that will identify target survey sites for regular assessment throughout the wider Caribbean. Our goal for the southwest coast of Puerto Rico is to organize bimonthly surveys at the two mid-shelf reefs (Cayo Ron and El Negro Norte) and the two offshore reefs (Candyland and Las Cuevas). We realize that conducting surveys at the offshore sites may be cost prohibitive to some divers. Therefore we will target adults with more discretionary income to survey these sites and encourage students and others with modest financial resources to survey the mid-shelf reefs. We are optimistic that with the commitment of local dive operators in the area, we can successfully implement our sampling plan.

REEF Summary Report

DATA

During the workshop, REEF surveys were conducted at 16 sites (Table 2, Figure 1). Eight workshop participants submitted 27 REEF surveys. The REEF AAT and staff conducted 116 surveys and documented 202 fish species. Immediately following the workshop, the REEF AAT and a local REEF member conducted a 3-day survey trip to Mona Island. This remote uninhabited island, located 40 miles off the west coast of Puerto Rico, features dramatic 200 foot cliffs and is home to dozens of endemic terrestrial species. The group camped on the island two nights and conducted 7 dives around the island. A total of 48 fish surveys were conducted and 169 fish species were documented. Data summaries presented in this report are based on both projects.

These are some of the first REEF surveys conducted in these areas. A total of 162 surveys documented 239 species. A summary of the effort and species seen can be found in the attached Survey Report; the report can also be accessed online at http://www.reef.org/cgi-bin/batchrep.pl?region=TWA&file_name=prczm02.dat)

REEF Zone Code	Site Name	REEF Survey Effort
Joyda/Cabo Real		
63030014	Cayo Negro Inside Buoy	1
63030015	Cayo Negro North Buoy	14
63030016	Cayo Negro East Buoy	3
63030017	Rum Cay Center	6
63030018	Nice Site	7
63030019	Engine Trouble	4
63030020	Rum Point	7
63030021	Rum Cay West	8
63030022	The Gardens	7
63030023	Jim's Wall	7
Mona Island		
63060002	Pearl Drop	4
63060003	Diablo's Grotto	7
63060004	Dos Piedras	6
63060005	Pinnacle	5
63060006	Playa Mujeres	6
63060007	Playa Sardinera Campground	7
63060008	DRN Buoy Sardinera	11
Desecheo Island		
63070002	Las Cuevas	17
63070005	Las Cueves 2 (East Caves)	7
63070006	North Ledge	7
63070007	Yellow Reef	7
63070008	Aquarium	2
63070009	Candyland	12

Table 2: REEF AAT and staff survey effort.

The near shore coral reefs along the west coast of Puerto Rico are subjected to multiple stresses, including river runoff, non-point source pollution, and harvesting. In addition to commercial and recreational fisheries, reef fish are moderately harvested by spearfishermen and tropical ornamental fishermen. Large individuals were noticeably absent on most reefs, most likely a result of the spearfishing pressure. The two islands visited during this project, Desecheo and Mona, are both relatively far from shore (14 miles and 40 miles, respectively) and are not as heavily visited. However, fishing pressure was still evident.

On average, surveyors documented 54 species per dive. Las Cueves on Desecheo Island was the most species rich site with 133 species reported there and Engine Trouble (an aptly named site as this was an area that was dove only because the boat broke down there) was the least species rich with 58 species. Unique sightings during the project included pirate blenny (*Emblemaria piratula*), barred clingfish (*Tomicodon fasciatus*), and large schools of school bass (*Schultzea beta*) on Mona Island.

A hierarchical cluster analysis was used to create a visual picture of similarity in assemblages among sites (Figure 6). 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.
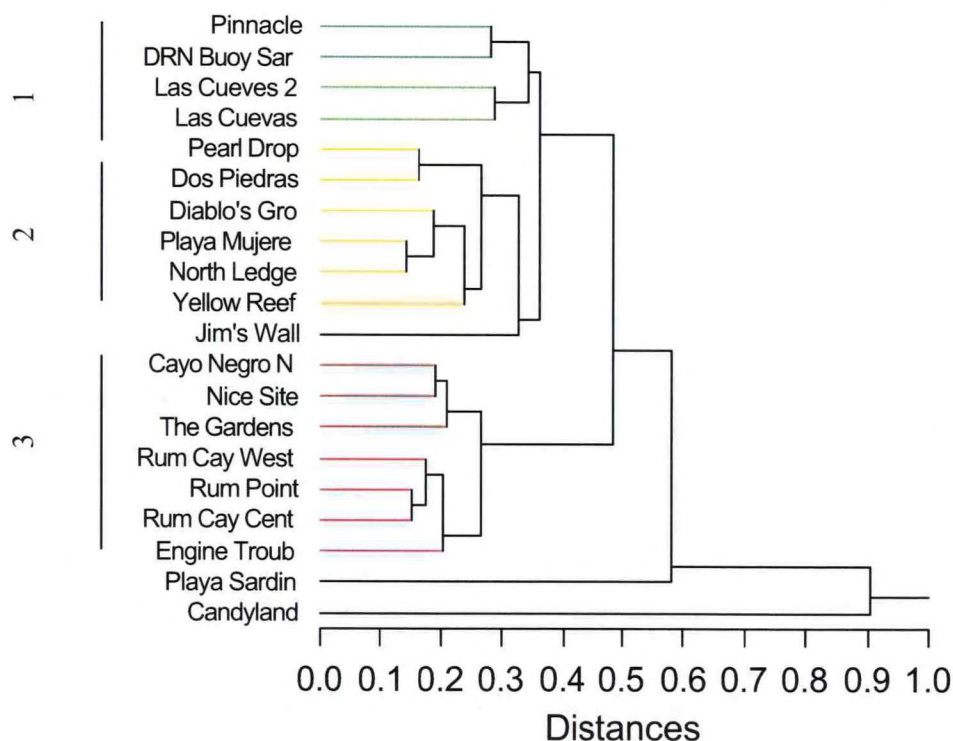
Figure 6: Cluster analysis results. The analysis used REEF's 2002 Advanced Assessment Team data, collected at 20 sites along the west coast of Puerto Rico, Desecheo Island, and Mona Island (sites with more than 3 surveys were included). Analysis used rank of the abundance score. Distance of the clusters are 1-Gamma with average linkage. Only species that were seen with a percent sighting frequency of at least 20% (88 species) were included in the analysis.

The analysis resulted in three primary clusters, and sites tended to cluster primarily by location (near shore versus island sites) with some sites clustering together according to reef type. Cluster 1 included two sites from Mona and two sites from Desecheo. Cluster 2 included most of the sites from Mona and two sites from Desecheo. Cluster 3 contained all of the mid-shelf, near shore sites. These sites are characterized by low relief and shallow depths and they lack the large numbers of pelagic and mid-water planktivore species that are found on the island sites. Another distinct difference between the near shore and offshore sites is the large number of hamlets (Family Haemulidae) near shore compared with their near absence around the islands. Candyland, a site on the south side of Desecheo Island was an outlier, most likely a result of overall lower relative abundance of most fishes at this site compared to other sites around 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 an effort to increase long-term local participation, REEF distributed five sets of its 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 a curriculum developer for the Department of Defense, a pro-active community member who routinely presents educational seminars for school groups in the San Juan area, a local environmental club (Sociedad Ambiente Marino), the University of Puerto Rico at Mayaguez, and Puerto Rico Department of Natural and Environmental Resources.

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 50,000 surveys from the Caribbean region.

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 = 7]
   Rating: ___71%___ Excellent ___29%___ Good _____ Fair _____ Poor _____ N/A
   Comments:
   ?? Humann's book is not the bible.
   ?? Excellent dynamic between students and instructors, making it better for learning.
   ?? Given a little too late at night.
   ?? More than I expected. Wonderfully educational fun.

2. **What would you like to see done differently in future workshops?**
   [# Respondents = 7]
   ?? Screening of dive experience.
   ?? More people taking the workshops.
   ?? Show videos of fish species as training aid – have VHF or CD-ROM videos available so one can take home or receive before workshop to begin practicing. Video is more realistic than slides to help train to identify species.
   ?? I'd like to have a proper translation to Spanish of the RECON "student manual".
   ?? I know that its not the scope and there's little time, but I would have liked to learn more about corals; interesting/useful facts (more).
   ?? Homework assignments to get students to read sections and do quizzes between classes.
   ?? Next time I would like info in advance to study and come more prepared.

3. **How would you rate the training materials?**
   [# Respondents = 1]
   Rating: _____ Excellent ___100%___ Good _____ Fair _____ Poor _____ N/A
   Comments:
   ?? Probably making sheets in other languages, like Spanish, would make it easier for those who don't speak English.
   ?? Shiny paper looks nice but is probably not the most environmentally friendly. Look into printing it on non-shiny or, even better, recycled paper (RECON Manual).

4. **Classroom Training Sessions:**
   [# Respondents = 7]
   Rating: ___71%___ Excellent ___29%___ Good _____ Fair _____ Poor _____ N/A
   Comments:
   ?? None.

5. **Training Dives:**
   [# Respondents = 7]
   Rating: ___57%___ Excellent ___43%___ Good _____ Fair _____ Poor _____ N/A
   Comments:

?? RECON rocks my world!

?? More training dives would be better to gain more comprehension on what we are learning.

?? Perhaps ask the students to pick 5 things they would like identified while under water (as it relates to the RECON survey).

6. Survey Dives (optional):
[# Respondents = 7]
Rating: 86% Excellent   14% Good   Fair   Poor   N/A
Comments:

?? A little rushed for time on first survey dive.

7. Examinations:
[# Respondents = 7]
Rating: 57% Excellent   43% Good   Fair   Poor   N/A
Comments:

?? Very easy.

?? Cruel, but fair.

Additional Comments
[# Respondents = 6]

?? Need to use Oceans Unlimited all the time!

?? It's been a great experience, learning a new perspective for diving.

?? Schedule more time in between dive trips so students can study and digest material being taught. Provide study charts or pictures that can show initial phase of fish species compiled by species, this way, one can associate color patterns with correct species.

?? I'd suggest the translation of all materials to Spanish, use of folk or local terms for species surveyed and more time allowing trainees to memorize the terms. Trainers were very efficient, knowledgeable, and very kind. Thanks for this opportunity!

?? Great program. Are RECON dives organized by The Ocean Conservancy in every country where there is a site at least once a year?

?? Next time on day one – start by learning fish families. I still had them in my head under group (i.e., reef fish book). I would like to continue training available two times per month here in Puerto Rico. Will continue and pass on to my family. Two kids 14 and 11 both Advanced Open Water soon to be master divers. Staff and Oceans Unlimited – excellent.

Appendix 2 – REEF Data Summary

Tropical Western Atlantic Data
Field Survey and Special Project Summaries
REEF Trip Report For:
Puerto Rico CZM AAT Oct 1-9, 2002 (2002-10-01 - 2002-10-09)
Survey Members Participating:

Joyce Schulke	Leda Cunningham	Cathy Coughlin	Jessica Armacost
Brice Semmens	Christy Semmens	Stephen Gittings	Peter Leahy
Dave Grenda	Chris Rilling	Leslie A. Cruz	

		Surveys				Bottom Time
		Expert		Novice		
Code	Site	SA	SO	SA	SO	(H:M)
63030014	Cayo Negro Inside Buoy, Joyuda/Puerto Real	1	0	0	0	0:58
63030015	Cayo Negro North Buoy, Joyuda/Puerto Real	13	0	1	0	13:01
63030016	Cayo Negro East Buoy, Joyuda/Puerto Real	3	0	0	0	2:37
63030017	Rum Cay Center, Rum Cay, Joyuda/Puerto Real	5	0	1	0	5:55
63030018	Nice Site, Joyuda/Puerto Real	6	0	1	0	7:05
63030019	Engine Trouble, Joyuda/Puerto Real	3	0	1	0	3:21
63030020	Rum Point, Rum Cay, Joyuda/Puerto Real	6	0	1	0	6:24
63030021	Rum Cay West, Rum Cay, Joyuda/Puerto Real	7	0	1	0	6:49
63030022	The Gardens, Boqueron	7	0	0	0	6:23
63030023	Jim's Wall, Boqueron	7	0	0	0	3:54
63060002	Pearl Drop	3	0	1	0	3:55
63060003	Diablo's Grotto	6	0	1	0	6:57
63060004	Dos Piedras	5	0	1	0	5:35
63060005	Pinnacle	5	0	0	0	4:46
63060006	Playa Mujeres	5	0	1	0	5:19
63060007	Playa Sardinera Campground	6	0	1	0	7:12
63060008	DRN Buoy Sardinera	9	0	2	0	11:30
63070002	Las Cuevas	15	0	2	0	16:31
63070005	Las Cueves 2 (East Caves)	6	0	1	0	7:43
63070006	North Ledge	6	0	1	0	4:43
63070007	Yellow Reef	6	0	1	0	6:24
63070008	Aquarium	2	0	0	0	1:52

63070009		Candyland/Monkeys Pass/Devils Grotto	11	0	1	0	11:08	
		TOTALS	**143**	**0**	**19**	**0**	**150:02**	
			Total		**Expert**		**Novice**	
Rank	**SP#**	**Common Name**	**SF%**	**DEN**	**SF%**	**DEN**	**SF%**	**DEN**
1	213	Bluehead	100%	3.5	100%	3.6	100%	2.7
2	155	Stoplight Parrotfish	96.9%	2.5	96.5%	2.5	100%	2.3
3	204	Blue Tang	96.2%	2.7	97.2%	2.6	89.4%	3.1
4	031	Foureye Butterflyfish	95%	2.1	95.1%	2.1	94.7%	2.2
5	048	Bicolor Damselfish	94.4%	3.3	94.4%	3.2	94.7%	3.5
6	042	Blue Chromis	91.3%	3.5	91.6%	3.4	89.4%	3.8
7	206	Ocean Surgeonfish	90.7%	2.5	90.9%	2.5	89.4%	2.7
8	220	Yellowhead Wrasse	90.1%	2.8	93.7%	2.9	63.1%	2.5
9	152	Redband Parrotfish	89.5%	2.7	93.7%	2.7	57.8%	2.1
10	201	Longspine Squirrelfish	86.4%	2	86.7%	2	84.2%	2
11	149	Princess Parrotfish	83.3%	2.4	83.9%	2.5	78.9%	2.4
12	043	Brown Chromis	82%	3.4	81.1%	3.4	89.4%	3.8
13	054	Yellowtail Damselfish	81.4%	2.2	81.1%	2.2	84.2%	2.4
14	133	Bar Jack	81.4%	2.1	84.6%	2.1	57.8%	2
15	010	Fairy Basslet	80.8%	3.1	81.1%	3.1	78.9%	3.3
16	079	Bridled Goby	74%	2.4	79.7%	2.4	31.5%	1.8
17	095	Graysby	72.2%	1.7	71.3%	1.7	78.9%	2.2
18	131	Spanish Hogfish	70.9%	2	72%	2	63.1%	2.4
19	214	Clown Wrasse	70.3%	2.2	76.2%	2.2	26.3%	2.4
20	076	Spotted Goatfish	70.3%	1.8	71.3%	1.7	63.1%	2.4
21	215	Creole Wrasse	69.1%	3.2	69.9%	3.2	63.1%	2.9
22	093	Coney	66.6%	2.6	64.3%	2.6	84.2%	2.6
23	198	Blackbar Soldierfish	66.6%	2.3	65.7%	2.3	73.6%	2.1
24	181	Harlequin Bass	66.6%	1.8	67.8%	1.8	57.8%	2.3
25	216	Puddingwife	64.8%	1.8	65.7%	1.8	57.8%	1.9
26	083	Masked Goby/Glass Goby	64.1%	3.5	69.9%	3.5	21%	3
27	081	Goldspot Goby	64.1%	2.2	67.8%	2.2	36.8%	2.5
28	207	Black Durgon	63.5%	3.2	62.9%	3.2	68.4%	3.5
29	019	Saddled Blenny	61.7%	2.2	65%	2.2	36.8%	2.8
30	167	Sharpnose Puffer	61.1%	1.9	60.1%	1.9	68.4%	1.9
31	156	Striped Parrotfish	60.4%	2.8	61.5%	2.9	52.6%	2.5
32	006	Rock Beauty	59.8%	1.9	60.1%	1.9	57.8%	2
33	030	Banded Butterflyfish	59.2%	1.9	56.6%	1.9	78.9%	2.2
34	053	Threespot Damselfish	58%	2.3	57.3%	2.3	63.1%	2.6
35	027	Smooth Trunkfish	56.7%	1.7	56.6%	1.7	57.8%	2
36	077	Yellow Goatfish	54.3%	2.3	55.9%	2.3	42.1%	2.3
37	218	Slippery Dick	53.7%	2.4	54.5%	2.4	47.3%	2.3

38	197	Yellowtail Snapper	50%	1.9	51%	2	42.1%	1.7
39	108	French Grunt	49.3%	2.1	49.6%	2.1	47.3%	2
40	087	Peppermint Goby	48.7%	2.2	54.5%	2.2	5.2%	2
41	200	Longjaw Squirrelfish	48.1%	1.8	50.3%	1.8	31.5%	2
42	238	Sand Tilefish	47.5%	2.1	46.8%	2	52.6%	2.3
43	099	Red Hind	47.5%	1.2	46.8%	1.2	52.6%	1.3
44	337	Secretary Blenny	46.2%	1.7	52.4%	1.7		
45	047	Beaugregory	45.6%	2.2	46.1%	2.1	42.1%	2.5
46	431	Sharknose Goby	45.6%	1.9	49.6%	1.9	15.7%	2.3
47	221	Bermuda Chub/Yellow Chub	45%	2.1	46.1%	2.1	36.8%	2.1
48	196	Schoolmaster	44.4%	1.9	44%	1.9	47.3%	2
49	052	Sergeant Major	43.2%	2.4	45.4%	2.4	26.3%	2.4
50	017	Redlip Blenny	42.5%	2.1	44.7%	2	26.3%	3
51	150	Queen Parrotfish	39.5%	1.9	43.3%	1.9	10.5%	2
52	025	Honeycomb Cowfish	39.5%	1.4	38.4%	1.4	47.3%	1.3
53	050	Dusky Damselfish	38.2%	2.4	40.5%	2.3	21%	2.7
54	036	Belted Cardinalfish	38.2%	2.2	40.5%	2.2	21%	2
55	051	Longfin Damselfish	37.6%	1.8	41.9%	1.8	5.2%	2
56	239	Trumpetfish	37.6%	1.3	36.3%	1.4	47.3%	1.2
57	203	Squirrelfish	37%	1.6	34.9%	1.4	52.6%	2.3
58	072	Whitespotted Filefish	35.8%	1.5	35.6%	1.5	36.8%	1.8
59	154	Redtail Parrotfish	35.8%	1.5	37.7%	1.5	21%	2
60	118	Barred Hamlet	34.5%	1.8	35.6%	1.8	26.3%	1.2
61	185	Tobaccofish	33.9%	1.8	33.5%	1.7	36.8%	1.8
62	080	Colon Goby	33.3%	1.7	37.7%	1.7		
63	205	Doctorfish	32.7%	1.8	34.2%	1.8	21%	2
64	147	Greenblotch Parrotfish	32%	1.6	33.5%	1.7	21%	1.2
65	003	French Angelfish	32%	1.2	32.1%	1.2	31.5%	1.3
66	153	Yellowtail (Redfin) Parrotfish	30.2%	1.8	32.1%	1.8	15.7%	1.3
67	004	Gray Angelfish	30.2%	1.5	31.4%	1.5	21%	1.5
68	020	Sailfin Blenny	29.6%	1.7	31.4%	1.7	15.7%	1.6
69	226	Redspotted Hawkfish	29.6%	1.5	28.6%	1.4	36.8%	1.7
70	180	Creole-fish	28.3%	2.3	30.7%	2.3	10.5%	2
71	121	Butter Hamlet	27.7%	1.4	30%	1.4	10.5%	1
72	211	Sargassum Triggerfish	27.1%	2.3	27.9%	2.3	21%	2.2
73	194	Mahogany Snapper	27.1%	2.2	27.9%	2.1	21%	2.5
74	088	Shortstripe Goby	26.5%	2.1	30%	2.1		
75	049	Cocoa Damselfish	25.9%	1.8	25.1%	1.7	31.5%	2.1
76	086	Pallid Goby	24.6%	1.5	27.9%	1.5		
77	234	Greater Soapfish	24.6%	1.4	22.3%	1.4	42.1%	1.3
78	069	Orangespotted Filefish	24%	1.2	24.4%	1.1	21%	1.5

79	128	Yellowtail Hamlet	23.4%	1.6	25.1%	1.6	10.5%	1.5
80	106	Caesar Grunt	22.8%	2.5	20.9%	2.6	36.8%	2.2
81	199	Dusky Squirrelfish	22.8%	1.6	25.8%	1.6		
82	007	Great Barracuda	22.8%	1.3	23%	1.3	21%	1
83	228	Yellowhead Jawfish	21.6%	2.1	22.3%	2	15.7%	2.3
84	005	Queen Angelfish	21.6%	1.2	20.9%	1.2	26.3%	1.2
85	039	Flamefish	20.9%	2	22.3%	1.9	10.5%	2.5
86	041	Whitestar Cardinalfish	19.7%	2.2	22.3%	2.2		
87	336	Roughhead Blenny	19.7%	1.5	22.3%	1.5		
88	059	Spotted Drum	19.7%	1.2	20.2%	1.2	15.7%	1.3
89	209	Ocean Triggerfish	19.1%	1.7	20.2%	1.6	10.5%	2
90	028	Spotted Trunkfish	19.1%	1.3	20.9%	1.4	5.2%	1
91	210	Queen Triggerfish	17.9%	1.6	18.1%	1.7	15.7%	1.3
92	338	Spinyhead Blenny	17.9%	1.5	20.2%	1.5		
93	145	Bluelip Parrotfish	17.2%	1.6	18.8%	1.7	5.2%	1
94	230	Sand Diver	17.2%	1.2	18.1%	1.2	10.5%	1
95	032	Longsnout Butterflyfish	16%	1.4	15.3%	1.4	21%	1.5
96	453	Black Jack	15.4%	1.8	16%	1.7	10.5%	2
97	116	Tomtate	14.1%	1.7	14.6%	1.8	10.5%	1
98	603	Tusked Goby	14.1%	1.6	16%	1.6		
99	183	Peppermint Basslet	14.1%	1.1	15.3%	1.1	5.2%	1
100	062	Goldentail Moray	14.1%	1	13.2%	1	21%	1.2
101	427	Orangespotted Goby	13.5%	2.3	15.3%	2.3		
102	166	Porcupinefish	13.5%	1.1	14.6%	1.1	5.2%	1
103	457	Mackerel Scad	12.9%	3.2	13.9%	3.3	5.2%	2
104	173	Green Razorfish	12.9%	2	13.2%	2	10.5%	2.5
105	012	Glasseye Snapper	12.9%	1.5	12.5%	1.5	15.7%	2
106	182	Lantern Bass	12.9%	1.4	12.5%	1.3	15.7%	2
107	429	Rusty Goby	12.3%	1.4	13.9%	1.4		
108	035	Barred Cardinalfish	11.7%	1.6	13.2%	1.6		
109	038	Dusky Cardinalfish	11.1%	2	12.5%	2		
110	082	Hovering Goby	11.1%	1.8	11.8%	1.7	5.2%	3
111	126	Tan Hamlet	10.4%	1.4	11.8%	1.4		
112	236	Glassy Sweeper	9.8%	2.6	10.4%	2.7	5.2%	2
113	326	Goldline Blenny	9.8%	2.3	11.1%	2.3		
114	418	Broadstripe Goby	9.8%	1.6	11.1%	1.6		
115	111	Porkfish	9.8%	1.3	10.4%	1.3	5.2%	1
116	066	Spotted Moray	9.8%	1	9%	1	15.7%	1.3
117	105	Bluestriped Grunt	9.2%	1.8	9.7%	1.8	5.2%	2

118	129	Hybrid Hamlet	9.2%	1.2	10.4%	1.2		
119	023	Boga	8.6%	2.8	9.7%	2.8		
120	179	Chalk Bass	8.6%	1.5	9%	1.5	5.2%	2
121	142	Cero	8.6%	1.1	9.7%	1.1		
122	146	Bucktooth Parrotfish	8%	1.8	6.9%	1.8	15.7%	2
123	332	Pirate Blenny	8%	1.3	7.6%	1.3	10.5%	1.5
124	113	Smallmouth Grunt	7.4%	2.7	8.3%	2.7		
125	539	School Bass	7.4%	2.3	8.3%	2.3		
126	419	Cleaning Goby	7.4%	1.8	8.3%	1.8		
127	193	Lane Snapper	7.4%	1.5	6.9%	1.4	10.5%	2
128	341	Yellowface Pikeblenny	7.4%	1.3	7.6%	1.3	5.2%	1
129	170	Southern Stingray	7.4%	1.1	8.3%	1.1		
130	212	Blackear Wrasse	6.7%	1.8	7.6%	1.8		
131	345	Redeye Triplefin	6.7%	1.6	7.6%	1.6		
132	235	Atlantic Spadefish	6.7%	1.6	7.6%	1.6		
133	117	White Grunt	6.7%	1.3	7.6%	1.3		
134	119	Black Hamlet	6.7%	1.1	7.6%	1.1		
135	123	Indigo Hamlet	6.7%	1.1	6.9%	1.2	5.2%	1
136	622	Triplefin species	6.7%	1	7.6%	1		
137	137	Horse-Eye Jack	6.1%	2.5	6.9%	2.5		
138	018	Rosy Blenny	6.1%	1.8	5.5%	1.7	10.5%	2
139	070	Scrawled Filefish	6.1%	1.2	6.2%	1.2	5.2%	1
140	469	Bluestriped Lizardfish	6.1%	1	6.9%	1		
141	075	Peacock Flounder	6.1%	1	6.9%	1		
142	033	Reef Butterflyfish	5.5%	1.8	6.2%	1.8		
143	526	Medusa Blenny	5.5%	1.8	6.2%	1.8		
144	034	Spotfin Butterflyfish	5.5%	1.8	6.2%	1.8		
145	172	Yellow Stingray	5.5%	1.2	3.4%	1	21%	1.5
146	568	Cardinal Soldierfish	5.5%	1	6.2%	1		
147	357	Oddscale Cardinalfish	4.9%	1.6	5.5%	1.6		
148	109	Black Margate	4.9%	1.2	5.5%	1.2		
149	319	Darkheaded Blenny	4.9%	1.2	5.5%	1.2		
150	343	Lofty Triplefin	4.9%	1.2	5.5%	1.2		
151	045	Sunshinefish	4.3%	2.7	4.8%	2.7		
152	313	Pearl Blenny	4.3%	1.4	4.8%	1.4		
153	223	Lancer Dragonet	4.3%	1.1	4.1%	1.1	5.2%	1
154	195	Mutton Snapper	4.3%	1.1	4.1%	1	5.2%	2

155	097	Nassau Grouper	4.3%	1	4.8%	1		
156	178	Spotted Scorpionfish	4.3%	1	4.8%	1		
157	217	Rainbow Wrasse	3.7%	2	4.1%	2		
158	372	Night Sergeant	3.7%	2	4.1%	2		
159	140	Rainbow Runner	3.7%	2	3.4%	2	5.2%	2
160	324	Dusky Blenny	3.7%	1.6	4.1%	1.6		
161	134	Blue Runner	3.7%	1.6	3.4%	1.6	5.2%	2
162	014	Diamond Blenny	3.7%	1.3	4.1%	1.3		
163	229	Yellowfin Mojarra	3.7%	1.1	4.1%	1.1		
164	219	Yellowcheek Wrasse	3.7%	1.1	2.7%	1	10.5%	1.5
165	227	Houndfish	3%	3.2	3.4%	3.2		
166	202	Reef Squirrelfish	3%	1.6	2%	1.3	10.5%	2
167	112	Sailors Choice	3%	1.6	3.4%	1.6		
168	225	Flying Gurnard	3%	1.4	3.4%	1.4		
169	365	Red Clingfish	3%	1.4	3.4%	1.4		
170	361	Sponge Cardinalfish	3%	1.2	3.4%	1.2		
171	168	Web Burrfish	3%	1	3.4%	1		
172	026	Scrawled Cowfish	3%	1	2.7%	1	5.2%	1
173	060	Brown Garden Eel	2.4%	3.5	2.7%	3.5		
174	189	Blackfin Snapper	2.4%	1.7	2%	2	5.2%	1
175	139	Permit	2.4%	1.2	2.7%	1.2		
176	114	Spanish Grunt	2.4%	1.2	2%	1.3	5.2%	1
177	164	Bandtail Puffer	2.4%	1.2	2%	1.3	5.2%	1
178	163	Balloonfish	2.4%	1	2.7%	1		
179	231	Sharksucker	2.4%	1	2.7%	1		
180	125	Shy Hamlet	2.4%	1	2.7%	1		
181	533	Cave Bass	2.4%	1	2.7%	1		
182	461	Round Scad	1.8%	3	2%	3		
183	157	Jolthead Porgy	1.8%	2	2%	2		
184	421	Dash Goby	1.8%	1.6	2%	1.6		
185	477	Mottled Mojarra	1.8%	1.6	2%	1.6		
186	175	Rosy Razorfish	1.8%	1.3	2%	1.3		
187	184	Sand Perch	1.8%	1.3	2%	1.3		
188	103	Yellowfin Grouper	1.8%	1	2%	1		
189	102	Tiger Grouper	1.8%	1	2%	1		
190	495	Shortfin Pipefish	1.8%	1	2%	1		
191	104	Yellowmouth Grouper	1.8%	1	2%	1		

192	518	Starksia Blenny (unidentified)	1.8%	1	2%	1		
193	492	Longsnout Seahorse	1.8%	1	2%	1		
194	071	Slender Filefish	1.8%	1	1.3%	1	5.2%	1
195	424	Greenbanded Goby	1.8%	1	2%	1		
196	222	Bluespotted Cornetfish	1.8%	1	1.3%	1	5.2%	1
197	107	Cottonwick	1.8%	1	2%	1		
198	056	Highhat	1.8%	1	2%	1		
199	187	Nurse Shark	1.8%	1	2%	1		
200	323	Downy Blenny	1.8%	1	2%	1		
201	573	Shortfin Sweeper	1.2%	3.5	1.3%	3.5		
202	232	Silversides, Herrings, Anchovies	1.2%	2.5	1.3%	2.5		
203	085	Orangesided Goby	1.2%	2.5	1.3%	2.5		
204	208	Gray Triggerfish	1.2%	2	1.3%	2		
205	191	Dog Snapper	1.2%	1.5	1.3%	1.5		
206	304	Threeline Basslet	1.2%	1.5	1.3%	1.5		
207	425	Leopard Goby	1.2%	1.5	1.3%	1.5		
208	159	Pluma	1.2%	1.5	1.3%	1.5		
209	040	Twospot Cardinalfish	1.2%	1.5	1.3%	1.5		
210	661	Green Sea Turtle	1.2%	1	1.3%	1		
211	596	Spotfin Goby	1.2%	1	1.3%	1		
212	160	Saucereye Porgy	1.2%	1	1.3%	1		
213	656	Hawksbill Sea Turtle	1.2%	1	1.3%	1		
214	067	Viper Moray	1.2%	1	1.3%	1		
215	127	Yellowbelly Hamlet	1.2%	1	1.3%	1		
216	474	Wahoo	1.2%	1	1.3%	1		
217	078	Blue Goby	0.6%	3	0.6%	3		
218	358	Pale Cardinalfish	0.6%	2	0.6%	2		
219	305	Yellowcheek Basslet	0.6%	2	0.6%	2		
220	476	Flagfin Mojarra	0.6%	2	0.6%	2		
221	445	Corocoro Grunt	0.6%	2	0.6%	2		
222	188	Reef Shark	0.6%	1	0.6%	1		
223	022	Spotcheek Blenny	0.6%	1	0.6%	1		
224	015	Hairy Blenny	0.6%	1	0.6%	1		
225	091	Black Grouper	0.6%	1	0.6%	1		
226	485	Keeltail Needlefish	0.6%	1	0.6%	1		
227	333	Puffcheek Blenny	0.6%	1	0.6%	1		

228	061	Chain Moray	0.6%	1	0.6%	1		
229	346	Roughhead Triplefin	0.6%	1	0.6%	1		
230	063	Green Moray	0.6%	1	0.6%	1		
231	130	Hogfish	0.6%	1	0.6%	1		
232	171	Spotted Eagle Ray	0.6%	1	0.6%	1		
233	362	Barred Clingfish	0.6%	1	0.6%	1		
234	669	Spikefin Blenny	0.6%	1	0.6%	1		
235	009	Blackcap Basslet	0.6%	1	0.6%	1		
236	090	Yellowline Goby	0.6%	1	0.6%	1		
237	396	Channel Flounder	0.6%	1	0.6%	1		
238	360	Sawcheek Cardinalfish	0.6%	1	0.6%	1		
239	613	Semiscaled Goby	0.6%	1	0.6%	1		
		Total Species	**239**		**239**		**122**	

Contact REEF

Appendix 2 - RECON Site Descriptions

CONTENTS-
Candyland
Cayo Ron
El Negro Norte
Las Cueves

RECON Survey Site Description

Reef Condition Monitoring Program

recon 🐟

The Ocean Conservancy

Name:_Judith Lang/Ron Moss_____ RECON ID #:_RI-WC-01-00002_____

Dive Site Name(s):_Candyland_____ Date: Month _OCT__ Day _04____ Year _2002_

Geographic Location:_Desecheo Island, Puerto Rico (SW side of island)_____

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

Survey Depth Range:____40____–__50___ ☐ m ■ ft   Check all that apply: ■ Boat Dive ☐ Shore Dive

Latitude: _1_ _8_ °_2_ _2_._7_ _7_ ___N   Longitude: _6_ _7_ °_2_ _9_._0_ _1_ ___W   GPS? ■ yes ☐ no

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

_A11 Imray-Iolaire W. Coast of Puerto Rico Bahia de Guanica to Punta Boringuen_____

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.

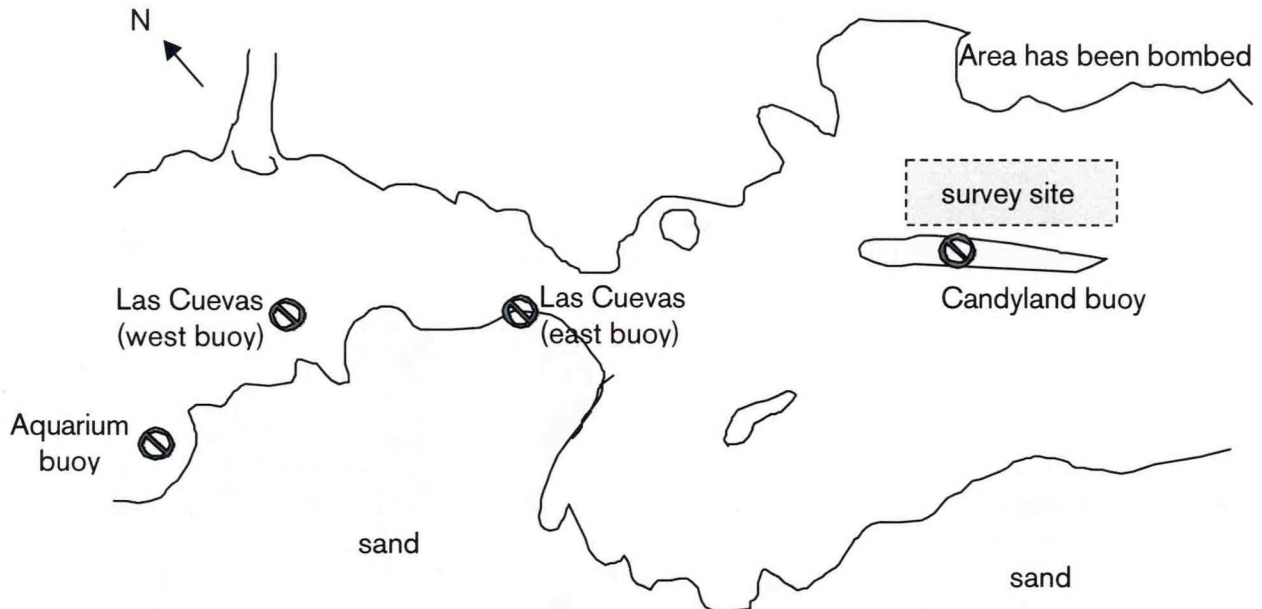|	A.				B.	C.
	Rare	Uncommon	Farily Common	Very Common	1st Choice for RECON Surveys	2nd Choice for RECON Surveys
lobed star (*Montastraea annularis* = *M. annularis* f. *annularis*)		X			■	
mountainous star (*Montastraea faveolata* = *M. annularis* f. *faveolata*)			X		X	
boulder star (*Montastraea franksi*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

Comments/Other Observations:

Directions to the survey site (include depth):

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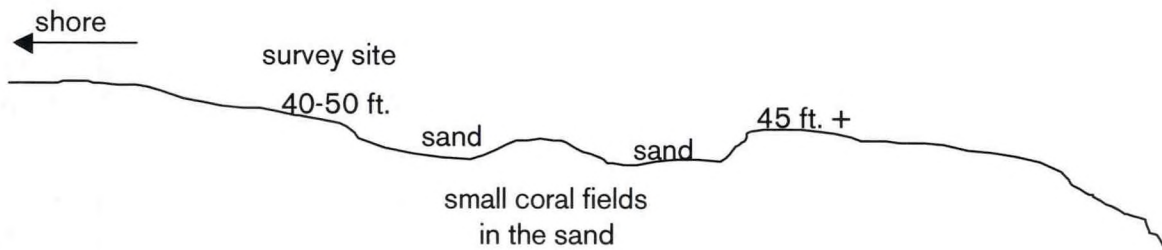
Plan view (horizontal). Refer to an aerial photo if you have one. Include approximate scale and depth intervals; notable features; locations of any spurs, pinnacles, bommies or patches; sand grooves or channels; mooring buoy(s) if any; dominant wind direction; dominant current direction(s) and strength(s);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

Plan view (horizontal): Candyland

N

Area has been bombed

survey site

Candyland buoy

Las Cuevas
(west buoy)

Las Cuevas
(east buoy)

Aquarium
buoy

sand

sand

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

Profile view (vertical): Candyland

shore

survey site
40-50 ft.

sand

sand

45 ft. +

small coral fields
in the sand

RECON Survey Site Description

Reef Condition Monitoring Program

recon
The Ocean Conservancy

Name:_Judith Lang_____ RECON ID #:_RI-WC-01-00002____

Dive Site Name(s):_Cayo Ron (Rum Cay)_____ Date: Month _OCT_ Day _04____ Year _2002_

Geographic Location:_Cabo Rojo, Puerto Rico (Tourmaline Reef Natural Reserve)_____

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

Survey Depth Range:____20____–__30___ ☐ m ■ ft   Check all that apply: ■ Boat Dive ☐ Shore Dive

Latitude: _1_ _8_^{0} _0_ _6_._2_ _4_ _6_N   Longitude: _6_ _7_^{0} _1_ _7_._1_ _7_ _4_W   GPS?■ yes ☐ no

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

_A11 Imray-Iolaire W. Coast of Puerto Rico Bahia de Guanica to Punta Boringuen_____

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 (<30^0) ☐ slope (~30–60^0) ☐ wall (>60^0)

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

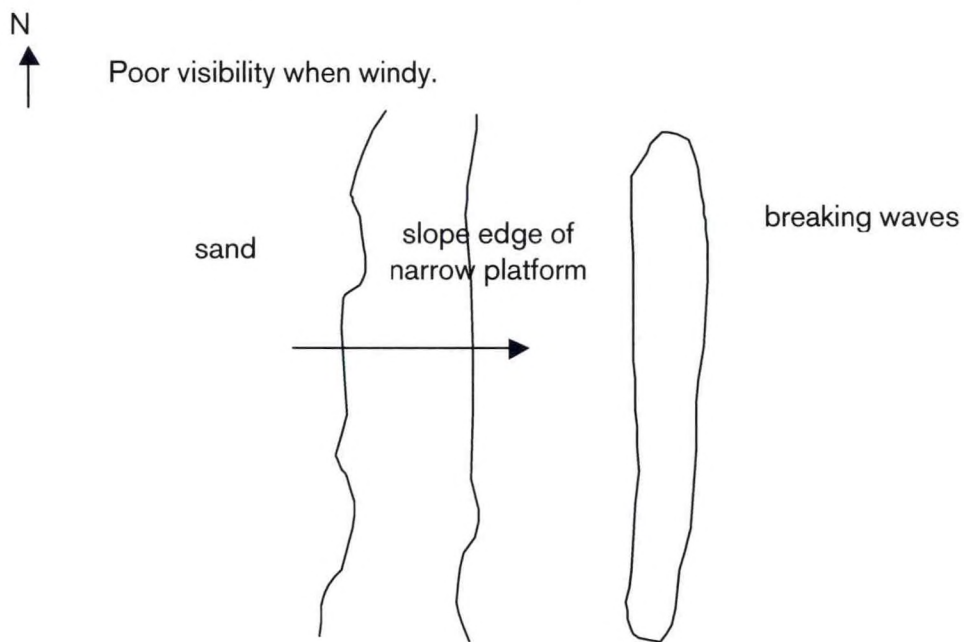| A. Check the relative abundance (as rare, uncommon, fairly common, very common) for each of the following stony and fire corals, if present at the survey site. Leave blank if absent. B. Select the kind of stony coral that will be easiest to survey as the 1st choice. C. If more than one kind of stony coral is suitable for survey, select the second easiest as the 2nd choice.	A. Rare	A. Uncommon	A. Farily Common	A. Very Common	B. 1st Choice for RECON Surveys	C. 2nd Choice for RECON Surveys
lobed star (*Montastraea annularis = M. annularis f. annularis*)		X			■	■
mountainous star (*Montastraea faveolata = M. annularis* f. *faveolata*)			X		X	
boulder star (*Montastraea franksi = M. annularis* f. *franksi*)		X			■	■
great star (*Montastraea cavernosa*)		X				
elkhorn (*Acropora palmata*)					■	■
staghorn (*Acropora cervicornis*)	X				■	■
brains (e.g., *Colpophyllia natans, Diploria strigosa, Diploria labyrinthiformis*)			X			X
mustard hill (*Porites astreoides*)			X			
massive starlet (*Siderastrea siderea*)		X			■	■
blade fire (*Millepora complanata*)		X			■	■

Comments/Other Observations:

Directions to the survey site (include depth):

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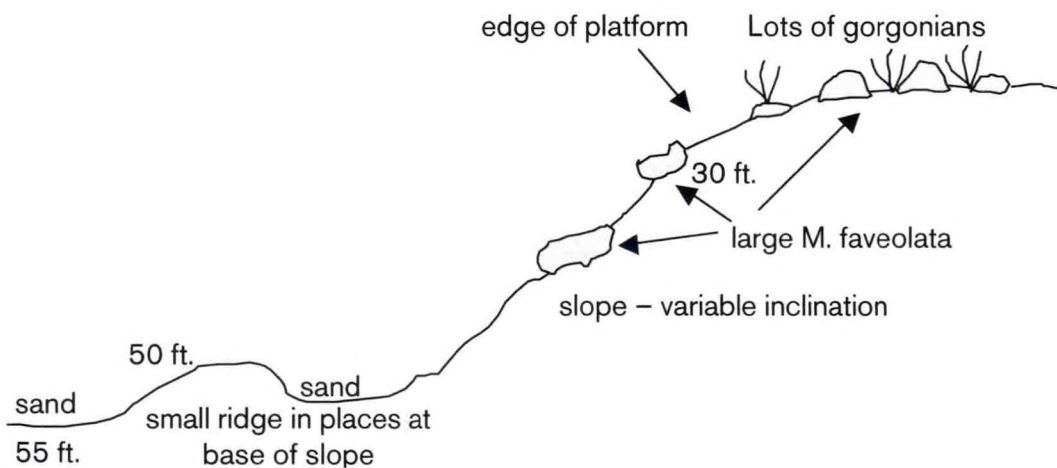
Plan view (horizontal). Refer to an aerial photo if you have one. Include approximate scale and depth intervals; notable features; locations of any spurs, pinnacles, bommies or patches; sand grooves or channels; mooring buoy(s) if any; dominant wind direction; dominant current direction(s) and strength(s);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

Plan view (horizontal): Cayo Ron

N

Poor visibility when windy.

sand

slope edge of narrow platform

breaking waves

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

Profile view (vertical): Cayo Ron

edge of platform   Lots of gorgonians

30 ft.

large M. faveolata

slope – variable inclination

50 ft.

sand   sand

small ridge in places at base of slope

55 ft.

RECON Survey Site Description

Reef Condition Monitoring Program

recon 🐟🪸

The Ocean Conservancy

Name:_Judith Lang_____ RECON ID #:_RI-WC-01-00002_____

Dive Site Name(s):_El Negro Norte_____ Date: Month _OCT__ Day _03____ Year _2002_

Geographic Location:_Cabo Rojo, Puerto Rico (on Escollo Negro off Bahia Branadero)_____

Mooring Buoy: ■ yes ☐ no   Mooring Buoy (name/#) - if applicable:_western most of 3 unmarked buoys_____

Survey Depth Range:____15____–___25___ ☐ m ■ ft   Check all that apply: ■ Boat Dive   ☐ Shore Dive

Latitude: _1_ _8_ ° _0_ _9_._2_ _2_ ___N   Longitude: _6_ _7_ ° _1_ _4_._6_ _2_ ___W   GPS? ■ yes ☐ no

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

_A11 Imray-Iolaire W. Coast of Puerto Rico Bahia de Guanica to Punta Boringuen_____

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)_mid-shelf_____

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

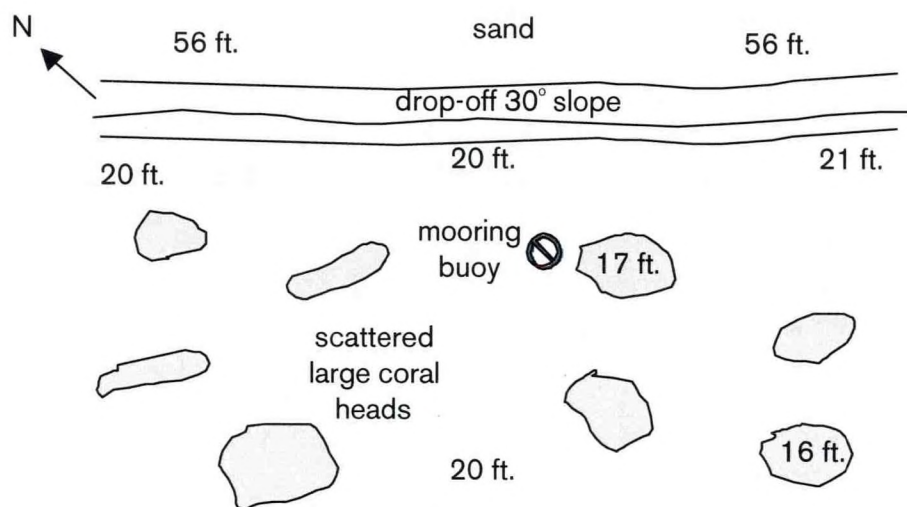| A. Check the relative abundance (as rare, uncommon, fairly common, very common) for each of the following stony and fire corals, if present at the survey site. Leave blank if absent. B. Select the kind of stony coral that will be easiest to survey as the 1st choice. C. If more than one kind of stony coral is suitable for survey, select the second easiest as the 2nd choice.	Rare	Uncommon	Farily Common	Very Common	1st Choice for RECON Surveys	2nd Choice for RECON Surveys
lobed star (*Montastraea annularis* = *M. annularis* f. *annularis*)				X	■	
mountainous star (*Montastraea faveolata* = *M. annularis* f. *faveolata*)			X		X	
boulder star (*Montastraea franksi* = *M. annularis* f. *franksi*)	X				■	■
great star (*Montastraea cavernosa*)		X				
elkhorn (*Acropora palmata*)					■	■
staghorn (*Acropora cervicornis*)					■	■
brains (e.g., *Colpophyllia natans, Diploria strigosa, Diploria labyrinthiformis*)		X				X
mustard hill (*Porites astreoides*)			X			
massive starlet (*Siderastrea siderea*)		X			■	■
blade fire (*Millepora complanata*)		X			■	■

Comments/Other Observations:

Directions to the survey site (include depth):

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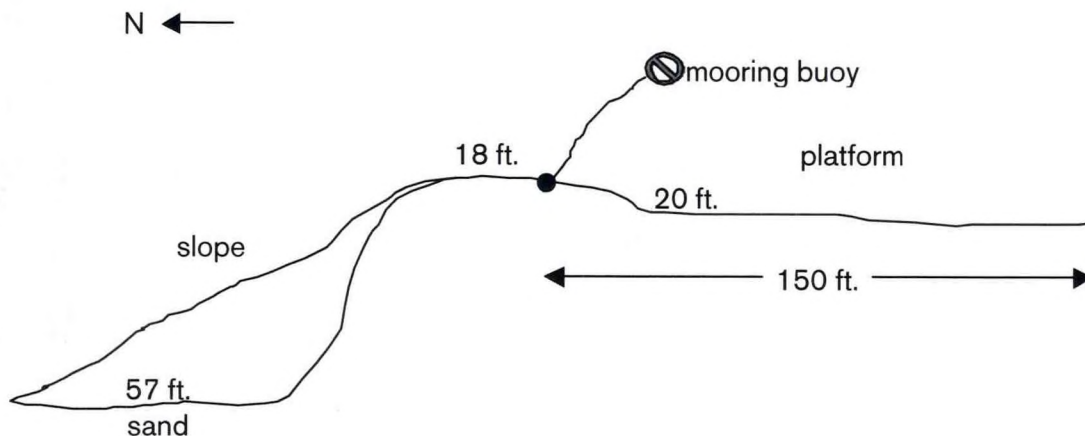
Plan view (horizontal). Refer to an aerial photo if you have one. Include approximate scale and depth intervals; notable features; locations of any spurs, pinnacles, bommies or patches; sand grooves or channels; mooring buoy(s) if any; dominant wind direction; dominant current direction(s) and strength(s);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

Plan view (horizontal): El Negro Norte

N

56 ft.   sand   56 ft.

drop-off 30° slope

20 ft.   20 ft.   21 ft.

mooring buoy   17 ft.

scattered large coral heads

20 ft.   16 ft.

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

Profile view (vertical): El Negro Norte

N

mooring buoy

18 ft.   platform

20 ft.

slope

150 ft.

57 ft.
sand

RECON Survey Site Description

Reef Condition Monitoring Program
recon
The Ocean Conservancy

Name:_Judith Lang/Ron Moss_____   RECON ID #:_RI-WC-01-00002_____

Dive Site Name(s):_Las Cuevas (The Caves)_____ Date: Month _OCT__ Day _04____ Year _2002_

Geographic Location:_Desecheo Island, Puerto Rico (SW side of island)_____

Mooring Buoy: ■ yes ☐ no   Mooring Buoy (name/#) - if applicable:_ 2 most eastern buoys (out of three buoys)_____

Survey Depth Range:____35____ – __45___ ☐ m ■ ft   Check all that apply: ■ Boat Dive   ☐ Shore Dive

Latitude: _1_ _8_° _2_ _2_._9_ _2_ ___N   Longitude: _6_ _7_° _1_ _8_._1_ _8_ ___W   GPS? ■ yes ☐ no

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

_A11 Imray-Iolaire W. Coast of Puerto Rico Bahia de Guanica to Punta Boringuen_____

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

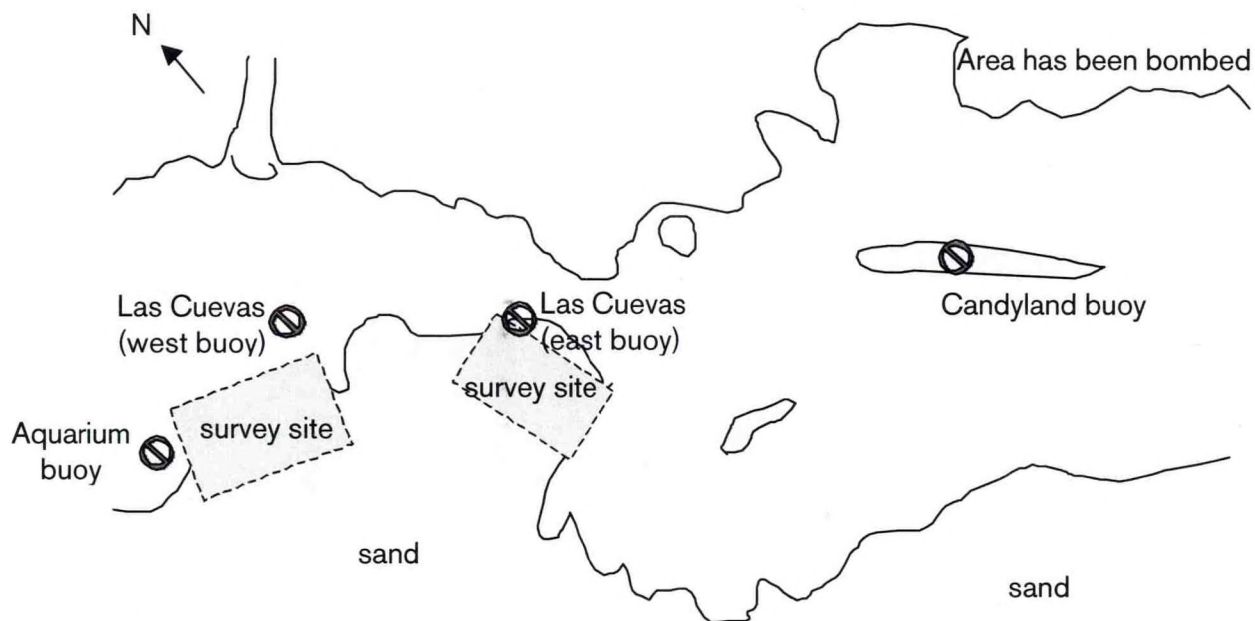| A. Check the relative abundance (as rare, uncommon, fairly common, very common) for each of the following stony and fire corals, if present at the survey site. Leave blank if absent. B. Select the kind of stony coral that will be easiest to survey as the 1st choice. C. If more than one kind of stony coral is suitable for survey, select the second easiest as the 2nd choice.	Rare	Uncommon	Farily Common	Very Common	B. 1st Choice for RECON Surveys	C. 2nd Choice for RECON Surveys
lobed star (*Montastraea annularis* = *M. annularis* f. *annularis*)			X		■	
mountainous star (*Montastraea faveolata* = *M. annularis* f. *faveolata*)			X		X	
boulder star (*Montastraea franksi* = *M. annularis* f. *franksi*)		X			■	
great star (*Montastraea cavernosa*)		X				
elkhorn (*Acropora palmata*)					■	
staghorn (*Acropora cervicornis*)	X				■	
brains (e.g., *Colpophyllia natans*, *Diploria strigosa*, *Diploria labyrinthiformis*)			X			X
mustard hill (*Porites astreoides*)			X			
massive starlet (*Siderastrea siderea*)		X			■	
blade fire (*Millepora complanata*)		X			■	

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): Las Cuevas

N

Area has been bombed

Las Cuevas (west buoy)

Las Cuevas (east buoy)

Candyland buoy

survey site

Aquarium buoy

survey site

sand

sand

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

Profile view (vertical): Las Cuevas

shore

survey site

sand

35 ft.

coral fields

45 ft.