**Why This Study Is Important**

Coral reefs provide many ecosystem services to coastal communities including the support of fisheries, tourism, coastal protection from storms, generation of sand and building materials, pharmacological products and the highest marine biodiversity on Earth. However, the ecological state of Caribbean reefs has deteriorated rapidly in the last few decades. As the human population increases in the wider Caribbean, the demand for reef-based resources will likely increase. The decline in coral cover poses a real threat for human societies: corals provide complex structures that influence biodiversity, fisheries production and the provision of a structural barrier to wave energy.

The overall aim of FORCE is to provide coral reef managers with a toolbox of sustainable management practices that minimize the loss of coral reef health and biodiversity. So far, the ecological team, consisting of scientists from University of Newcastle (England) and the University of Costa Rica have surveyed coral reef communities in Honduras, Belize, Curaçao, Bonaire, Jamaica, Barbados, Dominican Republic, Antigua, St. Lucia, and St Vincent and Grenadines. Aimed at those assisted the FORCE field team in its work, this report briefly outlines the work and ecological status of Belize coral reef studied. Detailed analyses of the huge amount of data collected will be disseminated in due course.

**What We Did & How We Did It**

Reef communities were surveyed at 10-15m in 15 locations (Fig. 1) during June 2011.
Our methodology included the following:

1) The cover of bottom-dwelling organisms (coral, algae, sponges etc.), coral recruitment, and species diversity are widely utilized measurements in identifying the current state of a coral reef in particular site/region. Coral, soft coral, sponge, and algae cover (%) was recorded every 10 cm along six 10 m point intercept transect lines. Presence of coral bleaching and of disease (% of affected corals) were recorded as measures of coral health. Coral recruitment data help improve understanding of the resilience potential of coral reefs. Coral recruitment and algal biomass were also measured in 25 cm² quadrat along each transect line (Fig. 2). We also counted the presence of the herbivorous long-spined sea urchin (*Diadema antillarum*) in 1 m wide belt transects.

2) Reef habitat structure can provide refuge for prey and hiding places for predators, this the complexity of this structure should be conducive to reef biodiversity. Reef structural complexity was assessed i) visually on a scale from 0 [flat] to 5 [highly complex] (‘rugosity’), ii) by draping a 10 m chain over the reef contour and measuring the actual distance covered by the reef surface, iii) by counting holes of difference sizes, and iv) by measuring angle of reef slope and vertical relief every 2.5 m along a 10 m transect.

3) All fish within two 30m x 4m transects at each depth were identified to species, their numbers counted, and their size estimated. Diversity was assessed as species richness (number of species present).

**What We Found**

**Bottom Communities**

We found the diversity of bottom-dwelling organisms to be high in Dominican Republic than other countries surveyed during this project. For example, there were a total of 38 hard coral, 30 soft coral, 52 sponge, and 6 sessile invertebrate species, and 17 algal genera identified in Dominican Republic. The dominant benthic substrates at all sites were algae (41%) and coral (21%). Overall mean soft coral, sponge and invertebrate cover was low (4%, 8%, and 2%, respectively).
The highest mean coral cover per site was found at La Caleta (La Bomba, 43%). While the lowest coral cover was observed at Sosua (Zangara, 10%).

The main coral species recorded in our surveys were great star coral (*Montastraea cavernosa*) and mustard hill coral (*Porites astreoides*). *Montastraea cavernosa* is an important reef building species. The prevalence of coral bleaching and disease was low (<0.27%).

**Coral Recruitment**

Coral recruitment in Dominican Republic (5.1 recruits/m²) was higher than Curacao and Bonaire, but lower than Bay Islands, Honduras, Barbados, Jamaica and Belize. The available substrate (Table 1) for corals to recruit was the second highest of seven countries, similar to Bonaire and Barbados.

**Reef Complexity & Fish Communities**

Over four kilometers of reef were surveyed by 60 detailed fish transects and 120 long transects for larger individuals in the Dominican Republic. In total 119 species of fish were identified, with on average 18 species on each transect.

Fish communities were characterised by high abundances of coneys, wrasses (blueheaded, yellowhead), and parrotfish (red band, stoplight, striped and princess).

Cayo Arena (Punta Rusia) had the highest fish abundance, while Sosua had the lowest (Fig. 4). Mean fish species richness was highest at Paisanito in La Caleta (average 29 species per transect), and lowest at Elephant in Sosua (9 species per transect).

**Table 1. Recruits and substrate availability in all locations in Dominican Republic.**

<table>
<thead>
<tr>
<th>Location</th>
<th>Recruits (#)</th>
<th>Substrate available (%)</th>
<th>Density (ind m⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Caleta</td>
<td>46.0</td>
<td>51.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Las Galeras</td>
<td>18.0</td>
<td>40.3</td>
<td>3.2</td>
</tr>
<tr>
<td>Punta Cana</td>
<td>31.0</td>
<td>56.6</td>
<td>4.1</td>
</tr>
<tr>
<td>Punta Rusia</td>
<td>9.0</td>
<td>32.0</td>
<td>4.8</td>
</tr>
<tr>
<td>Sosua</td>
<td>39.0</td>
<td>24.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Total</td>
<td>143.0</td>
<td>42.2</td>
<td>5.1</td>
</tr>
</tbody>
</table>

The most common recruits at all locations were *Agaricia* spp., *Siderastrea siderea* and *P. astreoides*.

In Dominican Republic, density of *Diadema antillarum* was low (0.02 m⁻²) at all locations. This sea urchin consumes algae and their high densities could explain the low algal cover recorded on the reefs in Dominica Republic.
Reef habitat complexity was assessed through 60 transects around the Dominican Republic. Reef complexity was highest in Punta Rusia, and lowest in Sosua (Fig. 4).

Fish diversity tended to be positively related to reef complexity. This means the more complex reefs typically had more diverse fish communities in the Dominican Republic, and the flatter reef areas fewer species.

**What this Means**

In comparison to other surveys conducted in the Caribbean by the FORCE team, the reef structure and fish communities in the Dominican Republic were poor. Reefs had very little structure (second only to Jamaica), and while a relatively high fish diversity was recorded, on average large individuals were absent, probably over fished. Fish communities were healthiest in protected areas such as Las Caletas or remote areas such as Cayo Arena.

Las Caletas had also the healthiest bottom communities, with high coral cover (comparable to other countries) and high sponge diversity. The only lobster and conch counted in the Dominican Republic were within Las Caletas Reserve. At other sites we noticed that the bottom communities were covered in silt and cyanobacteria. This may be due to land and river runoff in the region. Reefs in Dominican Republic may improve if regulations are set similar to La Caleta, an area protected from fishing and anchoring.

Data that have been collected will be analysed in detail and the data will be published in scientific papers and detailed reports describing the geographical differences of benthic and fish communities in the greater Caribbean region.

Stakeholder interviews by social scientist team from FORCE is to be used to characterise the present economic status, governance structure, and social composition. This information will be used in combination with the ecological data to increase understanding of difference scenarios of climate change and governance and how they could affect reefs and livelihoods in the great Caribbean region.

**Institutions We Thank**


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