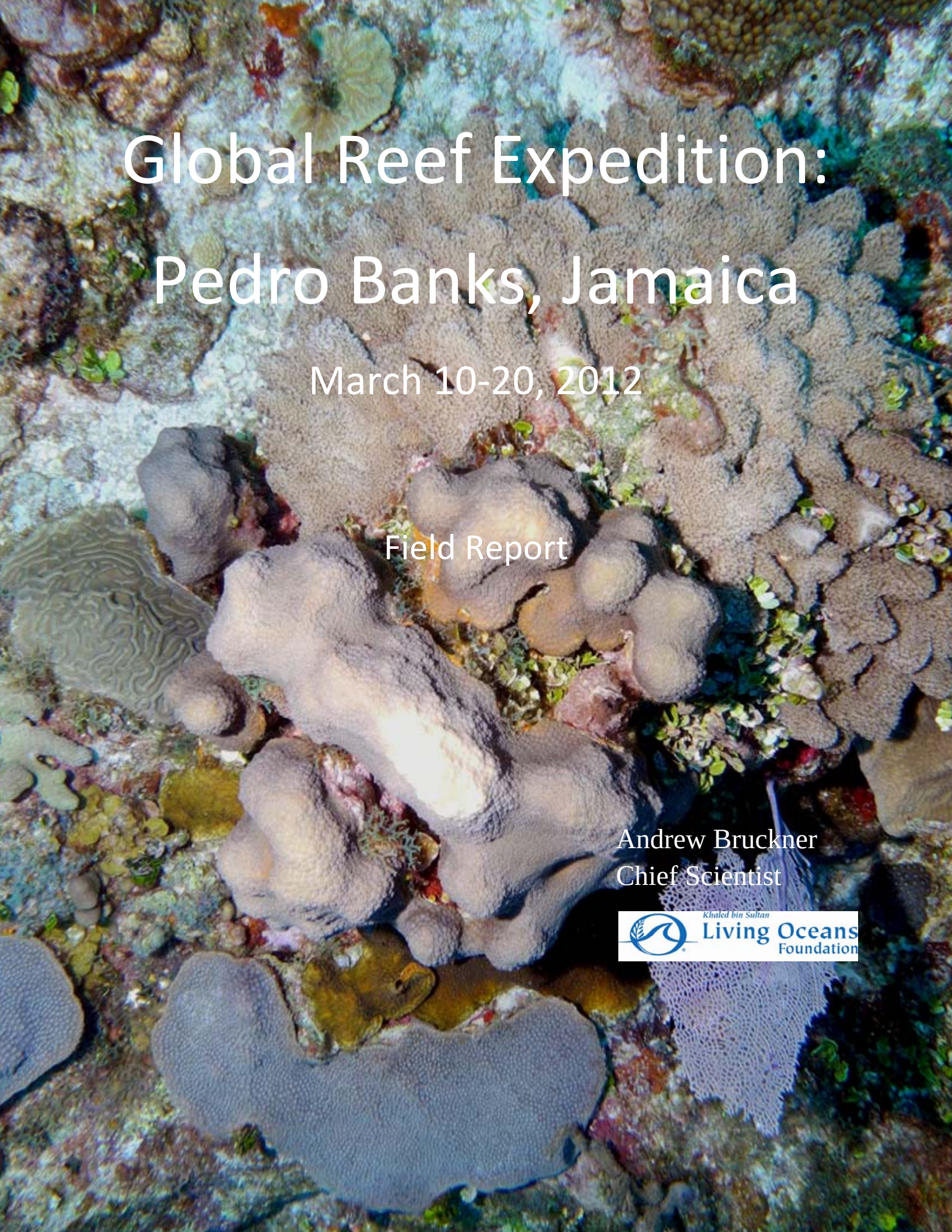

Global Reef Expedition: Pedro Banks, Jamaica

March 10-20, 2012

Field Report

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Front cover: Massive and branching corals at the shelf edge in Pedro Bank, Jamaica, within the proposed fishery reserve. 18 m depth. Photo by Andrew Bruckner.

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All research was performed under a permit obtained from the National Environment and Planning Agency (NEPA) (ref #18/27, 8 December, 2011). No animals or plants were collected during the research project. No animals were killed or injured during the execution of the project, and no injured or dead marine mammals or turtles were observed. No oil spills occurred from the M/Y Golden Shadow or any of the support vessels, and oil slicks were not observed. The Golden Shadow used a single anchorage during the mission located behind Southwest Cay. The Golden Shadow provided potable water to the fishers living on Middle Cay.

The information in this Field Report summarizes the operations conducted during the Pedro Bank research mission. Information presented in the report summarizes the activities conducted during the mission and general trends and observations. Data sets have not been analyzed or finalized as of the writing of this report. The Living Oceans Foundation cannot accept any legal responsibility or liability for any errors.

June 1, 2012.

Citation: Bruckner, A. (2012) Global Reef Expedition: Pedro Bank, Jamaica. Field Report. March 10-20, 2012. Khaled bin Sultan Living Oceans Foundation, Landover MD. pp. 28.

Executive Summary

The Khaled bin Sultan Living Oceans Foundation (KSLOF), in partnership with The Nature Conservancy, conducted a research mission to Pedro Bank, Jamaica between March 10-20, 2012. The expedition to Pedro Bank launched the second year of the Foundation's multi-year coral reef research program, the Global Reef Expedition. The research team included scientists from KSLOF, The Nature Conservancy, The National Environment and Planning Agency of Jamaica (NEPA), Fisheries Division and Veterinary Services Division of the Ministry of Agriculture & Fisheries; the University of the West Indies, NOVA Southeastern University's National Coral Reef Institute (NCRI), the Florida Aquarium and the Atlantic and Gulf Rapid Reef Assessment Program. The main objectives of the research were to : 1) characterize coral reef community structure and health; 2) characterize lobster populations throughout reef environments; 3) begin to develop habitat maps and bathymetry within a proposed fish sanctuary at the southern edge of the bank; 4) obtain plankton samples to characterize the distribution, diversity and size of larval fish, conch and lobster populations; 5) conduct habitat surveys and collect oceanographic information on currents, temperature and circulation; 6) collect observational data on sea turtles, seabirds, sharks, marine mammals, and unusual floating aggregations of Sargassum seaweed.

The research team assessed the coral reef community structure at 20 sites. At each site at least one 10 m X 1 m phototransect was taken. A subset of reef fish (approx. 70 species) were quantified (abundance and biomass) within 187 belt transects (each 30 m X 2 m). Additional roving surveys were undertaken to characterize reef fish diversity using REEF methodology. The size and condition of approximately 3000 corals was assessed within 74 belt transects (each 10 m X 1 m). Benthic assessments using a point count method were conducted on 158 transects (each 10 m in length; 100 points). Motile invertebrates (lobster, conch, crabs, sea cucumbers and sea urchins) were assessed in each location within circular plots (each 314 m^2 area). The team completed 252 dives and a total bottom time of 202 hours.

Additional data collected included 1) CTD deployments at each coral survey site; salinity and temperature profiles were obtained from the surface to the bottom; 2) continuous temperature recordings at the anchorage of the Golden Shadow off southeast Cay; 3) current data, along with temperature, oxygen and turbidity using a Recording Doppler Current Profiler (RDCP) deployed at 20 m depth in Site 3; 4) side scan sonar data of each habitat class located near the fishery reserve; and 5) ichthyoplankton, phytoplankton and epiphytic algae samples. Other components of the project included two fishermen's workshops (Middle Cay, Pedro Bank and Port Antonio), an educational workshop for school children (Port Antonio), fishery assessments on Pedro Bank and on the north coast of Jamaica (St. Ann's Bay), and coral assessments on the north coast (Discovery Bay, St. Ann's Bay and Port Antonio). Professional videography of the reefs and fishing activities was also undertaken.

Reef environments were generally in good condition. Stony corals exhibited low levels of partial mortality and little recent mortality, few diseases, and substrates had moderate to low cover of macroalgae. Coral communities were dominated by a relatively small number of species., with a maximum of 21 species identified in a single location. In shallow the *Acropora palmata* framework, most older colonies had died and many were still in growth position. A substantial number of small colonies were seen off southwest cay and in shallow habitats near C and D shoal. One extensive *A. palmata* reef near Blower's Rock experienced near total mortality, but recovery had occurred at the base of the reef, where a large (30 m long) patch of live corals occurred. *Acropora cervicornis* was rare; a few shelf edge reefs had isolated colonies. One large stand was identified seaward of Southwest Cay. Corals had colonized an entire ridge and fragments had been dispersed to surrounding spurs in shallower water. Unlike mainland reefs, *Montastraea annularis* and *M. faveolata* populations were abundant on fore reef sites and included many 2-3 m colonies.

On most reefs, few corals showed signs of recent mortality, and prevalence of diseases and signs of predation were low. Nuisance species were present at low levels throughout the region, although brown *Cliona, Cliona delitrix, Tridid*emnum, and other competitive invertebrates were documented in most locations. In most cases, the brown *Cliona* affected old dead corals and it colonized the substrates, while other species infrequently were overgrowing and killing corals. Predation scars included fireworms (on *A. cervicornis*), *Coralliophila abbreviata* (snails), and parrotfish lesions. Snails were seen most frequently on *Agaricia*, followed by *Montastraea, Diploria* and other species; lesions were generally small. Large parrotfish lesions were seen on a single reef (northwest ridge), while small lesions (spot biting) were seen sporadically on deeper shelf edge sites. Coral diseases consisted predominantly of isolated cases of white plague, yellow band disease and dark spots disease. Disease prevalence was low, with exception of one site (site 10) where an outbreak of yellow band disease was noted among *M. faveolata*. The most widespread condition, primarily affecting *Agaricia* and *Madracis* was dark spots disease.

Algal communities were dominated by small turfs, with moderate cover of crustose coralline algae (CCA), especially at the shelf edge. In protected deeper locations, turf algae trapped considerable sediment, but CCA was still present under the algae and coral recruits were documented. In general, macroalgal cover was low to moderate, with very little *Lobophora* and *Dictyota*. Higher cover of erect coralline algae (*Halimeda*) was seen, especially at the bases of corals and between lobes.

A moderate diversity of reef fish was observed on Pedro Bank, with 116 species recorded. Individual sites had from 24-57 species, with an average of 44 species per location. Fish were predominantly small in size (less than 20 cm total length), with very few individuals over 30 cm in length. Low cover of macroalgae was quite unexpected, given the paucity of reef fish. Herbivores were uncommon and dominated by small juveniles and sub adults. Surgeonfish were

generally observed alone or in small groups; a single large school of blue tangs was observed on one reef. Parrotfish were dominated by red band parrotfish. Very few larger terminal phase stoplight parrotfish were observed, and there was a near absence of Princess and Queen parrotfish. Parrotfish populations consisted predominantly of juveniles and initial phase females less than 20 cm total length; often terminal phase fish were much smaller than that seen in other Caribbean localities. Snappers, groupers, and grunts were all rare or absent, with exception of a few small schools of French grunts. The rarity or absence of species dependent on mangroves and grassbeds for a part of their life history was expected, as mangroves were absent and only two areas with seagrass beds were found. The dominant sea bass present were coneys and graysbys.

An unnatural abundance of nurse sharks were seen. These were very curious and followed divers around. This appears to be related to lionfish feeding of sharks. Current populations of lionfish appeared to be fairly small, as these were observed singly or in small groups in most locations, with a maximum of 10 fish seen on one reef. Lionfish were identified at 7 of the 20 locations surveyed, but were most common at deeper shelf edge sites within or near the proposed fishery reserve.

Motile invertebrates were identified in low numbers. *Diadema* was common in two places, a patch reef on the bank (Site 1), and a shallow leeward reef off the southwestern end of Banner Reef (Site 18). *Diadema* were observed in other areas, but these occurred as single individuals. Lobsters were rare, being identified primarily at shelf edge sites in deeper water. Queen conch were relatively common in site 1 (patch reef), 11 and 12, and were occasionally observed in other sites; no large aggregations were seen in reef environments or sand patches at the edge of reef communities. A low number of lobsters were seen at 12 sites; many of these observations were for *Panulirus guttatus*.

Fisheries assessments suggest that the bank is under considerable pressure from spearfishermen, which were observed using compressors to target primarily herbivores (parrotfish), with limited catch of other reef fish and lobsters. In addition, the use of fish traps was also widespread. The bulk of the catch was surgeonfish. Both of these families are critical to the health of the reefs, as they control algal populations. They were significantly depleted, and the current level of fishing pressure appears unsustainable. A larger fishing boat with multiple satellite boats was also observed on the Northwest Ridge. These fishermen were also using compressors and spear guns to target parrotfish.

Within the proposed fishery reserve, a total of 15 sq km of backscatter data and 96 drop camera videos were acquired. In addition, 10 ichthyoplankton surveys were completed within the proposed boundaries of the fishery reserve.

Background

The coral reefs located off the north coast of the Jamaican mainland are some of the best and most studied reefs in the world (Hughes 1994). In contrast, very few research studies have been conducted on the banks located off the south coast of Jamaica. The first and only comprehensive coral reef assessment conducted on a portion of Pedro Bank was completed in 2005 (Kramer 2006). Since this time, considerable work has been done in the development of management measures to protect these resources. This includes development of a possible zoning strategy, including the adoption of marine protected areas (i.e. a fishery reserve off southwest Cay). To date, no protection has yet been adopted for these areas, although stakeholder consultations have been completed and recommendations have been provided to the relevant government agencies in Jamaica.

Pedro Bank is Jamaica's most valuable and largest fishing ground. It is beginning to experience overfishing, like most other locations in Jamaica. A long history of fishing of lobster, conch, and fish has led to the overexploitation of these fisheries on Pedro Bank (Aiken et al. 1997; Gittens 2001; Koslow et al. 1988; Munro 1983; Nicholson and Hartsuijker 1983). The number of people living on Pedro Cays has increased over the years resulting in increased resource extraction, destruction of coastal vegetation, excessive trash debris, no sewage treatment, and diminishing habitat for nesting turtles and seabirds (Espeut 2006, Hay 2006).

We conducted an extensive survey of coral reef habitats within Pedro Bank to help inform constituents of the value of these resources and the benefits that would ensue through the development of a network of marine protected areas. In particular, the establishment of fish sanctuaries will help build connectivity, enhance resilience, and protect vital larval supplies, fish stocks and keystone habitats. The current research used the Atlantic and Gulf Rapid Reef Assessment protocol, which is the same methodology applied in 2005. Many of the same areas assessed in 2005 were evaluated during this study and we expanded surveys to new locations. Additional pilot efforts to map the proposed fish sanctuary were undertaken.

General Methodology

Coral and fish community structure were examined in 20 locations (Table 1) using three approaches: photographic transects, belt transects, and quadrats. Five measures were recorded for corals: 1) Benthic cover; 2) Coral diversity and abundance (by species); 3) Coral size class distributions (by species); 4) recruitment; and 5) Coral condition including prevalence of disease, bleaching and biotic interactions. Fish abundance and size structure were assessed for AGRRA species and fish diversity was assessed using a REEF survey approach. Benthic communities were characterized using a point intercept method.

Fish surveys

For fish, abundance and size structure were collected for about 70 species of fishes, targeting species that have a major functional role on reefs or are major fisheries targets. Reef fishes were assessed along 2 m X 30 m belt transects. A T square marked in 5 cm increments was used to gauge fish size. A minimum of 6 transects were conducted by each "fish" diver per site. Other indicators recorded along belt transects (both coral and fish transects) included large motile invertebrates (urchins, octopus, lobster, large crabs, queen conch, sea cucumbers).

Benthic cover

Cover of major functional groups were assessed along 10 m transects using either recorded observations and/or photographic assessments. For recorded observations, a point intercept method was used, whereas the organism and substrate were identified every 10 cm along a 10 m transects (total 100 points/transect), with a minimum of six transects examined per location. Corals were identified to species; sponges and other invertebrates were identified to class and growth form, or species for specific indicator organisms; five groups of algae including macroalgae, crustose coralline algae, fine turfs, turf algae with sediment and cyanobacteria were differentiated and certain macroalage were identified to genus. Substrate type was identified as hardground, sand, mud, rubble, recently dead coral, bleached coral, and live coral

An additional photographic assessment was also conducted as follows: A 10 m long transect tape was extended along depth contours at 20, 15, 10 and 5 m depth. Continuous digital still photographs were taken from of the reef substrate from a height of approximately 0.6-0.75 meters above the substrate, using a one meter bar divided into 5 cm increments placed perpendicular to the transect tape as a scale bar. Approximately 20 photographs were taken per transect to allow for overlap between adjacent images with two photo transects (each 10 m in length) per depth. Images were downloaded onto a computer, and benthic community composition, coral cover and cover of other organisms and substrate type will be determined by recording the benthic attribute located directly below a random points with 30-50 points per photograph, using Coral Point Count (CPCE) software developed by the National Coral Reef Institute (NCRI). This software also allows you to trace the outline of individual corals to determine their planar surface area.

Coral assessments

Five measures were recorded for corals: 1) benthic cover (see above); 2) coral diversity and abundance (by species); 3) coral size class distributions (by species); 4) recruitment; and 5) coral condition, including extent of mortality and causes of recent mortality (such as signs of coral disease and predation. All coral assessments were conducted using 10 m X 1 m belt transects. Other indicators recorded along belt transects included large motile invertebrates (urchins, octopus, lobster, large crabs, sea cucumbers); cover and biomass of algae (fleshy macroalgae, turf algae and crustose coralline algae); and prevalence of nuisance species.

Assessment of corals smaller than 4 cm was done using a minimum of five 0.25 m^2 quadrats per transect, with each quadrat located at fixed, predetermined intervals (e.g. 2, 4, 6, 8, 10 m), alternating between right and left side of the transect. Recruits were identified in both point intercept surveys and belt transects. Recruits were divided into two categories: corals up to 2 cm diameter and larger corals, 2-3.9 cm diameter. In addition, all corals settling on dead skeletal surfaces of colonies identified within the belt transects were recorded separately, with a single measure of diameter and an estimate of percent mortality made for those recruits exhibiting partial mortality.

Visual estimates of tissue loss was recorded for each colony over 4 cm in diameter using a 1 m bar marked in 1 cm increments for scale. If the coral exhibited tissue loss, estimates of the amount of remaining tissue, percent that recently died and percent that died long ago were made based on the entire colony surface. Tissue loss is categorized as recent mortality (occurring within the last 1-5 days), transitional mortality (filamentous green algae and diatom colonization, 6-30 days) and old mortality (>30 days). For each coral with partial or whole colony mortality, the cause of mortality was identified if possible. The diagnosis included an assessment of the type of disease, extent of bleaching, predation, competition, overgrowth or other cause of mortality. Each coral was first carefully examined to identify cryptic predators. Lesions were initially diagnosed into four categories: recent tissue loss, skeletal damage, color change, and unusual growth patterns; an individual colony could have multiple characteristics (e.g. color change and recent tissue loss).

1. CORAL REEF ASSESSMENTS

Coral reef sites examined were mostly concentrated on the edge of the bank, with one patch reef (site 1) and one leeward reef (site 3) examined. Also, site 17 was located within the bank. Reefs were selected from: 1) coordinates of past AGRRA surveys; 2) randomly selected sampling sites chosen by TNC; and 3) snorkel searches near the edge of the bank.

Extensive searches were made for coral reef habitats between the northwest ridge and Banner reef, but these areas do not appear to have any true reef framework. Most areas were low-relief algal-covered hardground, rubble fields, or sand flats. A few low relief mounds were identified. These had isolated gorgonians and sponges and several also had piles of rubble. In one case an extensive patch (>500 m) of *A. cervicornis* rubble was found; no living coral occurred on these mounds. An absence of a coral build-up at the edge of the drop-off was also apparent in this region. Generally, the bank sloped very gradually from about 15 m depth to the limits of visibility (30-40 m depth) with only isolated corals.

Snorkel surveys were conducted near Portland Rock in attempt to find a coral reef. On the southern end of the rock, there were several ridges (10-12m) surrounding deeper areas, but few corals had colonized these areas. A larger ridge extended from the Rock to the northeast, between roughly 5 m and 15 m depth. This ridge had some limited coral colonization (mostly lettuce corals, crustose brain corals and *Porites astreoides*), dense patches of brown macroalgae, and isolated gorgonians.

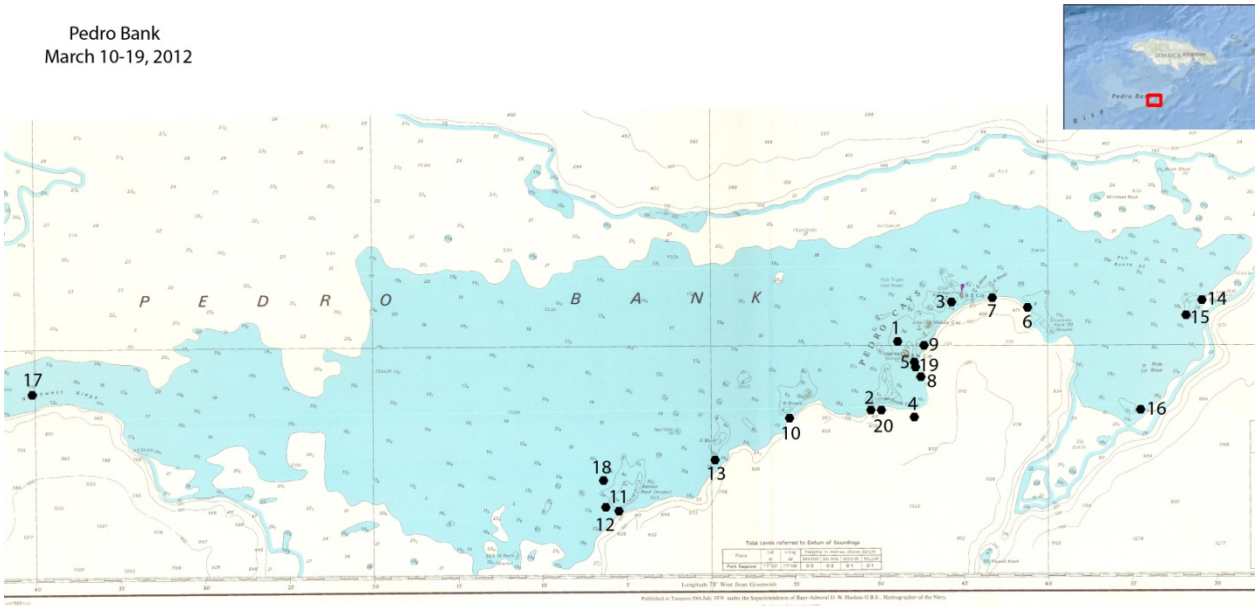

Fig. 1. Location of coral reef surveys conducted on Pedro Bank, Jamaica in March 2012.

Table 1. Locations examined using SCUBA

SITE #	DATE	COORDINATES		NAME	DEPTH (M)
		LONGITUDE	LATITUDE		
JA-PB-01	March 11	77.813490	17.006400	Northern leeward side of SW Cay	10.9
JA-PB-02	March 12	77.839630	16.938840	Bank edge, southwest of South Cay	13.9
JA-PB-03	March 12	77.796980	16.931920	Bank edge, S-SE of South Cay	23
JA-PB-04	March 13	77.760670	17.045090	Between NE and Middle Cay	10.4
JA-PB-05	March 14	77.797150	16.986050	S-SE of SW Cay	11.5
JA-PB-06	March 14	77.686070	17.039780	NW of Shannon Rock on edge	14
JA-PB-07	March 14	77.720600	17.049170	SE of NE Cay on edge	11
JA-PB-08	March 15	77.790700	16.971700	Bank edge, south of SW Cay	17
JA-PB-09	March 15	77.787440	17.002560	Bank edge, north of SW Cay	15
JA-PB-10	March 15	77.919800	16.930800	S-SW of D (2nd) Shoal	14
JA-PB-11	March 16	78.087100	16.839500	Banner Reef	20
JA-PB-12	March 16	78.100100	16.843500	Banner Reef	11
JA-PB-13	March 16	77.992650	16.889800	South of C Shoal	14
JA-PB-14	March 17	77.514620	17.047360	Blower's Rock	17
JA-PB-15	March 17	77.530160	17.032670	Blower's Rock	8
JA-PB-16	March 17	77.574680	16.939830	Beth Rock	15
JA-PB-17	March 18	78.663340	16.953510	NW Ridge	19
JA-PB-18	March 18	78.102480	16.869680	Banner Reef on western edge	12
JA-PB-19	March 19	77.796030	16.981220	Bank edge, south of SW Cay	20
JA-PB-20	March 19	77.829570	16.938900	Bank edge, southwest of South Cay	19

Table 2. Description of dive sites examined using SCUBA

SITE #	GENERAL DESCRIPTION
JA-PB-01	Patch reef – low relief with isolated coral heads; dominated by M. annularis, large expanses of rubble (*P.porites* and *A.cervicornis*); highest number of Diadema
JA-PB-02	Windward fore reef – low relief spur and groove with high abundance of branching gorgonians, scattered massive corals, outcrops of large *M. faveolata*, and smaller branching and massive corals growing on *Montastraea* framework. Low cover of macroalgae, absence of *Diadema*
JA-PB-03	Deeper windward fore reef . Low relief spurs (0.5m), with large sand channels . Dominated by medium sized *M. faveolata* and *M. cavernosa* and smaller massive corals. 10-15% cover , up to 20% in some places. Corals mostly low-lying, flattened or slightly concave. Moderate abundance of branching gorgonians. No macroalgae; substrate had turf and fine sediment layer.
JA-PB-04	Leeward reef – inside on Bank, near NE Cay. V. low relief. High abundance of *M. annularis*, smaller massive corals and erect lettuce corals (*A. agaricites*). Moderate abundance of gorgonians, mostly *Pseudoterigorgia*. Some macroalgae, mostly *Dictyota* and *Halimeda* and good cover of CCA (crustose coralline algae)
Ja-PB-05	Windward fore reef – spurs which extend 1-3m off sandflat; most with small massive and isolated branching corals. 3 spurs dominated by A. cervicornis intermixed with *M. faveolata, C. natans* and *P.porites*. Densest ridge had approx.. 60% cover; but colonies fairly low-lying (20-40cm). Uncolonised areas were fused *A.cervicornis* rubble with *Halimeda* and *Dictyota*.
JA-PB-06	Leeward fore reef. Low relief spurs with patches of massive corals including *M. cavernosa, M. annularis, S. siderastrea* and *M. faveolata*, 50-80cm in diameter. Corals interspersed with branching gorgonians, coral cover about 10%. Lot of pillar corals (6 colonies). Low cover of macroalgae, turf on substrate with fine sediment and CCA underneath sediment.
JA-PB-07	Leeward fore reef. Low relief spurs with high abundance of branching gorgonians and seafans. Outcrops dominated by medium to large *M. faveolata*, many 150cm in diameter or >. Low cover of macroalgae except *Dictyota* and *Halimeda* that surrounded base of coral heads.
JA-PB-08	Low relief hardground with high density of branching gorgonians. Mounds of massive corals inc. *M.annularis, M. faveolata* and *Diploria*. Large ridge colonized by a large stand of *M.mirabilis, A.cervicornis* and *P.porites*. Moderate cover of *Dictyota*.
JA-PB-09	Windward forereef. Spurs built up of Montastraea skeletons. Scattered live colonies of M. annularis and faveolata, and large patches of *P.porites*. Extensive areas of uncolonised framework with turf algae, brown *Cliona, Erythropodium, Palythoa* and CCA. *Dictyota* and *Halimeda* near base of corals. Coral cover 5-10%. *M. faveolata* recruit(s)
JA-PB-10	Windward forereef – high relief spur and groove. Spurs constructed of *Montastraea* framework. Many large (1-2m) *M. faveolata* and *M. annularis* colonies. High prevalence of disease, primarily yellow band. Dead *Montastraea* colonies colonized by brown *Cliona* and turf algae. *Halimeda* and *Dictyota* at bases of corals. Substrate colonized by turf; low cover of macroalgae. High number of recruits .

SITE #	GENERAL DESCRIPTION
JA-PB-11	Deeper windward forereef. Low relief spurs with large *M. faveloata, M. annularis* and *Diploria* colonies. Patches of *P.porites* and medium-large *Agaricia* colonies. In areas with *Montastraea*, there was a high number of massive corals (10-20cm). Low abundance of branching gorgonians. *Halimeda* and *Dictyota* at bases of corals. Substrate colonized by turf; low cover of macroalgae and moderate cover of CCA.
JA-PB-12	In closer to reef crest. Large ridge with sparse coral colonization. Ridge comes to within 8-10m from surface. Mostly small *Agaricia, P. astreoides* and *P. porites* colonies (< 10cm) on top of ridge. < 5% cover. Moderate abundance of small gorgonians. Low algal cover except in depressions and at base. Better coral development at base (about 15m depth) with small spurs with larger *Montastraea* and *Colpophyllia* colonies. Base of ridge had large caves and undercut ledge.
JA-PB-13	Low relief spurs with high abundance of branching gorgonians, seafans and small massive corals. High numbers of *Diploria* brain corals and small patches of *A. cervicornis.* A lot of corals with recent mortality from snails. Low cover of macroalgae and dead corals colonized by coralline algae.
JA-PB-14	Western leeward side of BR. Low relief habitat with large *Montastraea annularis* and *M. faveolata* colonies, many up to 2m in diameter. Many of the larger colonies had old mortality but also many completely live colonies. Colonies recovering from bleaching with some still showing pale patches. Surrounding hard ground had thin layer of sediment and very little algae, extensive CCA on dead massive coral skeletons.
JA-PB-15	*Acropora* reef surrounded by deeper hard ground. Towards the edge – dead *A. palmata* framework colonized by *Peyssonnelia*, CCA, *Halimeda* and brown *Cliona*. Very few other corals had colonized skeletons except in depressions and between branches with small *Agaricia* and *Porites* colonies. One large patch of live Palmata at base of mound and 2 other areas with live colonies. Surrounding hard ground had low abundance of branching gorgonians and small massive corals, mostly *Diploria* and *Siderastrea*. Little macroalgae except for small patches of *Dictyota* and *Stypopodium*. Only location we saw school of blue tangs.
JA-PB-16	Low relief hard ground with scattered large *Montastraea* corals, pillar corals and moderate abundance of branching gorgonians. Numerous small massive and plating corals (5-20cm in diameter). Some dead *Montastraea*s were colonized by brown *Cliona*.
JA-PB-17	Deeper spurs with 2-3m relief and highest coral cover (40%). Dominated by medium to large *Montastraea* colonies (all 3 species) intermixed with branching gorgonians and smaller massive plating and branching corals. *Dictyota* at base of corals and *Caulerpa racemosa* growing on dead corals and around live corals but not killing coral. Site with largest parrotfish – Stoplight, Princess, Queen (big terminal phase). Larger predatory fish (one and only hogfish).
JA-PB-18	*Montastraea* dominated reef surrounded by sand with small coral bommies. Large mounds of *M. annularis* and *M. faveolata* with dead areas colonised by other species. Substrate between *Montastraea* colonies had small to medium sized brain corals, clumps of *Agaricia* and patches of Porites. Some bioerosion, low macroalgal cover and a high number of *Diadema*. Some macroalgae at bases of corals in areas without *Diadema* and lots of CCA on dead patches of coral and reef framework. Relatively significant no. and species of fish.

SITE #	GENERAL DESCRIPTION
JA-PB-19	Windward reef. Well-developed spur and groove system, esp. near drop-off. Higher live coral cover at drop-off. Large *M. faveolata* colonies (1-3m diameter) intermixed with large *C. natans, M. annularis, S. siderea* and *Diploria* colonies. Several A. cervicornis colonies. Halimeda around bases of colonies and some *Dictyota* on reef substrates. More gorgonians in shallower area. Greater no. of lionfish than previous sites
JA-PB-20	Windward fore reef. Well-developed spur and groove with higher live coral cover. Spurs had moderate relief (1-2m), high nos. of large *M. faveolata* colonies and many other large colonies (50-200cm) inc. *Eusmilia, C.natans, P.porites, S.siderea* and *D. strigosa.* High diversity of other species inc. *A. cervicornis, Mycetophylia, Mussa* and *Dendrogyra*. Low abundance of branching gorgonians; v. low cover of macroalgae except *Halimeda* in lobes of *M. annularis* and at bases of corals. Greater no. of lionfish than previous sites.

The best reef development occurred within the proposed fishery reserve, and along the edge of the bank to the south and west, to site 20. Prominent reef growth began just below the *Acropora* framework (approx. below 10 m depth), continuing down the reef slope to about 25 m depth. Shallow areas consisted of dead, fused *Acropora* colonies and hardground areas with low cover of live coral. Coral growth was much more patchy along the remainder of the bank, with reef structures separated by gorgonian hardgrounds, algal-covered hardgrounds, rubble and sand.

At least two of the AGRRA sites (site 20 and 21) appear to have been destroyed. A shallow submerged reef crest was apparent near these coordinates, but the areas near the position, at the same depth contained few or no corals and were covered in sand. At one of the sites, the tops of coral skeletons were visibly protruding above the sand, but no living coral was observed. It appears that these sites have been buried by sediment.

Coral diversity recorded in each site is shown in Table 3. Data are indicated as presence/absence only. REEF data (roving surveys) summarizing diversity (number of species and families) are listed by site in Table 4. The relative abundance of each species of reef fish observed at each site are shown in Table 5. Species are ranked as single (1), few (2, 2-10), many (3, 11-100) and abundant (4, >100).

Table 3. Coral species identified within 20 sites examined on Pedro Bank, Jamaica.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Acropora cervicornis					X			X	X	X			X						X	X
Acropora palmata	X				X										X					
Agaricia agaricites	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Colpophyllia natans			X	X	X	X		X	X	X								X	X	X
Dendrogyra cylindrus		X			X	X	X	X	X				X	X		X				X
Dichocoenia stokesii	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	
Diploria clivosa				X						X				X	X					
Diploria labyrinthiformis	X	X		X	X	X		X	X	X	X	X	X			X			X	X
Diploria strigosa	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eusmilia fastigiata				X		X		X						X						X
Isophyllastrea rigida	X	X	X	X		X	X	X	X				X		X	X			X	
Isophyllia sinuosa																				
Leptoseris cucullata											X							X		X
Madracis decactis			X	X		X	X	X	X	X	X	X	X	X			X		X	X
Madracis auretenra (mirabilis)				X				X	X										X	
Manicina areolata	X																	X		
Meandrina meandrites	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Millepora alcicornis		X						X		X		X								
Millepora complanata				X			X						X			X				
Montastraea annularis	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Montastraea cavernosa	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Montastraea faveolata	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Montastraea franksi		X									X						X		X	X
Mussa angulosa																				X

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Mycetophyllia aliciae																				
Mycetophyllia daniana																				
Mycetophyllia ferox																				
Mycetophyllia lamarckiana																				X
Porites astreoides	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Porites divaricata	X						X				X									
Porites furcata	X	X		X			X		X	X	X	X	X					X		
Porites porites	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Siderastrea radians														X	X	X		X		
Siderastrea siderea	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Stephanocoenia intersepta		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	
Meandrina jacksoni			X	X		X	X	X	X			X	X			X			X	
Total	16	17	13	21	16	18	17	21	20	18	17	16	19	16	12	17	12	14	19	19

Table 4. Total diversity (species and families) of reef fish identified at each site.

Site	Species	Families
Banner Reef SW 1 (JAPB-11)	57	25
Blower Rock 1 (JAPB-14)	52	21
Banner Reef NW 2 (JAPB-18)	51	23
S W Pedro Cay SE 1 (JAPB-08)	49	23
S W Pedro Cay SE 2 (JAPB-19)	48	24
D Shoals SW (JAPB-10)	48	23
Banner Reef SW 2 (JAPB-12)	46	22
C Shoals S (JAPB-13)	45	21
Blower Rock 2 (JAPB-15)	44	23
NE Pedro Cay E (JAPB-07)	44	20
Shannon Rock NW (JAPB-06)	44	20
S W Pedro Cay NE (JAPB-09)	43	19
S Pedro Cay SW 1 (JAPB-02)	42	19
Beth Rock (JAPB-16)	41	19
S Pedro Cay SW 2 (JAPB-20)	38	18
S W Pedro Cay NW (JAPB-01)	35	15
N E Pedro Cay W (JAPB-03)	33	17
Northwest Ridge (JAPB-17)	24	13

Table 5a. Reef fish diversity and abundance at Pedro Bank Jamaica survey sites 1-10. Species are listed as single (1), few (2, 2-10), many (3, 11-100) and abundant (4, >100).

Common Name	Scientific Name	JAPB-01	JAPB-02	JAPB-03	JAPB-06	JAPB-07	JAPB-08	JAPB-09	JAPB-10
Balloonfish	*Diodon holocanthus*			2					
Banded Butterflyfish	*Chaetodon striatus*		2	2			2		1
Bandtail Puffer	*Sphoeroides spengleri*						2		
Bar Jack	*Caranx ruber*		3			3			3
Barred Hamlet	*Hypoplectrus puella*								
Barsnout Goby	*Gobiosoma illecebrosum*	2							
Beaugregory	*Stegastes leucostictus*	2	2	1	2	2		2	2
Bermuda Chub/Yellow Chub	*Kyphosus sectatrix/incisor*								
Bicolor Damselfish	*Stegastes partitus*	3	3	3	3	3	4	3	2
Black Durgon	*Melichthys niger*		3	3	2	3	2	3	3
Blackbar Soldierfish	*Myripristis jacobus*		2				1		2
Blue Chromis	*Chromis cyanea*	2	3		2	3	3	2	3
Blue Runner	*Caranx crysos*								
Blue Tang	*Acanthurus coeruleus*	3	3	3	2	3	3	3	3
Bluehead wrase	*Thalassoma bifasciatum*	3	3	3	3	4	4	4	4
Bluelip Parrotfish	*Cryptotomus roseus*						2		
Bluestriped Grunt	*Haemulon sciurus*								
Bridled Goby	*Coryphopterus glaucofraenum*	2		2	2	2			
Broadstripe Goby	*Gobiosoma prochilos*	2	2	2	2	2	2	2	2
Brown Chromis	*Chromis multilineata*	1	3		3	3	3	3	3
Caesar Grunt	*Haemulon carbonarium*		2			1	1		2
Cardinal Soldierfish	*Plectrypops retrospinis*						2		
Cero	*Scomberomorus regalis*								1
Chalk Bass	*Serranus tortugarum*				1				
Clown Wrasse	*Halichoeres maculipinna*	1					2	2	1
Cocoa Damselfish	*Stegastes variabilis*	2		1	1				
Colon Goby	*Coryphopterus dicrus*	2	2				1		1
Coney	*Cephalopholis fulva*		1		1	1			

Common Name	Scientific Name	JAPB-01	JAPB-02	JAPB-03	JAPB-06	JAPB-07	JAPB-08	JAPB-09	JAPB-10
Creole Wrasse	*Clepticus parrae*		3	2	3	2		3	3
Doctorfish	*Acanthurus chirurgus*							2	
Dusky Damselfish	*Stegastes adustus*								
Dusky Squirrelfish	*Sargocentron vexillarium*		2		2	2		1	2
Fairy Basslet	*Gramma loreto*	2			2			2	1
Flamefish	*Apogon maculatus*	1							
Foureye Butterflyfish	*Chaetodon capistratus*			2					
French Angelfish	*Pomacanthus paru*								
French Grunt	*Haemulon flavolineatum*		3	3	2	3	3	2	3
Glasseye Snapper	*Heteropriacanthus cruentatus*								2
Goldentail Moray	*Gymnothorax miliaris*						2		
Goldspot Goby	*Gnatholepis thompsoni*						1		
Gray Angelfish	*Pomacanthus arcuatus*							1	
Graysby	*Cephalopholis cruentata*	2	2	1	2	2	2	2	2
Great Barracuda	*Sphyraena barracuda*							1	
Green Razorfish	*Xyrichtys splendens*				1	2			
Greenblotch Parrotfish	*Sparisoma atomarium*	2	2			2	2	2	
Harlequin Bass	*Serranus tigrinus*	2	1		2	2		2	
Hawksbill Sea Turtle	*Eretmochelys imbricata*								
Highhat	*Equetus acuminatus*						1		
Honeycomb Cowfish	*Lactophrys polygonius*			2		2			
Longfin Damselfish	*Stegastes diencaeus*	2			2	2		2	3
Longjaw Squirrelfish	*Neoniphon marianus*		1			1			
Longspine Squirrelfish	*Holocentrus rufus*		2	2			1		2
Masked Goby	*Coryphopterus personatus/hyalinus*								
Neon Goby	*Gobiosoma oceanops*			1	2	2	1		
Nurse Shark	*Ginglymostoma cirratum*								
Ocean Surgeonfish	*Acanthurus bahianus*	3	3	3	3	3	3	3	4
Ocean Triggerfish	*Canthidermis sufflamen*								
Orange Filefish	*Aluterus schoepfii*								

Common Name	Scientific Name	JAPB-01	JAPB-02	JAPB-03	JAPB-06	JAPB-07	JAPB-08	JAPB-09	JAPB-10
Orangespotted Filefish	*Cantherhines pullus*		1	1	1			2	2
Pluma	*Calamus pennatula*								
Porcupinefish	*Diodon hystrix*								
Princess Parrotfish	*Scarus taeniopterus*		2	2	3	3	3	3	3
Puddingwife	*Halichoeres radiatus*							1	
Queen Angelfish	*Holacanthus ciliaris*								
Queen Parrotfish	*Scarus vetula*								2
Queen Triggerfish	*Balistes vetula*								
Rainbow Wrasse	*Halichoeres pictus*	3	2	3	3	3	2	3	3
Red Lionfish (exotic)	*Pterois volitans*		1		1				2
Redband Parrotfish	*Sparisoma aurofrenatum*	3	3	3	4	4	3	4	4
Redlip Blenny	*Ophioblennius atlanticus*								
Redspotted Hawkfish	*Amblycirrhitus pinos*	1	2		1		2	2	1
Redtail Parrotfish	*Sparisoma chrysopterum*								
Reef Butterflyfish	*Chaetodon sedentarius*								
Reef Shark	*Carcharhinus perezi*			1					
Reef Squirrelfish	*Holocentrus coruscus*								
Rock Beauty	*Holacanthus tricolor*	2	2	2	3	2	2	2	3
Rosy Razorfish	*Xyrichtys martinicensis*								
Roughhead Blenny	*Acanthemblemaria aspera*						1		
Saddled Blenny	*Malacoctenus triangulatus*	1	1			1	1	2	
Sand Diver	*Synodus intermedius*								
Sand Tilefish	*Malacanthus plumieri*	1	1	2	2	2	2	2	2
Scrawled Filefish	*Aluterus scriptus*						1		
Sergeant Major	*Abudefduf saxatilis*							1	
Sharksucker	*Echeneis naucrates*								1
Sharpnose Puffer	*Canthigaster rostrata*	2	2	2	2	2	3	3	3
Shy Hamlet	*Hypoplectrus guttavarius*								
Slippery Dick	*Halichoeres bivittatus*	3	2		2	3	2	2	2
Smooth Trunkfish	*Lactophrys triqueter*				2		1		
S. Stingray	*Dasyatis americana*				1				

Common Name	Scientific Name	JAPB-01	JAPB-02	JAPB-03	JAPB-06	JAPB-07	JAPB-08	JAPB-09	JAPB-10
Spanish Hogfish	*Bodianus rufus*					1			1
Spinyhead Blenny	*Acanthemblemaria spinosa*					1			
Spotfin Butterflyfish	*Chaetodon ocellatus*								
Spotted Drum	*Equetus punctatus*								
Spotted Goatfish	*Pseudupeneus maculatus*			1		2			
Spotted Moray	*Gymnothorax moringa*								
Spotted Scorpionfish	*Scorpaena plumieri plumieri*								
Spotted Trunkfish	*Lactophrys bicaudalis*					1	1	1	
Squirrelfish	*Holocentrus ascensionis*	2	1	2	2		2	1	1
Stoplight Parrotfish	*Sparisoma viride*	2	2	2	2	2	2	3	3
Striped Parrotfish	*Scarus iseri*	3	3	3	3	3	3	3	2
Threespot Damselfish	*Stegastes planifrons*	1	1		1	2	1		3
Tobaccofish	*Serranus tabacarius*				1				
Tomtate	*Haemulon aurolineatum*			1			3		
Trumpetfish	*Aulostomus maculatus*				2	1	2	1	2
White Grunt	*Haemulon plumieri*		1						
Whitespotted Filefish	*Cantherhines macrocerus*							2	1
Yellow Goatfish	*Mulloidichthys martinicus*		1	2					2
Yellow Stingray	*Urobatis jamaicensis*				1	2	1		
Yellowcheek Wrasse	*Halichoeres cyanocephalus*	2					2	1	
Yellowhead Jawfish	*Opistognathus aurifrons*	2				2	2		
Yellowhead Wrasse	*Halichoeres garnoti*	3	3	3	4	4	3	3	4
Yellowline Goby	*Gobiosoma horsti*				2		2	2	2
Yellowtail (Redfin) Parrotfish	*Sparisoma rubripinne*								2
Yellowtail Damselfish	*Microspathodon chrysurus*	2	2		3	2	2	2	3
Yellowtail Snapper	*Ocyurus chrysurus*								
totals		**35**	**42**	**33**	**44**	**44**	**49**	**43**	**48**

Table 5b. Reef fish diversity and abundance at Pedro Bank Jamaica survey sites 11-20. Species are listed as single (1), few (2, 2-10), many (3, 11-100) and abundant (4, >100).

Common Name	Scientific Name	JAPB -11	JAPB -12	JAPB -13	JAPB -14	JAPB -15	JAPB -16	JAPB -17	JAPB -18	JAPB -19	JAPB -20
Balloonfish	*Diodon holocanthus*										
Banded Butterflyfish	*Chaetodon striatus*	1					2	1			
Bandtail Puffer	*Sphoeroides spengleri*										
Bar Jack	*Caranx ruber*	2		1			2		2	2	
Barred Hamlet	*Hypoplectrus puella*								2		1
Barsnout Goby	*Gobiosoma illecebrosum*										
Beaugregory	*Stegastes leucostictus*	2	2	1	3	3	1		3	2	1
Bermuda Chub/	*Kyphosus sectatrix/*					4					
Bicolor Damselfish	*Stegastes partitus*	3	4	3	3	4	3	3	3	3	3
Black Durgon	*Melichthys niger*	3	3	3	3	3	3	2		3	2
Blackbar Soldierfish	*Myripristis jacobus*				2						
Blue Chromis	*Chromis cyanea*	4	3	3	4	4	3		4	4	4
Blue Runner	*Caranx crysos*				2						
Blue Tang	*Acanthurus coeruleus*	3	3	3	3	4	4	3	4	3	3
Bluehead	*Thalassoma bifasciatum*	4	4	4	4	4	4	3		3	3
Bluelip Parrotfish	*Cryptotomus roseus*										
Bluestriped Grunt	*Haemulon sciurus*					1					
Bridled Goby	*Coryphopterus glaucofraenum*	1			1		1	2		1	
Broadstripe Goby	*Gobiosoma prochilos*	2	1	2	2			2	2	2	2
Brown Chromis	*Chromis multilineata*		3	3	4	4	3		3	3	2
Caesar Grunt	*Haemulon carbonarium*	2	2	2	1	4	1				
Cardinal Soldierfish	*Plectrypops retrospinis*										
Cero	*Scomberomorus regalis*									1	
Chalk Bass	*Serranus tortugarum*	2							2		
Clown Wrasse	*Halichoeres maculipinna*	1	2	1	2	2					
Cocoa Damselfish	*Stegastes variabilis*		1		2						
Colon Goby	*Coryphopterus dicrus*	1			1			1		2	1
Coney	*Cephalopholis fulva*		1				2				

Common Name	Scientific Name	JAP B-11	JAP B-12	JAP B-13	JAP B-14	JAP B-15	JAP B-16	JAP B-17	JAP B-18	JAP B-19	JAP B-20
Creole Wrasse	*Clepticus parrae*	2		2	4					4	4
Doctorfish	*Acanthurus chirurgus*	2	2		2		3		2		
Dusky Damselfish	*Stegastes adustus*					4					
Dusky Squirrelfish	*Sargocentron vexillarium*			2			2		2		
Fairy Basslet	*Gramma loreto*	2	3	2	3	2	2		2	2	
Flamefish	*Apogon maculatus*										
Foureye Butterflyfish	*Chaetodon capistratus*								1		1
French Angelfish	*Pomacanthus paru*							1			
French Grunt	*Haemulon flavolineatum*	3	4	3	3	3	3		4	3	2
Glasseye Snapper	*Heteropriacanthus cruentatus*	1				1			1	2	
Goldentail Moray	*Gymnothorax miliaris*	1					1				
Goldspot Goby	*Gnatholepis thompsoni*	1							2		
Gray Angelfish	*Pomacanthus arcuatus*										
Graysby	*Cephalopholis cruentata*	2	2	2	2	1	1	2	2	2	2
Great Barracuda	*Sphyraena barracuda*										
Green Razorfish	*Xyrichtys splendens*	2		2					1		
Greenblotch Parrotfish	*Sparisoma atomarium*	2		2	2				2	2	2
Harlequin Bass	*Serranus tigrinus*	2		2	1				1		
Hawksbill Sea Turtle	*Eretmochelys imbricata*		1								
Highhat	*Equetus acuminatus*									3	
Honeycomb Cowfish	*Lactophrys polygonius*	1			1						
Longfin Damselfish	*Stegastes diencaeus*	2	2	1	2	4	2		4		3
Longjaw Squirrelfish	*Neoniphon marianus*	2	1		2		1			2	1
Longspine Squirrelfish	*Holocentrus rufus*	2	2	2	2		2	2	2		1
Masked Goby/	*Coryphopterus personatus/*									2	1
Neon Goby	*Gobiosoma oceanops*										
Nurse Shark	*Ginglymostoma cirratum*				1	2					1
Ocean Surgeonfish	*Acanthurus bahianus*	3	3	4	4	4	4	3	4	4	3
Ocean Triggerfish	*Canthidermis sufflamen*				2						

Common Name	Scientific Name	JAPB -11	JAPB -12	JAPB -13	JAPB -14	JAPB -15	JAPB -16	JAPB -17	JAPB -18	JAPB -19	JAPB -20
Orange Filefish	*Aluterus schoepfii*									2	
Orangespotted Filefish	*Cantherhines pullus*	2		2		2	1			1	
Pluma	*Calamus pennatula*	1							2		
Porcupinefish	*Diodon hystrix*	1						1			
Princess Parrotfish	*Scarus taeniopterus*	3	3	3	3	3	3	2	3	4	2
Puddingwife	*Halichoeres radiatus*			1	2	2	2		1		
Queen Angelfish	*Holacanthus ciliaris*		1						1		
Queen Parrotfish	*Scarus vetula*	1		2					2	1	
Queen Triggerfish	*Balistes vetula*	1	1	2					2		
Rainbow Wrasse	*Halichoeres pictus*	2	2	3	2	3	2		3	3	
Red Lionfish (exotic)	*Pterois volitans*			1	1					2	1
Redband Parrotfish	*Sparisoma aurofrenatum*	4	4	4	4	4	3	3	3	4	4
Redlip Blenny	*Ophioblennius atlanticus*		1			3					
Redspotted Hawkfish	*Amblycirrhitus pinos*				2		1				
Redtail Parrotfish	*Sparisoma chrysopterum*				1			1			
Reef Butterflyfish	*Chaetodon sedentarius*									1	
Reef Shark	*Carcharhinus perezi*		1			1				1	1
Reef Squirrelfish	*Holocentrus coruscus*								1		
Rock Beauty	*Holacanthus tricolor*	3	3	2	2	2	3	2	2	2	2
Rosy Razorfish	*Xyrichtys martinicensis*	2	1								
Roughhead Blenny	*Acanthemblem aria aspera*			1							
Saddled Blenny	*Malacoctenus triangulatus*		2	1	2	1	2	1			
Sand Diver	*Synodus intermedius*								1		
Sand Tilefish	*Malacanthus plumieri*	2	2	2		2		1	1	1	1
Scrawled Filefish	*Aluterus scriptus*						1			1	
Sergeant Major	*Abudefduf saxatilis*		2							2	
Sharksucker	*Echeneis naucrates*	1							1		1
Sharpnose Puffer	*Canthigaster rostrata*	3	2	3	2	2	2	1	2	2	2
Shy Hamlet	*Hypoplectrus guttavarius*								1		

Common Name	Scientific Name	JAPB -11	JAPB -12	JAPB -13	JAPB -14	JAPB -15	JAPB -16	JAPB -17	JAPB -18	JAPB -19	JAPB -20
Slippery Dick	*Halichoeres bivittatus*	2	2		3	3	2		3		
Smooth Trunkfish	*Lactophrys triqueter*			1	1	1				1	
Southern Stingray	*Dasyatis americana*		1								
Spanish Hogfish	*Bodianus rufus*	2	2		1	2	2		2	1	
Spinyhead Blenny	*Acanthemblemaria spinosa*										
Spotfin Butterflyfish	*Chaetodon ocellatus*										2
Spotted Drum	*Equetus punctatus*	1							2	1	
Spotted Goatfish	*Pseudupeneus maculatus*				1	1					1
Spotted Moray	*Gymnothorax moringa*	1	1				1		1		
Spotted Scorpionfish	*Scorpaena plumieri*			1							
Spotted Trunkfish	*Lactophrys bicaudalis*					1			1		
Squirrelfish	*Holocentrus ascensionis*	2	2	2	1	2	2		2	1	
Stoplight Parrotfish	*Sparisoma viride*	2	3	3	3	4	3		3	2	2
Striped Parrotfish	*Scarus iseri*	3	3	3	2	4	3	2	4	4	3
Threespot Damselfish	*Stegastes planifrons*					3			4		2
Tobaccofish	*Serranus tabacarius*										1
Tomtate	*Haemulon aurolineatum*										
Trumpetfish	*Aulostomus maculatus*	1	1	1	1	2				2	
White Grunt	*Haemulon plumieri*				1						
Yellow Goatfish	*Mulloidichthys martinicus*	2				3	2			2	
Yellow Stingray	*Urobatis jamaicensis*		2	2	1						
Yellowcheek Wrasse	*Halichoeres cyanocephalus*	1								1	1
Yellowhead Jawfish	*Opistognathus aurifrons*	2	2						2		
Yellowhead Wrasse	*Halichoeres garnoti*	4	4	3	4	4	3	3	4	4	3
Yellowline Goby	*Gobiosoma horsti*	2		2	2			2		1	
Yellowtail Parrotfish	*Sparisoma rubripinne*										
Yellowtail Damselfish	*Microspathodon chrysurus*	2	2	3	2	4	2	2	2	2	2
Yellowtail Snapper	*Ocyurus chrysurus*					1					
	totals	**57**	**46**	**45**	**52**	**44**	**41**	**24**	**50**	**48**	**38**

Table 6. Motile invertebrates recorded within the 20 sites.

Site	1	2	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Lobster	2	3	0	5	0	6	0	6	1	0	8	0	4	0	6	0	2	2	5
Conch	16	0	0	10	3	2	2	1	0	14	15	7	0	0	1	1	5	9	2
Crabs	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0
Sea Cucumber	1	0	0	2	2	2	0	0	1	0	3	5	0	0	0	0	1	1	1
Diadema	30	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4	123	0	0
Lionfish	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	1	1	3	2
# of transects	3	2	1	3	3	3	1	2	2	2	2	2	2	2	2	2	2	2	2
Radius (m)	5	10	5	10	10	5	10	10	10	10	10	10	10	10	10	10	10	10	10
Total area (m^2)	240	628	80	942	942	240	314	628	628	628	628	628	628	628	628	628	628	628	628

2. SONAR SURVEYS

A pilot project using a Tritech Starfish 990f sidescan sonar was undertaken to:

1) Create a library of sonar data that matches the different habitat types;
2) Understand what each habitat class looks like using sidescan; and
3) Determine how much time is needed to map a site using side scan.

The pilot effort focused primarily within about 2 miles of Southwest Cay, within the proposed fishery reserve. The Twin V slowly navigated back and forth collecting backscatter data (acoustic reflections) along the track to obtain a continuous image of the seafloor. At varying distances a drop camera was deployed to correlate backscatter data with actual video imagery of the habitat.

Surveys were run throughout the proposed reserve from just below the water's surface to about 25 m depth. Additional tracks were run across habitat types not included in the reserve (sea grass beds). A total of 15 sq km of backscatter data and 96 drop camera videos were acquired.

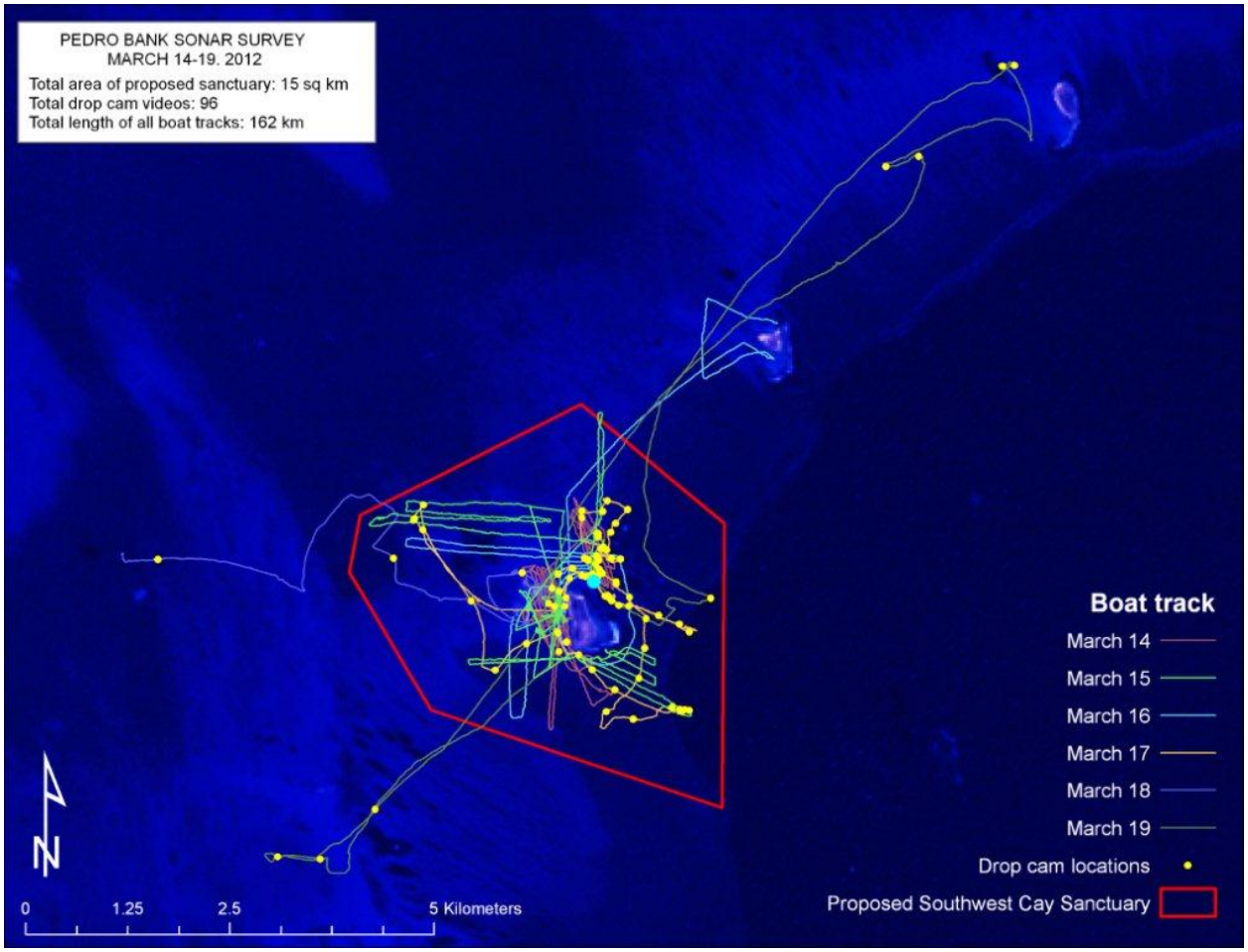

Fig. 2. Groundtruthing track of the Twin V catamaran. Yellow dots indicate drop camera locations.

3. PLANKTON SURVEYS

Baseline data on plankton communities was obtained from sites located within the proposed fishery reserve. Sampling included 1) plankton tows for fish and conch larvae; 2) water samples for phytoplankton to identify potentially harmful species that may affect conch larvae; and 3) macroalgal samples for epiphytic species to determine if cigotoxic dinoflagellates or other toxic species are present that would affect bottom feeders such as *Strombus gigas.*

All plankton tows were done within the boundaries of the proposed sanctuary (Table 7). The Depth and Location parameters were taken at the beginning of each tow. Each tow lasted for 15 minutes except for bottle #7 which consisted of 2 short hauls for about 100m each way.

Table 7. Plankton tows completed on Pedro Bank within the vicinity of the proposed fishery sanctuary.

DATE	TIME	SPEED (knots)	DEPTH (metres)	LOCATION	BOTTLE #
13/03/2012	12:53pm	1.8	10	N 17°02.617' W077°45.668'	1
14/03/2012	10:05am	3	4.5	N 16°59.527' W077°48.541'	2
14/03/2012	10:41 am	4	8	N 16°58.927' W077°48.256'	3
14/03/2012	11:50am	3	5	N 16°59.337' W077°48.661'	4
14/03/2012	2:07pm	2.5	9.6	N 16°59.734' W077°48.810'	5
14/03/2012	4:03pm	3.5	9.5	N 16°59.734' W077°48.810'	6
15/03/2012	9:00am	3	6.5	N 16°59.469' W077°48.580'	7
15/03/2012	10:50am	3.5		N 16°58.923' W077°47.906'	8
15/03/2012	3:20pm	2.8	12	N 16°58.926' W077°47.911'	9
15/03/2012	4:27pm	3	11	N 17°00.712' W077°48.305'	10

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Appendix I. Science Team

Full Name	Institution	Role
Phil Renaud	KSLOF	Executive Director/phototransects
Andy Bruckner	KSLOF	Chief scientist/coral surveys
Brian Beck	KSLOF	Benthic surveys
Judy Lang	AGRRA	Coral surveys
David Grenda	Fl Aquarium	Fish surveys
Kenneth Marks	AGRRA	Fish surveys
Alex Dempsey	NCRI	Benthic surveys
Rachel D'Silva	UWI	Benthic surveys
Oliver Squire	Fisheries	Fish surveys
Steve Schill	TNC	Habitat mapping
Llewelyn Meggs	TNC Jamaica	TNC Pedro Bank project lead, Invertebrate surveys
Nathalie Zenny	TNC Jamaica	Invertebrate surveys
Andrew Ross	Eco Reefs	Benthic surveys
Anna Ebanks	Fisheries	Fish surveys
Mr. Sean Green	NEPA	Habitat mapping
Azra Blythe-Mallet	VSD	Plankton tows