



## Expedition report

### Surveying the Caribbean coral reef of the Cayos Cochinos marine protected area, Honduras.



in partnership with



**Expedition dates:** 12 March – 7 April 2006

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# ABSTRACT

The Cayos Cochinos Natural Monument, located off the coast of Honduras in the Caribbean, was declared a protected area by the Honduran government in 1992 and in 2003 was awarded the status of a Marine Nature Monument. The Cayos Cochinos Natural Monument is an important and protected part of the Meso-American barrier reef, the world's second largest barrier reef system. In 2004 a management plan was published and new zoning and connected regulations were approved.

The current project was initiated in 2006 between the Honduras Coral Reef Fund and Biosphere Expeditions with the purpose of establishing baseline study protocols, a reef monitoring programme using the Reef Check Methodology and evaluating the effectiveness of new regulations for the protected area.

A low density of key predator species, especially groupers, was found during the monitoring programme. Furthermore no significant difference in fish indicator populations of Haemulidae, butterflyfish, moray eels, groupers, parrotfish and snapper was found between fishing and non-fishing sites. This is not surprising as these fish taxa are target species for local fishermen and fishing restrictions have only recently (August 2005) come into effect. A very high number of algae populations was found, indicating elevated levels of nutrients coming from the mainland as a result of fertiliser-driven intensive plantation agriculture.

The recommendations flowing from this report are (1) to maintain and increase the no fishing zones so that natural or near natural levels of reef assemblages can reestablish themselves, (2) to start an educational campaign on the mainland in order to decrease the amount of nutrient laden (often polluted) sediments reaching the reef and (3) to continue with the monitoring programme in order to (a) evaluate the effectiveness of the zoning regulations established in the management plan and (b) document the recovery of reef assemblages in a baseline study.

# RESUMEN

El Monumento Natural Marino Archipiélago Cayos Cochinos, ubicado en el mar caribe de Honduras, fue declarado por el gobierno como área marina protegida (AMP) en el año 1992 y en 2003 le fue otorgada la categoría de Monumento Natural Marino. Forma parte importante de la segunda barrera arrecifal más grande del mundo. En el año 2004 fue publicado el Plan de Manejo del AMP y nuevas zonas de uso y regulaciones fueron establecidas.

El presente proyecto fue iniciado en 2006 con el propósito de establecer una línea base y obtener evidencia de la efectividad de las recientes regulaciones para el área marina protegida. Biosphere Expeditions y Honduras Coral Reef Fund iniciaron un programa de monitoreo de los arrecifes coralinos usando la metodología Reef Check.

Durante los monitoreos fue observada una baja densidad de especies predatoras clave como meros y pargos. Esto era de esperarse ya que estas especies son blanco de los pescadores locales y las regulaciones de pesca son de reciente implementación. Un alto número de algas indicadoras de nutrientes evidencia un aporte considerable de sedimentos que llega de tierra firme como resultado de la actividad agroindustrial.

Se recomienda (1) mantener y fomentar las zonas de no pesca para acercarse al punto de restablecer el equilibrio ecológico natural entre los grupos de organismos en el arrecife, (2) iniciar una campaña de concientización sobre la importancia de proteger las cuencas para disminuir el aporte de sedimentos (comúnmente contaminados) hacia los arrecifes y (3) se debe continuar con el programa e monitoreo para (a) evaluar la efectividad de la zonificación y regulaciones establecidas en el Plan de Manejo y (b) documentar la recuperación de los ecosistemas arrecifales sobre la base de estudios.

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# 1. Expedition Review

M. Hammer (editor)  
Biosphere Expeditions

## 1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our 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. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, 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](http://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 12 March to 7 April 2006. 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



Map of the study 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<sup>2</sup> 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 World 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

### **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:

2006: 12 – 24 March | 26 March – 7 April.

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 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.

## Diving

Although dive training was offered as part of the expedition, all team members who signed up for the expedition came as qualified divers (minimum PADI Open Water) already. Future expeditions will no longer offer dive training, but require a PADI Open Water qualification or equivalent as a minimum, as well as evidence of some recent diving or a refresher course to ensure proper buoyancy control to limit damage to the reef.

Standard PADI diving and safety protocols were followed.

### **1.5. Local Scientists**

Adoni Cubas is a reef biologist and Reef Check trainer who has been working with HCRF since 1997. Adoni has worked with community development programmes, fish, reef, fisheries and spawning aggregation monitoring programmes in close relation with international institutions like The Nature Conservancy, the World Wildlife Fund, Inter American Foundation, Avina Foundation, the Wildlife Conservation Society, the United States Geological Survey and others.

Italo Bonilla is also a biologist, PADI dive instructor and Emergency First Response instructor. He has worked for the United States Geological Survey and within several reef survey methodologies, amongst them Reef Check and on many expeditions in Belize and Honduras.

## **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:

12 - 24 March

Caroline Bruce (UK), Franz Lerchenmueller (Germany), Stefanie Lindemann (Italy), Louise Reader (UK), Christoph Schmid (Germany), Karin Thiele (Switzerland), Sabine Wuttke (Germany).

26 March - 7 April

Carol & Glyn Davies (USA), Hellen Griffiths (UK), Greg Muelrath (USA), Detlef Rausch (Germany), Kay Sennitt (UK), Michele Steffey (USA), Karin Thiele (Switzerland), Sabine Wuttke (Germany).

## 1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1150 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.

<b>Income</b>	<b>£</b>
Expedition contributions	19,180
 <b>Expenditure</b>	
<b>Accommodation and food</b> includes all meals, station equipment	4,160
<b>Transport</b> includes fuel, boat & vehicle maintenance	17,90
<b>Equipment and hardware</b> includes research materials, research gear	1,180
<b>Biosphere Expeditions staff</b> includes salaries, travel and expenses to Cayos Cochinos	2,944
<b>Local staff</b> includes salaries, travel and expenses, Biosphere Expedition tips, gifts	1,264
<b>Administration</b> includes registration fees, sundries, etc	465
<b>Team recruitment Honduras</b> as estimated % of PR costs for Biosphere Expeditions	2,600
 Income – Expenditure	 4,777
 <b>Total percentage spent directly on project</b>	 75%



## **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](http://www.biosphere-expeditions.org).

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

## 2. Reef Check Survey

Adoni Cubas  
Fundación Cayos Cochinos

### 2.1. Introduction

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 Cayos Cochinos Marine Natural Monument. 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.

In 2004 HCRF published a new management plan for the area, which has been discussed extensively with the various stakeholders and has now been adopted by the Honduran government. 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 2000).

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 History (adapted from Hodgson 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.

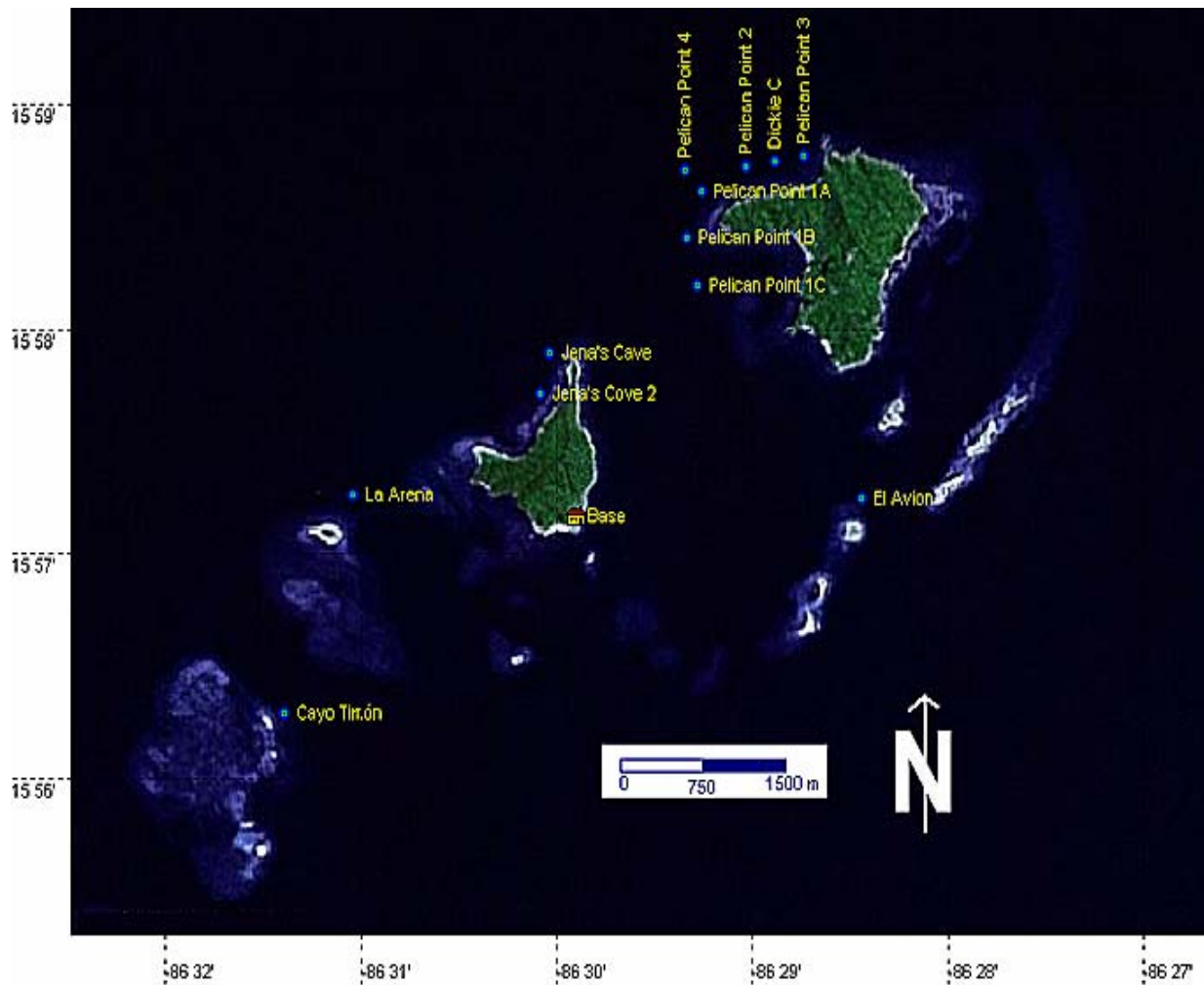
Base line data and year one internal survey for Cayos Cochinos

Since the main purpose of starting this long-term monitoring program in Cayos Cochinos is to establish a baseline (year one survey) from which comparisons will be made in the future, null hypotheses are not stated. As such presentation of year one data is mainly descriptive and designed as a reference for comparative analysis in the future (year two and subsequent surveys).

## 2.2. Methods

### Site selection

Twelve dive sites (Fig. 2.2.a) within the different management zones inside the marine protected area were selected according to their level of use in relation to the regulations of the management plan (Table 2.2a). Selections were made so that over time the effectiveness of the recently established zoning and regulations can be monitored.



**Figure 2.2a.** Position of dive survey sites in relation to base and longitudinal/latitudinal grid.

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

**Table 2.2a.** Dive sites and impact patterns.

Dive site name	Fishing allowed	Tourism impact	Remarks
Cayo Timón	No	Medium	Some beach tourism
Dickie C	No	Medium	Some yacht/boat tourism
El Avión	Yes	High	Local community tourism & fishing
Jena's Cave	No	None	
Jena's Cove	No	None	
La Arena	Yes	Medium	Some beach tourism
Pelican Point 1A	No	High	Main mooring site for yachts & boats
Pelican Point 1B	No	Medium	Some yacht/boat tourism
Pelican Point 1C	No	Medium	Some yacht/boat tourism
Pelican Point 2	No	Medium	Some yacht/boat tourism
Pelican Point 3	No	Medium	Some yacht/boat tourism
Pelican Point 4	No	Low	

### 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 their 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 again 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 as far as possible.

Training in organism, substrate and disease identification skills was given using Reef Check teaching materials and special slide shows and discussion forums.

### Survey procedures & data collection

Data collection by and large followed Hodgson et al. (2004) with some minor adaptations to local conditions, such as designing a new set of hand signals to simplify underwater communication between team members (see appendix 1).

Data were entered underwater on specially produced slates and then transferred in the dry lab computer room onto standard Reef Check Excel datasheets. These Excel sheets were submitted to Reef Check after each slot.

## 2.3. Results & Discussion

### 2.3.1. Fish

The almost total absence or very low abundance of predators (especially groupers) is immediately obvious (Fig. 3.1a). In fact only five Nassau groupers (*Epinephelus striatus*) were found during the entire month-long survey (one each at Dicky C, El Avi3n, La Arena, Pelican Point 1B & 4). Sluka et al. (2001) report much higher numbers than those observed at Cayos Cochinos for similar habitats along the Florida Keys and have identified intense fishing pressure as one of the main reasons for grouper decline (Sluka et al. 1997). Around Cayos Cochinos, as in many other places around the Caribbean, groupers have been targeted due to their high commercial value. Marine reserves have been suggested as areas which can ameliorate the effects of intense fishing pressure and protect the size, abundance and reproductive output of targeted species such as the Nassau and other groupers; as well as provide benefits to fisheries outside of the reserve. Sluka et al. (1997) found an up to six times higher reproductive Nassau grouper biomass inside a marine reserve of the Central Bahamas. Rudd and Tupper (2002) showed that Nassau grouper in marine reserves can also provide nonextractive economic value to recreationalist, especially scuba divers who showed a marked preference for visiting dive sites with large Nassau grouper individuals in the Turks and Caicos Islands and as such may influence the economic viability of marine reserves.

The enforcement of the recently established no fishing zones therefore becomes a important task for HCRF so that grouper populations can recover their original status or at least to levels necessary to control other fish groups populations like the damselfish.

Pooled and unpooled statistical comparison of sites where fishing is currently permitted (El Avi3n and La Arena) with sites where no fishing is allowed (the other ten sites) revealed no statistically significant difference between them (see Table 3.1a). This is not surprising as the no fishing zones were only established in August 2005, about seven months before the expedition conducted its first surveys. Further surveys over a number of years will be required to show how the establishment of no fishing zones is affecting fish populations.

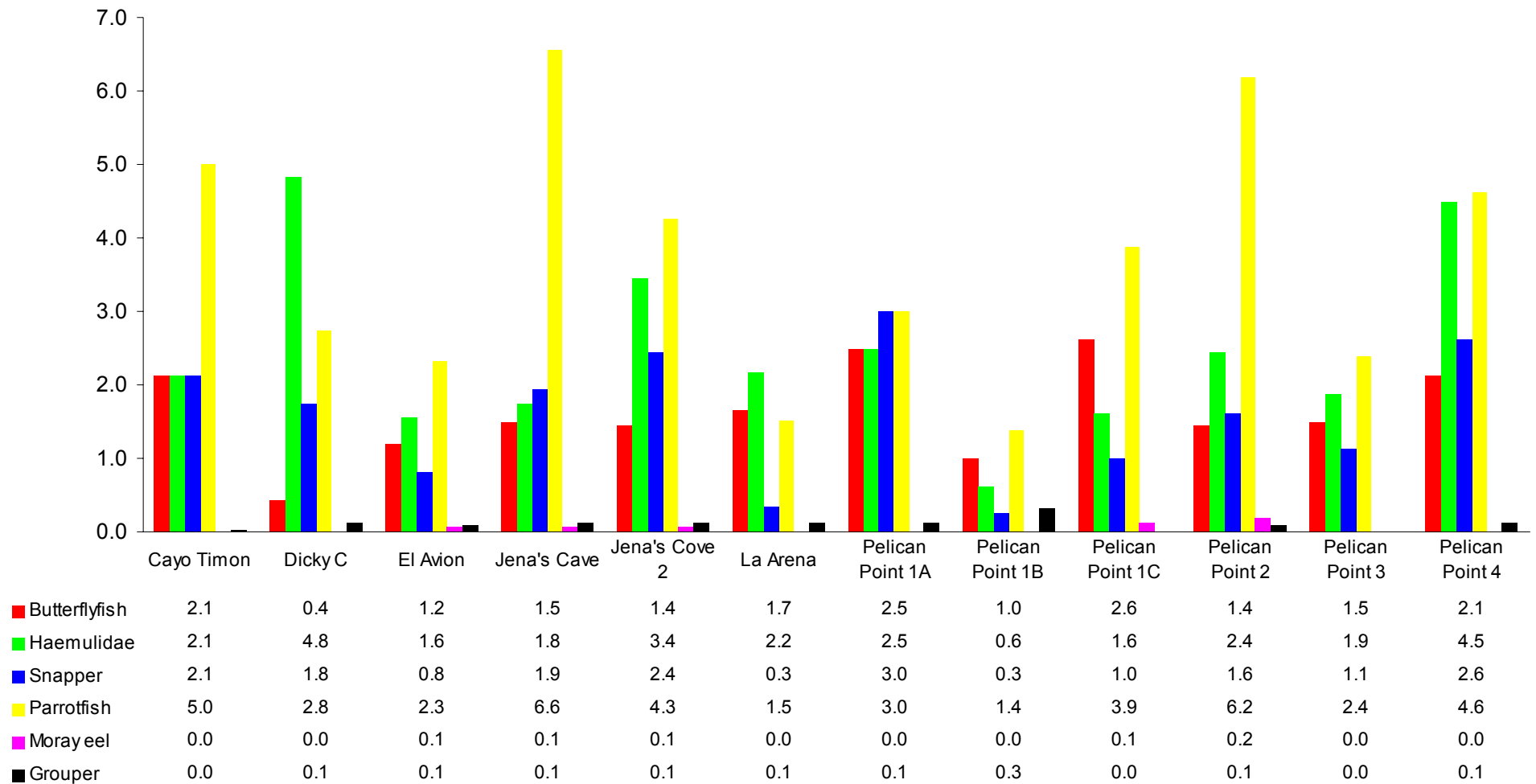
**Table 3.1a.** p values of pooled (shallow and deep transects) one-way ANOVA analyses of fish indicator groups of fishing vs. non-fishing zones.

Indicator fish group	p value
Haemulidae	0.224
Butterflyfish	0.698
Moray eels	0.750
Groupers	0.895
Parrotfish	0.045
Snappers	0.008

The surveys revealed large parrotfish populations (see Fig. 3.1a). Their abundance may be due to three reasons. Firstly, the high availability of food (nutrient indicator algae) that is also shown on the surveys (see below). Secondly, because parrotfish are not a target group for the fisheries at Cayos Cochinos. And thirdly, because of the absence of groupers, which are known to prey on parrotfish (Rojan and Lewis 2006).

Experts in fisheries have found that in the areas where overfishing has caused a severe impact on the fish populations, parrotfish become a target group and begin to decline (personal communication). As such the relative parrotfish abundance observed here is an indirect indicator that, even though there has been some overfishing at Cayos Cochinos, it had not reached critical levels by the time the no fishing zones were declared in August 2005.

However, corals are vulnerable to parrotfish predation. Whilst preying on the corals, parrotfish can also destroy the substrate in the process and prevent other corals from settling (Jones & Endean, 1976).



**Figure 3.1a.** Average number of fish for each 20 m transect for all dive sites.



### 2.3.2. Invertebrates, Coral Disease & Algae

Overall a low abundance of sea urchins was observed. Low urchin numbers means that the algae that are invading the substrate are not sufficiently controlled (i.e. eaten by the urchins), which in turn can have a negative effect on coral recruitment because coral polyps need rocky substrate for initial attachment.

Disease is a natural process that has been poorly studied in the oceans because of its ephemeral nature. Epidemics in animal populations, called epizootics, are a serious threat to the health of coral reefs worldwide. Recent observations of epizootics affecting sea urchins and corals show that diseases on reefs can devastate their target populations and act as agents of rapid and dramatic community change. Marine pathologists and microbiologists are attempting to identify the causes of infection, but the pathogens responsible for most diseases affecting reef organisms remain elusive. These difficulties complicate efforts by scientists and managers to study outbreaks and to determine if control measures are warranted.

Recent scientific reviews list four to six confirmed coral diseases in the Caribbean region alone; other estimates, based only on observed symptoms, run as high as fifteen. Bacteria, fungi, and cyanobacteria ("blue-green algae") are known to cause diseases in corals.

Three coral diseases - white-band, black-band, and plague - were first reported in the Caribbean in the 1970s. The first documented, regional-scale epizootic, however, affected the long-spined sea urchin, *Diadema antillarum*. In 1983-84, a disease carried by ocean currents, and possibly in the ballast water of ships, killed more than 95% of *Diadema* throughout the Caribbean. This epizootic clearly demonstrated that diseases can have major impacts on reef ecology. Before its mass mortality, *Diadema* was an important herbivore. It ate fast-growing fleshy algae (seaweeds), keeping space free for corals to survive and grow. After the urchins died, algae increased dramatically on many Caribbean reefs. They colonized corals that had been killed by hurricanes and by diseases, particularly white-band disease. Since then algal growth has been so rapid on some reefs that the surviving corals have been unable to continue growing, and small, newly-settled corals are simply being overgrown and killed. Precisely this effect can be observed on some dive sites at Cayos Cochinos. The problem of algae not being grazed upon by urchins is compounded by nutrient-rich waters from the mainland stimulating further algal growth (see next section for more details).

Although the effective agent of white-band disease remains unknown, there is some evidence that it is bacterial. White-band disease infected populations of staghorn and elkhorn coral (*Acropora cervicornis* and *Acropora palmata*) throughout the Caribbean region in the 1980s and 1990s, inflicting enormous losses. Because *Diadema* also disappeared, algae rapidly colonized the dead coral skeletons. As a result large areas of Caribbean reefs are now covered with algae and have been for over a decade. However, the expedition observed a low frequency of white-band disease, suggesting that the reefs around Cayos Cochinos have recovered from the white-band epidemic of the 1980s and 1990s.

Many marine scientists suspect that human activities, such as pollution and changing patterns of land use, promoted the spread of white-band disease in Florida and the Caribbean. There is little evidence for a human connection, however, other than the historical novelty of the outbreak. Eutrophication, or nutrient pollution, may be an important source of stress to reef organisms. This stress may compromise disease resistance, allowing infections to take hold and new diseases to emerge. A fungal disease of sea fans appears to provide a link to human activity. The fungus *Aspergillus sydowii* has infected large populations of sea fans in the Florida Keys and throughout the Caribbean. *Aspergillus sydowii* is thought to be a land-based fungus that has invaded the marine environment via the sediment in terrestrial run-off. But for this disease too, the expedition reported a very low number of incidences suggesting that the reefs around Cayos Cochinos are relatively disease free.

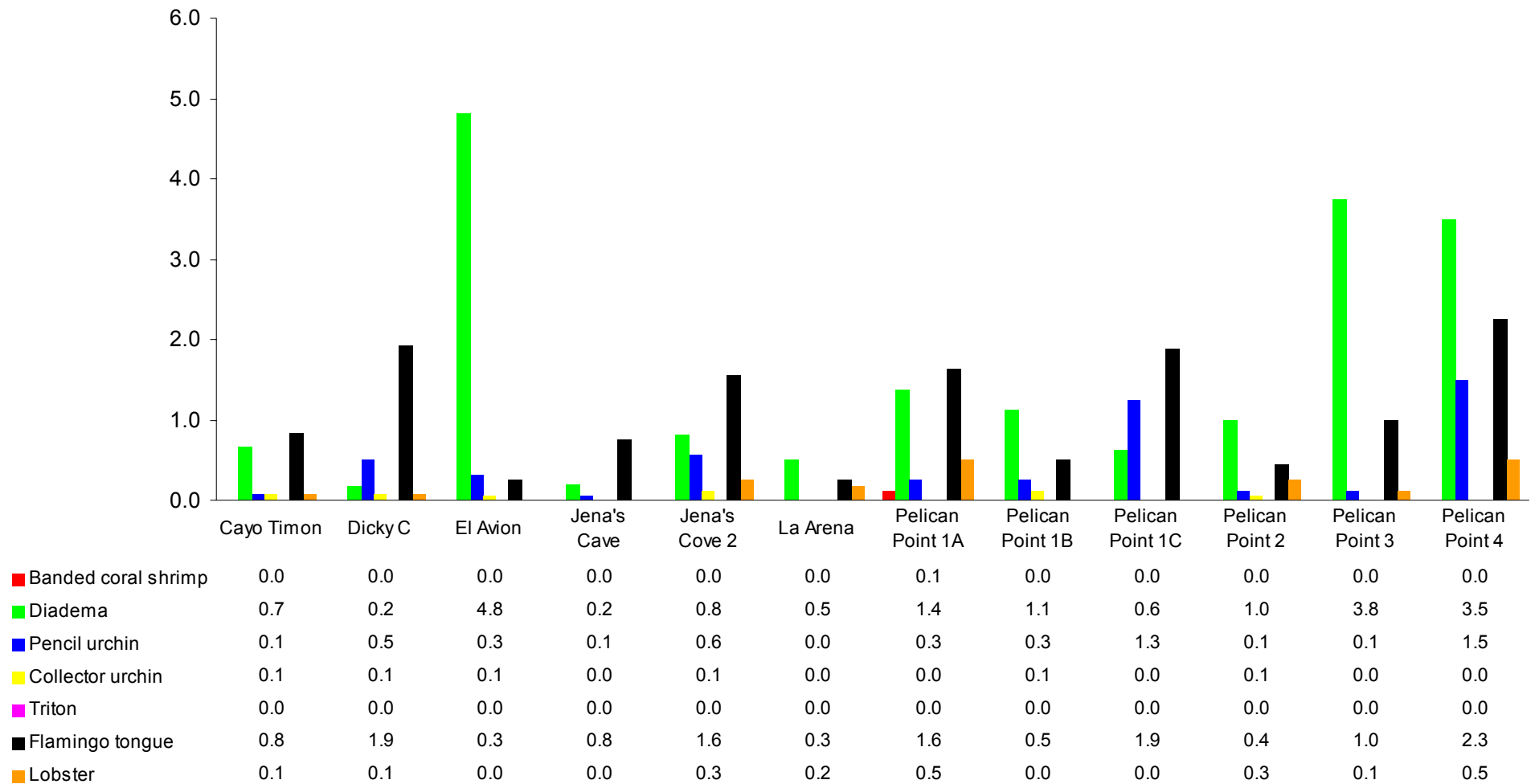
There is an absence of recently killed coral as well as an absence of bleaching, which suggests that reef populations are not in decline. In fact they are likely to be stable or still recovering from hurricane Mitch. However, at Pelican Point 1A a higher level of damage was observed. As this is one of the most used sites for tourism, this might be the reason for observing a higher level of damage. At Jena's Cave a high bleaching level compared to other sites was observed. Jena's Cave is located in the north area of Cayo Menor. In general, the north side of Cayo Menor is not frequently exposed to the influence of the prevailing current and it is possible that this causes an increment in the water temperature that results in a higher stress level and therefore of bleaching.

### 2.3.3. Substrate & Coral Damage

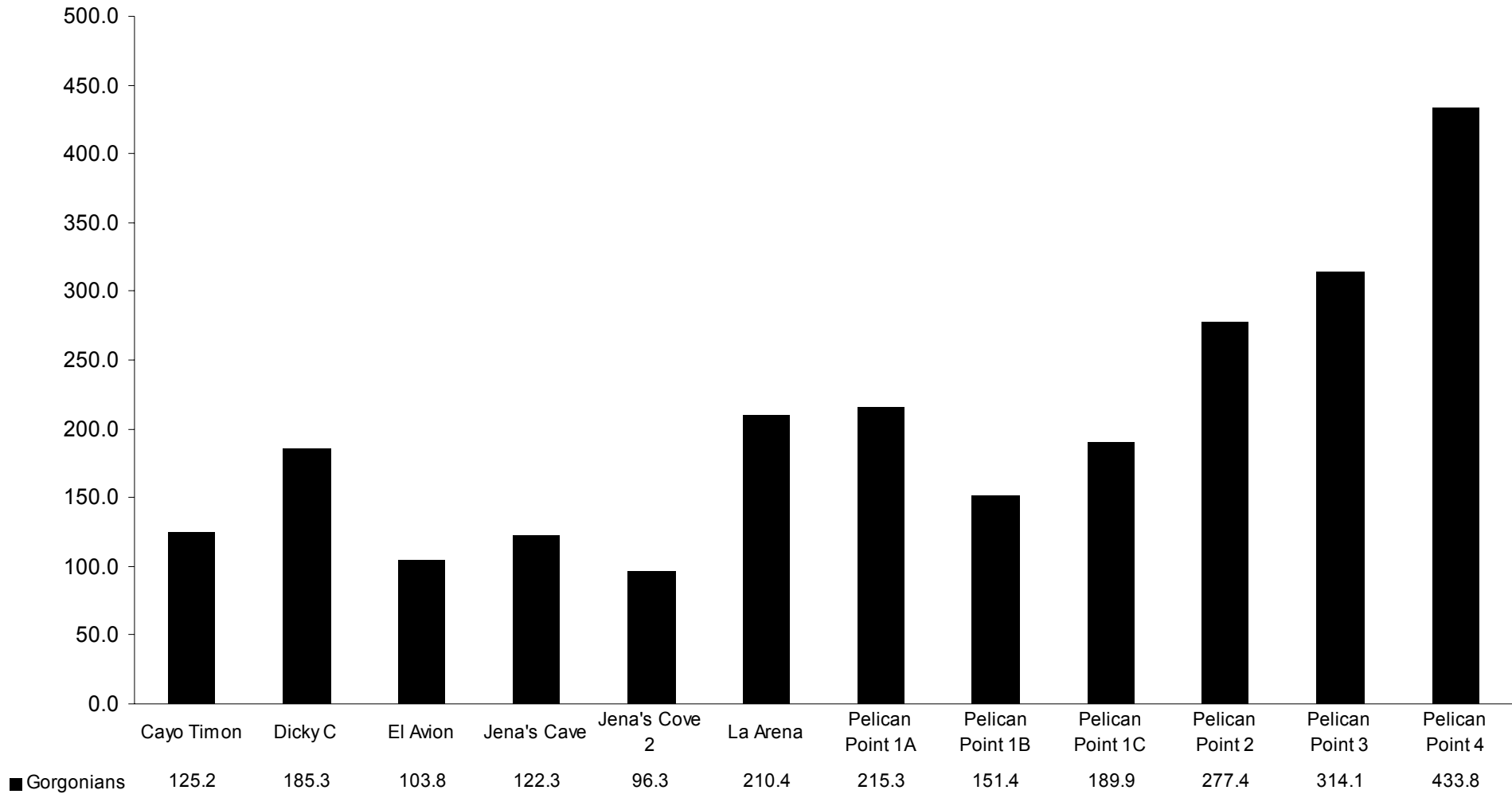
There is an abundance of hard coral, which is important for the reef structure since hard corals are the reef builders.

There is a very high or high abundance of nutrient indicator algae, particularly at El Avi3n and La Arena, which are most exposed to the prevailing currents, suggesting that the reefs surveyed are receiving a high amount of nutrients. As the data also show a very low presence of siltation, it is likely that the nutrient source is fertiliser coming on the prevailing currents from the mainland, where intensive plantation agriculture is widespread. Cayo Timon shows a predominance of hard coral reef builders, followed by nutrient indicator algae, also suggesting a significant amount of nutrient input. This is consistent with the fact that these three sites are the ones most exposed to the nutrient-rich prevailing currents.

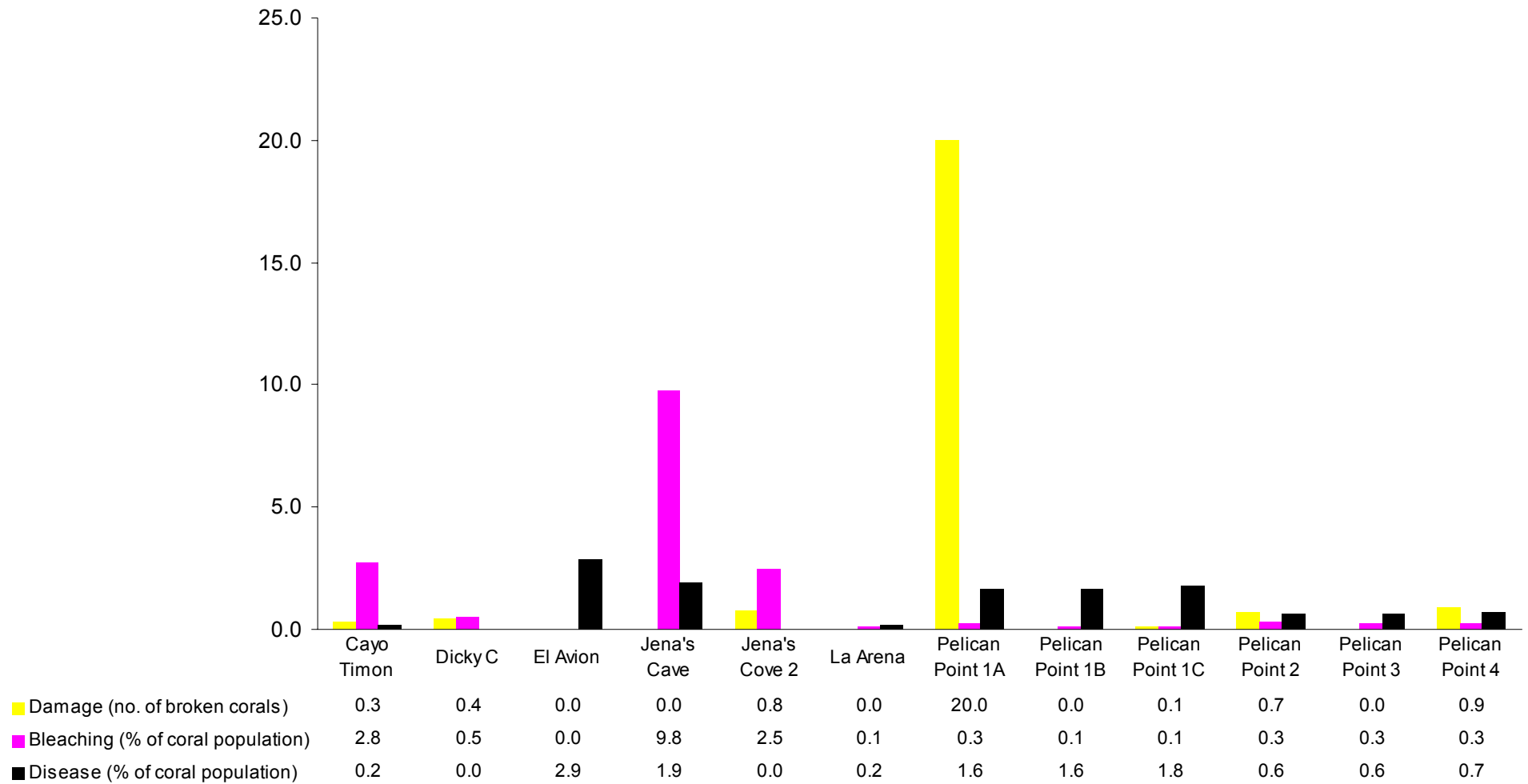
In general living cover is more abundant than non-living cover. Rock is the most abundant non-living cover, particularly at Pelican 2, giving the sites overall and Pelican 2 in particular good potential for coral recruitment, provided the herbivores keep algae growth under control and the abundance of parrotfish does not prove detrimental to the amount of rocky substrate available for coralline recruitment. Around Dicky C sandy substrate dominates, and the site therefore is not an appropriate area for coral recruitment.



**Figure 3.2a.** Average number of invertebrates (except gorgonians) for each 20 m transect for all sites.



**Figure 3.2b.** Average number of gorgonians for each 20 m transect for all sites.



**Figure 3.3a.** Average coral damage for each 20 m transect for all sites.

### 2.3.4. Reef Check Results & Data Submission

All survey data obtained served two purposes. Firstly as a baseline internal survey for Cayos Cochinos and secondly as a standard Reef Check survey. All data collected during the surveys were also submitted to Reef Check following their standard data submission protocol (Hodgson et al. 2004). These data will be analysed by Reef Check and used to scientifically monitor, restore and maintain coral reef health. Please refer to [www.reefcheck.org](http://www.reefcheck.org) for further details.

## 2.4. Conclusions

Overall the reefs around Cayos Cochinos are in good health; remarkably good health when compared to many other reef systems around the globe. Of course they are not in an ideal condition, but then very few remain so. Even if the reef ecosystems around Cayos Cochinos are not in ideal condition, they have by no means reached the level of irreversible degradation. It is hoped that the creation of the Natural Marine Monument, the implementation of the Management Plan and continued monitoring of the reef through scientists and helpers such as provided by Biosphere Expeditions will help to restore the reefs around Cayos Cochinos to their best possible state. Within this context the presence of herbivorous fish species such as parrotfish is a good opportunity to keep the abundance of algae at a level that will give the reef corals a chance to recruit and continue building the reef.

Furthermore, efforts to implement proper regulations inside the marine protected area in order to reestablish the health of the reef, have to be complemented with the reduction of impacts that come from outside the boundaries of the Natural Marine Monument.

## 2.5. 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:

- Maintain the status of no fishing zones at the sites where are already implemented.
- Promote the establishment of more and bigger areas as no fishing zones.
- Start a campaign to reduce the input of nutrients coming from the mainland in order to decrease the dominance of nutrient indicator algae.
- Continue the monitoring programme to obtain medium- and long-term information on the effect of the zoning and regulations contained in the Cayos Cochinos Management Plan.

- Make sure that the team members have enough previous experience in diving.
- Invest the time that is needed to get to a proper level to handle the diving gear and tools to data recording.

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**Appendix 1:** Hand signals designed by the expedition team to simplify underwater communication.



**HARD CORAL – HC**  
Closed fist up and down



**SOFT CORAL – SC**  
Open fist up and down



**RECENTLY KILLED CORAL – RKC**



**NUTRIENT INDICATOR ALGAE – NIA**



**SPONGE – SP**



**ROCK – RC**  
Closed fist (NOT up and down)





**RUBBLE – RB**  
Circular motion with downpointed finger



**SAND – SD**  
Wiggling fingers downwards  
(because sand sinks)



**SILT/CLAY – SI**  
Wiggling fingers upward  
(because silt stays suspended)



**OTHER – OT**  
Shrugging action with one hand



**BUTTERFLYFISH**  
(because they all have an eye stripe)



**GRUNTS/MARGATES**  
Mimicking a military salute with a closed fist



**SNAPPER**  
Snapping action with hand



**GROUPER**  
(because they are usually large, heavy fish)



**PARROTFISH**  
Mimick parrot sitting on pirate's shoulder

## Appendix 2: Expedition leaders' diary by Katherine Wilden

6 March

It was 8 am on Saturday morning when the boat set off from Lagoon Marina, La Ceiba, to take us to the island that is to be our expedition base for the next few weeks. It had rained overnight, something that has become a pattern over the last few days, but the clouds were clearing away as we headed out to sea. The journey took around 40 minutes in the open-topped motorboat – warm and windy – and on landing at the jetty we were met by two very enthusiastic dogs and the epitome of a paradise island.

If you're wondering who I am, I'm Kathy Wilden, and I'm lucky enough to be your expedition leader for this diving expedition. Today is Monday and I've done some settling in. I've been working with Italo, who is leading the scientific work here (and is a diving instructor) and Matthias who is also from Biosphere. We have been finalising the training schedule and the daily routines as well as acclimatising to being on a beautiful desert island. I'm sure I don't have to remind you to bring your diving kits (mask, snorkel, fins, dive computer or watch and wetsuits essential, everything else can be hired here) and diving paperwork (certification/referral, medical statement, logbooks), but I did want to stress the need for long-sleeve tops and trousers, along with insect repellent, as the sandflies can be quite annoying here – the itching doesn't seem to last long but there can be quite a few of them!

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 7pm 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 be 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, Tel: (please note that this number is for emergency communication only and will only work intermittently once we are on the island). Looking forward to meeting everyone.

Regards

Kathy.

8 March

This is a quick update on things over here and an apology for not including my mobile number in the last email. My mobile number (only for problems and emergencies) is a Honduran number Tel: +504 xxx [number withheld on web] (where 504 is the code for Honduras).

I'm settling into the island routine now and looking forward to the diving. 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 all 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. I'm attaching the plan for you all to have a look at, but remember to stay flexible as nothing is as constant as the change on plan on expedition ;->

Looking forward to seeing you all on your arrival.

15 March

First, apologies for the gap in communications – the internet has been down for a few days so I haven't been able to email. All part of the fun of island living. Everyone arrived safely at the meeting point on Sunday and we set off in good time for the boat ride over here. Even though we left early, a few of us got a bit damp (think of someone throwing buckets of water at us) on the way over as the wind picked up and the seas got a bit boisterous. We were travelling in a large boat called "Baracuda" (one 'r' in Spanish) that is going to be our dive boat for the next two weeks. She is an excellent boat for choppy seas, originally being a drugs-running boat that was seized by the police from some Columbian smugglers and donated to the research station here! On arrival everyone settled in and we spent the rest of the day with introductions and briefings about the work that goes on here and what the team will be doing. We ended the afternoon with an entertaining snorkel run-through of the survey technique that we will be using underwater. It involves laying a 100 m tape measure down on the bottom (our transect line) and then pairs of divers swimming at suitable intervals down the line looking for different aspects of the underwater environment. The first team identifies and counts certain families of fish, the second looks on the bottom for invertebrates and coral damage & disease, and the final team concentrates on what the bottom is made of (soft coral, hard coral, rock, sand, etc.). There is a lot to look out for, but the survey is designed so that each team has a manageable task.

Over the next two days we worked in the dry lab on our fish, invertebrate and substrate identification skills and then put them into practice with two dives, the second one also testing out the survey procedures. Although a few of us were a bit nervous about the first 'proper' survey, I am writing this at the end of the first day and we have had two very successful dives. Everybody was organized and efficient in getting into their buddy pairs and going down to the beginning of the transect, and then followed each other down the line like true professionals. The scientists here have been really impressed by everyone's abilities and dedication. We have also devised some interesting new hand signals underwater – when surveying, each diver has to carry several things with them, one team only has to carry a large slate to write down their observations but the fish team need a 2.5 m PVC tube (to demarcate the edges of their transect), a slate to write on and a couple of identification slates, so when they are asked how much air they've got left, the signals which say 'how am I supposed to pick up my gauge now?' can be quite direct! We are also working on some one-handed signals for the different types of fish. Snappers were quite easy (chomping action with hand) but we haven't really agreed on one for the parrotfish yet (my idea of putting your hand up as if it is sitting on your shoulder was rudely rejected). I'll let you know how things progress.

In other aspects of life here, the weather has been great with a good strong wind keeping things at a pleasant temperature and, more importantly for some of us, keeping the sandflies away. The island's wildlife has kept us entertained, with iguanas watching us as we walk up through the wood to the dining room for each meal, only occasionally falling out of the trees as we go past. There are a lot of crabs that live in holes in the sand on the seashore and run for cover as anyone approaches. As the slightly limited diet (refried beans with – almost – every meal) starts to make people crave alternative food types, it is lucky for the crabs that they are not quite big enough to be worth catching. I have just radioed an SOS to La Ceiba with an order for chocolate so I'm hoping that its arrival on Saturday will prevent mutiny!!

20 March

Work has been progressing at a steady pace here. Since I last wrote we have had three more survey days and a well earned day off. Baracuda leaves the jetty at 8.30am and 2pm everyday, everyone sitting in their buddy pairs with all their equipment, often doing some last minute work on identification and swapping tips on distinguishing grunts from snappers (the most difficult groups to separate as they are closely related, but more on this later). Underwater signals are run through, but not the normal ones that you will see on tourist dive boats. On Baracuda the array of signals can look very strange. The fish team's signs range from the parrotfish sign (they adopted mine in the end – hand sitting on shoulder!) to grunts (fist held sideways on head in manner of stupid person saluting - used because of the use of the word 'grunt' to describe a lowly private in the army) and the substrate team practicing the difference between sand and silt (fingers pointing downwards and wagging versus fingers pointing up and wagging), and soft coral (open fist) and hard coral (closed fist). To the uninitiated we must look like a rather eccentric bunch.

Back to fish identification (ID) problems. I thought that over the weeks I'd give you a few tips on our main indicator species so that next time you are in the water, diving or snorkeling, or watching the latest underwater programme, you can bore your friends and family with annoyingly knowledgeable details. The groups that we have the most difficulty distinguishing between are the grunts and the snappers. Both are medium to large fish with very similar body shapes. The text books can be a bit tricky to tie down on the differences. They say that snappers are 'usually' longer than grunts, 'usually' less colourful than grunts and their body shape is 'usually' fatter than grunts. So we've had to use close observation and the best advice from our local scientists to come up with a guaranteed way of telling them apart. The grunts feed on inverts on the bottom whilst snappers feed on crustaceans and fish, and this has caused their feeding parts to evolve differently. So, if you are observing a fish one day, and you can't tell whether it's a grunt or a snapper, all you need to do is ask them to smile at you. As soon as they smile, take a look at their teeth and see if they've got any at the front – a nice big toothy grin means you've got a snapper on your hands, no canines, and you've got a grunt!

One type of fish that we haven't had any difficulty in identifying is the barracuda. At several of the sites that we've been diving we have been observed, and sometimes followed, by these magnificent animals. The biggest one was found hiding in a small ravine. It looked like a large dark fish hiding between the rocks but we couldn't see what it was. Its large and very pointed teeth seemed to shine out from the shadows. Then it suddenly decided it had had enough of us and darted out into the light. As it swiftly and elegantly glided off we could see its silver colour shining in the sun and estimated a length of around 2 metres. Definitely the largest fish so far.

As well as the magic of the underwater world we've been having some land-based experiences too. As we were suiting up one day at the end of the jetty Christoph very calmly called me over. 'Katherine, Katherine, could you come here? It's stung me twice'. I wandered over to where Christoph was standing with his wetsuit, thinking that maybe some stinging cells had been stuck in his suit, but when I looked down I saw a small brown scorpion sitting on the back of his hand. I made some rather pathetic efforts at getting it off (scorpions can really stick to things when they want to) until Christoph finally got it off very gently himself. There then followed a bit of a debate with our dive leader, who has a phobia of scorpions, over what we should do with it – this took the form of our leader holding a large shoe and waving it threateningly, and Christoph & I trying to protect the little scorpion. In the end the scorpion made its own decision on its future and ran off under the jetty, hopefully not to be seen again. Christoph went out for the morning dive and when he got back there wasn't even a mark on his hand where he had been stung.

Other incidences have included: minor foot surgery – splinter removal with three people taking turns to play surgeon (unsuccessful); sarong rescue from the jetty – after much debate our dive leader eventually jumped in (successful); and a Bay Watch moment when an empty fuel drum blew off the jetty - Louise spotted it and sprinted to the dry lab, in what proved to be rather unsuitable clothing for running, to get help and the help appeared in the form of a young man who ran onto the sand, stripping as he went, and diving into the sea to save the day (successful on so many levels for so many different people!).

With Sunday as our day off, Saturday night became party night for the researchers of Cayo Menor. Four year old Nicaraguan rum appeared (the favourite local tippie here), Caribbean music played on the stereo and we chatted the night away in our open-air dining room set up in the hill. When it started to get late and some people headed for bed, the rest of us went in search of phosphorescence with a paddle on the beach and ended the evening sitting on the jetty watching the sea and the stars. For our "day off" the next day everyone chose different things to do. In the morning some chose to relax around the bungalows whilst the others took a wonderful walk across the island from our base on the south up to the northern beaches. Every year in June the north beaches become a site for nesting turtles, so from now until June the rubbish (plastic bottles washed up on shore) has to be removed from the beaches and large logs that block the turtles' path up the beach have to be cleared away. The walk across the island took us along a ridge through oak woods, past pirate treasure caves (according to local legend), snake spotting and learning about the pink boas that are protected here on the island. We also passed the tall antenna that has been set up amongst the trees on the highest peak here – it has taken many experts many months to get it set up properly but the result is that this island and those around can access the internet for the first time (before you get too excited, internet access is restricted to administrative staff in the office). The beach itself was spectacular and it was easy to imagine a large pirate galleon anchored out in the bay, but it was difficult to believe that so much rubbish had been

washed up here. We filled our bags but realised that this was merely the start of this crucial work. On our return to base, and after a good lunch, the boat left to take half of our group for a fun dive and the other half to a hotel on the neighboring island for some rest and relaxation. After diving, the dive group joined the others at the hotel for a sundowner before we returned to base and supper. An early night was had by all in preparation for the resumption of our work in the morning.

23 March

The hot debate for our last 3 days of survey work was, as you might expect, something simple – who has seen the biggest fish? Lou has made claim to the biggest find, the 2 meter barracuda that I reported on in the last diary, but there have been some serious contenders and some ill feeling amongst the team! The substrate team often doesn't see anything except the tape measure and the bottom (signals for hard coral, soft coral, rocks etc flying between the buddy team) and the invertebrate team are busy looking in holes and crevices for illusive creatures (as well as counting the plant-like gorgonian soft corals), so I think they feel slightly at a disadvantage in the 'biggest fish you have seen' game at the end of each dive. Having said that, the substrate and invert teams are often those that come back with stories of lobster, flamingo tongues, squid (which sometimes hide in the sponges) and other tricky to spot species. Another fish-bone of contention happened just as the dive boat had moored on its buoy for the last survey dive of this slot. Just as the divers were about to kit-up and get in the water a voice rang out - 'Shark, shark!!' There was a lot of excited scrabbling in the boat as everyone went to look. A few people saw a dark shape in the water but whether it was a shark or not was fiercely contested – unfortunately we didn't have an underwater sighting to confirm the theory.

Yesterday was the last survey dive and all the data have been put into the computer spreadsheets. After a final check from the scientists our first submission to the central 'Reef Check' database has been made. The scientists have been very impressed with the team's professionalism and dedication to the work and were pleased to be able to submit all of the surveys in the knowledge that the data were accurate and complete. The Honduran Coral Reef Foundation office in La Ceiba have just emailed to say that the data looks very interesting and will help with the decision making about future conservation strategies for the area. The submission to Reef Check will also ensure that the data from the reefs here are analysed along with hundreds of other reefs around the world to give a good picture of the health of the world's coral reefs and will help to inform global strategies on conservation.

As I write this it is the morning of the first team's last day here on the island. Some are just heading off for a fun dive whilst Christoph is doing an inventory of the survey kit to make sure that everything is in order for the next team. Caroline and Stephanie are also working hard, preparing a Happy Birthday banner for our lead scientist/dive leader using, for their creative inspiration, a mixture of fish identification cards, reef species books, and children's crayons! It should be interesting.

This afternoon is free time for everyone to sort their stuff out and pack up, followed by a final round-up at 4pm. We will depart at 7a.m. tomorrow morning, hoping for some quiet seas to give us a nice dry crossing! For those of you receiving this who will be coming on the next slot, I will be staying at the Banana Republic and on Saturday evening will be very pleased to meet up with anyone wanting to come for supper. I'll be in the reception area at 7pm if anyone would like to join me. If you need to get in touch with me, I can be reached either through a message at reception or on my new mobile which is Tel: +504 9842810. If I don't see you then, I'll see you (no later than) 7am on Sunday morning in the same location.

26 March

I know that somewhere in the dossier it says, 'stay flexible, things can change'? Unfortunately, it has been the weather that has changed and this has caused us a few problems. The first team left very successfully as planned on Friday at 7am, in what turned out to be the last good weather of the weekend. It was dead calm all that day, with not even a puff of wind on the island (wicked sandfly weather), and then the rain began overnight. At least it does 'rain' properly here – the serious torrential stuff that gets you wet when you look out of the window at it. Quite nice as a change but there's not much to do on a tropical island on a wet Saturday afternoon. There was some worrying news that a boat coming from La Ceiba had sunk and the staff here went out on a search and rescue mission. Two hours later word came that the people had been found swimming towards the mainland – they had had engine trouble, no bilge pump and no life jackets so as the boat started to sink they decided to swim for it. Luckily the patrol team from here reached them in time.

I'm glad to report that our boat coming with the new team this morning did, eventually, arrive here without any such mishap. They were slightly delayed by the weather but eventually decided that there was enough of a gap in the rain clouds to get over late this morning – and they even arrived dry! The rest of today was settling in and introductions and briefings on survey techniques. After an early night we should all awaken refreshed and ready for diving tomorrow.

28 March

It's been a packed couple of days training. The team have covered everything from snapper and grunt identification (something you know all about) to what the different 'nutrient indicator algae' look like (not a mean feat – maybe that should be your next training?). They also know exactly how slow they need to swim down the transect line, how to do all the hand signals, what the different sorts of sea urchins look like and much, much more. Formal training and practises have finished for today but the team are being very impressive and studying quietly in the dry lab together. Everyone has their nose in a book and the few sounds you hear are mutterings about stripes, fin shapes and teeth. Yesterday we had a weight-check and orientation dive from the jetty here in the morning and then the team went out for a boat dive in the afternoon. Everyone came back with stories of sightings and questions on identification, plus a few lucky people saw a Nassau grouper (this is the only fish that we need to count at species level). I think I was the most excited about it as it was the first one that I've seen since I've been here.

This morning we did a practice survey, splitting the team into two so that two different transects could be completed at the same time. One group had quite a good time with a relatively straightforward transect to follow whereas the other team had an interesting time trying to work on a wall that went from 6 m down to 12 m – not the easiest starting point when you are trying to count lots of things that you've rarely seen before, keep your buoyancy and not accidentally wack your buddy in the face with a 2.5 metre long PVC pipe (the fish team have to carry these). I have to say that they did amazingly well, especially given the added fun of a buffeting current, and still managed to surface with smiles on their faces.

You'll be pleased to hear that despite a rather slow start on the food this week (two suppers involving beans, tortillas and eggs) our lunch today was a triumph of chicken, rice and salad. I was thinking about bringing out the emergency chocolate early (this was very kindly provided by Carol and Glynn who arrived with enough to keep the whole team happy for a long time) but now that we've had chicken and I'm told that Italo's birthday cake has arrived, I think I'll hold it back for a few more days....

1 April

We have had three and a half days of survey work with good solid data coming in. The first two days we had an interesting mix of walls and shallow reefs to work on, swimming past a sunken plane at one site and around the side of a bowl-shaped reef on another. Everyone swapped roles and managed to master their positions really well. The only non-programmed activity involved a slight problem with the transect tape. The tapes that we use are 100 m tapes that are wound onto a plastic holder. Unfortunately the end of one of the tapes came off as it was being laid, so the people who were supposed to wind it in ended up having to do the best they could with a sort of gathering effort. We've got a lovely pictures of Sabine draped in tape underwater on the ImageStation site, laughing very hard.

The third day saw a wonderful dive at 'Dickie C', which is just off the neighbouring island, with big towers of coral reef to swim over and between. We didn't necessarily see the most in terms of indicator species, but it really was a great dive. Yesterday afternoon saw our most 'interesting' dive so far. As we moored up to a buoy at Cayo Timon, the sea was beginning to build a little as the wind got up, which made the boat a little uncomfortable to be on as we kitted up. The two teams that were going to lay the transect then left the boat and after a swim of about 200 m signalled and descended to lay the lines out for everyone else to follow. The rest of the team then entered the water and split into two to follow the two different transect lines (one deep and one shallow). The shallow team had a good survey, but one buddy pair had to surface at the end as one member became temporarily blinded after a mask flooding incident. Of the deep team, only the fish survey was completed as two team members didn't manage to find the start of the transect. They and the cover divers spent an interesting half an hour looking for each other underwater with regular surfacing to ask the boat for directions to each other. Just as the transect line was being reeled in everyone met at the start – just in time to head home to the boat! When we all surfaced the seas had really got up and it was hard work getting back on the boat. One buddy pair from the shallow dive had to surface quite a way from the boat after one of them became entangled in the transect tape and after 10 minutes watching them attempt to swim to the boat we saw a signal for help and took the boat to them. Although several of our team had had some quite anxious moments during, and at the end of, their dives, everyone was calm and level-headed. We all came away with nothing more than a good story and an amazement that so many unrelated things can happen to one small dive team!

After yesterday's excitement we chose a very sheltered site for this morning's dive. A gentle sea lapped the sides of the boat as everyone went in for a completely incident-free and successful survey. I think that one team member, Greg, is even warming to the role of substrate team recorder, something that he, at least, didn't think would ever happen.

As I write, we are about to go to lunch but are just hatching something for the team when they come back for the afternoon dive. Although it is 1 April, we managed to hold back on setting up a joke survey dive this morning, wanting people to have a relaxed dive following the excitement of yesterday – so this afternoon is a delayed April Fool's session. Our briefing board shows this afternoon's dive site as 'Lado del Tonto' ('The Fool's Place' in Spanish) and the team will be asked to look for two important site specific indicator species – *Diadema rosetta* (pink sea urchins) and the rare but wonderful 'horned butterflyfish'. I just hope that Italo, our dive leader, will be able to hold a straight face when he's going through the briefing!!

4 April

The April Fool's joke went quite well considering that there are a few Spanish speakers amongst the team and they're all quite clever people. There was some discussion about the meaning of the word 'tonto' (fool) and a couple of people knew exactly what it meant. Carol was good enough to accept the explanations of our field scientists and started to discuss exactly what a horned butterflyfish looked like – apparently a few people had tried to look it up in the reference books and couldn't find it. Michele, on the other hand, had a very wide and sceptical smile on her face the whole way through! Anyway, it made the organisers giggle and everyone smiled and laughed good-naturedly when the truth was admitted.



The afternoon dive that day was great, with only the lack of Greg on the team to spoil things. When we were about to jump in he noticed a hole in the high-pressure hose that goes to his gauges and Sabine located two, so unfortunately he couldn't dive (despite us trying to fit an alternate regulator which didn't fit and a rather sad and desperate attempt by me with duck tape – I know, the term 'high-pressure hose' should have given me a bit more of a clue about how useful a bit of tape was going to be, but I wanted my buddy in the water). The shallow dive team were unaffected and the deep dive team managed to muddle through as our transect was mercifully relatively shallow and there was lots of sand (Greg was due to work on the substrate team that has to take a reading every half metre of the make-up of the bottom i.e. sand, hard coral, rock etc etc – something that can take a long time except when you've got lots of sand readings).

Saturday night became Salsa night. After farewells to Matthias the team opened a drop of the local brew (rum) and turned to swapping stories of diving, love and dance! It turned out that both Detlef and Hellen were excellent salsa dancers and they took to the floor for a couple of demonstration dances. Everything fell apart shortly after that when some of the rest of us decided to have a go – but lots of fun was had by dancers and spectators alike. The evening ended with a now traditional (well, we've done it twice!) walk to the end of the jetty and a final drink looking out to sea and up at the stars.

Sunday was our "day off" and followed the same pattern as for the previous slot, so half the team stayed at base for a rest in the morning whilst the others trekked across to the north beach to do some beach cleaning. Arriving at the beach this time was much better as the results of our efforts the previous time were very apparent. We still managed to fill more than 10 rubbish sacks in about 45 minutes, so you will understand that there is still plenty of work to be done there. We considered setting up a market stall in La Ceiba with some of the debris – an amazing number of shoes and some interesting children's toys. The afternoon was spent with a mixture of fun diving and sitting at the hotel on the next door island, drinking pina coladas or sipping rum. Ecson, our boat captain, very kindly slowed the boat at appropriate moments on the boat ride home so that we could all get our cameras out to snap sundown over our very own island.

Monday dawned with some bad news of two of our members who were unable to dive (one tummy problem and one ear problem) so despite having the extra assistance of Ecsson, who is a qualified divemaster, we still didn't have enough people to run two transect groups. We organized ourselves into one group, which allowed us to experiment with some extra support for the invertebrate team in the form of an additional person who is dedicated to counting the soft corals called gorgonians. The invertebrate team is always stretched by the number of gorgonians that have to be counted (often 800 plus on a transect) as well as having to hover upside down in the water peering into cracks and crevices looking for the likes of lobster and shrimp. The gorgonian person proved to be a popular improvement to the team and even Detlef, who volunteered to do the job, was quite pleased with the results. Ecson has also proved to be a popular addition to the team and has been voted the coolest diver so far. To start with we weren't sure whether he'd forgotten his wetsuit (we all wear 3 mm or 5 mm suits) as he started to kit up on the boat in his shorts and T-shirt, but no, it seems that he doesn't need a wetsuit. He also doesn't seem to need much in the way of weights to get him down – in his previous diving he had been happy without any weights but Italo insisted that he carried one, just to show that he had thought about it!

This morning we all awoke to a change in the weather. Not even a breath of wind disturbed the island as we sat in our hill-top dining room for breakfast and several people left early to avoid being eaten alive by the return of the sandflies. By lunchtime there were threatening clouds as well and as we changed for the afternoon dive the rain began in what was generally regarded as an English drizzle. We arrived back from the dive as the sky opened and gave us a proper Honduran version, everyone eager to get dry and warm up (yes, here we are sitting on our island in the Caribbean and I'm moaning about the cold and the rain). We hope for a return to sunshine before we all leave the island on Friday.

4 April (interlude from L.A.)

Sorry for butting in everyone, this is Matthias, but I thought you'd all like to hear this story. Today I went to the Reef Check HQ in L.A. and guess who the first person I see? Our very own "outstanding" film star Craig from Reef Check, the movie! Within a split second I was transformed into a groupie, begging him for an autograph and a picture. Poor Craig I think did not quite know what to make of it all and like a true star kept us waiting for a while before gracing us with his attention and an autograph. Before you think I am serving you a bullshit story, I have taken the precaution of taking a photograph of the event, complete with the man himself and his autograph. The trip to California's been worth it just for this! Oh, and by the way, the meeting was very good too. They like our work and we are making plans for the future.....

P.S. I have copied Craig into this (see top) in case you want to send him some fan mail ;->



9 April

After a little bit of bad weather, followed by sandfly-heaven conditions, the island finally returned to our favourite weather state of hot and windy for the last day. The team continued working right up to lunchtime on the last day as we had to complete a final transect on what should have been a 'fun dive' at the end. I think that Matthias' meeting with the Reef Check video star, Craig, had boosted our motivation and we were all keen to impress. Craig has now said that he might 'drop-in' on an expedition with us soon - so you'd better all join up for next year now!!

It was with sadness that I spent Thursday packing up and clearing away all of our equipment. It has been a wonderful experience, living at the research base and sharing the lives of the people there. All of the team members have been great with a really strong commitment and wonderful team spirit. We left on 'our' boat, Baracuda, on Friday morning and said our final farewells at the Banana Republic. I didn't manage to see everyone before I had to go to a meeting at the Foundation's office so I'd like to say a warm goodbye to everyone that I didn't catch up with - I hope to see you all again. Since then I have been travelling and nearly 48 hours later have arrived back in the Biosphere UK office and completed the paperwork for the expedition. It has been an amazingly successful expedition - a really good set of data for the Honduran Coral Reef Foundation to base their decision-making on over the next months and years (they have asked us to come back with teams for at least the next five years), the Reef Check organisation that takes in all the data worldwide from these types of surveys is impressed with some of the procedures that the teams have developed and have asked if they can collaborate with us in other areas, and we at Biosphere are happy that the project has gone so well and that everyone has contributed so much. All that is left for me to say is thank you to all those involved and I hope to be back out at Cayos Cochinos next year. Maybe see some of you there?