



# TRINATIONAL INITIATIVE CUBA - MEXICO - USA

INICIATIVA TRINACIONAL EN CIENCIAS MARINAS Y CONSERVACIÓN DE  
GOLFO DE MÉXICO Y EL CARIBE OCCIDENTAL

TRINATIONAL INITIATIVE FOR MARINE SCIENCE AND CONSERVATION IN THE  
GULF OF MEXICO AND WESTERN CARIBBEAN



*Guanahacabibes National Park, Cuba. Photo: Claudia Legge*

## Trinational Initiative Coral Reef Working Group Workshop

Universidad Nacional Autónoma de México, Mérida, México

May 4-5, 2016

Workshop Summary



TEXAS A&M  
UNIVERSITY  
CORPUS  
CHRISTI

HARTE  
RESEARCH INSTITUTE  
FOR GULF OF MEXICO STUDIES



THE OCEAN FOUNDATION



## Background

After 55 years of political isolation, change is afoot in relations between the US and Cuba. After the December 17, 2014 announcement by Presidents Barack Obama and Raul Castro to normalize relations between the US and Cuba, CubaMar has found itself in a unique position to advance joint marine research between our countries. Yet even before the 2014 announcement, CubaMar had been hard at work building bridges through marine science by way of the [Trinational Initiative \(TNI\)](#), a collaborative platform founded by CubaMar, [Harte Research Institute for Gulf of Mexico Studies](#) (HRI) and the [Cuban Ministry of Science, Technology and Environment](#) in 2007. Through this platform, every year, scientists from the three countries that share the Gulf of Mexico (Cuba, Mexico and USA) have met to discuss research plans and chart the course forward for targeted research projects that help solve some of the regional problems facing the Gulf of Mexico and Western Caribbean. The last TNI meeting took place in November 2015 in Havana and had the largest participation since this platform was established in 2007.



*Participants of the Coral Reef Working Group Workshop.*

## Coral Reef Working Group Workshop

On May 4<sup>th</sup> and 5<sup>th</sup>, 2016, CubaMar, in collaboration with our partners at the Universidad Nacional Autónoma de México (UNAM) and HRI, organized a workshop that again brought together members of the Coral Reef Working Group of the Trinational Initiative. Twenty-eight participants from the U.S., México, and Cuba representing 14 different government agencies, NGOs, and academic institutions met to define coral reef research priorities for the Gulf of Mexico and Western Caribbean region. The workshop was hosted by UNAM and funded by HRI and CubaMar. This workshop was the first meeting of any of the six Trinational Initiative working groups outside of the larger annual [Trinational Initiative](#) workshop.

## Workshop objectives and activities

The organizers defined the workshop objectives as:

- Identify bi- or tri-national coral reef projects for the region with specific objectives that answered participant's interests, as well as their institutions and national priorities (e.g., connectivity, coral restoration, spatially explicit biodiversity database, etc.)
- Identify uniform and comparable sampling methodology for coral reef ecological assessments to be used by collaborating institutions across the three countries (e.g. alternatives to AGRRA protocol, resilience assessment protocols, etc.)
- Identify potential funding sources for each project
- Develop a plan to document the actions of the TNI coral reef group in English & Spanish, adapting the Trinational Initiative Plan of Action, and the new research priorities identified at TNI 2015 in Havana

The workshop opened with presentations on new coral reef research priorities in Cuba; a recent assessment of coral reefs at two MPAs in Cuba and Mexico; CONABIO's information system of Mexico's biodiversity; and the assessment methodology adopted by NOAA's National Coral Reef Monitoring Program. There was also a panel on identifying funding opportunities for Trinational projects led by HRI, NOAA, and CubaMar.



*A panel on fundraising trinational research. Left to right: Larry McKinney (HRI), Harriet Nash (NOAA), Fernando Bretos (CubaMar).*

Participants first brainstormed research priorities and gaps, then met in breakout groups where they developed specific projects based on the expertise of the participants and the research gaps identified. The three breakout groups were:

- Coral restoration, genetic and larval connectivity, and population dynamics of *Diadema*
- Ecosystem services valuation and human-use impacts on reefs
- Mapping of shallow and mesophotic reefs

## Workshop results

The Coral Reef Working Group Workshop allowed participants to have in-depth conversations about specific trinational research projects and future collaborations. The specific projects developed by the breakout groups include:

- Ecosystem services valuation and use impacts – with a focus on the following project: “MPA management in Mexico and the U.S. in the face of increasing tourism -- What

lessons can be learned and transferred to Cuba?” with Dr. Daria Siciliano (US), Susana Perera (Cuba) and Dr. Jaime Gonzalez Cano (Mex) as country leads

- Coral restoration and connectivity – with a focus on 2 projects, with Dr. Andrew Baker (USA), Anastasia Banaszac (Mex) and Hansel Caballero as country leads
- Reef habitat mapping of shallow and mesophotic reefs – with Nuno Simoes (Mex), Bill Kiene (USA) and Patricia Gonzalez (Cuba) as country leads
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Leaders for each of these projects are tasked with developing proposals outlining the rationale and specific objectives for each of these projects and submitting to funders.

Workshop participants also learned about funding and conference opportunities for trinational coral reef research. A large part of the funding conversation was dedicated to better understanding the funding possibilities through the U.S. government as Cuba and the U.S. continue the process of normalizing relations.

Overall, as a result of the workshop, the Trinational Initiative Coral Reef Working Group was expanded and strengthened. Participants made new professional connections and formed collaborations that did not exist before the workshop.



*Left to right: Fernando Bretos (CubaMar), Larry McKinney (HRI), Patricia Gonzalez (Univ. of Havana CIM), Victoria Ramenzoni (HRI), Katie Thompson (CubaMar), Richard McLaughlin (HRI)*

## Next steps

On Monday, June 20<sup>th</sup> Merida workshop participants Daria Siciliano (US, Fernando Bretos (US), Juan Pablo Carricart (MX), Andrew Baker (US), Patricia Gonzalez (CU), Susana Perera (CU), Dorka Cobian (CU), Harriet Nash (US) and Justine Kimball (US) met in Honolulu during the International Coral Reef Symposium to discuss the three priorities and projects that were initiated in Merida two months earlier. While there was not enough time, nor critical mass to

finalize all of the three action plans, we moved forward in terms of assigning next steps and assessing expectations.

The Trinational Coral Reef Group will now begin a phase of finalizing the three projects independently. We expect to have these completed by September 2016. These will be attached as appendices to the final version of this report. In the meantime, the group devoted to MPA management and tourism impacts, led by Dr. Daria Siciliano (US), Susana Perera (CU) and Jaime Gonzalez (MX) has made considerable progress on their proposal and as such is attached to this interim report.

## APPENDIX 1

### Coral restoration, genetic and larval connectivity, population dynamics of *Diadema*

#### Breakout Group 1 Project Proposals

Proposal generated by TNI Coral Reef group meeting participants in Mérida, Mexico, May 4-5, 2016

Country leads: Andrew Baker (US), Hansel Caballero (CU) and Anastazia Banaszak (MX)

#### Current Restoration Efforts in Cuba, Mexico, and U.S.:

In all three countries the emphasis, in terms of restoration, has been fragmentation or other cloning techniques such as reskinning, especially of *Acropora palmata* (MX) and *A. cervicornis* (FL), and more recently with other reef-building species such as *Orbicella faveolata*, various species of brain corals. TNC provided training in Cuba. Efforts mainly use coral trees and table or block nurseries. Originally the method was only used with fragments of opportunity but is now expanding to selecting colonies (without genotyping in Mexico) and fragmenting. The success of the out plants especially over long term time frames is unproven, exceptions maybe Jaime's park in Cancun and Diego Lirman's work.

Genotyping of mother or stock colonies is important and has been undertaken in Florida where known genotypes are placed in different nurseries and outplanted in different environments to test the hypothesis whether "one genotype fits all environments and situations" ie there is no one super genotype. Genotyping has also been done along the Mexican Caribbean.

There is an increased interest and work being done since 2007 in the Aquarium in Tampa, Florida and at UNAM in Puerto Morelos, Mexico on the production of sexual coral recruits to ensure genetic diversity especially of *Acer* in FL, *Apal*, *Ofav*, *Dlab* in MX. This is slow going as there is one shot per year to collect gametes. In Mexico there are 4 year old sexual recruits out planted onto Cuevones Reef (about 30 colonies). We run workshops and training courses in English and Spanish.

#### Proposed restoration project

Interested parties in all three countries come together to:

- Run **training workshops** where we share techniques and methods for restoration (fragments and sexual recruits). Best practices. Lessons learnt.
- Undertake a concerted effort to **genotype** nursery and stock colonies and natural populations in the three countries.
- Improve **out plant survivorship** on a long-term basis is a major knowledge gap. Share literature and data about successful methods: Diego Lirman and Jaime.
- Establish methods for **cryopreservation** of sperm and eggs in the three countries from many reef sites on a tri-nation level with backup copies in each country to ensure genetic diversity. This

summer there will be two efforts (one in Florida with Cuban presence and another in Puerto Morelos, Mexico).

- Determine the importance of **stress hardening** in promoting resilience in corals and their symbionts; coral gardens are particularly useful for this.
- Determine the **impact of moving colonies** between sites: costs, risks, issues involved; Where to get stock from to repopulate areas which have lost their colonies. There is a risk of spreading disease, introducing new genotypes and hybridization of those genotypes. Is it worth the risk?
- Study the apparently **resilient populations** of *A. palmata* to bleaching and diseases in Cuba. Is it because the environment is more pristine or because they are more resilient physiologically?

NOTES for proposal: Frame the need for restoration, resilience value, OA, CC, species range changes, climate preparedness, success stories for restoration in the region

### **Current Genetic and Larval Connectivity Efforts in Cuba, Mexico, and U.S.:**

There are many and varied genetic and larval connectivity studies in all three countries on various reef species particularly focussing on corals and fish. We know that Apal has two large populations (one eastern and another western) at level of microsatellites. More advanced techniques show more fine-scale genetic structuring, revealing potential selection for specific genotypes (that does not mean that there is a lack of connectivity). In the USA, work has also been done on Past, Mcav and Acer and fish species. In Mexico two coral species (Apal y Mcav) and two fish species (Aheb, Spar), from Banco Chinchorro in the southernmost part of the Mexican Caribbean up and around to Tuxpan in Veracruz. It would be great to have a coordinated effort to get samples from USA and Cuba to complement this study. There are also data for Apal, its algal symbionts, lionfish (from Costa Rica to EUA). In the Florida Keys, connectivity studies have also been done on red snapper, *Halimeda*, sponges, bicolored damsel fish and blue headed wrasse (Florida Keys), and *Neopomacentrus* (Gulf of Mexico). In Cuba, there are limited genetic connectivity studies but more emphasis on larval connectivity, connecting it with oceanographic and current patterns and there are plans to do more research.

### **Proposed connectivity project**

- **Link genetic and larval connectivity studies** between the three nations. Not just focussing on corals but other species as well. It is important to find partners to collect and share samples to complement each other's work to have data for Mexico, Cuba and USA. Lion fish is of particular interest.
- Develop a **connectivity data base**: What species have been studied in the three countries? What information is already available in databases?

Notes: Incorporate biophysical modelling efforts, link megafaunal connectivity to previous studies, e.g., sea turtles; deploy light traps for larval collections to estimate larval recruitment to different reefs simultaneously – low tech solution to complement other activities.

### **Current Population Dynamics of *Diadema* efforts in Cuba, Mexico, and U.S.:**

This should be a topic for Group 2 (Water quality/fishing impacts/human use) rather than Group 1. There have been many attempts to culture *Diadema* but they have universally failed especially once they are out planted. It appears that *Diadema* have to be exposed early on to predators to learn to avoid them.

NOTES: Incorporate population dynamics of corals into restoration/connectivity studies, to establish need to restore and/or capacity for connectivity. Large variation in recruitment success across the region, existence of mature populations (e.g., Cayos Arcas in MX) that are either resilient or lucky – where are the sinks for these larvae? What is the goal for restoration in terms of population.

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Internal group notes:

FOCUS on data and information sharing but NOT capacity building.

Educational training

Academic and educational exchanges

Organization of professional meetings

Educational grants and awards



## APPENDIX 2

### **MPA management in Mexico and the U.S. in the face of increasing tourism -- What lessons can be learned and transferred to Cuba?**

#### **Breakout Group 2 Project Proposal**

Proposal generated by TNI Coral Reef group meeting participants in Mérida, Mexico, May 4-5, 2016

Country leads: Dr. Daria Siciliano (US), Susana Perera (CU) and Dr. Jaime Gonzalez (MX)

#### **Rationale**

Cuba has relied on tourism to boost its economy since the collapse of the Soviet Union in 1991 (Elliott S and Neirotti LD 2008). In the last decade, however Cuba has made a major shift in its economic policies, opening opportunities for a more entrepreneurial economic approach. As a result, tourism in Cuba is on the brink of a renaissance of development as the political structure and state management practices continue to change (Sharpley and Knight, 2009). At the forefront of the changes taking place in the Cuban society in the last decade are economic reform and the steady growth of international tourist arrivals (Hingtgen et al. 2015). Increasing the role of international tourism as a way of improving the economy is one focus of the reforms started with President Raul Castro's 2008 assumption of power. Tourism infrastructure, visitor arrivals, and revenue generated by tourism all increased drastically throughout the 1990s and early 2000s, topping over 3 million visitors in 2015.

This new reality brings benefit and challenges to Cuba, particularly to the management of its natural resources. As experienced in many other developing countries, tourism can be a primary source of income and frequently exceeds the value (particularly the foreign currency value) of marine fisheries in those nations. The components of coastal and marine environments that are important for tourism include clear water, clean sandy beaches and opportunities to view abundant marine life, so that reducing pollution and maintaining biodiversity are common goals of tourism development and MPA managers. Despite the importance to tourism of the quality of the natural environment, coastal and marine tourism areas are vulnerable to hasty and inappropriate development. Poorly managed tourism can lead to site degradation and a decline in visitor numbers. Some Cuban MPAs are seeing for the first time a limited number of cruise ships calling port on their rustic docks, in addition to a steep surge in visitation of recreational boaters, bringing anchor damage, pollution from fuel and waste from the ships, and increasing pressure from snorkeling and diving to the reefs. In 2005, the Cuban government published a document on how to handle increased boating visitation in its parks, but the government did not expect the number and size of boats that are arriving today. The volume of both cruise ships and foreign recreational boaters is also about to increase dramatically with the enactment of relaxation of US regulations.

Leading scientists and MPA managers from the Gulf of Mexico region agreed in a historic trilateral meeting (Cuba-Mexico-US) which took place in May 2016 in Merida, Mexico, that much can be learned from the experiences of MPA managers in Mexico, particularly its Yucantan's region, and the US,

particularly Florida, to face the challenges posed by increasing tourism on their countries' marine assets while realizing the benefits that sustainable tourism can offer. They identified in particular the need to focus on the effects of cruise ships and recreational boaters in established MPAs.

## **Objectives**

The objectives of this project involve a two-pronged approach:

1) Exchange of lessons learned and Management Plan updates: a workshop/ exchange focused on preventing and mitigating the effects of increased cruise ship and recreational boaters visitation based on lesson learned by MPA managers from the Yucantan's peninsula and Florida and their applicability to the Cuban reality. The second focus of the workshop/ exchange of lessons learned is on how to capitalize on the potential benefits of increased visitation from *sustainable* tourism. This workshop will take into consideration that the legal and historical contexts in the U.S., Mexico, and Cuba are very different and such differences need to be explicitly recognized for effective transfer of lessons from the US and Mexico to Cuba. The objectives of this workshop will be to gather sufficient background information on what worked and didn't work for US and Mexican MPA managers over the last decades in different MPA regimes to allow Cuban MPA managers to develop short- and long-term measures to integrate in and update their MPA management plans in an effort to cope with the increase in cruise ship and recreational boating traffic specifically.

2) Baseline monitoring: Capitalizing on the changes witnessed in MPAs in Yucatan and in Florida over the last couple of decades, collecting comprehensive baseline data of ecological parameters specifically at risk to the effects of the increased visitation in selected Cuban MPA sites, to compare temporally to future yearly monitoring efforts, and spatially with historical data from Mexican and US sites at the time they were experiencing similar visitation pressure. Such parameters include: coral cover, water quality, incidence of diseases, fish biomass, evidence of trampling and anchor damage, etc. This project will capitalize and expand on rich ecological data already collected at Cuban MPA sites, such as long time series of benthic characterization and fish biomass, as well as water quality, and compare with historical data from the neighboring countries (Mex and US) and the changes they experienced over the last couple of decades following the intensification of tourism pressures, particularly from cruise ships and recreational boaters.

[Or 3) MPA ecosystem services valuation at selected Cuban MPAs??]

## **Proposed Study Sites**

### Mexico:

- 1) Cancun - Represents high intensity of tourism, Cancun and Puerto Morelos have estimated the value of loss if park was closed
- 2) Banco Chinchorro - Represents low intensity of tourism

## U.S.:

1) Florida Keys - Key West has seen an increase in revenue from cruise ships which has made the cruise industry more and more attractive to the area, resulting in a fight over dredging to bring the cruise ships closer to land

## Cuba:

1) Guanahacabibes National Park - The park has started to receive weekly cruise ships, but thanks to the work of park managers, these cruise ships were prohibited from stopping in Guanahacabibes because the park was not able to support the sudden increase in visitors. Managers are currently working on way to increase the capacity of the park in order to accommodate future visitors from cruises.

2) Punta Francés Marine National Park - The park currently accepts one cruise ship per week but does not receive any revenue from the cruise ships

## **Partners**

CONANP (Comision Nacional de Areas Naturales Protegidas), Mexico

CNAP (Centro Nacional de Areas Protegidas), Cuba

Parque Nacional Guanahacabibes, Cuba

Parque Nacional Punta Frances, Cuba

The Florida Keys National Wildlife Refuge (? Best jurisdiction?)

The Ocean Foundation

Harte Research Institute

## **References**

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Sharpley R and Knight M (2009) Tourism and the state in Cuba: from the past to the future. *International Journal of Tourism Research* 11(3): 241–254.

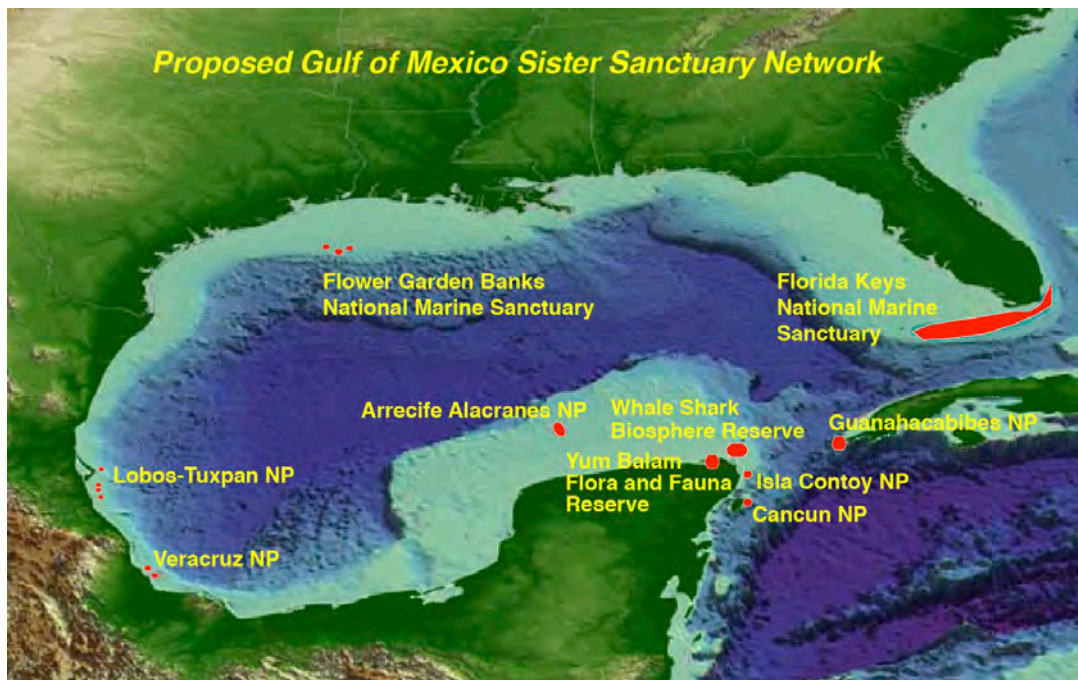
## APPENDIX 3

### Mapping of shallow and mesophotic reefs of the Gulf of Mexico

#### Breakout Group 3 Project Proposals

Proposal generated by TNI Coral Reef group meeting participants in Mérida, Mexico, May 4-5, 2016

Country leads: Bill Kiene (US), Patricia Gonzalez (CU) and Nuno Simoes (MX)



#### Project Objectives:

- Produce high resolution spatial information on bathymetry and habitat characterization to support trinational research and management activities
- Assembling a trinational coral reef atlas
- Identify key sites
- Standardize information quality and scope
- Share information
- Do a gap analysis to identify areas where information is lacking
- Baseline of current structure and vertical complexity in key sites

#### Justification for the Objectives:

- Shallow reefs – better quantification of impacts and come up with a plan to respond and increase the resilience
- Mesophotic – where are they? How large? What diversity? They are more resilient, and they act as a refuge for certain species and larval supply pool for shallow areas

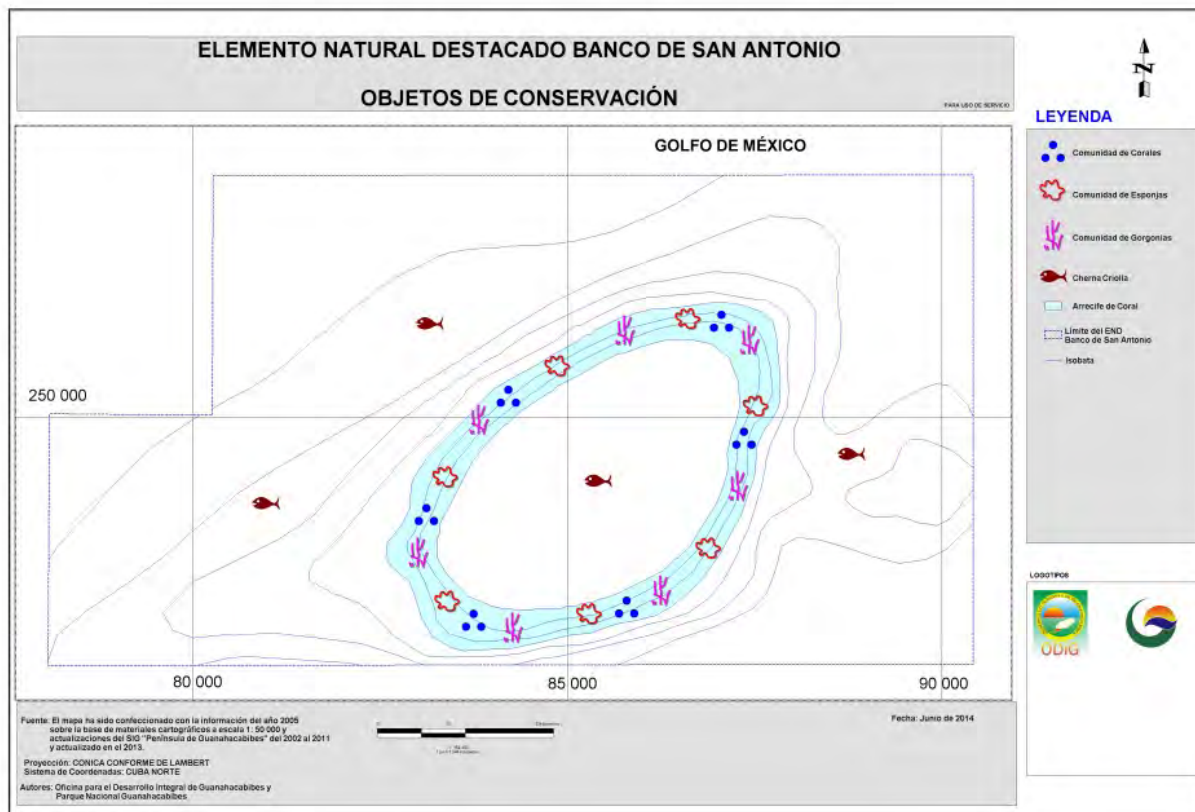
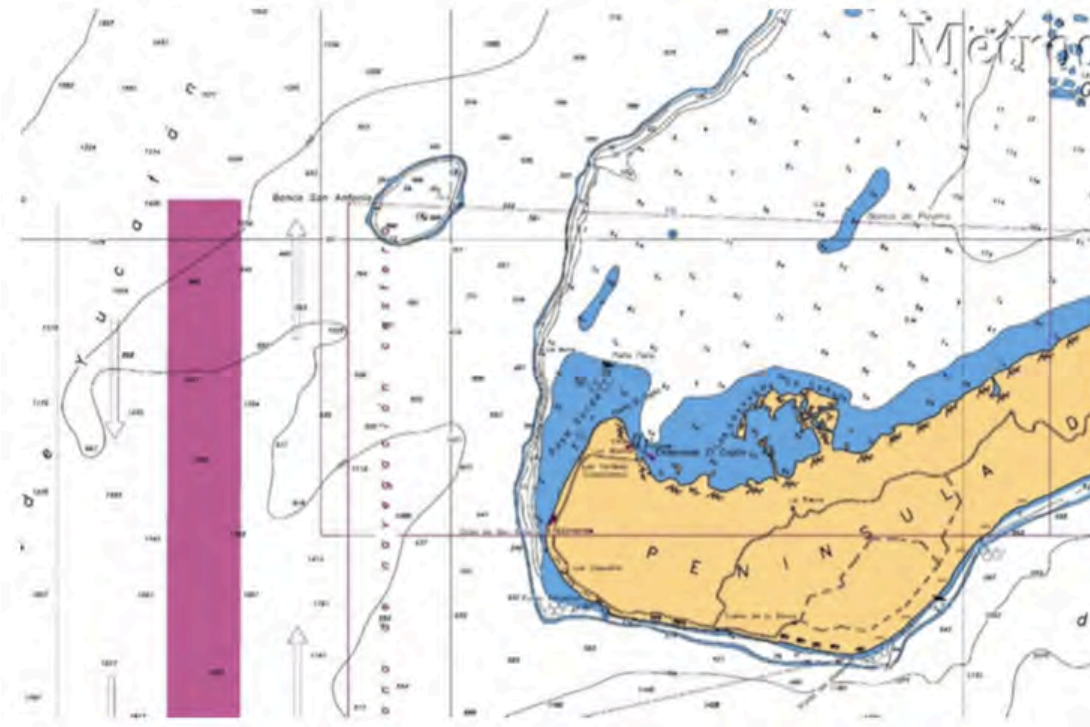
**Proposed Study Sites:**



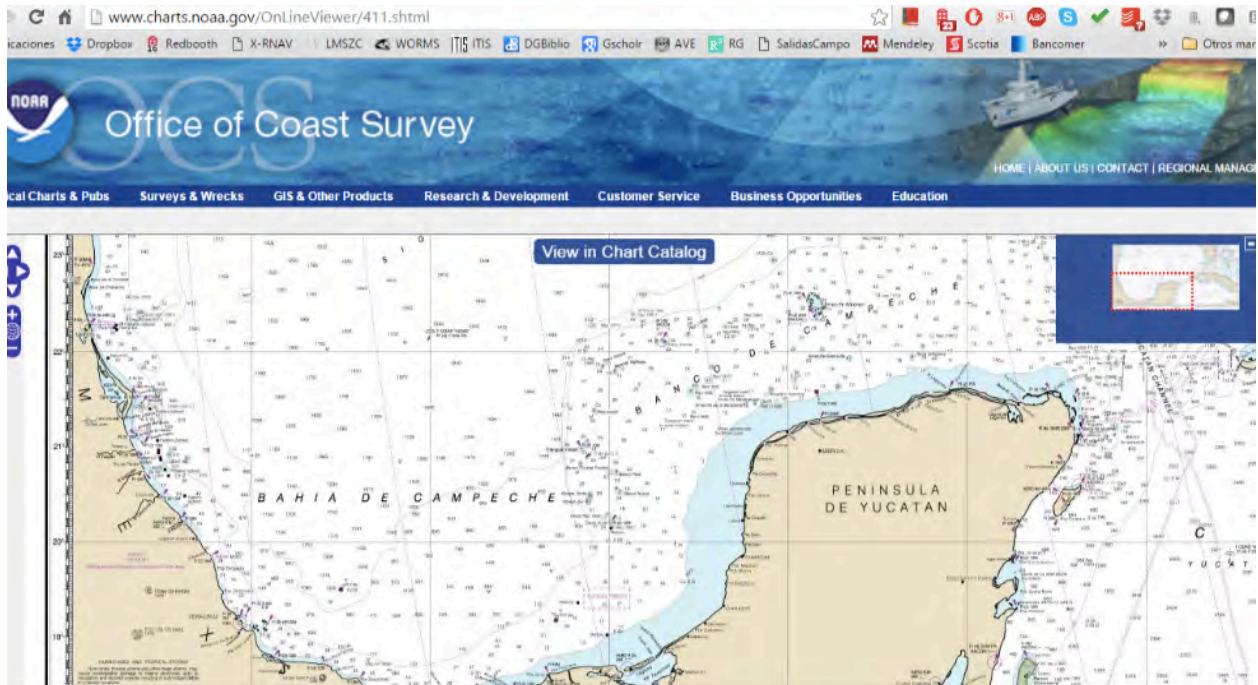
**1. Guanahacabibes Peninsula and Banco de San Antonio:**



Biosphere Reserve:	121,572 ha.
Guanahacabibes:	23,880 ha. Land / 15,950 ha. Marine
Lagoons:	564.5 ha.
San Antonio Bank:	7,411 ha.



## 2. Yucatan Peninsula:



### Notes on Methodology

- Multi-beam
- Side-scan-sonar
- Remote satellite imagery
- Aerial photographs / drones

Boat time for the multibeam equipment

Falkor boat – schimit ocean institute

RV Manta – FlowerGardens national marine sanctuaries

Nancy Foster NOAA boat

### Potential Partners:

- NOVA south-east (Bernard Riegl, Dick Dodge)
- Harte Institute (Jim Gibeaut)
- NOAA (Bill and Harriet)
- CONABIO Sergio Cerdeira (Cuba) Rheiner Diana Hernandez
- Centro Nacional de Areas Protegidas (Susana)
- Sistema Nacional de Areas Protegidas (Dorka)
- CIM.UH (Patricia)
- UNAM (Nuno, Rodrigo)
- University of Miami RASMAS) Andrew Baker
- TOF – UCSC – Daria

- TOC – Fernando Bretos
- Veracruz – (Horacio)

**Possible Funding Sources:**

- Large Marine Ecosystem funding Project funded UNAM fisheries and water quality
- Bureau of Energy Management (BOEM)
- National Academy of Sciences
- NOAA
- Lansbury Foundation
- McArthur Foundation
- International Coral Reefs Conservation Cooperative Agreement
- Oceans Acidification Program
- RESTORE
- CAMPAM (Caribbean GCI)

