EXPEDITION REPORT

Expedition dates: 18 March – 13 April 2007
Report published: December 2007

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Authors:

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Matthias Hammer (editor)
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ABSTRACT

The Marine Natural Monument Archipelago Cayos Cochinos (MNMACC) is located at 15º 57' N and 86º 30' W in the Caribbean off the coast of Honduras. The MNMACC is characterised by a number of interconnected critical marine habitats. These habitats are coral reef, sea grass beds, octocoral formations, rock, sand, algae and mangroves.

Reef Check was designed to assess the health of coral reefs and is quite different from other monitoring protocols in that it focuses on the abundance of particular coral reef organisms that best reflect the condition of the ecosystem and that are easily recognisable to the general public. The densities of organisms reported here show that historical pressure in the area has reduced the abundance and diversity of the reef community.

Overall, there were low numbers of important fisheries such as grouper and lobster. No-fishing zones have had an effect, with more snapper found in no-take areas (P<0.01). High numbers of the urchin *Diadema* were found at the storm impacted site El Avion, but were in low numbers elsewhere. Coral disease and bleaching was present, but at low levels. High amounts of nutrient indicator algae were found at the majority of sites. Continued monitoring of permanent transects is required to monitor reef degradation and to further understand the role of sedimentation and fishing in the Marine Natural Monument Archipelago Cayos Cochinos.

RESUMEN

El Monumento Natural Marino Archipiélago Cayos Cochinos (MNMACC) está localizado 15°57' N y 86°30' W de la costa del Caribe Hondureño. El MNMACC se caracteriza por un número de hábitats marinos críticos interconectados. Entre estos hábitats se encuentran arrecifes coralinos, lechos de pasto marino, formaciones octocoralinas, roca, arena, algas y manglares.

Reef Check fue diseñado para poder evaluar el estado de la salud de los arrecifes coralinos, y es algo diferente de otros protocolos de monitoreo. Reef Check se ha enfocado en la abundancia de ciertos organismos del arrecife particulares que reflejan la condicion del ecosistema y que son fácilmente reconocibles por el publico en general. Las densidades reportadas aquí reflejan una idea de la presión histórica en esta área, y de como se ha reducido la abundancia y diversidad de la estructura en la comunidad arrecifal.

En general, se encontró un número bajo de especies importantes para la pesca tales como Meros y Langostas. Las zonas de no pesca han tenido un efecto, encontrandose aquí un alto número de Pargos (P<0.01). Una alta incidencia de Erizos Diadema se encontró en el sitio impactado de El Avión, pero una baja incidencia en los demás sitios. Blanqueamiento y enfermedades de Coral fueron reportadas pero en bajos niveles. En la mayoría de los sitios se encontraron altas densidades de Algas indicadoras de nutrientes. Monitoreos continuos en transeptos permanentes para poder evaluar la degradación del arrecife y para un entendimiento complementario en el papel o rol de la sedimentación y de la pesca en el Monumento Natural Marino Archipiélago Cayos Cochinos.

Contents

Please note: Each expedition report is written as a stand-alone document that can be read without having to refer back to previous reports. As such, much of this section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

1. Expedition Review

K. Wilden & M. Hammer (editor)
Biosphere Expeditions

1.1. Background

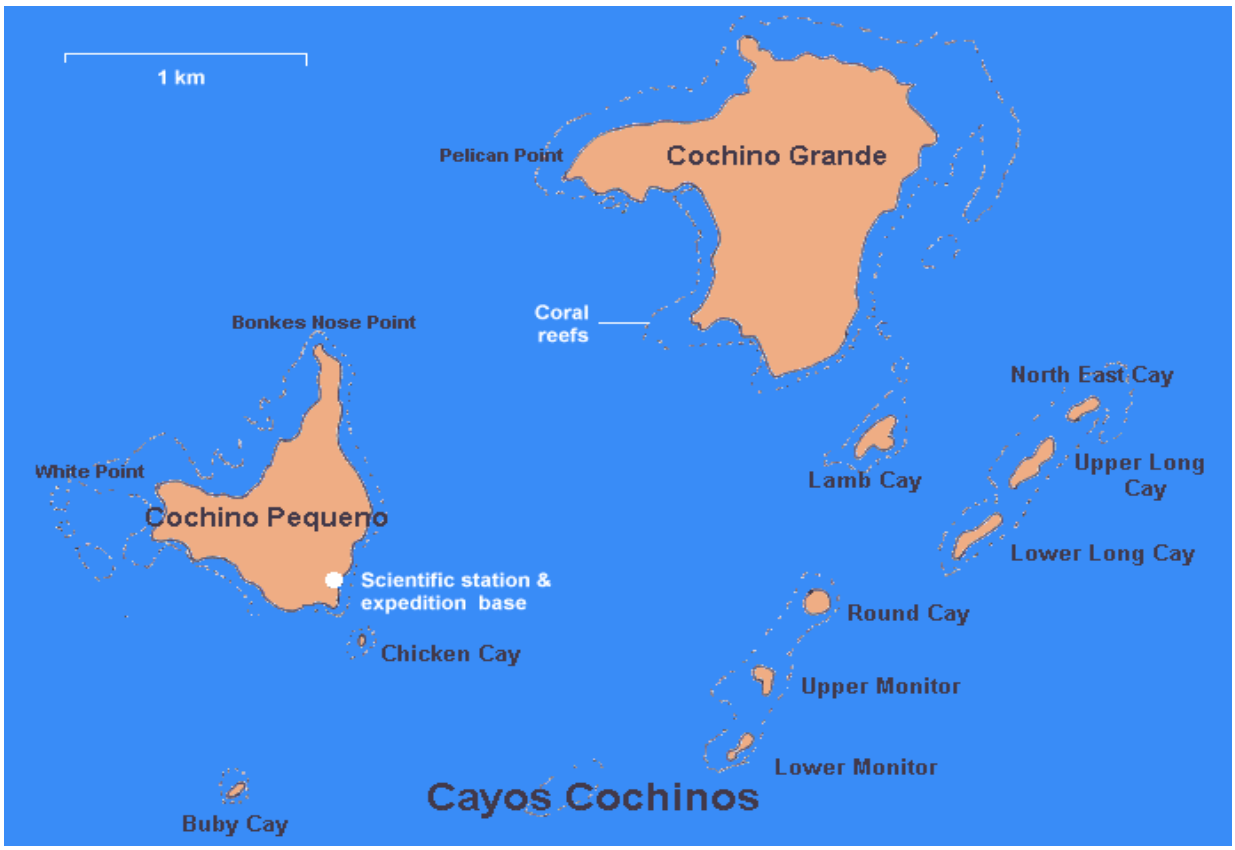
Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Expeditions are open to all and there are no special skills (biological or otherwise) required to join. Expedition team members are people from all walks of life and of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This expedition report deals with an expedition to the world's second largest reef system in the middle of the Cayos Cochinos Natural Monument in the Caribbean Sea, off the coast of Honduras, which ran from 18 March to 13 April 2007. The purpose of the survey programme was to provide data on the current biological status of the reefs and islands and of population levels of protected species within the marine protected area. All this as part of an international coral reef research programme, called the Reef Check monitoring programme.

1.2. Research area

The Cayos Cochinos are a group of two small islands (Cochino Pequeno and Cochino Grande) and 13 small coral cays situated 30 kilometres northeast of the town of La Ceiba on the northern shores of Honduras. In November 1993, a Presidential Decree designated the Cayos Cochinos a Natural Protected Area and the Honduras Coral Reef Fund (HCRF) as the managing agency responsible for the conservation of the islands. In August 1994 a second Presidential Decree, confirmed the protected status of the islands. In November 2003 a Legislative Decree declared a Marine Natural Monument. The protected area covers 460 km^2 and HCRF are responsible for its management.

The Cayos Cochinos form part of the world's second largest barrier reef system, known as the Meso-American Barrier Reef, and have been identified by the Smithsonian Institute, The Nature Conservancy, the Word Wildlife Fund and the World Bank as one of the key sections of the barrier reef system to preserve. The reefs are the least disturbed ecosystems in the so-called Bay Islands Complex and have had a strong and active NGO working with local communities, private sector bodies and government organisations to help manage the reefs and their fisheries over the last 10 years.



Map of the study area. See also See also Google Maps for an internet-driven view of the study site.

1.3. Dates

The expeditions ran over a period of four weeks divided into two two-week slots, each composed of a team of international research assistants, scientists and an expedition leader. Slot dates were:

18 – 30 March | 1– 13 April 2007.

Dates were chosen when survey conditions like the clarity of water and therefore visibility were best.

1.4. Local Conditions & Support

Expedition base

The expedition team was based on the island of Cochino Pequeno at the scientific station of Cayos Cochinos. The Cayos Cochinos site and scientific station was set up by the Honduras Coral Reef Foundation (HCRF) in 1994 and features spacious bungalow-style cabins, a fully equipped dive centre with compressors and equipment for hire, wet and dry labs, a computer and lecture room, common areas and a dining area. 4 – 8 team members shared a spacious bungalow-style cabin (2 – 4 persons to a room). Each cabin had a shower and toilet, a small kitchen cum lounge and a veranda overlooking the beach. A cook provided all meals and vegetarians and special diets were catered for.

Field communications

Each dive boat carried one radio for communication with other boats and with the scientific station. Mobile phones worked on the island and within a few kilometres out at sea, but very few European and North American providers seemed to have a roaming agreement with Honduran providers. There was e-mail and internet connection on the island for staff.

Transport, vehicles & research boats

Team members made their own way to the La Ceiba assembly point. From there all transport was be provided for the expedition team and on the island a variety of HCRF boats were used to move to survey sites and back.

Medical support & insurance

The expedition leader was a trained divemaster and first aider, and the expedition carried a comprehensive medical kit. Further medical support was provided by a hospital and doctors within easy reach at La Ceiba. All dive boats carried safety equipment and oxygen. For urgent emergency cases there was a helicopter landing pad on Cochino Pequeno and a recompression chamber on nearby Roatan island.

All team members were required to carry adequate travel insurance covering emergency medical evacuation and repatriation.

There were three incidences of mild barotraumas. In one incidence the diver was returning home the next day, in the second incidence it was necessary for the diver to remain out of the water for one day. The third incidence meant that the diver could return to the water for only short periods for the remainder of the expedition. Other minor incidences included a tank causing bruising a diver's foot, some mild diarrhoea and the occasional splinter.

Diving

The minimum requirement to take part in this expedition was a PADI Open Water or equivalent qualification. Team members who had not dived for twelve months prior to joining the expedition were required to complete a PADI Scuba Review before joining the expedition.

Standard PADI diving and safety protocols were followed.

One team member did not comply with the above Scuba Review requirement and indeed had not been in the water for ten years. This caused problems on initial dives in establishing adequate buoyancy control and this is likely to have contributed to the mild barotrauma that the diver suffered. The requirement for people to have dived (either in open water or in a pool) within the previous twelve months needs to be emphasised further in future expeditions.

Dive groups were divided into different teams, each working on specific areas of survey work. Divers were allocated to teams based on a mixture of personal preference, diving skills and knowledge of the species.

1.5. Local Scientists

Italo Bonilla is a biologist, PADI dive instructor and Emergency First Response instructor. His research interests are spawning aggregations sites for reef fish in Belize and Honduras and several reef survey methodologies, amongst them Reef Check, on many expeditions in Belize and Honduras.

The expedition also benefitted from the presence of Jon Shrives, a PhD student from Oxford University, and Greg Cowie, a senior lecturer from Edinburgh University.

Jon has been studying the coral reefs at Cayos Cochinos for the last five years and has a wealth of knowledge on the local environment and coral reef ecology.

Greg was visiting the island to support Jon in his work by providing detailed water quality information using a highly specialised probe that he was deploying in several locations around the reefs. They discussed many aspects of the work with the expedition team members and acted as guests scientists by giving evening lectures on their work.

1.6. Expedition Leader

This expedition was led by Katherine Wilden. Katherine joined Biosphere Expeditions in 2000. She was born and educated in England. Since gaining her BA in Business at Bristol, she has worked in development and regeneration for a variety of public sector organisations. She has travelled extensively in Europe and Australasia and lives in England and Germany. At Biosphere Expeditions she is in charge of the financial and UK operations planning, but also leads expeditions into the field whenever her time allows. Katherine is a qualified offroad driver, keen sailor, divemaster and a keen allround watersports enthusiast with experience in a variety of offshore settings and a particular love of diving.

1.7. Expedition Team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were:

18 - 30 March

Matt Bull (UK), Alexander Dobbin (UK), Dörthe Dräger (Germany), Alistair Franics (UK), Eric Frazier (USA), Kate Hedges (Canada), Rachel Martin (UK), Suzanne Mills (UK), Rachael Prados (USA). Also: Journalist Tony Woodward (UK).

1 - 13 April

Charlotte Denham (UK), Tina Fuchs (Germany), Andreas Odey (Germany), Daniel Steinbach (Germany), Susanne Tromm (Germany), Neil Welpton (UK). Also: Marcio Aronne, logistics coordinator.

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1190 per person per two week slot. The contribution covered accommodation and meals, supervision and induction, special non-personal diving and other equipment and air, and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses like telephone bills, souvenirs etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	18,636
Expenditure	
Accommodation and food includes all meals, station equipment	3,854
Transport includes fuel, boat & vehicle maintenance	1,241
Equipment and hardware includes research materials, research gear	680
Biosphere Expeditions staff includes salaries, travel and expenses to Cayos Cochinos	3,332
Local staff includes salaries, travel and expenses, Biosphere Expedition tips, gifts	1,634
Administration includes registration fees, sundries, etc	484
Team recruitment Honduras as estimated % of PR costs for Biosphere Expeditions	3,010
Income – Expenditure	4,401
Total percentage spent directly on project	76%

1.9. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members (who are listed above) who provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff (also mentioned above) were central to making it all work on the ground. Thank you to all of you, and the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank members of the Friends of Biosphere Expeditions and donors, Land Rover, Cotswold Outdoor, Globetrotter Ausrüstung and Buff for their sponsorship.

1.10. Further Information & Enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Enquires should be addressed to Biosphere Expeditions at the address given below.

2. Reef Check Survey

Jonathan Shrives, Oxford University and Italo Bonilla-Mejía, HCRF

2.1. Introduction

Study site

The Marine Natural Monument Archipelago Cayos Cochinos (MNMACC) is located at latitude 15º 57' N and longitude 86º 30' W in the Caribbean. The MNMACC belongs to the Honduran Bay Islands Department and covers an area of 485.337 square km, consisting of a core area (Fig 2.1a).and the five nautical mile buffer zone (Fig 2.1c).

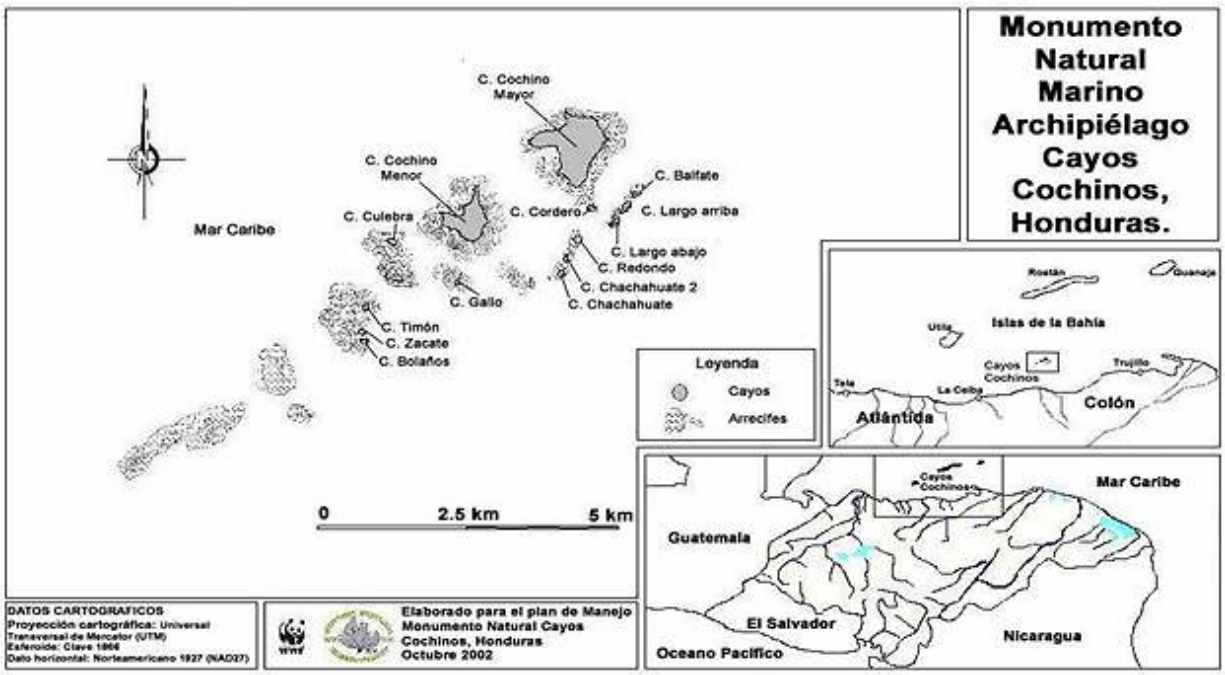


Figure 2.1a. Cayos Cochinos.

The main areas influencing Cayos Cochinos from east to west are the city of La Ceiba (39.35 km), Garifuna communities of Sambo Creek (25.83 km), Nueva Armenia (18.53 km), which belongs to the municipality of La Ceiba and Jutiapa in the Department of Atlántida; Garifuna communities of Balfate (23.27 km), and Río Esteban (23.27 km) part of the Department of Colón, and finally on the north side Roatan island (39.00 km) (Fig. 2.1c).

General characteristics

The MNMACC it characterised by a set of critical connected marine habitats with fish, crustaceans and other species. These habitats are coral reef, sea grass beds, octocoral formations, rock, sand, algae and mangroves. Among the biodiversity of the associated fauna are yellowtail snapper (*Ocyurus chrysurus*), lane snapper (*Lutjanus sinagris*), Caribbean spiny lobster (*Panulirus argus*), a highly important species for the economy of the area, and endangered species such as the Queen conch (*Strombus gigas*), hawksbill turtle (*Erethmochelys imbricata*); and other species of interest to the tourism industry such as the whale shark (*Rhincodon typus*) (Andraka et al. 2004).

The MNMACC is part of the Mesoamerican Barrier Reef System (MBRS), the world's second largest reef barrier (Fig. 2.1b), extending from the Bay Islands, Honduras to the north side of the Yucatán peninsula, México. Cayos Cochinos is within the sub-region of the north coast of Honduras, defined by two rivers: Ulúa and Patuca and includes the Bay Islands as well (Kramer & Kramer 2002).

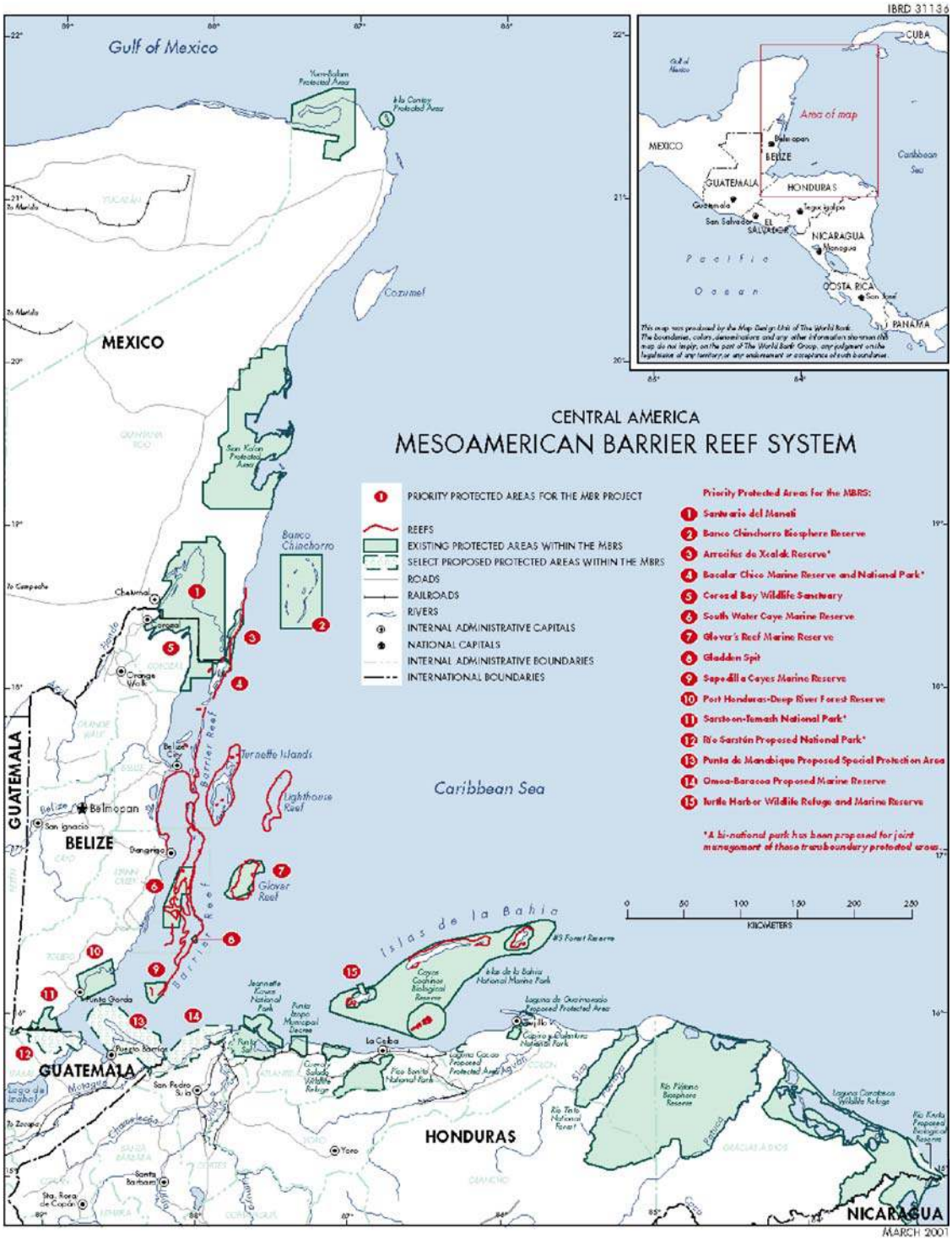
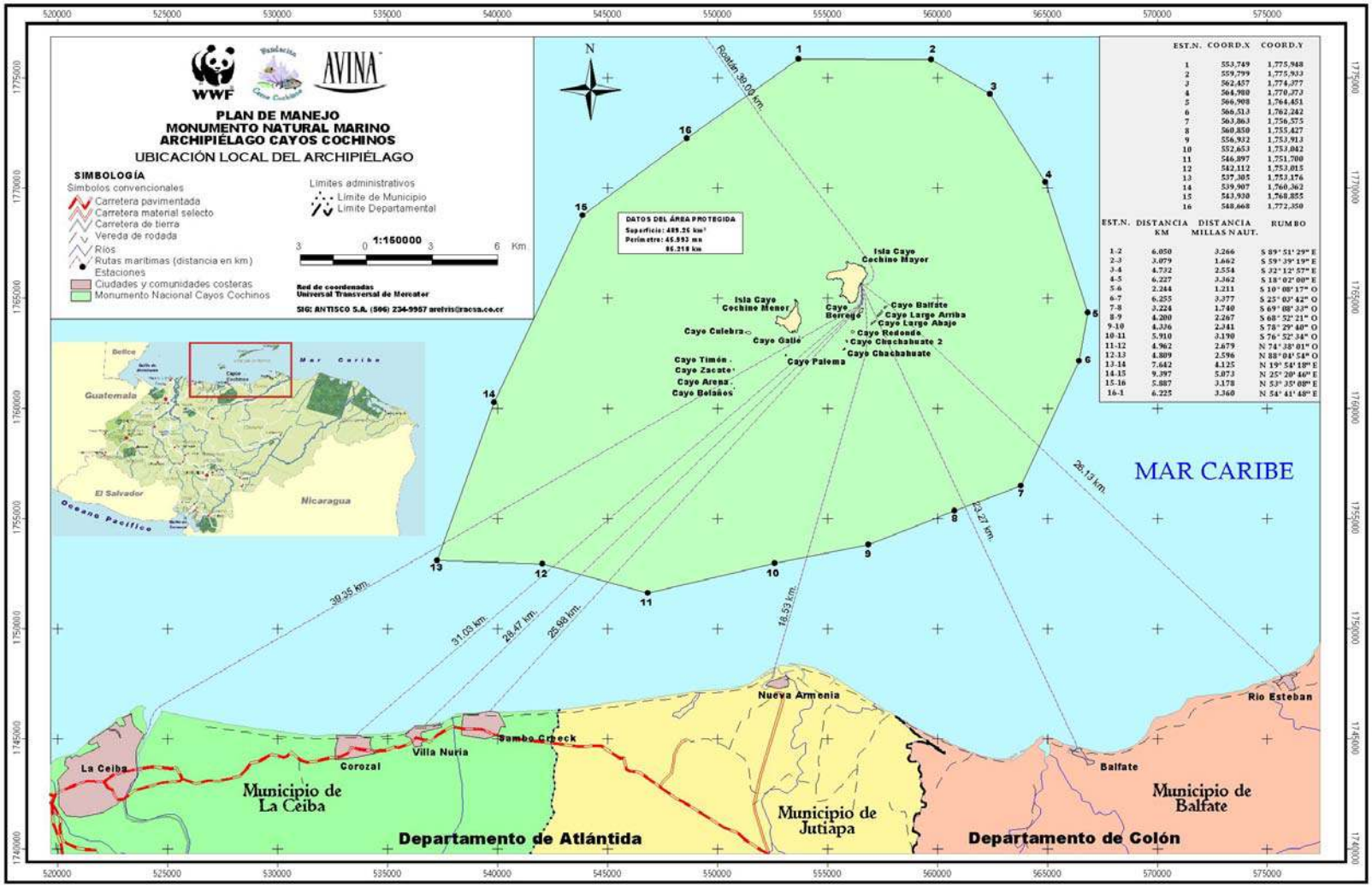


Figure 2.1b. The Mesoamerican Barrier Reef.



EST.N.	COORD.X	COORD.Y
1	553,749	1,775,948
2	559,799	1,775,933
3	562,457	1,774,377
4	564,980	1,770,373
5	566,908	1,764,451
6	560,513	1,762,242
7	563,863	1,756,575
8	560,850	1,755,427
9	556,932	1,753,913
10	552,653	1,753,042
11	546,897	1,751,700
12	542,112	1,753,015
13	537,305	1,753,176
14	539,907	1,760,362
15	543,930	1,760,855
16	548,668	1,772,350

EST.N.	DISTANCIA KM	DISTANCIA MILLAS NAUT.	RUMBO
1-2	6.050	3.266	S 89° 51' 29" E
2-3	3.079	1.662	S 59° 39' 19" E
3-4	4.732	2.554	S 32° 12' 57" E
4-5	6.227	3.362	S 18° 02' 00" E
5-6	2.244	1.211	S 10° 08' 17" O
6-7	6.255	3.377	S 25° 03' 42" O
7-8	3.224	1.740	S 69° 08' 33" O
8-9	4.200	2.267	S 68° 52' 21" O
9-10	4.336	2.341	S 78° 29' 40" O
10-11	5.910	3.190	S 76° 52' 34" O
11-12	4.962	2.679	N 74° 38' 01" O
12-13	4.809	2.596	N 88° 04' 54" O
13-14	7.642	4.125	N 19° 54' 18" E
14-15	9.397	5.073	N 25° 20' 46" E
15-16	5.887	3.178	N 53° 35' 08" E
16-1	6.225	3.360	N 54° 41' 48" E

Figure 2.1c. Areas influencing Cayos Cochinos.

This eco-region is shared between four countries (Mexico, Belize, Guatemala and Honduras) that also share some of their watersheds. It provides a basis of living for several indigineous, Garifunas and Mestizo communities and is a critical natural resource of activities such fishing and tourism.

The MNMACC is part of an interconnected system of coastal habitats and sea currents that originate in the Caribbean and elsewhere. The MBRS is a coherent ecological unit that includes a set of characteristics unique in the Atlantic Ocean: atolls and a high diversity of commercial species (lobster, conch, shrimp and fish). The whale shark, manatees and sea turtles all have important habitats for their reproduction, nesting and foraging in the MBRS and the extensive sea grass beds and mangroves are important sites for the spawning aggregation of reef fish (Kramer & Kramer 2002).

Honduras Coral Reef Foundation

The Honduras Coral Reef Foundation (HCRF) was founded in 1993 and is the non-governmental organisation (NGO) officially responsible for the management and conservation of the MNMACC. The main tasks for HCRF are to enhance conservation and management activities; to enforce the natural resource use regulations; to increase scientific station development and to promote sustainable development options for local fishermen communities. To achieve all the objectives in a long term HCRF has been supported mainly by AVINA/MARVIVA, the World Wildlife Fund (WWF), The Nature Conservancy (TNC), Operation Wallacea and Biosphere Expeditions amongst other international institutions.

By the year 2004, HCRF along with WWF and the support of Cayos Cochinos' local communities published the first management plan for the area specifying regulations to help the conservation and protection of all natural resources. Also in the same year a sustainable development plan for tourism was created thus giving HCRF the tools to measure the carrying capacity and public use of the whole area.

Biosphere Expeditions has been invited to help with the implementation of this plan. As part of the management plan several zones with different use regulations were established. In order to find out if these zones and its regulations have been effective for the conservation of natural resources, a long term monitoring programme of the reef's conditions needs to be conducted. The Reef Check methodology provides an easy protocol for this purpose that is replicated all over the world and allows for the use of volunteer divers (Hodgson et al. 2006).

Reef Check

Reef Check is the name of both the most widely used coral reef monitoring protocol and an international coral reef conservation program. The Reef Check programme brings together community groups, government departments, academia and other partners to educate the public about the coral reef crisis, create a global network of volunteer teams which regularly monitor and report on reef health, scientifically investigate coral reef ecosystem processes, facilitate collaboration among academia, NGOs, governments and the private sector, and stimulate local community action to protect remaining pristine reefs and rehabilitate damaged reefs worldwide using ecologically sound and economically sustainable solutions (Hodgson 2000).

Reef Check was designed to assess the health of coral reefs and is quite different from other monitoring protocols. Since its inception Reef Check has focused on the abundance of particular coral reef organisms that best reflect the condition of the ecosystem and that are easily recognizable to the general public. Selection of these “indicator organisms” was based on their economic and ecological value, their sensitivity to human impacts and ease of identification. Sixteen global and eight regional indicator organisms serve as specific measures of human impacts on coral reefs. These indicators include a broad spectrum of fish, invertebrates and plants that indicate human activities such as fishing, collection or pollution. Some Reef Check categories are individual species, whilst others are families (Hodgson et al. 2006).

For instance, in the Caribbean the Nassau grouper (*Epinephelus striatus*) is the most desired fish in the live food fish trade, whereas the trumpet triton (*Charonia variegata*) is collected for the aquarium trade. Both species are very distinctive organisms and excellent indicators of human predation. On reefs where these organisms are heavily exploited, their numbers are expected to be low compared to their abundance on unexploited reefs.

Reef Check teams collect four types of data: (1) a description of each reef site based on over 30 measures of environmental and socio-economic conditions and ratings of human impacts, (2) a measure of the percentage of the seabed covered by different substrate types, including live and dead coral, along four 20 m sections of a 100 m shallow reef transect, (3) invertebrate counts over four 20 m x 5 m belts along the transect and (4) fish counts up to 5 m above the same belt (Hodgson et al. 2006).

Reef Check History (adapted from Hodgson et al. 2006)

Scientists have been monitoring coral reefs since the time of Darwin. The 1993 Colloquium on Global Aspects of Coral Reefs was a turning point for many reef scientists who met to discuss the health of the world's reefs. At the end of the meeting, it was clear that there was not enough information available to form a picture of the status of coral reefs on a global scale. A group of coral reef scientists felt that part of the problem lay with some of the standard monitoring methods scientists have used.

These detailed methods were designed to investigate community ecology and included measurements of many parameters that may not be affected when coral reef health is damaged. The scientists felt that more specific methods should be designed to investigate human impacts on coral reefs, because those are the impacts that are preventable.

It was recognized that another problem with the conventional approach to coral reef assessment and monitoring was that there are only a small number of reef scientists, most of whom are only able to carry out surveys periodically. Thus, the database of coral reef condition was incomplete and the data that existed were not easily comparable. The solution was to organize a global survey effort that would take place annually over a defined period using one standard method - a synoptic survey of the health of the world's reefs, with help from non-scientists. The Reef Check concept grew out of this initiative and was developed in early 1996. The methods were drafted and subsequently posted on the internet and peer-reviewed by many reef scientists. Reef Check was launched in 1997 and during that year conducted the first-ever global survey of coral reef health. The results provided scientific confirmation that coral reefs were facing a major crisis.

In the 1980s, many scientists thought that the major threats to coral reefs were primarily pollution and sedimentation. The Reef Check results demonstrated for the first time, that overfishing was a major threat to coral reefs on a global scale. Since then, hundreds of Reef Check teams have been monitoring reefs every year in more than 60 countries. The results of the first five years of monitoring were presented in a major report, “The Global Coral Reef Crisis – Trends and Solutions” at the World Summit on Sustainable Development in Johannesburg, South Africa in September 2002. The report documented the continuing global decline in reef health but also included coral reef conservation success stories from around the world. Monitoring was carried out on over 1500 reefs in the Atlantic, Indo-Pacific and Red Sea. Following quality assurance procedures, 1107 sites were accepted for analysis, amongst them the expedition study site.

2.2. Methods

Site selection & sampling design

Reef Check’s regional coordinator advised us on the site selections as well as other aspects of setting up our Reef Check team. All teams had a team scientist and a team leader trained by a Reef Check trainer.

The Reef Check protocol is designed to be as simple as possible so that untrained volunteer divers can participate. Practical team sizes are two, three, or four pairs of divers. However, larger or smaller groups are possible. Divers should be sufficiently experienced (> 30 dives or equivalent experience) that they are able to perform simple activities underwater. It is the role of the team leader to decide if the team members are adequately qualified to undertake these activities.

Reef Check surveys can be carried out by snorkellers in shallow water (Hodgson et al. 2006). An ideal Reef Check team includes six members (three buddy pairs) plus support crew, each with different specialties and experience. In our case we selected a team of six members plus the team leader and the scientific leader of the expedition. Some adaptations to local conditions were made (i.e. substrate, underwater hand signals) for the team members.

Eight sites were surveyed in each of the two expedition slots. Due to the high importance of the Marine Protected Area (MPA) sites were selected according to the zoning categories in the management plan: No take zone (no fishing), high, medium and low tourism impact (Table 1).

Table 2.2a. Overview of sites surveyed in 2006 and 2007.

Dive site name	Fishing allowed	Tourism impact (2006)	Tourism impact (2007)	Remarks
Cayo Timón	No	Medium	High	Some beach tourism and Snorkeling
Dickie C	No	Medium	Medium	Some yacht/boat diving
El Avión	Yes	High	High	Local community tourism & fishing
La Arena	Yes	Medium	Medium	Some beach/diving tourism
Pelican Point 1A	No	High	High	Main mooring site for yachts & boats
Pelican Point 2	No	Medium	Medium	Some yacht/boat tourism
Pelican Point 3	No	Medium	High	Some yacht/boat tourism
Pelican Point 4	No	Low	Low	Some Boat tourism
Jena's Cave	No	None	Not surveyed	No buoy available
Jena's Cove	No	None	Not surveyed	No buoy available
Pelican Point 1B	No	Medium	Not surveyed	No buoy available
Pelican Point 1C	No	Medium	Not surveyed	No buoy available

All sites were recorded by Global Positioning System (GPS) coordinates for future comparative surveys. All positions were collected in degrees, minutes and seconds NAD27 Central, according to Reef Check methodology (see Table 2.2b).

Table 2.2b. Coordinates of the 2007 dive sites.

Dive site name	Geographic coordinates
Cayo Timón	N 15°56'13.4" W 86°31'23.4"
Dickie C	N 15°58'41.4" W 86°28'52.1"
El Avión	N 15°57'10.6" W 86°28'25.5"
La Arena	N 15°57'15.1" W 86°31'03.1"
Pelican Point 1A	N 15°58'22.0 W 86°29'20.1"
Pelican Point 2	N 15°58'39.3" W 86°29'04.5"
Pelican Point 3	N 15°58'43.1" W 86°28'43.6"
Pelican Point 4	N 15°58' 49.4" W 86°28'43.1"

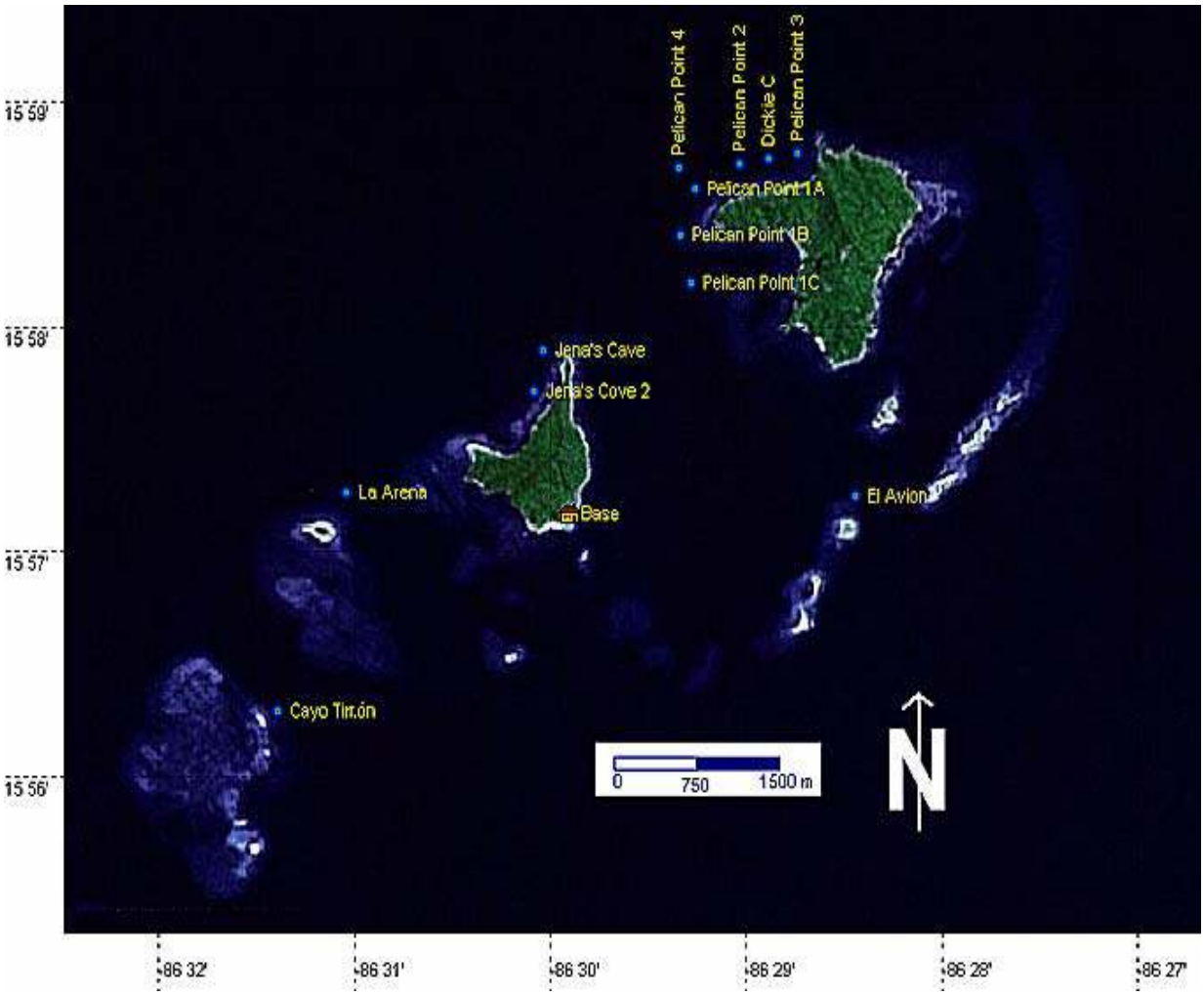


Figure 2.2a. Position of dive survey sites 2006 and 2007 in relation to base and longitudinal/latitudinal grid. Map of the study area. See also See also Google Maps for an internet-driven view of the study site.

Sites were marked by buoys, but no permanent transect markers were installed on the reef in order to minimize impact.

Training of expedition team members

The first three days of each expedition slot were spent on land and in the water with training. Each group was prepared for its fieldwork, and received lectures on the research methods and goals over and above what is recommended by Reef Check. Open water dives were organized so that everyone could get comfortable in the water and put into action the fish, invertebrate and other ID skills taught before the actual survey work began. Talks were organized to make team members familiar with the research and the area and to tell teams about species assemblages and their function in the ecosystem. Once the survey work started, the tasks of the expedition team as a whole were dive-based and consisted of several distinct underwater activities. Diving ability was assessed and team members were allocated to suitable tasks. Training in organism, substrate and disease identification skills was given using Reef Check teaching materials and special slide shows and discussion forums (Cubas et al. 2006).

Survey procedures & data collection

Data collection was based on methods described in Hodgson et al. (2006). Data were recorded using underwater slates and then transferred at the end of the day onto one of the computers provided by HCRF onto standard Reef Check Excel datasheets. These Excel sheets were then submitted to Reef Check.

2.3. Results

2.3.1. Structure of the fish community

To consider the Cayos Cochinos as a whole, underwater visual census (UVCs) data from all transects were pooled and analysed using a Poisson linked one-way ANOVA for count data (Fig 2.3.1a). Of the six categories of indicator fish used in the Reef Check methodology, parrotfish were the most abundant species seen on transects (P<0.05). The next most abundant are butterflyfish, Haemulidae and snapper. These three categories are significantly different in abundance from parrotfish, but not from each other. Moray eels and groupers are highly significantly lower in abundance than the other indicator species (P<0.01), but not from each other.

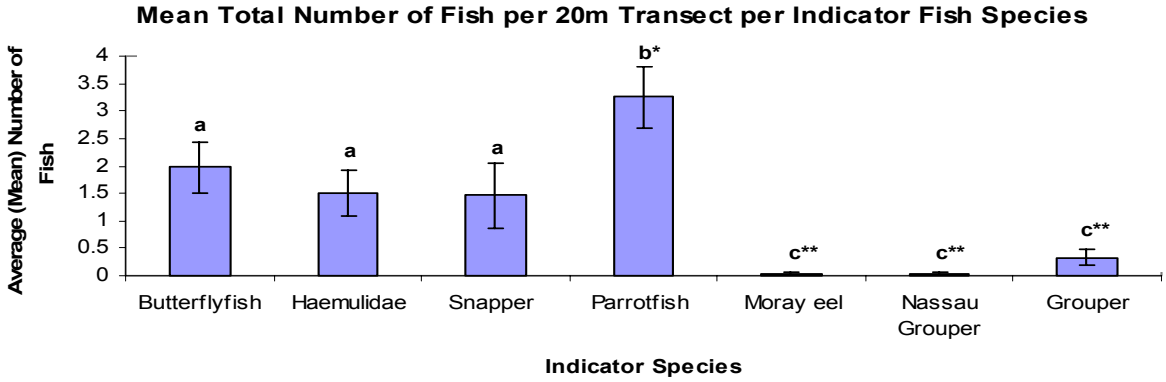


Figure 2.3.1a. A comparison between Reef Check indicator fish categories using pooled average number of fish seen in all transects for all sites in Cayos Cochinos. Bars are +/- 1 Standard Error. Significant difference is displayed by letter code (i.e. all letters a do not differ significantly from each other, but do differ from letters b and c). Degree of significance is illustrated by * = P<0.05 and ** = P<0.01.

Next, pooled data were analysed, again using ANOVA, for differences between sites using total average abundance across categories (Fig 2.3.1b). El Avión was the only site to show a significant difference in mean abundance. This site had significantly lower (P<0.05) abundance of fish than Dicky C, Pelican Point 2 and Pelican Point 4, but not from Cayo Timón or The Arena. In turn, none of the other sites were significantly different from each other.

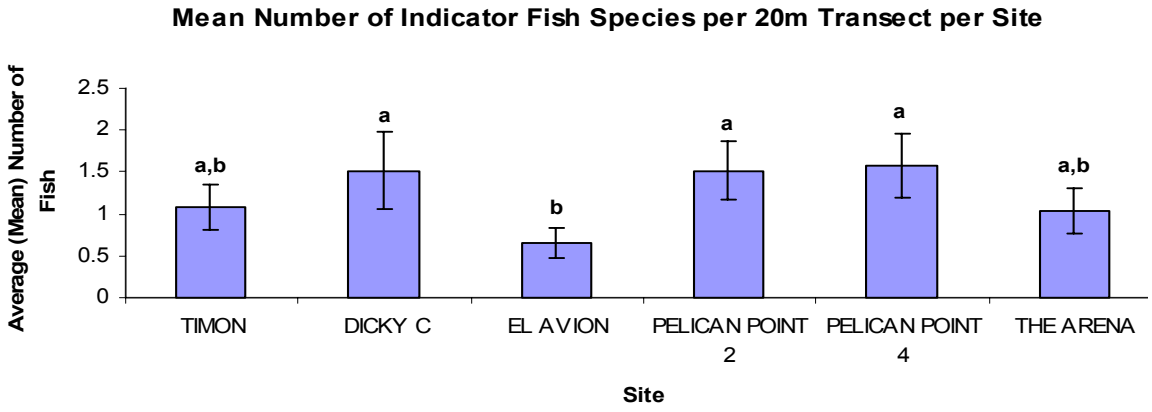


Figure 2.3.1b. A comparison between surveyed sites using pooled average number of fish seen in all transects. Bars are +/- 1 Standard Error. Again significant difference is displayed by letter code. All differences were at P<0.05 level.

A two-way ANOVA was then used to look at the interaction between site and category of indicator fish. A significant interaction was observed at the P<0.05 level, but this was not as strong as site or category on their own, which were both at the P<0.01 level. However, when analysis was conducted within indicator fish categories with post-hoc tests of a Poisson linked General Linea Model, It was found that the only species that differed significantly between sites were butterflyfish at Pelican Point 2 and snapper at The Arena (Fig 2.3.1c) (P<0.05).

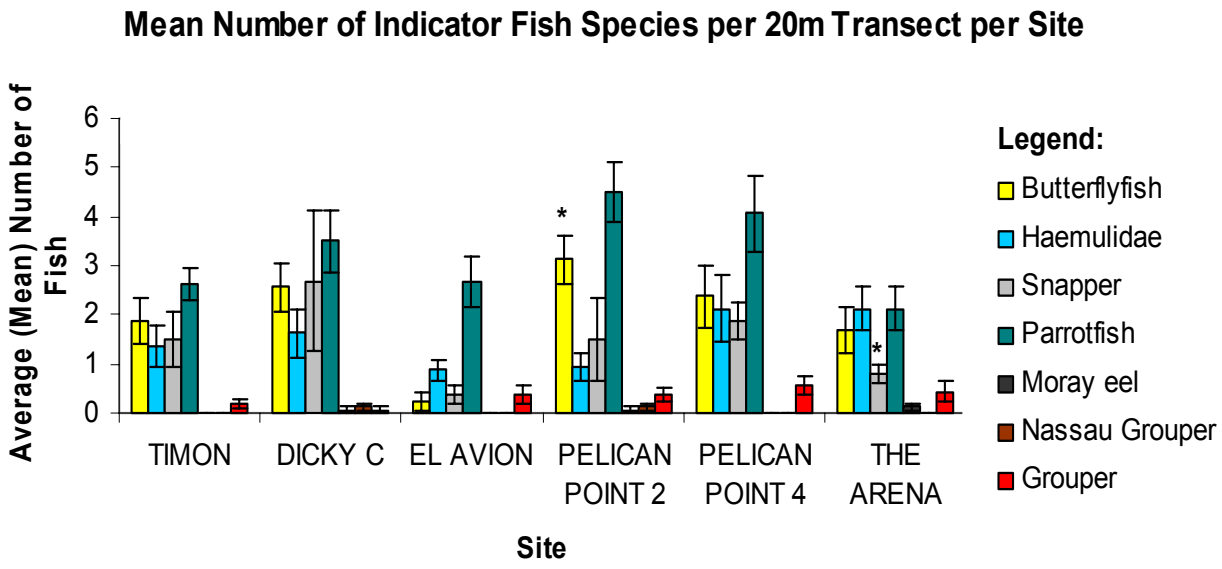


Figure 2.3.1c. A comparison between surveyed sites and within sites for average number of fish per category of indicator fish seen in transects. Bars are +/- 1 Standard Error. Here significant difference within categories of fish is displayed by * = P<0.05

Finally, as per 2006's expedition report (Cubas et al. 2006), the fish community was pooled into two categories to explore differences between sites that are actively fished, and sites that are protected as no fishing zones (Table 2.3.1a). Analysis was conducted again with a one-way ANOVA. Parrotfish abundance is significantly different between fished and un-fished sites (P<0.05). Snapper abundance is the most significantly different between fished and un-fished sites (P<0.01), with none of the other categories of fish showing any difference.

Table 2.3.1a. Results of one-way ANOVA upon the categories of Reef Check fish indicator species, tested for differences in mean abundance between fished and non-fished sites. * = P<0.05, ** = P<0.01

Indicator fish group	P value 2007
Haemulidae	0.513
Butterflyfish	0.241
Moray eels	1
Groupers	0.311
Parrotfish	0.049*
Snappers	0.002**

2.3.2. Structure of the invertebrate community

The guilds, niches and expected abundance of the various invertebrate species used by the Reef Check methodology vary greatly and therefore are not as comparable between categories as used in the analysis of the indicator fish and substratum data. For example, attempting to compare the abundance of gorgonians with lobsters is not practical and is like comparing 'apples and oranges'. However, analysis of differences in abundance between sites, within the species, is useful in assessing site health and quality. Due to comparatively high abundance gorgonians and *Diadema* categories were analysed and displayed independently of the other invertebrate categories.

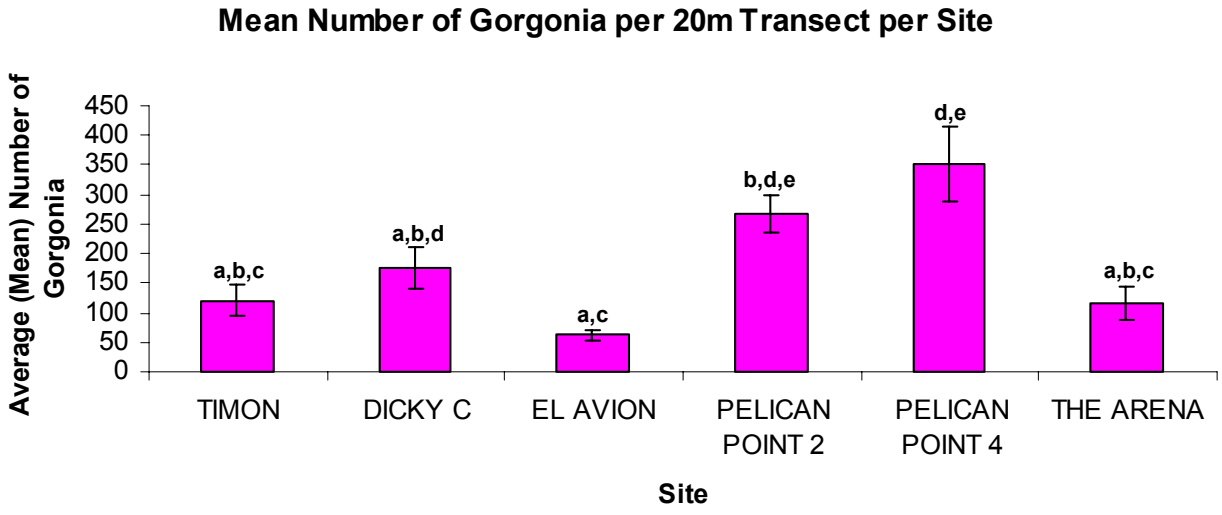


Figure 2.3.2a. A comparison between surveyed sites for average number of gorgonians per transect. Bars are +/- 1 Standard Error. Here significant difference between sites is illustrated by letter code. Sites sharing the same letter are not significantly different from each other. Letter coding is from left to right (i.e. Cayo Timón is a, Dicky C is b, etc.) All differences are at the P<0.05 level.

Gorgonian abundance was analysed using a one-way ANOVA (Fig.2.3.2a). Cayo Timón was found only to have a significant difference in abundance from Pelican Point 2 and Pelican Point 4. Dicky C only significantly differed from El Avión and Pelican Point 4. El Avión, in turn, only differed significantly from Dicky C and both Pelican Points. The Pelican Point sites differed significantly from all sites except each other and Dicky C. Finally, The Arena only differed significantly from the two Pelican Point sites. All statistically significant differences were at the $P<0.05$ level.

Diadema were similarly compared, again using a one-way ANOVA (Fig. 2.3.2b.). Here the only significantly different site was El Avión, with by far the greatest average abundance ($P<0.01$).

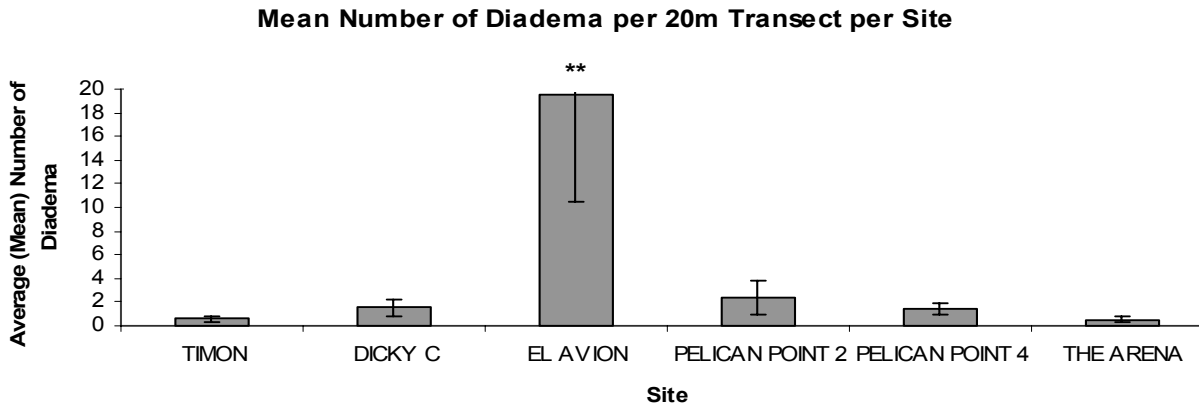


Figure 2.3.2b. A comparison between surveyed sites for average number of *Diadema* per transect. Bars are +/- 1 Standard Error. El Avión is the only significantly different site with ** = $P<0.01$

The rest of the invertebrate categories were then tested for inter-site differences, again using a Poisson-linked one-way ANOVA for count data (Fig.2.3.2c.). Interestingly none of these other indicator invertebrate species varied significantly between sites.

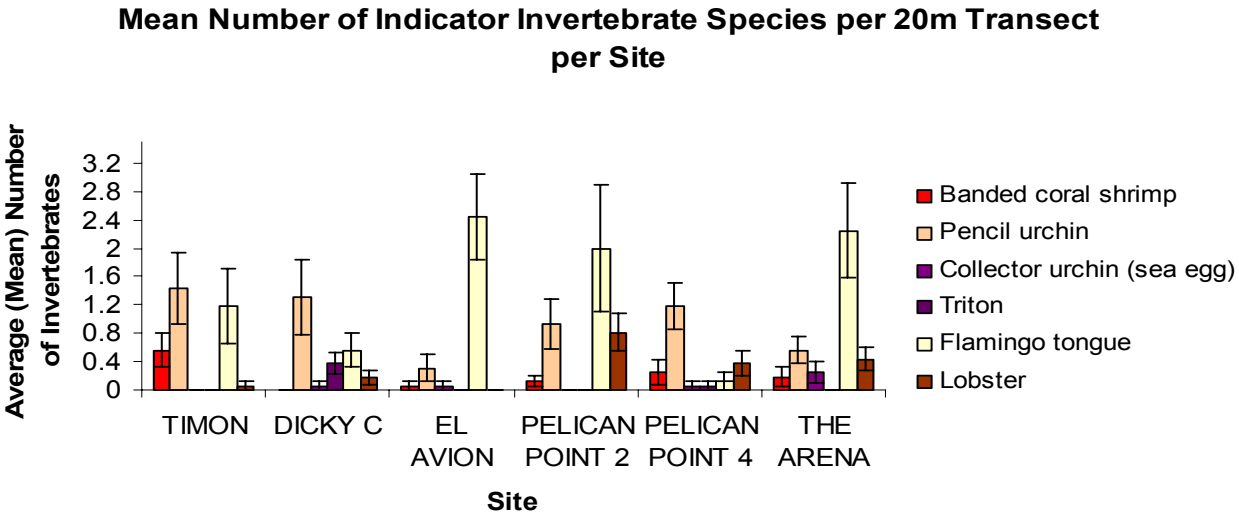


Figure 2.3.2c. A comparison between surveyed sites for average number of each indicator invertebrate species category, excluding gorgonians and *Diadema*, due to their comparatively high abundance and subsequent effect on scale. No significant difference was found between sites for any of these remaining invertebrate categories. Bars indicate +/- 1 Standard Error.

2.3.3. Structure of the substratum / benthic community

Mean percentage cover for all transects was pooled and then compared between substratum types using angular transformation followed by one-way ANOVA (Fig 2.3.3a.). This allows a gross comparison between Reef Check substratum categories for Cayos Cochinos. Hard Coral cover was found to differ significantly from all other categories, except Rock and Other. Nutrient Indicator Algae has a significant difference in percentage cover to all other categories except Other. All other categories did not differ significantly from each other. All differences were at the $P<0.01$ level.

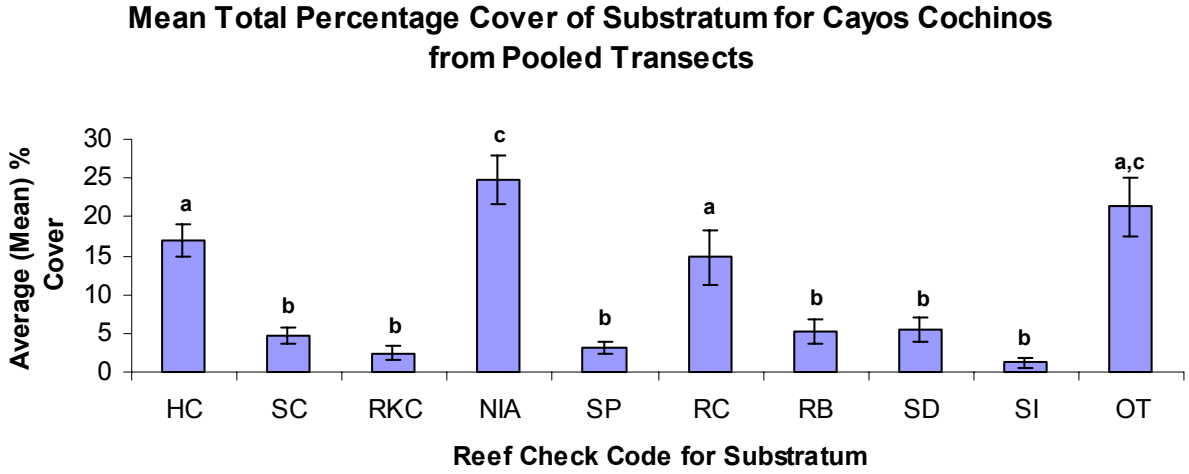


Figure 2.3.3a. A comparison between substratum categories for pooled data of all transects. Letters indicate significant difference. All differences are at the $P<0.01$ level. Bars indicate +/- 1 Standard Error. HC = hard coral, SC = soft coral, PKC = recently killed coral, NIA = nutrient indicator algae, SP = sponge, RC = rock, RB = rubble, SD = sand, SI = silt, OT = other.

Substratum data were then compared within categories to explore differences in percentage cover between sites. The pooled data for these transects were then analysed again using a one-way ANOVA on transformed data. For the purposes of ease of interpretation, the results have been shown here in two different graphs; 'Mean Percentage Cover for Living Substratum Categories' (Fig.2.3.3b) and 'Mean Percentage Cover for Living Substratum Categories' (Fig. 2.3.3c). Hard Coral only differs significantly in percentage cover at Pelican Point 4 ($P<0.05$). Nutrient Indicator Algae has a highly significant difference in percentage cover at Pelican Point 4 ($P<0.001$), but does not differ significantly at any other site. The category Other at Pelican Point 2, is the only other type of substratum to differ significantly. No other substratum category differs significantly in percentage cover at any site in either 'living' or 'non-living' classifications.

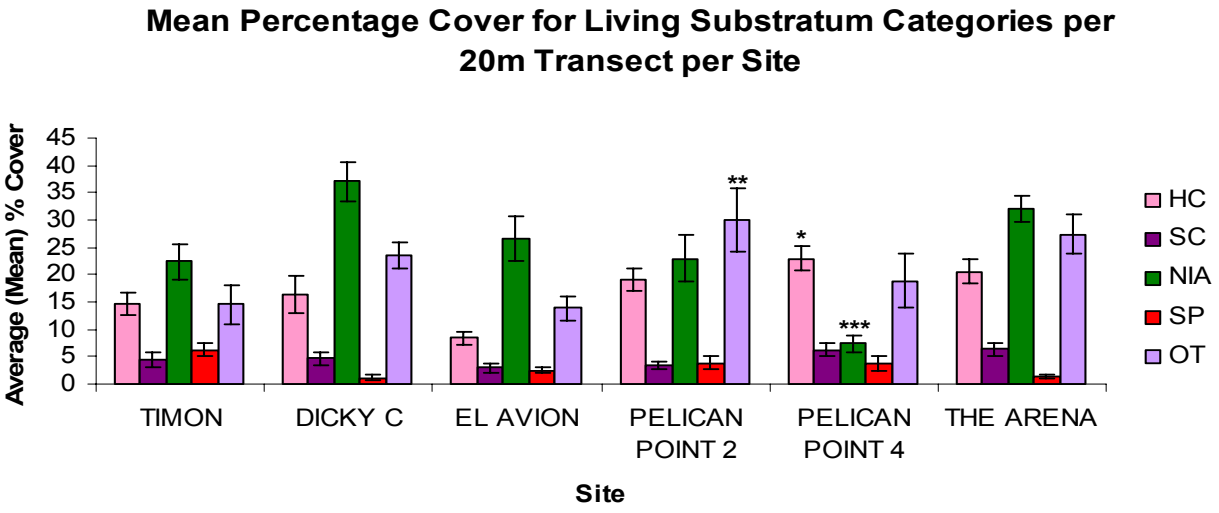


Figure 2.3.3b. A comparison between surveyed sites within living substratum categories for pooled data of transects. * = difference within substratum category (between sites) at the *P*<0.05 level. ** = difference within category at the *P*<0.01 level, and *** = difference at the *P*<0.001 level. Bars are +/- 1 Standard Error. Reef Check Substratum codes are; HC = Hard Coral, SC = Soft Coral, NIA = Nutrient Indicator Algae, SP = Sponge, OT = Other.

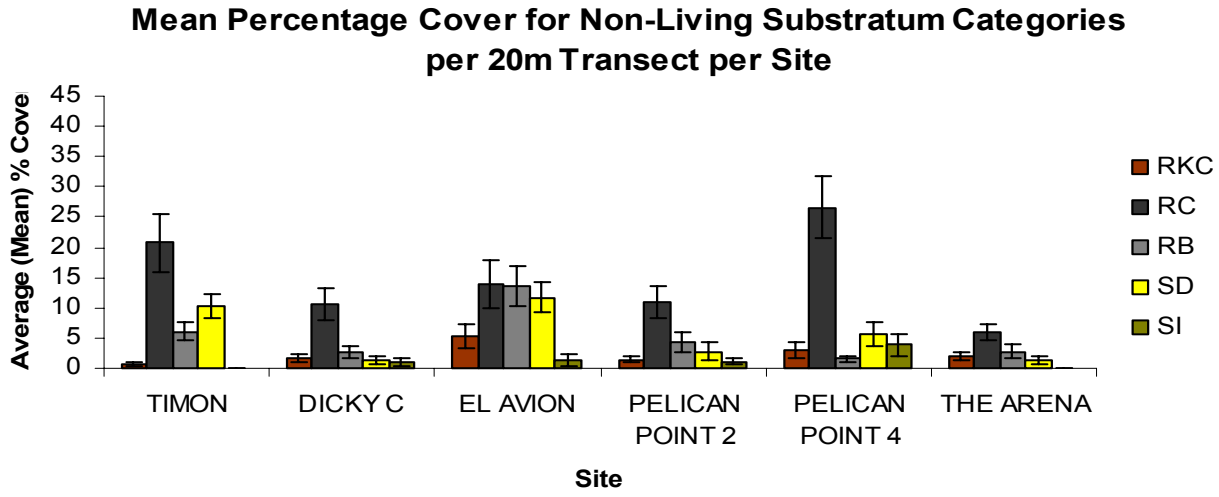


Figure 2.3.3c. A comparison between surveyed sites within non- living substratum categories for pooled data of transects. No significant difference was detected between sites, within categories. Bars are +/- 1 Standard Error. Reef Check Substratum codes are; RKC = Recently Killed Coral, RC = Rock, RB = Rubble, SD = Sand, SI = Silt.

2.3.4. Coral damage, site condition and coral disease

The only types of coral damage recorded, were in the Coral Damage: Other category. The only type of trash recorded at all sites was in the Trash: General category. Inter-site variation in their levels were compared using a one-way ANOVA (Fig. 2.3.4a). Pelican Point 2 has a significant difference in levels of coral damage, only with El Avión and Pelican Point 4. The Arena has a significant difference with Dicky C, El Avión and Pelican Point 4. All other sites do not differ significantly in damage between themselves. Trash was only recorded at Timón and Pelican Point 2, but averages such a small amount at these sites that it does not differ significantly from zero. All significant differences are at the *P*<0.05 level.

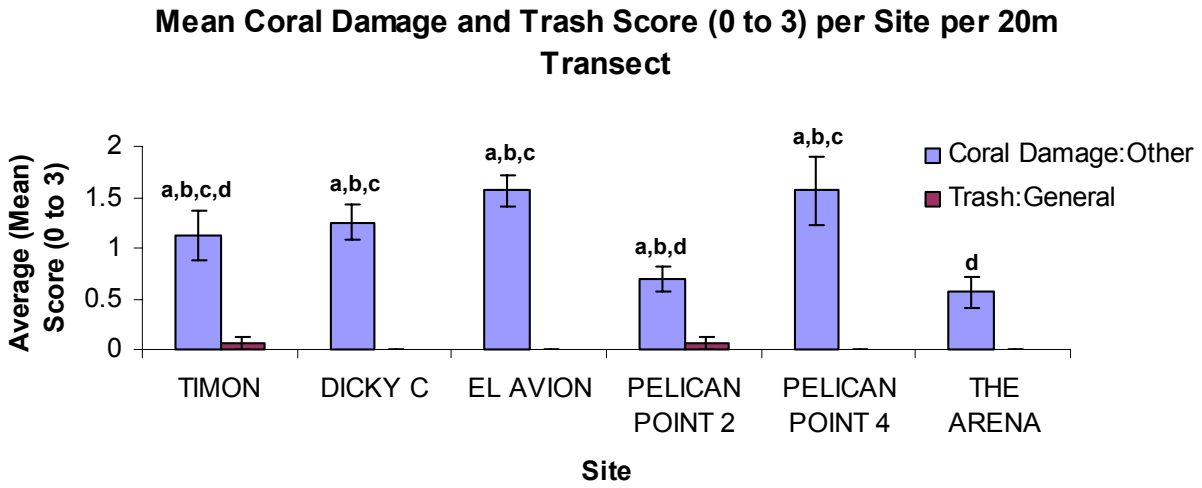


Figure 2.3.4a. A comparison between surveyed sites of Mean Coral Damage and Trash Scores on a scale of 0= None, 1 = Low, 2 = Medium, 3= High. Bars are +/- 1 Standard Error. Letters indicate significance.

Bleaching and coral disease was compared between sites with a one-way ANOVA after angular translation of percentage data (Fig.2.3.4b). The only significantly different results found were for percentage of colony bleached. El Avión and The Arena were significantly different from the rest of the sites surveyed, and from each other.

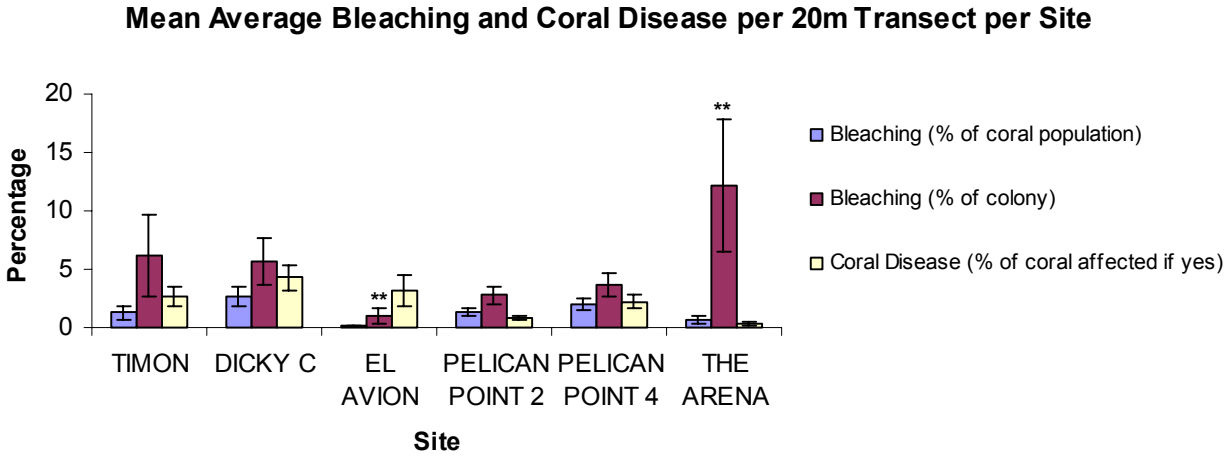


Figure 2.3.4b. A comparison between surveyed sites for pooled data of transects on Bleaching (both % of population and % of colony affected) and Coral disease (% of Population with disease). ** = difference within category at the *P*<0.01

2.4. Discussion

2.4.1. Structure of the fish community

The low mean abundance of predator indicator species (e.g. grouper) versus the high mean abundance of herbivore and consumer species (e.g. parrotfish and butterflyfish) is consistent with most density dependent ecosystems, terrestrial or marine, which usually have prey out-numbering predators (Begon, Harper et al. 1986). However, in the case of the pooled data of Cayos Cochinos transects (Fig. 2.3.1a), large apex predators such as grouper, Nassau grouper and moray eel are extremely low in overall abundance. This could be due to over-extraction in the case of groupers, or inadequate prey populations or habitat in the case of moray eels. In future studies it may be possible to compare predator / prey populations and relationships between sites using logistic regression and tease apart the reason for low abundance by using multivariate statistics to include substratum data and look at the role of habitat upon these populations.

In contrast, snappers are one of the most important commercial fisheries in the region (Guzman 1998; Ogden and Ogden 1998; Shrives 2003) and yet have a population not differing significantly in abundance from Haemulidae or butterflyfish (Fig. 2.3.1a). However fishing does appear to have some effect on the snapper population. When comparing fish abundance between sites (Fig. 2.3.1c), snappers are one of only two indicator fish categories seen to have a significant difference across sites (the other being butterflyfish). In Figure 2.3.1c, snapper abundance is significantly lower at The Arena site, a site which is not currently protected from fishing. The site El Avión is equally not protected from fishing, and together with The Arena showed a highly significant difference (P<0.01) in mean snapper abundance compared to no-take, non-fishing sites (Table 2.3.1a). El Avión is also the only site to show significantly lower total fish abundance than some of the other sites (P<0.05, Fig 2.3.1b). Again without multivariate statistics to look at the exact role of habitat in conjunction with fish populations, it is difficult to be absolutely certain that this is mainly due to fishing pressure. However it is interesting to note that El Avión was not shown to differ significantly in substratum to other sites (Fig. 2.3.3b and c), which would lend weight to the over-extraction hypothesis. Also further integration and joint work with the Fisheries and Social Scientists of the HCRF, WWF, TNC and CURLA, would allow comparison of Reef Check data with catch data, thus allowing us to consider the role of what is caught where and how often.

Butterflyfish were seen to have a significant difference in abundance between Pelican Point 2 and the other sites (Fig. 2.3.1c). However, although they are important coralivores, their higher abundance at this site does not seem to be directly linked to hard coral distribution, which is significantly higher at Pelican Point 4 (Fig. 2.3.3b). Pelican Point 2 hard coral cover does not differ significantly with any of the other sites, excluding Pelican Point 4. It is unclear as to whether this unusual result is due to the cosmopolitan nature of reef fish migrating in to transects from areas of higher hard coral cover, or due to the constraints of the data set and analysis, which will improve in resolution with the collection of more data next season. There was also no significant difference in butterflyfish abundance between fished and non-fished sites (Table 2.3.1a), which is not surprising, as butterflyfish are not considered a fishery species in Cayos Cochinos (Cubas, personal communication).

Overall, parrotfish are the most abundant species seen in the transects (Fig. 2.3.1a). The ANOVA test performed in Figure 2.3.1c suggests that they do not differ significantly in abundance across sites. However, when the data were grouped into fishing and non-fishing categories and an ANOVA test used again, there was just about a significant difference with non-fished sites having slightly more parrotfish (*P*=0.049, Table 2.3.1a). Although parrotfish are sometimes used as a fishery species, preference is usually towards snapper and other pelagics (Cubas and Bowne, personal communication). It is a possibility that due to the significantly lower snapper populations at the fished sites (*P*=0.002, Table 2.3.1a), fishermen are switching to parrotfish as an alternate food item, but again this needs to be confirmed by interview and social studies with the local fishing community. Habitat is another variable that needs to be considered in this result. As an important grazing species, parrotfish populations would be affected by the amount of nutrient indicator algae (NIA) found at fished and non-fished sites. As such, a simplistic hypothesis would be to expect to find more parrotfish at sites with more NIA. Paradoxically this is not the case, with Pelican Point 4 having significantly lower NIA (Fig. 2.3.3b) than another site, yet still having high parrotfish abundance (Fig. 2.3.1c). This suggests that parrotfish abundance is not as highly influenced by NIA in Cayos Cochinos as hypothesized, and lends some weight to the hypothesis that the difference in ecology between fished and non-fished sites may be due to fishing pressure. Again we have to be cautious, as this is a synergistic problem, and further exploration of the data next season will help us tease apart this problem and allow us to further understand the role of fishing upon the ecology of the local reefs.

2.4.2. Structure of the invertebrate community

Pelican Point 4 has significantly more gorgonians than most of the other sites, except for Pelican Point 2 (Fig 2.3.2a) to which it is not significantly different from. On the other end of the scale, El Avión has significantly lower gorgonian abundance than most other sites, except for Cayo Timón and The Arena. A possible explanation is that Pelican Point 4 has the highest hard coral cover and lowest cover of nutrient indicator algae (NIA), suggesting that it is one of the better condition sites (Fig. 2.3.3b). With less spatial competition form the ever dominating NIA, there would be more space for other benthic species such as gorgonians. At El Avión the reverse is true. This site has less hard coral cover, more NIA (Fig. 2.3.3b) and greater abundance of non-living types of substratum (Fig. 2.3.3c).

For most of the sites across Cayos Cochinos, *Diadema* are recorded at a generally low level (Fig 2.3.2b.), which is to be expected considering their recovery from a Caribbean-wide decline from disease in the 1980s (Wilkinson 2004). However, in the transects from the site El Avión, *Diadema* are thriving and averaging ten times the amount seen at other sites. As such they are highly significantly different in abundance at El Avión than the other sites. This could be due to the large amount of rubble (Fig. 2.3.3c and personal observation) and high amounts of algae found at this site (Fig. 2.3.3b). These types of substrata would provide both increased habitat complexity and nutrition for *Diadema*.

The other invertebrate categories are recorded at low levels with the exception of Flamingo tongues and pencil urchins (Fig.2.3.2c). Although there appears to be no significant difference between sites in abundance of any of these remaining indicator invertebrate species, the test could be biased by the generally low number of observations.

It is difficult to tell whether this low number is actual, or due to the slightly more cryptic and therefore difficult to detect nature of these species. Either way it is highly important to keep monitoring the population, as many of these invertebrates are of major commercial and conservation importance (e.g. lobster).

2.4.3. Structure of the substratum / benthic community

Analysis of pooled data for the whole of Cayos Cochinos shows Nutrient Indicator Algae (NIA) as having the highest mean percentage cover of all the reef check substratum codes (Fig.2.3.3a). When run through an ANOVA, it is significantly different to all other substratum codes (P<0.01) with the exception of Other (OT). The next highest categories are Hard Coral (HC) and Rock (RC), which are significantly different to all other categories except Other and themselves (P<0.01). The remaining substratum categories are not significantly different from each other. The dominance of NIA is a concern and could be due to several factors. In general NIA is becoming more and more dominant in the Caribbean (Wilkinson 2004), but Cayos Cochinos could be exceptionally susceptible due to historical storm and hurricane damage, as well as the proximity of the islands to the mainland (Harborne et al. 2001; Shrives 2006). Such proximity puts the archipelago at risk due to the influence of several nearby rivers. These rivers could be causing a slow, year-round chronic deposition of fine sediment on the reefs, as well as one-off catastrophic episodes of high sedimentation and nutrient eutrophication, as seen after Hurricane Mitch in 1998 (Harborne et al. 2001). The increase of sediments and nutrients act as fertiliser, benefiting the fast growing, plant-like algae, but also smothering and damaging the corals, giving NIA a helping hand in spatial competition on the reef. The increase in terrestrial activities and local development upon the main two islands of Cayos Cochinos may also be having a localized chronic effect on water quality and thus reef health. For example, the site Pelican Point 4 is upstream of any local terrestrial influences (Shrives 2007) and is the only site with significantly higher coral and significantly lower NIA levels (Fig.2.3.3b).

In future seasons, a serious of permanent sediment traps, repeatedly sampled, could be used to try and assess trends in water quality. They would act as an early warning system to help understand how sediments, both local and riverine, may be influencing the local reefs.

2.4.4. Coral damage, site condition and coral disease

Coral damage across the sites approaches a medium; level, with only The Arena and Pelican Point 2 showing significantly different levels of damage approaching low level (Fig. 2.3.4a.). Ideally levels should average lower, with a score of low. It is of concern that some of the sites that are in best condition for substratum, fish and invertebrates, such as Pelican Point 4 are also those with the highest amount of damage. A more detailed assessment of the type of damage is required to make sure that these relatively pristine and popular SCUBA diving sites are not suffering from diver impact. It is encouraging to see that Trash levels are low enough to not be significantly different from zero (Fig. 2.3.4a).

The percentage of the population of corals undergoing bleaching, is relatively low (Fig. 2.3.4b.), which is encouraging in terms of assessing year-round, chronic bleaching. However, the peak time of year from thermal stress, disease related and storm damage bleaching tends to be in July-August (personal observation). There was also no significant difference in the mean number of colonies between sites that experienced bleaching. However, of those colonies that were undergoing bleaching, colonies at The Arena had significantly more of their surface bleached (P<0.01) and those at El Avión had significantly less of their surface bleached (P<0.01). It may be that colonies at El Avión are more hardy and resilient to mechanical stress or allopathy from NIA, evident by the site's high levels of rock, rubble and NIA (Fig. 2.3.3b and c). This would result in the remaining population of corals exhibiting a lower amount of bleaching. Conversely, the corals at The Arena may only just be undergoing stress from increased NIA or poor water quality and thus exhibiting a higher than average amount of bleaching. However, without experimental manipulation and study of the corals at these two sites, these are just hypotheses and the main driver of these differences remains uncertain. Encouragingly, coral disease is also observed at relatively low levels at all sites and an ANOVA did not detect any differences between sites in levels of infection.

2.4.5. Additional external factors effecting area

Although there does not appear to have been an effect on the study sites this year, it should be noted in this report that there was a short term influx of people and boat movements within the area during and following the survey period and that there was a lot of concern both within the research group and, we were told, within the local community, of the impact of this activity. Activity of this nature occurred during several distinct time periods during the year, both prior to, during and following the survey work. The concerns will be outlined below as regard must be given to this activity when the results of the 2008 expedition are reviewed.

During the period of the expedition the island and nearby cays were being used by a film company who were setting up for a reality TV series. The TV programme was to involve placing 'celebrities' on one of the neighbouring remote island cays and then filming them living there and performing various tasks. There was concern from both research staff and team members regarding the impact that this work may be having on the environment, both above and below the sea. Concerns centred on the following issues:

1. The TV production work involved large numbers of people moving to and from the island research base, with consequent high levels of rubbish being found around the site.

2. A large temporary structure was erected on the island with the appearance of a sort of 'Jungle Mayan Temple'. To erect this structure a large amount of materials had to be brought to the island and the structure included the use of some non-endemic flora and the use of gasoline to sculpture polystyrene, probably causing soil and water table pollution.

3. Large boats were used to bring materials and technical production gear to the island, causing some concern about damage to the sea floor where at least one boat was seen to ground and needed to be hauled off the bottom by a large team of workers.

4. Cable was laid between the island research base and one of the cays, causing concern regarding possible damage to the reefs around the area.

The Honduran Coral Reef Foundation gave strong assurances about the care that was being taken to limit any damage and insisted that the film production company were compelled by a legal contract to ensure that there were no adverse effects to the local area. This activity will have provided crucial funding to the Foundation to help support its research and protection activity, but care must continue to be taken to ensure that there are no adverse effects to the Marine Protected Area from this activity. Funding conservation work is often a balancing act that requires great skill and diplomacy and a solid view on the whole picture. Some short-term change and upheaval can be seen as acceptable if it financially secures longer-term conservation work, but managers must ensure that the balance of decision-making comes down on the side of conservation, and not on the side of income-generation.

2.5. Conclusion

The establishment of no-fishing zones seems to have had a positive effect, with some key species, such as snapper, having significantly higher populations in the no-take areas. However, there is cause for concern that some other key commercial species of fish and invertebrate are recorded at low levels across the MPA. Further monitoring at regular intervals is required, making sure that these levels do not decline further and that no-take areas are acting as adequate reservoirs and refuges for the recruitment of fish and lobster in support of other fished reefs. The large numbers of *Diadema* at the impacted site El Avión is encouraging, and it is hoped that as a result continued monitoring will show some level of recovery in the local benthic community. Gorgonian distribution and abundance appears to mirror that of site quality. High levels of nutrient indicator algae are dominating many of the sites surveyed, which is of chief concern to the future health and quality of the reefs of Cayos Cochinos. Many of the reasons behind this increasing abundance are synergistic and complex, but the establishment and maintenance of permanent transects, moorings and sediment traps at several sites across the archipelago will go a long way to understanding this problem. The use of volunteers and the Reef Check methodology this season has allowed a wealth of data to be collected relatively quickly and easily. This has created a strong baseline of data, which will be developed further and expanded upon in future seasons to provide a powerful tool in the continued management and understanding of the Honduran Marine National Monument, Cayos Cochinos.

2.6. Recommendations

The purpose of this expedition was to establish a baseline to monitor the influence of the zoning and regulations implemented recently on the status of the resources within the Cayos Cochinos Natural Marine Monument. In light of this the following recommendations are made:

- Even though HCRF released their management plan in 2004 and declared no fishing zones in 2005, the expedition observed subsistence fishing in some of the no-fishing zones. We therefore recommend that HCRF should regularly patrol these and other important areas within the limits of the MPA.

- New regulations within the management plan should aim to re-establish the optimal conditions for the reef. Within this plan it should be noted that no-fishing zones alone will not work, unless alternative subsistence fishing sites for the local communities are found.

- A long term carrying capacity study for tourism and other related activities, which is re-assessed at least once a year.

- Establishing a constant fishing monitoring programme to establish a baseline for further scientific studies and to estimate the actual fish stock status of the MPA.

- Maintain and standardize all dive buoys / moorings in accordance with the regulations of the management plan.

- Establish at least 2 x 100m permanent transects (6m and 12m depth) at six different sites, for long term monitoring with Reef Check and other methodologies.

- Establish permanent sediment traps at the same six sites, which can be collected and monitored at regular intervals to assess local and riverine sediment impact upon reefs.

- Monitor the impact of TV crew activity and establish a formal impact monitoring protocol so that decision makers can balance the need for funding and conservation based on reliable evidence and with conservation as the ultimate goal of HCRF.

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Appendix 1: Expedition leaders' diary by Kathy Wilden

12 March

Hello everyone and welcome to the Honduras 2007 diary. I'm Kathy, your expedition leader, and you will be hearing from me regularly over the next few weeks. I'm all packed up and I will be boarding a flight to San Pedro tomorrow very early in the morning, so by the time you get this, I should be at the Banana Republic or on the island. All if things go to plan of course!

Anyway, I look forward to meeting you in La Ceiba soon. My Honduras mobile number (FOR EMERGENCY USE ONLY OR IF YOU ARE ABOUT TO BE LATE FOR ASSEMBLY) is +504 9842810 and I'll see you at the Banana Republic.

If you are still trying to swot up for the expedition, remember to read the recently published report of the 2006 expedition available via www.biosphere-expeditions.org/reports.

So long

Kathy Wilden
Expedition leader

16 March

I'm settled in here now on what is the epitome of a paradise island. Not only is the place stunningly beautiful, but it's also sparklingly clean courtesy of the President of Honduras who dropped in for a visit last week! Even just swimming off the beach here there are fish coming into the shallow waters and the visibility here, at least, is excellent. Arrangements are virtually finalised with the survey sites now agreed and our timetable organised. When people arrive on the Sunday we'll spend some time on briefings and orientation, and then the next two days will be training for the survey work. After that we will settle into a daily routine with one survey dive in the morning and one in the afternoon. That's the general plan anyway, but remember to stay flexible as nothing is as constant as the change on plan on expedition ;->

I'll be travelling back to La Ceiba on Saturday morning to do some shopping and last minute paperwork and I'll be around on Saturday evening if anyone from the first slot would like to meet up for supper. I'll come to the Banana Republic Guesthouse at around 7 pm and hang around for half an hour or so hoping for a date, so if you fancy joining me just turn up – I'll be somewhere around the reception. For our official meeting I'll back at the Banana Republic Guesthouse at about 6.40 am on Sunday morning - our 7 am meeting time is the earliest start on the whole expedition, but it is essential that you are there on time as the boat has to leave early enough to beat the developing waves that cause a nasty choppy sea later in the morning. If anyone needs to contact me then please use my local mobile. Looking forward to meeting everyone.

18 March

The team set off on a dark and rainy morning from the main marina in La Ceiba. An expedition atmosphere had already kicked in as the promised breakfast didn't arrive (cook delayed by car trouble), it was pouring with rain, and people and gear were all wrapped in big black plastic bin-liners for the 40 min boat ride to our island base. We arrived on time at around 9 a.m. and were happily greeted with a toasted sandwich by way of brunch. The rest of the morning was then taken up with an introduction to the island and the area, and a run through of the risk assessment.

Following lunch the team sorted dive gear and paperwork and had their first taste of the water with a quick dive from the beach and a couple of buoyancy exercises. Two of us stayed on land and had great fun watching people appearing, going down, then reappearing, being loaded with more weight and finally going down never to be seen again. One of the exercises was a practice 'hover' in the water (this is where the diver has to hang/sit at a the same depth for a period, effectively hovering in one spot). This would have been fine had the practice area been just a little bit deeper but as it was there were several body parts regularly coming into view above the water, depending on which way up the individuals were 'hovering'.

Once kit and people had been rinsed, the team showed great fortitude and opted to watch the Reef Check training video rather than collapse in their cabins. For those who have seen this video they will understand the invigorating effect of the main presenter, Craig. Team members from last year will be pleased to know that he is still 'outstanding' and that we are all using the Craig 'length check' procedure now (this is where you put your fins on and stretch one leg out to the side whilst extending the other arm upwards – this should give you a length of around 2.5 metres to use as a guide to distance underwater).

19 March

After breakfast, the day began with a walk-through of the survey method that we will be adopting underwater. A transect line (or tape measure, as the non-scientific community likes to call it) was laid out on the beach in front of our cabins and the team practiced carrying various pieces of equipment and slates as they walked down the line looking for fish (a few strangely shaped pieces of cardboard had to suffice) and sand ('yep, found some more') whilst avoiding the palm trees (ouch!). This may seem like a strange thing to do, but it gives a good idea of how slowly the team need to swim for the survey work, and how long the 100 m transect actually is, even though we're not necessarily seeing many of the indicator fish. The exercise did yield the first adaptation to come from this year's team. Last year the team came up with signs to use underwater to tell each other about the different types of substrate (things found of the bottom) that they came across. The 2007 team have adapted 'rock' from a simple 'fist' (which could have been confused with the sign for 'hard coral' which is a fist that moves up and down) to a much cooler and more L.A. version with the first and ring fingers being raised and the middle 2 fingers being held back by the thumb. I think you need to say ´yo´ at the same time into your regulator.

The rest of the morning was taken up with identification (ID) work in the dry lab. The team went through presentations and discussions on all of the aspects of the work that they will be doing. There were a lot of questions particularly relating to the difference between coral bleaching and coral disease, and how to tell them apart. Luckily enough there just happened to be a PhD student, who specialized in this area, on the island and he was kindly giving a talk that evening, so it was agreed that we would clarify some of the more complex aspects that evening……so, the next step was off to the water with our equipment. Italo, our dive leader and scientist, picked a relatively shallow area with a sandy bottom and a reef fringing the area. This proved to be an excellent training ground for practicing diving in a head down position holding various slates for writing on and for assisting with identification, plus some lucky people who were also carrying 2.5 m long PVC pipes as well. After a short swim-through everyone relaxed and managed to have a look at the reef as well before we headed home.

Our evening highlight was a talk from John, the coral reef scientist, who has been studying the reefs around Cayos Cochinos for the past 5 years. He was supported by a visiting scientist from Edinburgh University, Greg, with a large water probe that he was using to sample many aspects of the quality of the water around the reefs. John was also supported by the consumption of a small amount of rum and coke (by his audience as well as him), which helped us all to spot the fish in his presentation and cope with the long technical terms, such as 'isotope', 'quadrat' and 'coral'.

20 March

This was our final training day before the beginning of the work proper. We had a full dress rehearsal with everyone taking all their equipment and recording all the necessary data. Although there were some issues with speed (the fish team disappeared over the horizon, and the invert team held the substrate team up slightly too much so that we didn't quite finish the transect before we had to end the dive) but apart from this it all looked good. I think the team felt that it was a bit chaotic, but it definitely looked like controlled chaos and gave myself and Italo every faith that the team would be ready to do their first real survey the next morning.

The afternoon was spent with more ID work and some individual study. This included working in the dry lab, but one enterprising team decided that a little swim and a snorkel from the beach would also add to their study, so they managed to fit this into their intensive work programme.

21 March

The day began with much rejoicing as the God Neptune saw fit to deliver beer from the sea (plus chocolate and coke) - well, actually I think it came from La Ceiba, but the effect was the same. There was so much excitement that two people promptly fell ill and couldn't come diving. Actually, that's not quite true. Su had unfortunately suffered with a very painful ear the evening before and had been inspected by our resident ear specialist Doctore Juanito (or John, the coral reef scientist who also doubles as an ear consultant when necessary, no formal qualifications just a lot of experience). Su had been declared unfit for diving so had to sit the day out. That morning Doerthe had come down with a head cold and had also decided, very sensibly, to take the day off.

The reef check divers had two very good dives with excellent team work throughout and some good data collected. The non-diving pair also had an excellent day with some crucial sun-bathing in the morning followed by a visit to one of the communities on a local island and some economic redistribution of wealth in the form of buying cold beers.

22 March

Our second full Reef Check day and everyone is working really well as a team. The survey kicks off with Matt and Alex carrying their 2.5 metre long PVC pipes and swimming at a slow steady pace down the transect spotting all the indicator fish that swim into their 'box' (a 5 m wide by 5 m high tunnel that runs down the 100 m transect line). After them come Rachel, Rachael and Alf, working on spotting the 'little critters' that live on the bottom and counting a couple of specific soft corals from the Gorgonian family. The first part of the job is really quite fun – trying to look in all the crevices and holes for lobsters, banded shrimps and little molluscs. The second part of the job is more like hard graft, as counting the Gorgonians is surprisingly time consuming because there are so many of them. There are so many that we have had to use a different counting system from the usual 5 bar gate - for gorgonians we have followed the pattern set by last year's teams and adopted a circle for 10 with a cross over it for the next 10. Using this system there is just about enough room to put all 150 odd of them onto the slate! The final team is the substrate team. They have the job of recording what is on the sea bottom at half meter intervals all the way down the transect. This can be the most difficult job as the measurer spins round and round on their head trying to drop a plumb line onto the substrate to get an unbiased view on what's on the bottom. It can also be one of the most rewarding jobs as the sense of achievement at the end of a transect is immense. Through all these jobs the teams have really come together and look like true professionals.

You'll be pleased to know that Doerthe has now recovered and was able to dive today. Unfortunately Su has not, so we have made our first trip over to the small clinic that is run by a retired nurse on the neighbouring island. There was good news and bad news – no infection in the ear but no diving until Monday. Su, however, is really pleased with this because having kept out of the water for a day she is now being allowed to swim and snorkel – it really isn't fair being on an island like this, surrounded by inviting blue waters, and not being allowed to go in.

The weather here continues to be very strange (El Nino, the boatmen say). It has rained almost every day that we have been here at some point. There has been a series of tropical downpours, followed by strong sunshine, and all accompanied by fluctuating winds – shortly before the storm the wind drops to nothing and then blows up as the rain clouds come over. This doesn't really bother us as we get plenty of sunshine and as we're diving most of the time it isn't really an issue. However, there is an associated fluctuation in sand flies, which does have an impact on the team. The nasty little bitey flies seem to be everywhere, especially when the wind drops away, they come out in their thousands. My best recommendation to all those coming on the next slot is bring your waterproof jackets, and please don't forget your insect repellent or you're going to be 'uncomfortable'.

Back to our day. We rounded it off with two very interesting talks in the dry lab, this time accompanied by beer. The Chief Executive from the Honduran Coral Reef Foundation gave a formal welcome to the team and his Director of Conservation gave a talk about the work of the Foundation and the use that they put the data that Biosphere collects. One of the main findings from the work last year was that there was a major absence of predator fish and that this was most likely due to fishing. The Foundation is therefore beginning to extend the boundary of the no-fishing zone so that it reaches all the way to the mainland and should therefore make a major contribution to the sustainability of the reefs.

Then Greg, the visiting senior lecturer from Edinburgh, gave us a fascinating talk about the work that he does looking at activity that goes on deep on the ocean floor and his upcoming work with a sub that will take him more than 1 km below the surface. The first question from the floor was one that we all wanted to ask 'how much space have you got in your sub and how do you select people?'. It seems that there is no available room…

23 March

Su has been 'signed off' diving until Monday by the clinic nurse and Doerthe still has a head cold, so didn't dive this morning. That, and the fact that Tony, our knowledgeable PADI journalist, left the island early in the morning, left us a few hands short for the morning dive today. The team, however, as usual, coped admirably without a hitch. 'M Dog' or Matt as he is otherwise known, has taken up the status as most likely to get sunburnt and therefore the status of 'most covered up man' on the island. He effectively utilizes two Buffs on his head and neck, gloves, wetsuit etc and is shortly to add socks to his look. Our L.A. team members have decided that it would be an interesting addition to our research work to send M Dog into the more colourful parts of L.A. and observe the consequences, but the rest of us are not sure that this conforms to the 'no touch' requirement of our research.

This afternoon's dive proved eventful. The team were a little tired after lunch, so I can only assume that our dive leader, Italo, instigated a number of happenings to wake them up and keep them on their toes. First there were a couple of leaking O rings as we were kitting up, but once we were out in the boat we thought that all problems were solved. Unfortunately, when we got to 'La Arena', our dive site, there was an obvious problem with a leaking tank valve, two slightly misleading gauges (two of the team were apparently fish and didn't use any air) and then Italo threw in an 'out of air emergency' himself and buddy breathed his way to the surface thanks to Alf. The rest of the team managed to complete the survey and bring in the transect line – quite an impressive team response to 'one of those dives'. The day was rounded up with some suitably intellectual conversation around world politics (Europe/USA debate), modern cultures (Alex, one of our 18 year old team members explaining 'stuff' to us oldies) and literature (the merits of 'Catch 22' and 'The Life of a Geisha' over Mr Darcy in 'Pride and Prejudice').

24 March

Pelican 2 was our destination today, and two masterfully completed survey dives. There were lots of sightings of barracuda, lobsters, triggerfish, surgeonfish and even a scrawled filefish and several cowfish. None of these, of course, are the ones that we need to count, but hey, it makes for a great dive. This was the last day for everyone to work in their current teams and everyone seemed to be showing off about how good they were after four days of survey work. Tomorrow is a rest day and then everyone will switch teams so that they can carry out a different part of the survey work.

Today is Italo's birthday, and with a day off work tomorrow we have decided to make tonight party night. In preparation for this almost all of us had a nice nap after lunch today, and some even 'napped' their way through the dive briefing and halfway through kit-up time. It's a good thing we're taking it easy tomorrow.

26 March

Party night was fun with the team staying up late into the night talking. The hard core stayed up until around 2 a.m. and had a wonderful of experience when they went out onto the jetty to see the stars and saw a host of rays hanging out under the jetty. A great end to a good night.

The next day was rest day. Most of the team opted to take the walk across the main ridge on the island and down to the north beach to help with beach cleaning in preparation for the turtles to nest there in June time. It is amazing the amount of litter that gets washed ashore here, most of it coming from the mainland. The team had a very productive, and hot, time and made a real impact on the rubbish that had accumulated on the beach. The north beach is a wonderful, unspoilt and deserted spot and it is very satisfying to bring it back to the pristine state that it should always remain in. After our cleaning efforts a boat came to pick us and the rubbish up and transport us back to the research station in time for lunch.

After lunch the team set off, some for a fun dive and some straight to the hotel over on the next island. The hotel team spent the afternoon sipping chilled white wine and talking the time away. The diving crew returned to the hotel after their dive and we all enjoyed a couple of drinks before we took the boat back to base as the sun was setting. An early night was had by all in preparation for more work the next day.

After up to 10 hours sleep for some of us, we bounded into Monday with renewed enthusiasm and a switch around of the work allocations. New teams had been agreed the day before and now each member needed to apply slightly different skills to their work. Su had tested her bad ear the day before on the fun dive and was pronounced fit to dive, so we were back up to full strength. Everyone performed with true professionalism and we had two great dives at Cayo Timon, with Italo even spotting a large nurse shark. When I went to pick up the end of the transect tape to reel it in I got a big surprise to find a large crab holding on to it with its claw – it turned out to be a dead one that had been placed there by our dive leader but it took me a few minutes of working out how to get it off before I realized (very funny Italo!!).

27 March

Tuesday dawned and El Avion beckoned. El Avion is the site of a sunken plane that lies in the sand just along the side of the reef. The wreck was going to be very close to our transect so all of the team were hoping for a glimpse, and some were looking for a full photo shoot. For the first dive of the day, Su decided to sit it out as her ear had been playing up again, this meant that we were one man down and had lost her excellent time keeping abilities (which involved very exaggerated watch tapping at tardy members of her invertebrate team to keep them in line).

As there was to be a bit of a swim from the boat to the start of the transect we were instructed by Italo to kit up and get into the water quickly – you'd be amazed at how quickly a group of amateur researchers can metamorphose into a U.S. navy seal team in a matter of seconds. You could almost hear the shouts of 'Go, Go, Go' as each diver in turn rolled backwards into the water and then headed off for the start of the transect. The dive itself was quite hard work as the visibility wasn't great but everyone got a good look at the plane and ended the dive happy. For this afternoon's dive the current had got up which made entering the water a bit trickier than normal and the visibility still wasn't great. The invert team had their time taken up with a massive sea urchin count but other than that there was very little to see today.

28 March

Our final work day and unfortunately now two people down. Matt fell ill to a slight stomach bug in the night and is therefore resting this morning, and Su is still out of action (although her tan is now looking really good). We saved the best deep dive until last – Pelican 3 – which is my favourite site, with big towers of coral that you can swim around. Unfortunately, this makes for a complicated transect line, weaving around the coral heads. It was great and we had high hope when we returned in the afternoon with Matt back up to speed. Unfortunately, the shallow reef at the same site was dreadful, like a moonscape, and very shallow (which allowed some of us to snorkel the whole transect).

There is a definite feeling of the end of the expedition this evening. Eric, our resident professional photographer, has just taken probably the best group picture in the entire history of Biosphere. He is also going to give us a slide show of his best pictures from the expedition, so we should have a good night ahead.

Tomorrow is a fun dive, followed by a short break at the hotel, and then cleaning up and packing, ready to leave the island early on Friday. We've had a great time (don't listen to the grumbles about the food and the sandflies, but if you're in the next slot please could you spare the expedition leader and not moan on about your need for oranges!) and gathered loads of good data. Thanks to all in slot one and I look forward to the next!

2 April

Just a quick interlude to say that the second team have now all arrived safely. Andreas was delayed by 24 hours (stuck in Houston and then detoured via the capital here) but arrived first thing today. We only have one missing bag now and I'll send a full diary entry when I get some time, hopefully tomorrow.

3 April

We're well underway with the second slot now and are nearing the end of the training. I was very sorry to say goodbye to the last of the people from the first slot on Sunday morning – thanks especially to Matt and Kate for not only being up to wave us off, but also for offering a European postal service (Matt) for me and a U.S. Dollar exchange service (Kate) for anyone who would take her rates!! (only kidding, they were very good rates really).

Unlike the first slot we set off on Sunday in hot sunshine, the only clouds in sight were the ones that permanently hover over the mountains along the coast. Our team was short of one person who was stuck in Houston, but our boat was 'snuggily' full with the rest of the team and some staff from WWF who were going out to one of the communities that live on the Cays near to the research base. After a bouncy but dry crossing we arrived at base in time for a light breakfast and a briefing about living on the island. The afternoon was spent with a brief dive from the beach to do weight checks and a couple of exercises.

The next day we were very pleased to greet our lost team member, in the form of Andreas, arriving by the morning boat from La Ceiba. It turned out that he had shared the boat of the President of the Honduran Coral Reef Foundation, so probably more style than the rest of us had travelled in! El Presidente is arriving here for his Easter holidays and we have been told to expect most of his family too, so we are looking forward to a Honduran (one team member, our dive leader and the rest of the country), Italian (the reality TV crew who are here building sets etc in preparation for their show which starts in a couple of weeks – a 'Survivor' type programme), German (four of our team) and UK (two of our team plus me) Easter celebration next weekend. The Germans want to hide eggs all over the island for everyone to look for, the UK want to eat chocolate, the Italians want to drink wine and the Hondurans don't care as long as there's dancing!!

Our Reef Check training was taken on with admirable concentration and seriousness by everyone in the team. We have one team member who has just started working for the Foundation and speaks little English, so we are having bi-lingual training sessions with this team – and I think my Spanish is improving a little at the same time. That morning was spent going through presentations with lots of questions and discussion on the various aspects of the survey work. In the afternoon we did an orientation dive where everyone took the Reef Check equipment with them and had a short practice over the transect and then a look at the reef and the fish. After the dive we met back in the dry lab for a debrief and some book work – I left them all still working at 6pm!! Very impressive.

Today we had our first 'dress rehearsal'. It went pretty well – the fish team were impressive and only slightly confused by the damselfish who liked to swim across the transect pretending to be butterflyfish; the invertebrate team did okay, but sped down the line ('we didn't see anything') and only stopped for the occasional tea-party and a good chat by writing on their slates; the substrate team looked great, with good buddy working and a conscientious approach, unfortunately they ran out of time half-way down the transect!! So all in all a good first attempt – we'll do another trial run tomorrow morning and hope to start the work for real in the afternoon. This afternoon has been spent with more book work and the team are planning to snorkel the small reef at the end of the beach, just to top up their ID work.

8 April

Happy Easter Sunday, and our day off. As we had already achieved the beach and underwater cleaning around the jetty we decided that we were due a proper day off so while Italo snoozed in his bed, the team set off for a walk across the island to see the north beach. As the previous team had done such a good job of cleaning only two weeks before, we prepared ourselves for a walk and some snorkelling over the other side.

We spent a very happy two hours strolling through the woodland on the high ridge that crosses it from south to north. Marcio led the team and talked us through the ecology of the island with help from two able interpreters, Andreas and Captain Jack (Daniel). The Captain was especially enraptured by the stories of buried pirate treasure on the island but swore blind that with all the rum that he had drunk over the years he couldn't remember anything about where it was (I should point out that Daniel doesn't drink so we're not sure we can believe this). Unfortunately the only items we found that had been discarded by humans was a very long cable going across the island and a whole load of rubbish at the summit of our journey (those damned Italians, I'm afraid). Also, when we got to the beach it had, once again, become litter-strewn and we were sorry not to have brought any bin bags with us.

Having said that, the walk itself was great with lots of sightings of hermit crabs, why they drag themselves to the top of the island we were unable to find out, but there were a lot of them there. We also found a very strange looking tiny silvery snake which it was suspected was a new discovery, but we have yet to confirm or name our discovery. We failed to see any of the famous pink boas that live on the island but enjoyed the hunt.

On our return, very hot and, yet again, sweaty, we had a quick lunch and then (after recovering our dive leader who had got lost somehow on one of the local islands having some chicken and potato apparently ;) we set off on our 'fun' dive.

…next section of diary courtesy of expedition team member Neil…

You have to remember this IS NOT A HOLIDAY, so we aren't really allowed to have fun (but so far we've had lots!). We headed to Peli 3 for some cave diving and low and behold Kathy finally saw a hogfish (the fish our boat is named after) kindly pointed out to her by the ever alert Velly (Neil's German nickname). A few underwater team photos later and some rather strange sea horse swimming and we retired to the hotel on the neighbouring island to sink a few white wines as the sun set across the raging seas (these Honduran storms!)

The Anglo-German relations have been permanently intensified by the terrible German efficiency (complete lack thereof), however, following his earlier reprimand from Herr Kathy, Daniel is now much improved! The late night card games are doing little to enhance relations as the favourite German game of Skat is constantly rubbished by the ignorant Brits.

Due to the early start on the wine an early night was had by most, in fact some even skipped dinner altogether. With the new day looming, and new teams with new skills you may have expected some last minute revision of the new skills required, not this terrible loutish behaviour.

9 April

After a week of zero banded shrimp on the slates, Neil spotted three in his first day of searching, impressive work! Neil is a natural and a truly gifted diver, I don't know how the others dare to dive in the same water, he's so great!!

…thanks for your entry, Neil, I'm going to take over again!!!...

Our last three days of Reef Check work was marked by some interesting sites and a world championship in free diving that was soundly won by Ronnie, our Honduran 1st mate who has been a lobster fisherman all his life. He was able to swim down to around 15 m and then swim along the bottom a bit and slowly ascend. The combined European team probably managed to get down to around 6 m before they had to surface and gulp for air. There were several occasions when we were finishing our dive and Ronnie would nonchalantly swim past on a leisurely reccee.

Apart from the survey work, our last few days have been marked by evenings spent watching for rays from the end of the jetty (there are usually eight that swim around in circles under the lights), beer and card games, a lot of German jokes (some are pretty funny), lots of people being pushed in the water, and a lot of reminders that 'This is not a holiday'. We have also been learning how to say 'outstanding' in other languages - for the linguists amongst us, the German version is 'aussergewöhnlich' and the Spanish version is 'extraordinario'. I'm thinking of printing this on the backs of the T-shirts for next year.

12 April

We've finished all our survey work and had an excellent fun dive this morning. We actually left very early, at 8.30 am, but only after some stern words from our Captain the evening before - finally the Germans have proved their efficiency (and were not late because they were 'washing their socks' or some such other excuse)!! The dive was marked by a sighting of a turtle who surfaced to have a look at us and then disappeared again beneath the water.
It was also marked by our early arrival ahead of some Italians (those damned Italians again) who wanted to take our mooring, but luckily we got there before them and they had to queue.

We are just tidying up equipment, swapping photos and completing log books before we head off to the hotel on the next door island for a relaxing afternoon.

17 April

Well, I'm back in the UK and have just finished doing the debrief with the office staff here. I'd just like to say a final thanks to everyone, for making the expedition not only productive, but lots of fun too.

There are some images that will stay with me for a long time (usually for a good reason) and many happy memories. You'll get an e-mail from the office about the picture sharing website that we've got, but I'll mention it too as it is really great to be able to get copies of other peoples' photos (and there don't seem to be any on there yet!!). www.biosphere-expeditions.org/picturexchange explains how it all works (scroll past the links to see the instructions), so please start sharing.

Take care.
Kathy.