Preliminary Report of Coral Reef Monitoring of the Portland Bight Protected Area (PBPA)

prepared by

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December 2003

UNEP
United Nations Environment Programme

CARIBBEAN ENVIRONMENT PROGRAMME

ICRAN
International Coral Reef Action Network


British High Commission Kingston

Background

The primary aim of Jamaica Coral Reef Monitoring Network (JCRMN) is to support coral reef monitoring around the island. At its inaugural meeting at the Discovery Bay Marine Laboratory, St. Ann, the group agreed that the reefs on the south coast of Jamaica required priority attention as very little data had been collected for these reefs.

Following a series of meetings, training workshops and data collection exercises in Negril and Port Royal, a JCRMN group of volunteer divers were trained in the Reef Check coral reef monitoring methodology which facilitates the assessment of a wide area of reef, collecting information on percentage cover of live hard corals as well as fish, invertebrates and other related reef organisms.

The JCRMN under the direction of the CCDC/CMS and with the assistance of Caribbean Coastal Area Management (CCAM) Foundation spearheaded the monitoring expedition of the Portland Bight Protected Area. After two weekends of training in the Reef Check Methodology, a monitoring team was selected to undertake four days of monitoring in the Portland Bight Cays. Monitoring activities began on December 4 and ended on December 7, 2003. The data and information collected will be sent to Reef Check and will also be used to inform local stakeholders on the status of corals in the Portland Bight area of Jamaica. As well, the information will be used by the CCAM Foundation, which has management responsibilities for the Portland Bight Protected Area (PBPA), to help develop its sustainable management programmes.

The Portland Bight Cays were selected because of their status as a new protected area in Jamaica. The PBPA contains 210 sq km (81 sq miles) of dry limestone forest, 82 sq km (32 sq miles) of wetlands, and an as yet undetermined area of seagrass beds and coral reefs. It is habitat for birds, iguanas, crocodiles, manatees, marine turtles, and fish. The marine and estuarine habitats within the PBPA are home to a wide range of native and migrant wildlife. Some of the native wildlife is endemic to Jamaica, and some are found only in Portland Bight. Portland Bight has the largest remaining mangrove system in Jamaica (The Great Salt Pond, Galleon Harbour, West Harbour, the Goat Islands and almost all areas between), which, together with extensive sea-grass beds and coral reefs, provide probably the largest nursery area for fish, crustaceans and molluscs on the island.

The cays of Portland Bight, including Pigeon Island, Bare Bush Cay, Portland Cay, Long Reef, Hans Reef, Pelican Reef, are relatively inaccessible and the current status of the coral reefs and related ecosystems before this monitoring exercise was not known.

The data collection exercise was designed primarily to:

- Collect data and information on the status of the coral reefs and related ecosystems.
- Build the capacity of CCAM Foundation to monitor and manage coral reef resources in the PBPA.

Partnerships

JCRMN, as is its *modus operandi,* partnered with a number of organizations to conduct the Portland Bight monitoring. Financial support for the monitoring activities was gratefully received from the British High Commission, which willingly came on board and provided funds necessary for rental of boats and acquisition of equipment, which will assist in future JCRMN monitoring activities within Portland Bight and other South coast reefs.

The United Nations Environment Programme, Caribbean Environment Programme (UNEP-CEP), specifically through the ICRAN project in collaboration with the CCDC is assisting with developing capacity for coral reef monitoring within the eight countries of the GCRMN's Northern Caribbean and Atlantic sub-node in which Jamaica falls. Funds from the ICRAN project were used to defray costs associated with the monitoring activity in Portland Bight, Jamaica.

The Monymusk Gun Club, located at Salt River in relatively close proximity to the Portland Bight study area, provided free accommodation to the team of divers and support staff, 25 persons in total. The

CCAM Foundation staff coordinated rental of boats and the provision of meals for the survey teams and were generally responsible for on-the-ground support once monitoring got underway.

The National Environment Planning Agency (NEPA), the Government's monitoring and regulatory arm, provided a boat and a number of the staff of the Coastal Zone Management Branch participated in the activity.

The University of the West Indies, through the Centre for Marine Sciences, the Caribbean Coastal Data Centre and members of the University Sub-Aqua Club (USAC) has been providing leadership for the JCRMN, assisting in coordinating monitoring activities, including sourcing of funding for the activities, training of teams in Reef Check and CARICOMP monitoring methods and providing data management and reporting support.

JCRMN dive team members represent different organizations/institutions including: the Montego Bay Marine Park (MBMP); The Nature Conservancy (TNC); the University of the West Indies through the University Sub-Aqua Club (USAC), the Discovery Bay Marine Laboratory, and the Centre for Marine Sciences; the National Environment Planning Agency (NEPA); the CCAM Foundation, the United Nations Environment Programme (UNEP) and the United States Peace Corps volunteers.

It is envisaged that these partnerships will be strengthened as JCRMN continues to promote coral reef monitoring to increase the available information on the status of Jamaica's coral reefs thus leading to improved management.

The Teams

The Table 1 lists the personnel who were involved in monitoring activities over the period of four days. Monitoring activities began on Thursday morning with two teams collecting data at two locations at Pigeon Island. Friday's excursion was aborted due to poor weather and visibility. Saturday and Sunday morning saw the largest contingents with the rest of the volunteers arriving on Friday night for the early Saturday morning start.

Team leaders were assigned for each team of six persons (see below), however over the course of the surveys, personnel were relocated to different teams whenever this became necessary. Brandon hay of CCAM Foundation had overall responsibility for the monitoring exercise including determining which sites were surveyed depending on weather conditions and visibility.

At the end of each day data were collated by the team leaders and submitted to CMS/CCDC data analyst, Loureene Jones for error-checking and entry into the Reef Check data files and database. The final surveys were conducted on Sunday; one team went to Portland Cay and one other team to Hans Reef. The monitoring team departed the Monymusk Gun Club after lunch.

Table 1: Team leaders and members who participated in the PBPA monitoring

Team 1	**Team 2**
Peter Edwards (Team Leader/Team Scientist) – UWI, Centre for Marine Sciences Michael Loftin – Montego Bay Marine Park (MBMP) Jahsen Levy – University Sub-Aqua Club (USAC) Minke Newman – University Sub-Aqua Club (USAC) Loureene Jones – UWI, Centre for Marine Sciences Tadaomi Nakai – Montego Bay Marine Park (MBMP)	**Dave Guinness (Team Leader)** – University Sub-Aqua Club (USAC) Peter Gayle – Discovery Bay Marine Laboratory (DBML) Ann Sutton – The Nature Conservancy (TNC) Sean Green – National Environment Planning Agency Michelle McNaught – University Sub-Aqua Club (USAC) Bryan Murray – US Peace Corps volunteer
Team 3	**Team 4**
George Warner (Team Leader) – UWI, Centre for Marine Sciences Jerome Smith – National Environment Planning Agency Nathalie Zenny – The Nature Conservancy (TNC) **Brandon Hay** – CCAM Foundation **(Project Leader)** Ainsley Henry – National Environment Planning Agency Dana Roeber – US Peace Corps volunteer	**Marlon Hibbert (Team Leader)** – University Sub-Aqua Club (USAC) Kimberly John – The Nature Conservancy (TNC) Malden Miller - UNEP Krishna Desai – National Environment Planning Agency Elizabeth McGhie – University Sub-Aqua Club (USAC) Andrew Ross – Montego Bay Marine Park (MBMP)

Front Row (L-R) Dave Guinness, Marlon Hibbert, Malden Miller, Brandon Hay. 2nd row Elizabeth McGhie, Loureene Jones, Nathalie Zenny, Minke Newman, Michelle McNaught, Ann Sutton, Dana Roeber, Kimberly John. Back Row Sean Green, Jerome Smith, Jahsen Levy, Andrew Ross, Tadoami Nakai, Michael Loftin, Brian Murray, Peter Edwards, Ainsley Henry. Missing: Krishna Desai, Peter Gayle and George Warner.

Figure 1. Aerial Photo of Pigeon Island, Portland Bight where 4 sites were surveyed

Preliminary Results & Analyses

A total of six sites on 3 cays were monitored during the 4 days. Four sites were surveyed at Pigeon Island (Figure 1), 1 at Hans Reef and 1 at Big Portland Cay. Both shallow and deep reefs were surveyed using the Reef Check method.

Summary statistics of the six sites surveyed showed mean percentage hard coral cover ranged from a low of 5.8% at Big Portland Cay to a high of 33.4% at South East Reef, Pigeon Island. At all reefs surveyed deeper sites had better hard coral coverage than shallow sites while higher values for Nutrient Indicating Algae were recorded at shallow sites. All the PBPA sites reflected relatively high rock/rubble content ranging from a high of 85.3% to a low of 21.4%. Personal

communication with B. Hay of CCAM Foundation suggests that the level of exposure of the cays may possibly be correlated with a high level of rock and rubble; Big Portland Cay, the most exposed having the highest value of 85.3%, followed by the Western and South West sites of Pigeon Island with 44.2% and 59.6% rock/rubble respectively. The most sheltered sites, Lighthouse reef, Pigeon Island as well as Hans reef, which is considered relatively sheltered had rock/rubble values of 21.4% and 30.9% respectively (Table 2 and Figures 2-7).

The surveys at Pigeon Island suggest that, with the exception of the South West side of the island, the reefs are in fairly good condition. The South East and Lighthouse reef sites of Pigeon Island are considered to be the most sheltered sites on the island and this may explain the higher coral cover compared to the West and South West sites. Three of the four Pigeon Island sites had cover ranging from 22.3% to 33.4%, while the South West reef of Pigeon Island averaged only 11.7% hard coral cover. The only other reef site surveyed showing comparable coral reef cover to Pigeon Island was Hans Reef with a mean cover of 25.1%.

Big Portland Cay had by far the lowest coral cover of the cays surveyed with a range of 4.4 to 7.3% from shallow to deep and a high cover by rock/rubble of 91.9% and 78.7% in shallow and deep, respectively. Big Portland Cay is the most exposed of the Portland Bight cays surveyed and is vulnerable to storm damage as well as high fishing pressure, which may include such destructive practices as dynamiting. Agricultural nutrient inputs from underground fresh water springs are also thought to impact the reefs of Portland Cay and may be responsible for the excessive growth of Halimeda observed at that reef site, particularly at shallow depth. These factors may be responsible for the low hard coral cover observed there (Figure 2).
Hans Reef, in contrast to Portland Cay, is relatively sheltered and therefore somewhat protected from storm damage, but is thought to be affected by poor water quality from land-based sources of pollution. Coral cover was relatively good ranging from a low of 20.6% to a high of 29.7%, while rock/rubble averaged 30.9%. Percent cover by Nutrient Indicating Algae (NIA) at the Hans Reef shallow site was actually the highest recorded of all sites surveyed, averaging 18.8%. Overall average NIA, however, was 10.7%, which was the second highest after the Pigeon Island West site which averaged 12.5%. Generally, NIA values throughout the study area were low with 3 sites recording less than 1% NIA and only 2 sites recording greater than 10%, with the ranges being 0.4% to 12.5%. Percentage of recently dead corals was relatively low ranging from 0 to 2.7%

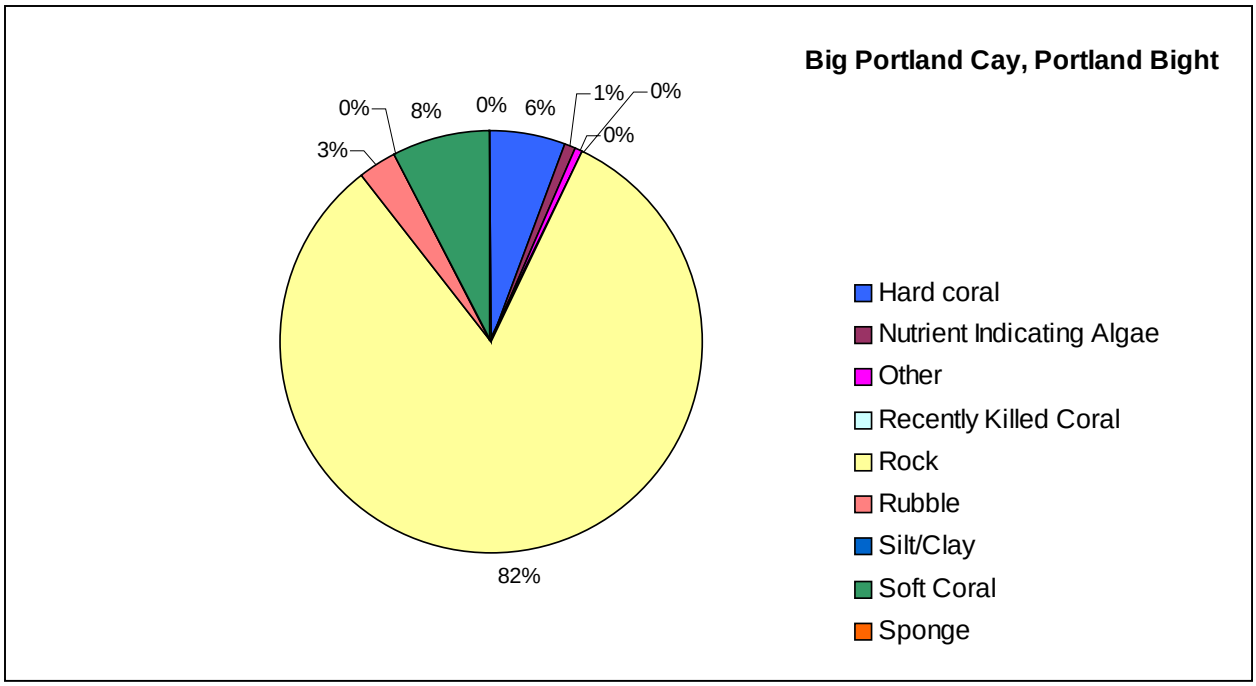

Figure 2. Cover by hard coral and other benthic substrate at Big Portland Cay

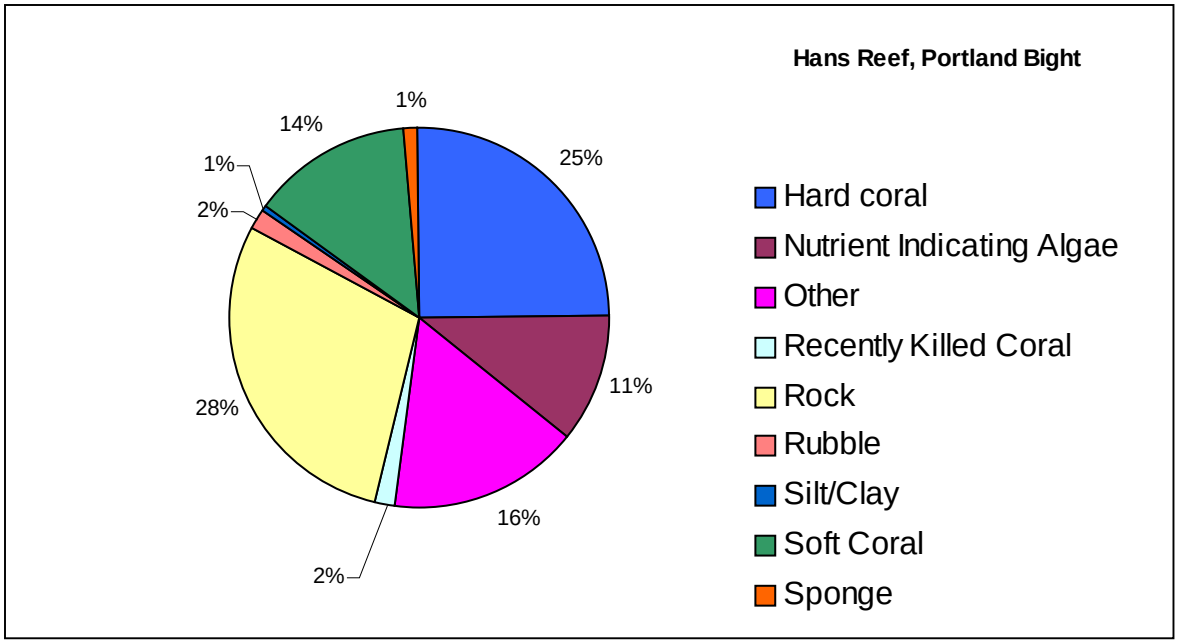

Figure 3. Mean cover by hard coral and other benthic substrate at Hans Reef

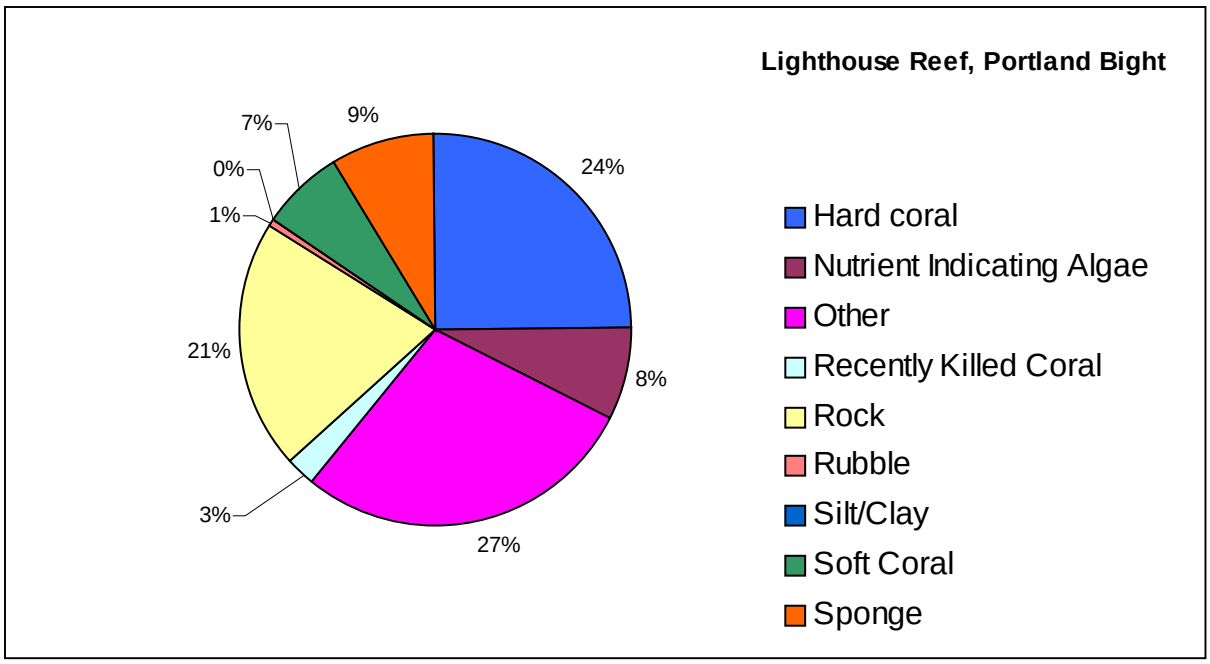

Figure 4. Cover by hard coral and other benthic substrate at Lighthouse Reef, Pigeon Island

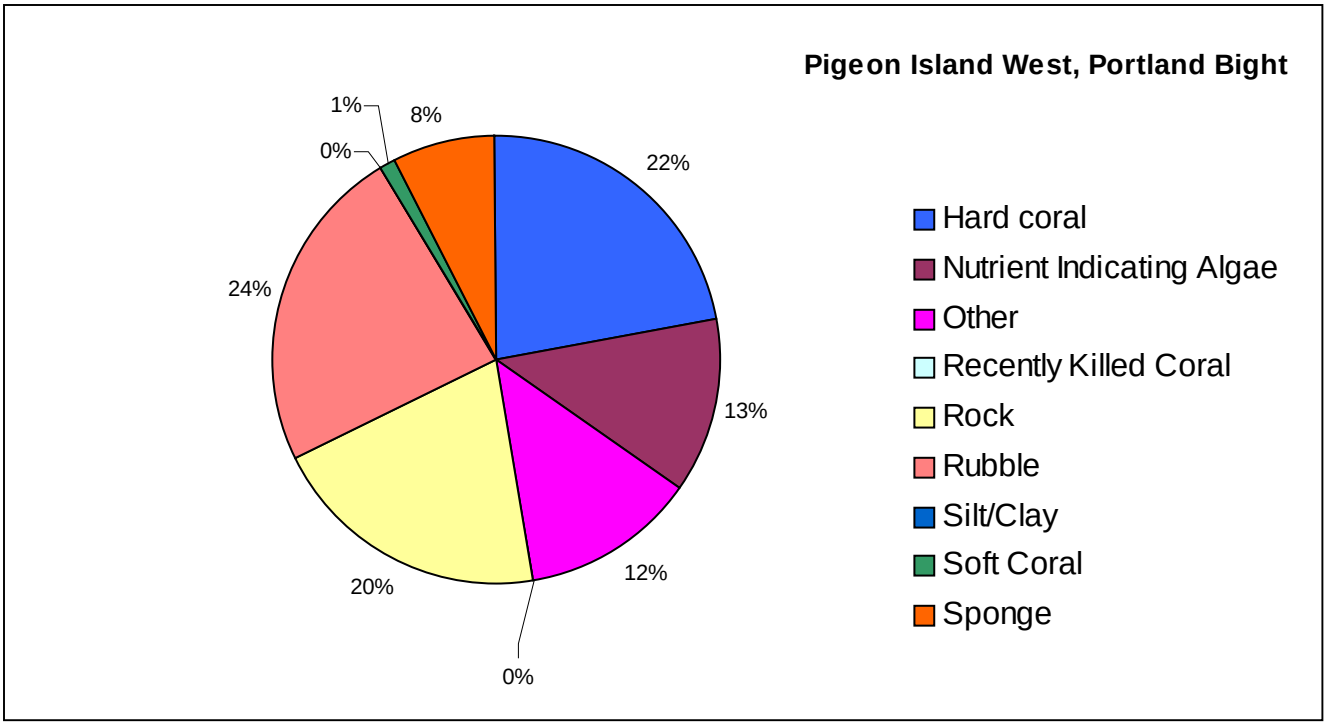

Figure 5. Cover by hard coral and other benthic substrate at Pigeon Island West

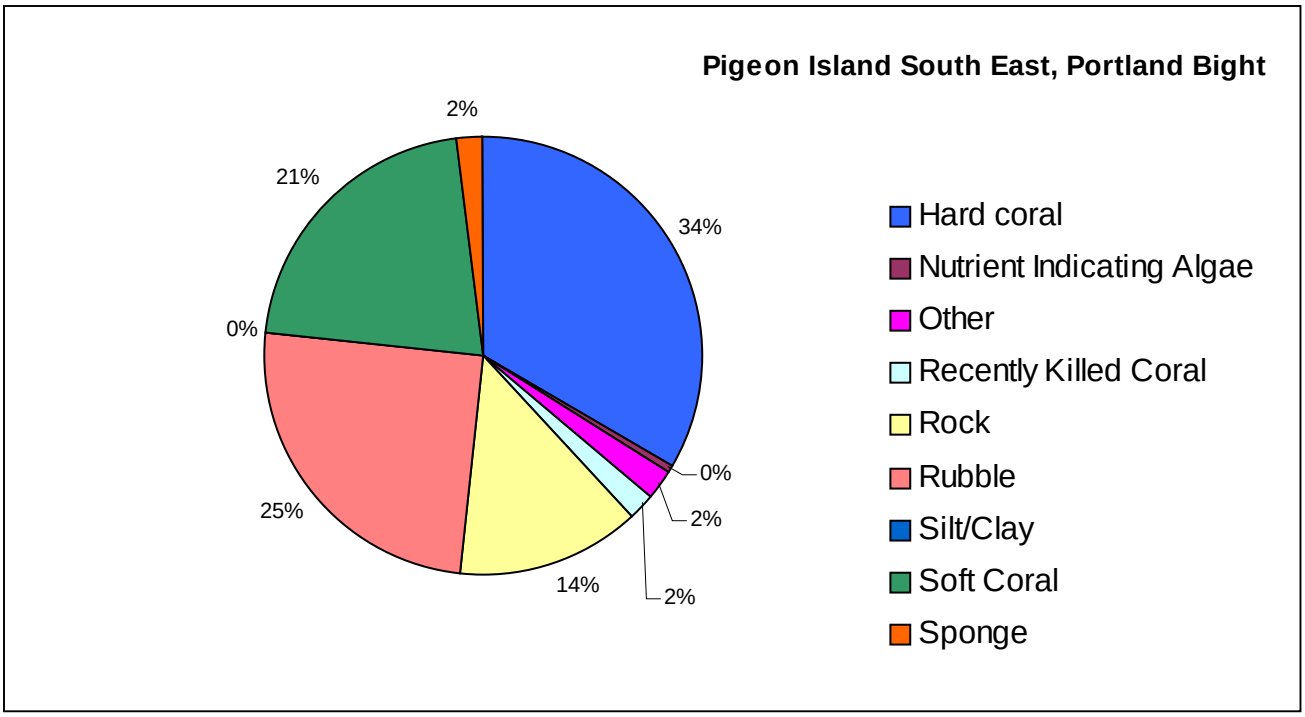

Figure 6. Cover by hard coral and other benthic substrate at Pigeon Island South East

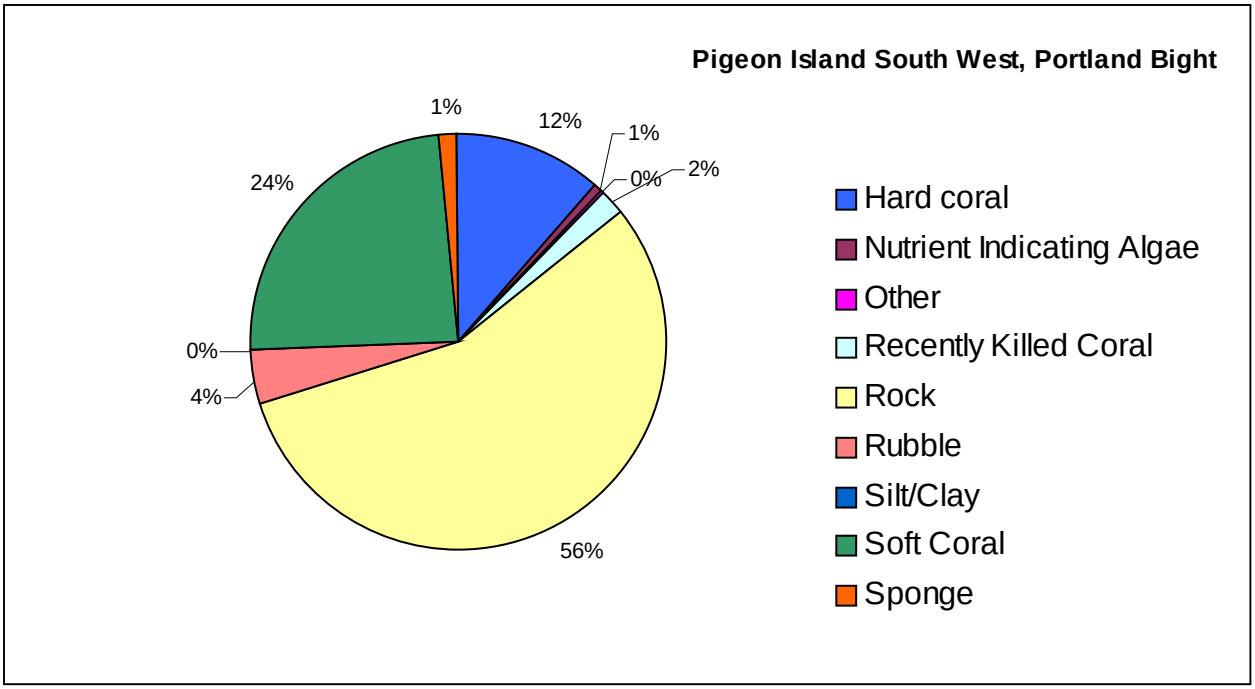

Figure 7. Cover by hard coral and other benthic substrate at Pigeon Island South West

Fish and Invertebrates

Overall mean total fish density was highest at South East Reef, off Pigeon Island where 13.4/100 sq m were recorded, compared to 8.5/100 sq m, 5.4/100 sq m, 5.3/100 sq m, 3.6/100 sq m and 2.25/100 sq m at Big Portland Cay, Pigeon Island West, Hans Reef, Lighthouse Reef and South West Reef, Pigeon Island respectively (Table 3). Generally more fish were observed in deeper sites when compared to shallow sites. South East Reef, Pigeon Island, had the highest mean total fish density (butterfly, grunts, parrot, snapper, Nassau and other groupers, lobsters and Moray eels) of 16/100 sq m recorded at 7 m, compared to 10.8/100 sq m at 3 m, while the Pigeon Island South West Reef recorded the lowest mean total fish density with 3.75/100 sq m at the deep site and 0.75/100 sq m at the shallow site (Figure 8).

South East reef had the highest count, per 100 sq m, of butterfly fish (1.9), parrotfish (5.6), snapper (2.25) and the only recorded grouper sighting. Lobster count, per 100 sq m) was second only to Lighthouse reef (1.9 to 2.1). Grunts were most abundant at Big Portland Cay where the mean total count per 100 sq m was 6.6. Fish from the Scaridae and Haemulidae family were the most abundant with a mean count of 1.8 fish/100 sq m/site. The least abundant fish was from the grouper Epinephalus spp., where no fish were observed at most sites.

Urchin (diadema, pencil and Tripneutes) densities were relatively low in the Portland Bight area, totaling a high of 4.5/100 sq m at Big Portland Cay and a low of 0.25/100 sq m at Pigeon Island West. The highest diadema density was 2.5/100 sq m at Big Portland Cay while the South West Pigeon island site recorded 0. However, percentage cover by NIA was relatively low throughout the area surveyed. This may be due to the generally higher density of grazing fish spp, such as grunts and parrotfish, which were observed in the Bight compared to other sites in Jamaica.

Gorgonian counts were higher at the deeper reef sites than at shallow sites. Gorgonian density was highest at Pigeon Island West with 612.8 gorgonians/100 sq m, while the lowest density was recorded at Pigeon Island South West site at 25.4 gorgonians/100 sq m.

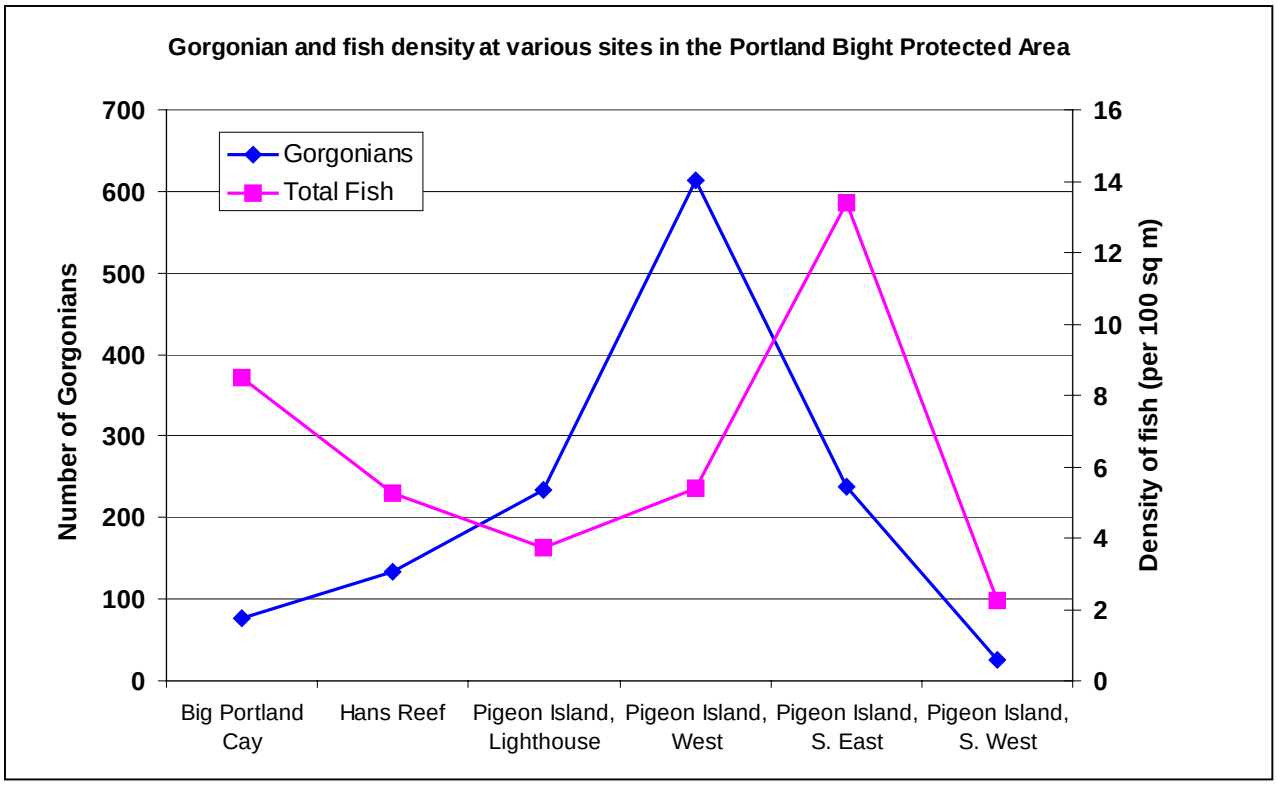

Figure 8. Variation in density of gorgonians and fish at various reef sites in Portland Bight

Conclusions:

These initial surveys indicate that there is some variability in the status of the reefs of the 3 cays surveyed in the Portland Bight area. The area is quite wide and the cays are subjected to varying impacts depending on proximity to land and exposure to ocean currents. The sites surveyed generally have fairly good coral cover and low nutrient indicating algae. Fish counts were generally higher than at other Jamaican sites surveyed using Reef Check method. Density of diadema and other urchins was relatively low. More comprehensive surveys are planned for this area in 2004, which will see additional cays being surveyed to assess their conditions as well as more detailed monitoring to determine species composition of corals and invertebrates within the Bight.

Table 1: Mean benthic substrate percent cover at reef sites in the Portland Bight Protected Area (PBPA)

Site	Depth (m)	Hard Coral	Overall Hard Coral	Nutrient Indicating Algae (NIA)	Overall NIA	Other	Recently Killed Coral	Rock	Rubble	Silt/Clay	Soft Coral	Sponge
Big Portland Cay	3	4.38		0.63		0.00	0.00	91.88	0.00	0.00	3.13	0.00
	7	7.26	5.82	1.28	0.95	0.86	0.00	72.37	6.27	0.00	11.96	0.00
Hans Reef	3	20.63		18.75		13.13	3.13	29.38	0.63	0.00	11.88	2.50
	8	29.65	25.14	2.67	10.71	19.04	0.00	29.02	2.74	1.32	15.57	0.00
Lighthouse Reef	4	24.16		3.16		42.42	1.61	14.92	0.00	0.00	5.10	8.62
	8	25.66	24.91	12.22	7.69	13.31	3.84	26.22	1.56	0.00	8.48	8.72
Pigeon Island West	3	17.90		17.59		14.11	0.00	28.65	20.12	0.00	0.00	1.64
	8	26.70	22.30	7.44	12.51	10.71	0.00	11.68	27.97	0.00	2.09	13.41
South East Reef	3	32.82		0.81		1.43	1.43	3.31	46.63	0.00	9.65	3.93
	7	33.92	33.37	0.00	0.40	3.15	2.52	23.87	3.59	0.00	32.95	0.00
South West Reef	3	9.38		0.00		0.63	0.63	63.75	0.00	0.00	23.75	1.88
	8	13.95	11.66	1.25	0.63	0.00	3.31	47.33	8.14	0.00	25.06	0.96

Table 2: Mean densities (per 100 sq m) of various fish and invertebrates at reef sites in the Portland Bight Protected Area (PBPA)

Site	Depth (m)	Diadema	Gorgonians	Banded Coral Shrimp	Butterfly Fish	Flamingo Tongue	Grunts	Lobster	Moray Eel	Nassau Grouper	Other Grouper	Parrot Fish	Pencil Urchin	Snappers	Tripneutes	Triton
Big Portland Cay	3	2.5	7.25	0.5	0	0	6.5	0	0.5	0	0	0.75	2.75	0	0	0
	7	1	147.75	0	0	0.25	6.75	0.25	0.25	0	0	1.75	0.25	0.25	2.5	0
Hans Reef	3	1	32.75	0	1.75	0	2	0	0	0	0	3	0.25	2	0.5	0.25
	8	0	234.25	0	0.25	0	0	1.25	0	0	0	0.25	0.5	0	0	0
Lighthouse Reef	4	1	259.25	0	0	0	0.75	1.25	0.25	0	0	0.5	0.75	0.75	0	0
	8	0.75	207	0	0.5	0	0.25	3	0	0	0	0	1	0.25	0	0.5
Pigeon Island West	3	0.25	544.75	0	0.25	0.25	1	1.25	0	0	0	0.5	0	0.5	0	0
	8	0.25	680.75	0.5	0.25	0	1.25	1	0	0	0	0.75	0	4	0	0
South East Reef	3	0	199.75	0	3.25	0	0.5	0	0	0	0.5	5.5	2	1	0	0.5
	7	1	275.75	0	0.5	0	2.5	3.75	0	0	0	5.75	0.75	3.5	0	0
South West Reef	3	0	3.75	0.25	0	0	0	0	0	0	0	0.75	0.5	0	0	0
	8	0	47	0	0.75	0	0	0.5	0.25	0	0	2	0	0.25	0.5	0