



FORCE (Future Of Reefs in a Changing Environment: *considering people, corals & marine life in finding the best ways to manage Caribbean coral reefs*):

Summary of Dominican Republic Ecological Surveys June 2011



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 FORCE project uses an ecosystem approach that links the health of the ecosystem with the livelihoods of dependent communities, and identifies the governance structures needed to implement sustainable development. This project plays an important and measurable role in helping communities adapt to climate change in the Caribbean.

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 Dominican Republic 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 depth in 15 locations (Fig. 1) during June 2011.



Fig. 1 Study sites in Dominican Republic (black dots).





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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.

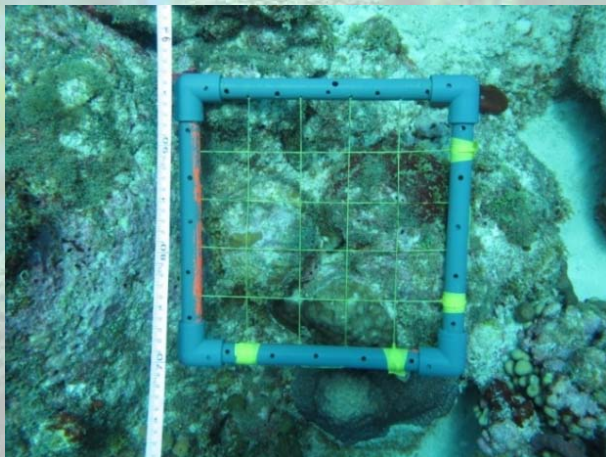


Fig. 2 Picture of 25 cm² quadrat next to transect.

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 the 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 the 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).

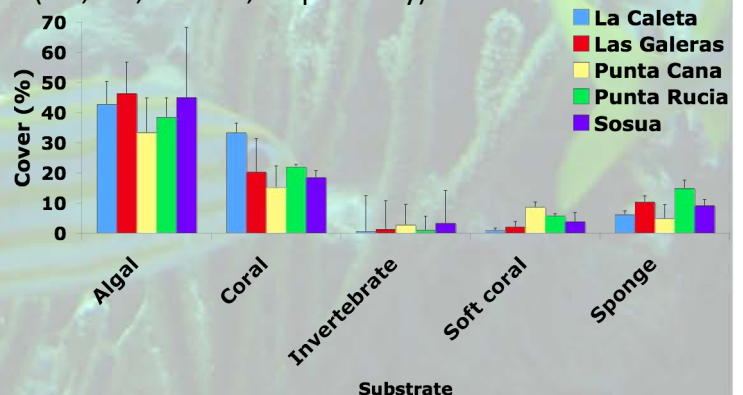


Fig. 3 Bottom cover at each of the locations in the Dominican Republic.





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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 the Dominican Republic (5.1 recruits/m²) was higher than Curaçao 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.

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

Location	Recruits (#)	Substrate available (%)	Density (ind m ⁻²)
La Caleta	46.0	51.4	8.2
Las Galeras	18.0	40.3	3.2
Punta Cana	31.0	56.6	4.1
Punta Rucia	9.0	32.0	4.8
Sosua	39.0	24.7	5.2
Total	143.0	42.2	5.1

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

In the Dominican Republic, density of *Diadema antillarum* was low (0.02 ind 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 Dominican Republic.

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 Rucia) 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).

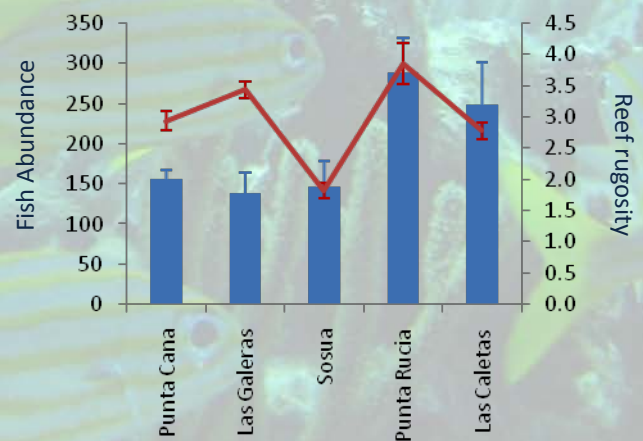


Fig. 4 Variation in reef rugosity (red line) and fish abundance (blue bars) in Dominican Republic.





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Reef habitat complexity was assessed through 60 transects around the Dominican Republic. Reef complexity was highest in Punta Rucia, 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 La Caleta or remote areas such as Cayo Arena. Cayo Arena is a popular tourist destination. Tour operators regularly feed the fishes. This practice could negatively affect the coral reef communities.

La Caleta 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 La Caleta 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.

These ecological assessments represent part of a series of studies to understand the ultimate and proximate drivers of reef health. Ultimately the FORCE project will assemble a toolbox of sustainable management practices that minimise the loss of coral reef health and biodiversity, which will also benefit high-level policy makers by highlighting the governance reform needed to implement such tools effectively. We expect this project to play an important and measurable role in helping communities adapt to climate change in the Caribbean.

Institutions We Thank

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For more information please visit www.force-project.eu

Our project partners:

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