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Momentos Seaflower: La Expedición científica en los barrios

COMISIÓN COLOMBIANA DEL OCÉANO

Seaflower: Ecosystems for wellbeing

Seaflower: Ecosistemas para el bienestar

Diana Castaño[1], Adriana Santos-Martínez[1], Julián Prato[1]

Universidad Nacional de Colombia Sede Caribe. Archipiélago de San Andrés, Providencia y Santa Catalina, Colombia.

Archipiélago de San Andrés, Providencia y Santa Catalina, Colombia
July, 2019

Foto, Cortesía CN León, Archivo DIMAR 2014

Why is related ecosystems and wellbeing?

Por qué se relacionan ecosistemas con bienestar?

Bienestar: Calidad de vida, acceso a la alimentación, condiciones seguras para la vida, trabajo y buena economía, entre otras cosas

The importance of coral reefs:

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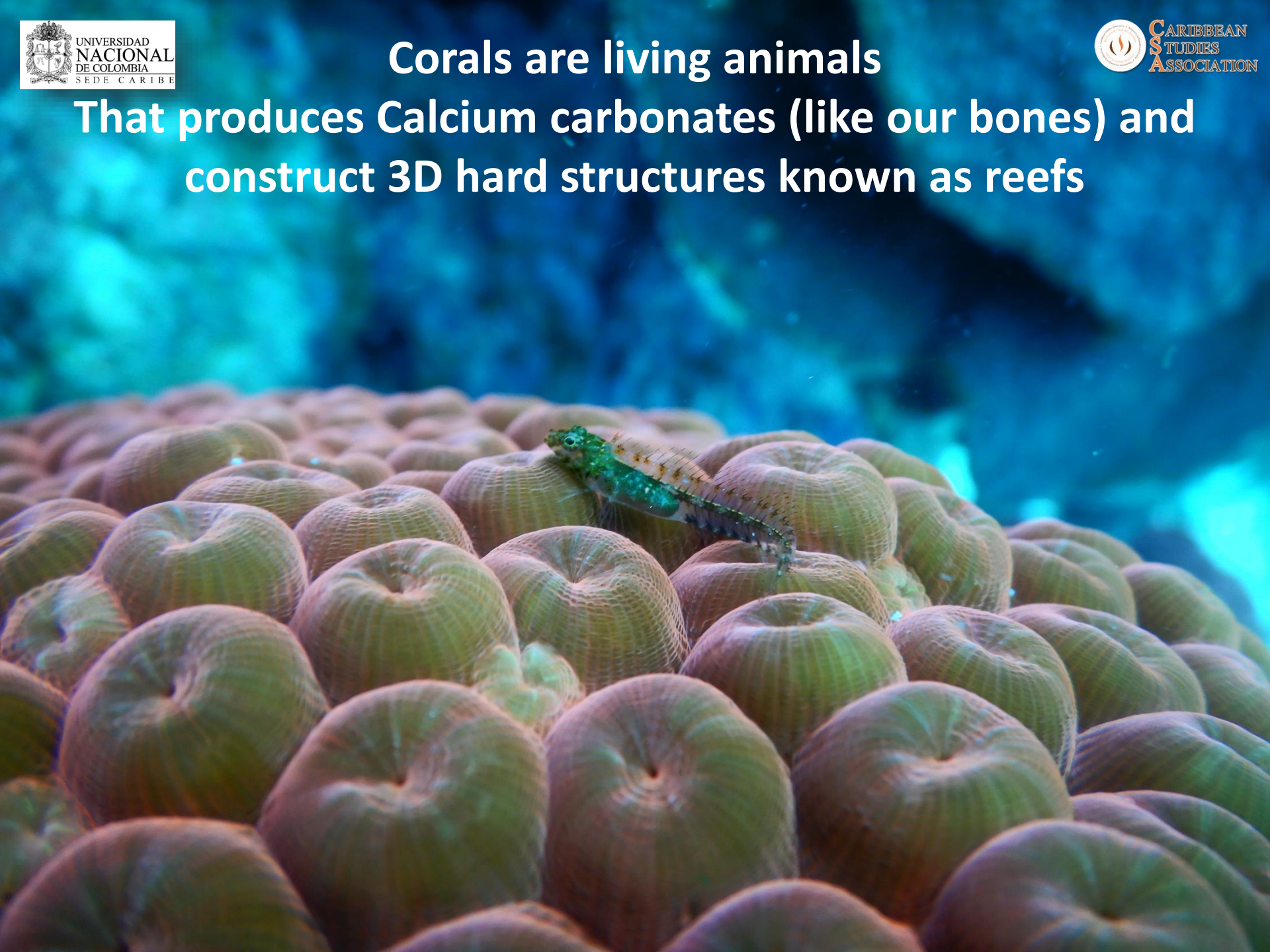
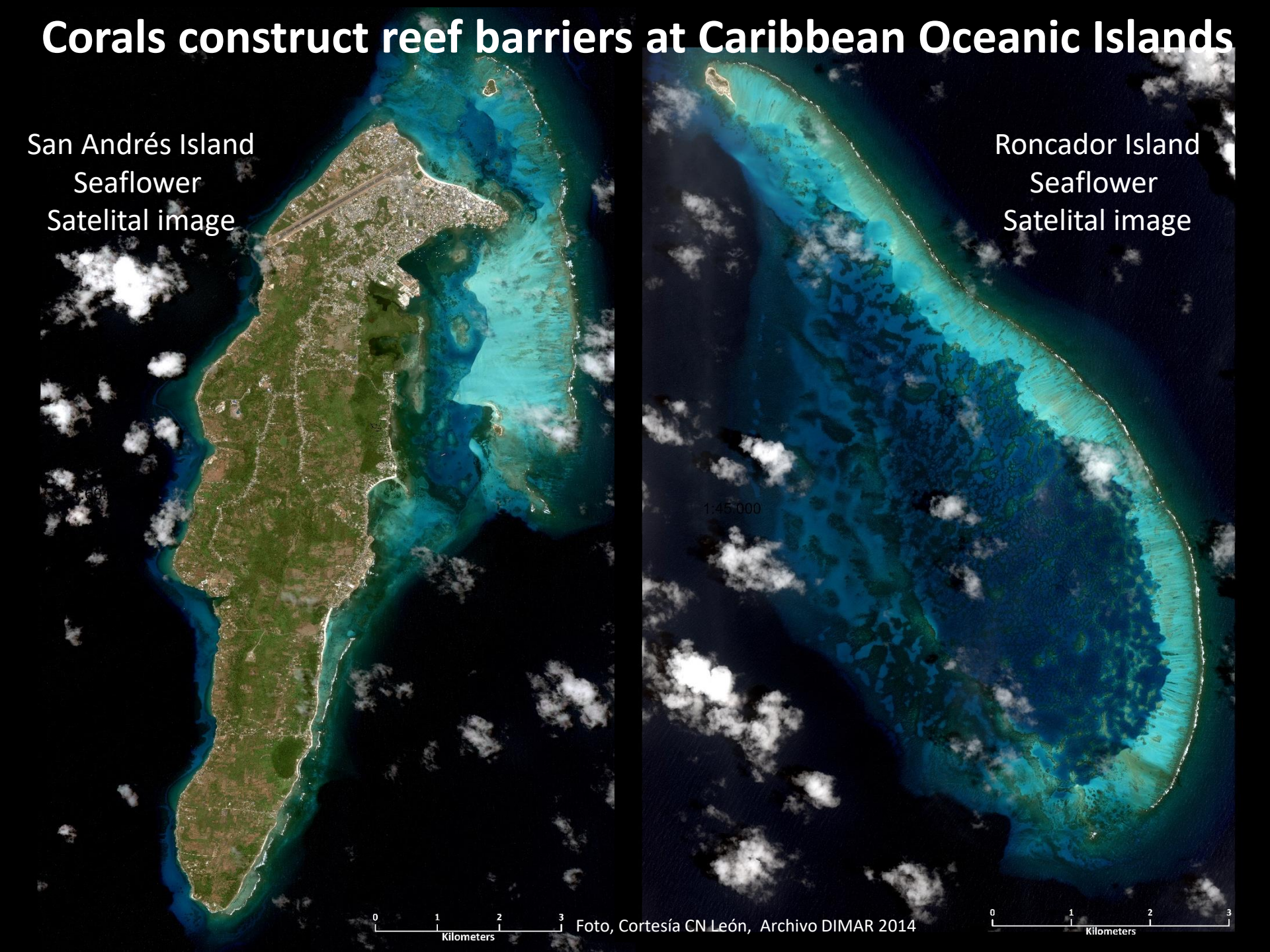
CARIBBEAN STUDIES ASSOCIATION

Corals are living animals

That produces Calcium carbonates (like our bones) and construct 3D hard structures known as reefs



Corals construct reef barriers at Caribbean Oceanic Islands



Foto, Cortesía CN León, Archivo DIMAR 2014

Reef barriers protects islands (Coastal protection)

(Albuquerque, Seaflower expedition 2018) Photo by Santiago Estrada


And provides shelter for fishes (Food provision)

Caribbean islands are exposed to waves formed across more than 700 km wind fetch

Reef barriers protects could be vital for Caribbean Islands

Foto, Cortesía CN León, Archivo DIMAR 2014

Universidad Nacional de Colombia Sede Caribe:

Have been conducting reserarch at the Archipiélago since more than 20 years
Participation on Seaflower expeditions with the iniciative of CCO and interinstitutional support including Armada Nacional de Colombia, Colciencias and Coralina.

Participation on Seaflower expedition 2017 (I.C. Serranilla), 2018 (I.C. Albuquerque) and this year 2019 (I. Old Providence and Ketlina) with th Project:

Valoración de servicios ecosistémicos de los arrecifes de coral en los alrededores de Isla Cayos de Albuquerque, Reserva de Biosfera *Seaflower*, Caribe Colombiano.

Directora e investigadora: Adriana Santos Martínez, PhD. Directora UNAL Sede Caribe.
Participation of islander and UN pre- and post graduated student researchers

Objetive: To know the benefits that coral reefs gives to people for their wellbeing, to biodiversity, territory and economy.

Objetivo general: Conocer los beneficios que los arrecifes de coral de la Isla Cayos de Albuquerque aportan al bienestar, la biodiversidad, el territorio y la economía de los colombianos

Foto, Archivo DIMAR, Fuente Aplicación SIG DIMAR, 2018.

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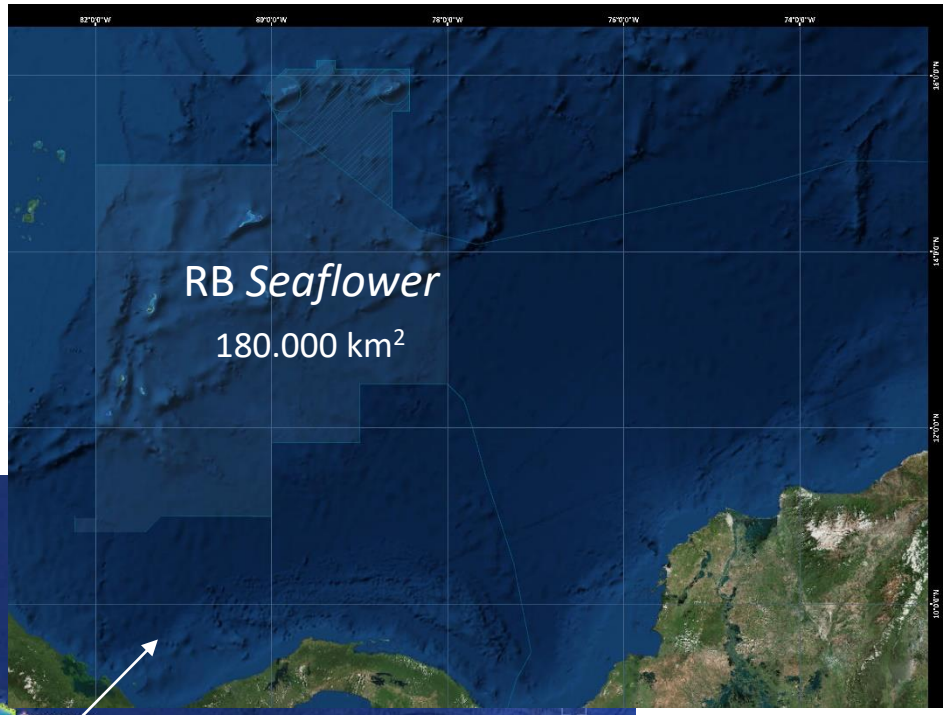
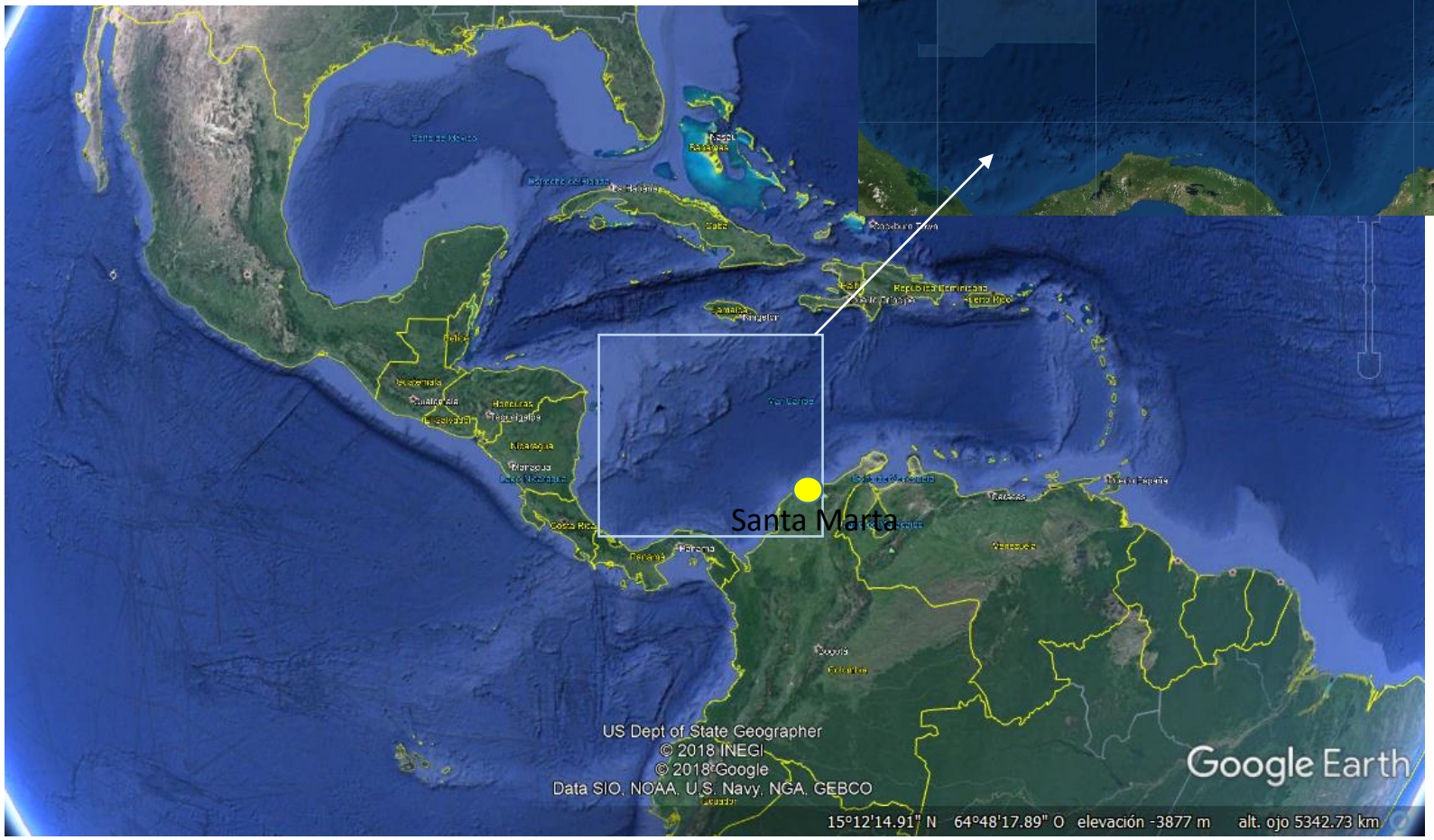
Study Case, Serranilla Island Seaflower Biosphere Reserve, Colombian Caribbean, Seaflower Expedition 2017





Departamento de San Andrés, Providencia y Santa Catalina, Colombia

82°0'0"W

16°0'0"N

14°0'0"N

12°0'0"N

10°0'0"N

Islas Cayos de Serranilla

Bajo Alicia

Islas Cayos de Bajo Nuevo

Islas Cayos de Quitasueño

Islas Cayos de Quitasueño

Islas Cayos de Serrana

Islas Cayos de Serrana

Islas de Providencia y Santa Catalina

Islas Cayos de Roncador

Reserva de Biósfera *Seaflower*
9 islas, 99% mar
77% de los corales de Colombia

Islas Cayos de Roncador

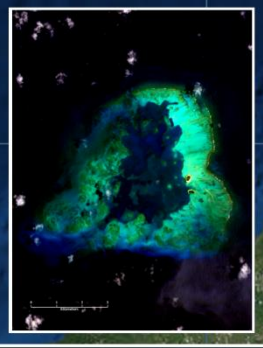
Islas de San Andrés

Home

Islas Cayos de Este Sudeste

Islas Cayos de Albuquerque

Islas Cayos de Albuquerque

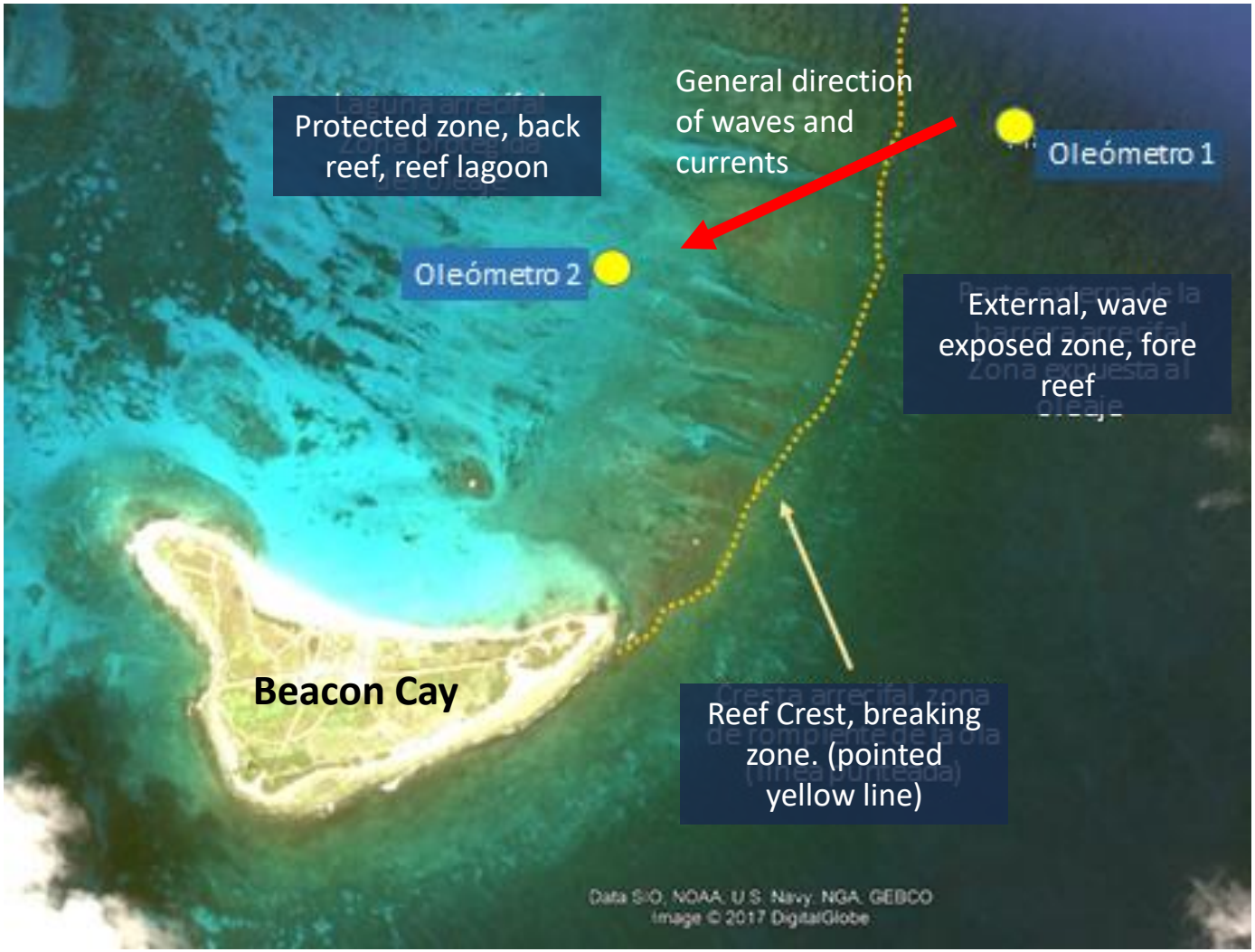


Islas Cayos de Este Sudeste

Study case: Isla Cayos de Serranilla.

0 4 8
Kilometers

Ecosystem service: Coastal protection
Methodology measurement of wave energy attenuation



Sensors were underwater for seven days with continuous data meassurement

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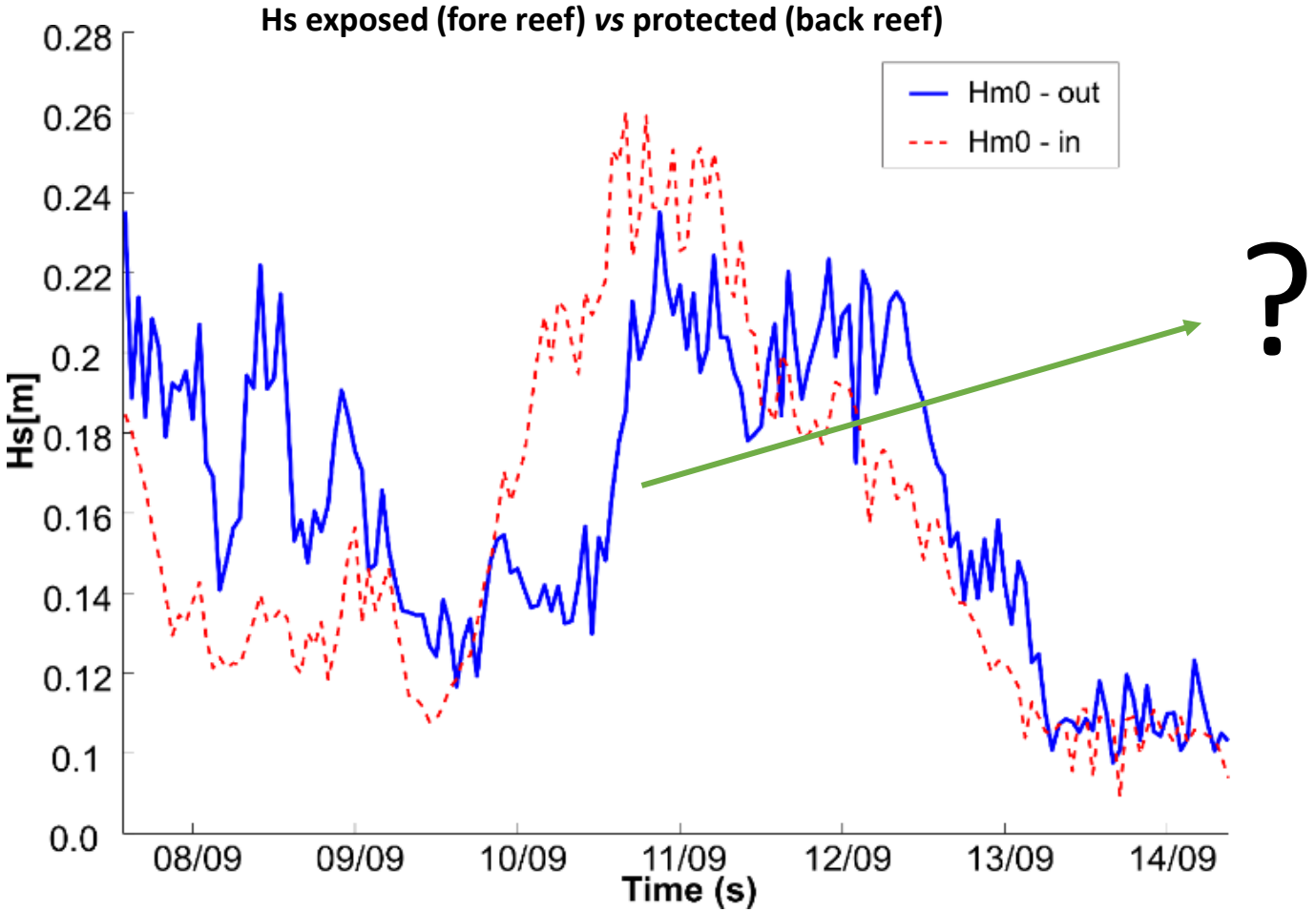
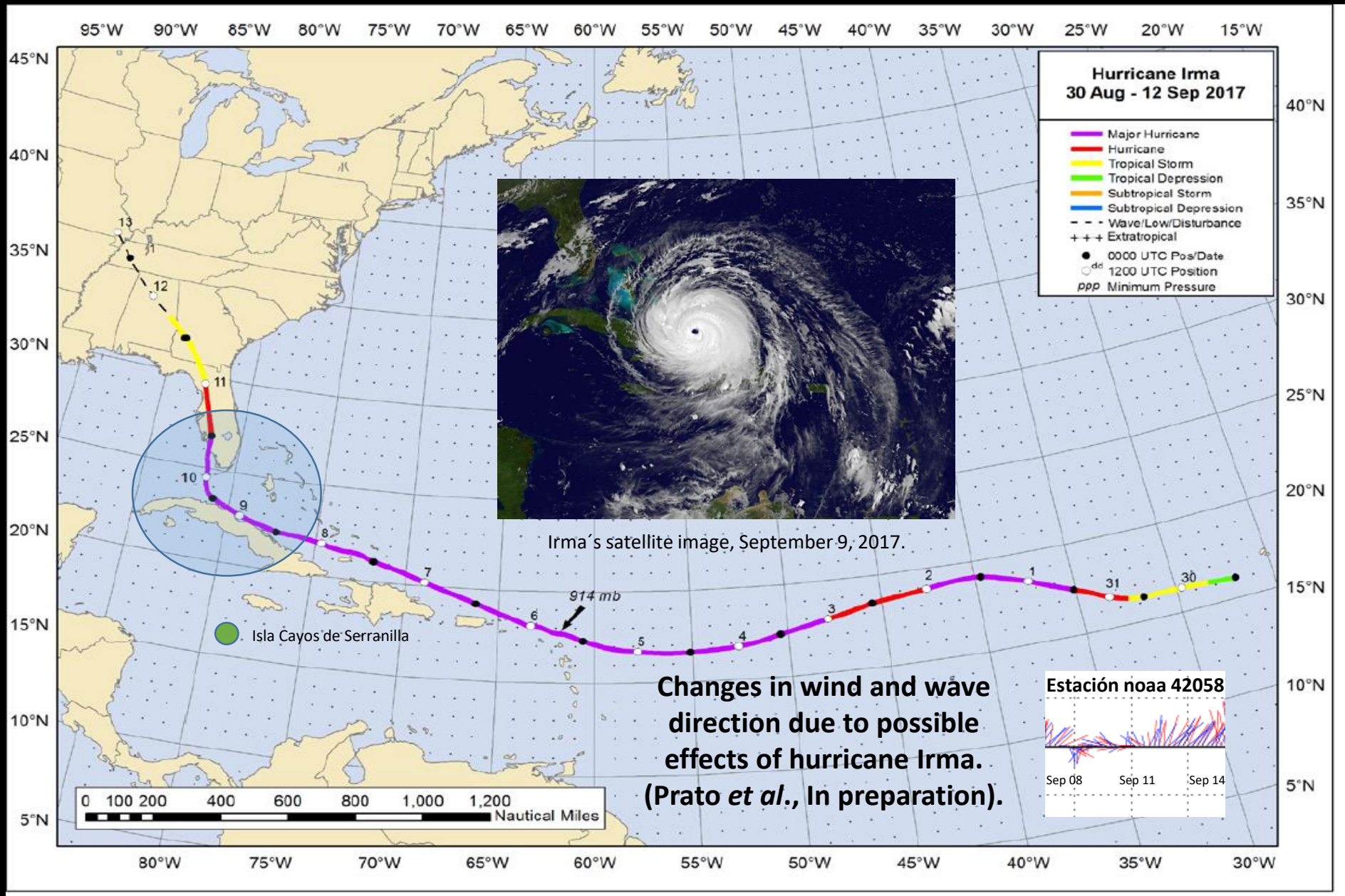
Results wave energy attenuation

The reef barrier in the evaluated zone showed an **ability to attenuate wave energy (Hs: wave height) of up to 40%** under those conditions**.** Effect of the coral barrier cause processes as shoaling, bottom-breakage, bottom-friction and reflection which together can explain attenuation of wave energy.



Preliminary results wave attenuation barriers in I.C. of Serranilla, Seaflower Expedition 2017

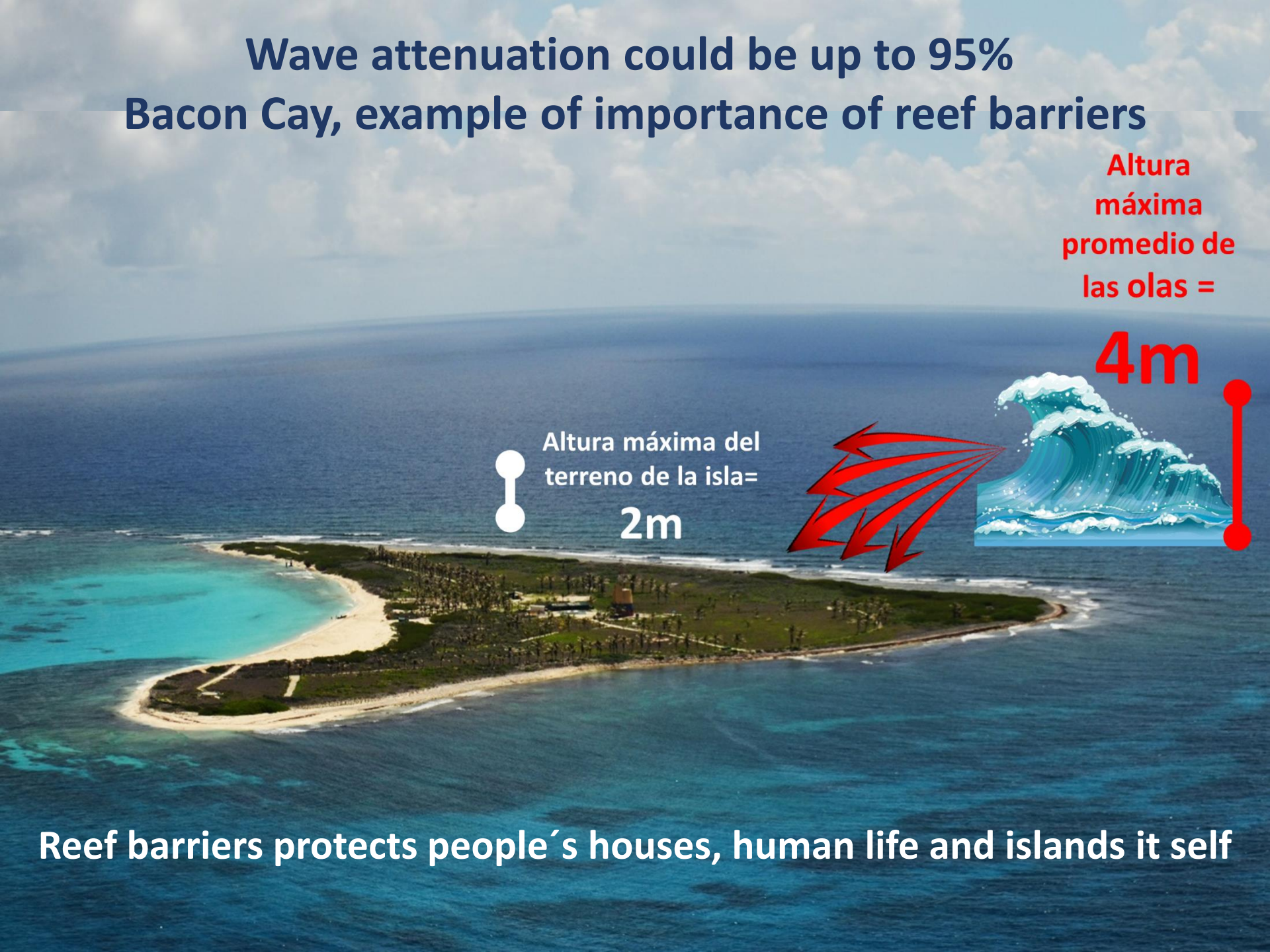


Irma´s satellite image, September 9, 2017.

Best track positions for Hurricane Irma, 30 August–12 September 2017.

Source: (Cangialosi *et al.,* 2018) National Hurricane Center. US.

Wave attenuation could be up to 95%
Bacon Cay, example of importance of reef barriers



Reef barriers protects people´s houses, human life and islands it self

Ecosystem services and wellbeing at risk: Coral cover and complexity losses

Coral reefs have been widely affected by several causes as pollution, climate change (elevated temperatures and acidification), overfishing and massive tourism. (Spalding *et al.,* 2001)

At Caribbean since 1970s decade it is estimated **losses around 80% of coral cover** (Gardner *et al*., 2003). Close to 75% of Atlantic corals are considered at risk and could reach 100% by year 2050 (Burke *et al.,* 2011).

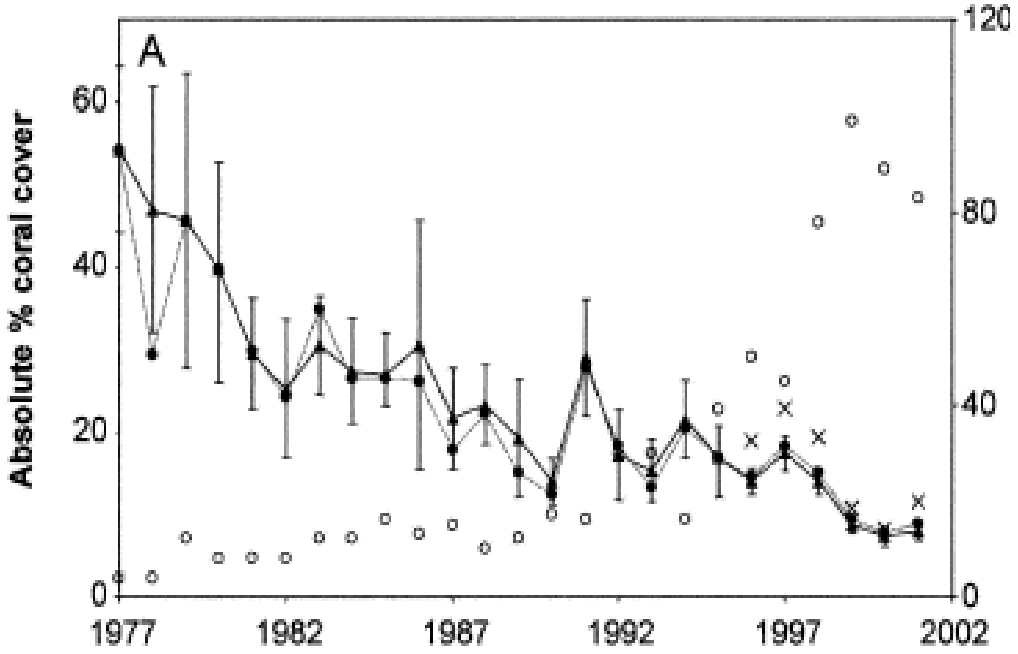


Imagen tomada de Gardner *et al.,* (2003)

Coral cover and complexity losses

Coral reefs ecosystem services and function depends on tridimensional structural (Alvarez-Filip *et al.,* 2013 , Franklin, 2015).

OPEN

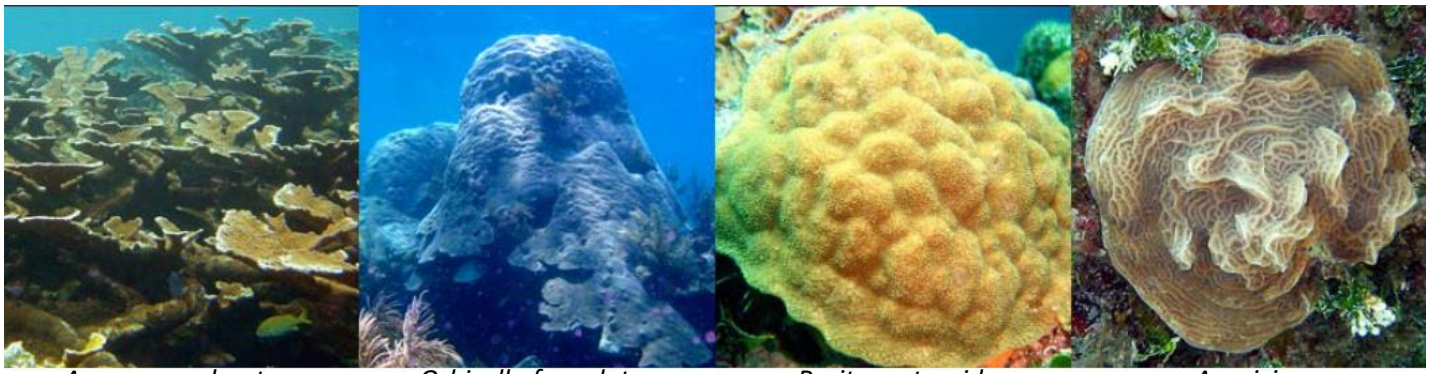
SUBJECT AREAS:
ECOLOGICAL MODELLING
CONSERVATION
CORAL REEFS
CLIMATE-CHANGE ECOLOGY

Shifts in coral-assemblage composition do not ensure persistence of reef functionality

Lorenzo Alvarez-Filip[1], Juan P. Carricart-Ganivet[2], Guillermo Horta-Puga[3] & Roberto Iglesias-Prieto[2]

[1]Healthy Reefs Initiative, Puerto Morelos, Quintana Roo, México, [2]Unidad Académica de Sistemas Arrecifales, Instituto de Ciencias

Coral degradation, coral cover looses and replacement of reef structuring species by algae and weedy coral especies (*Porites astreoides*, *Agaricia* spp), causes reefs become flat with reduction on structural complexity. (Alvarez-Filip *et al.,* 2013; Mumby *et al*., 2014). This causes losses on ecosystem services as well.



Acropora palmata *Orbicella faveolata* *Porites asteroides* *Agaricia sp.*

Imagen tomada de Alvarez-Filip *et al.,* (2013)

Ecosystem services and wellbeing at risk: Coral cover and complexity losses

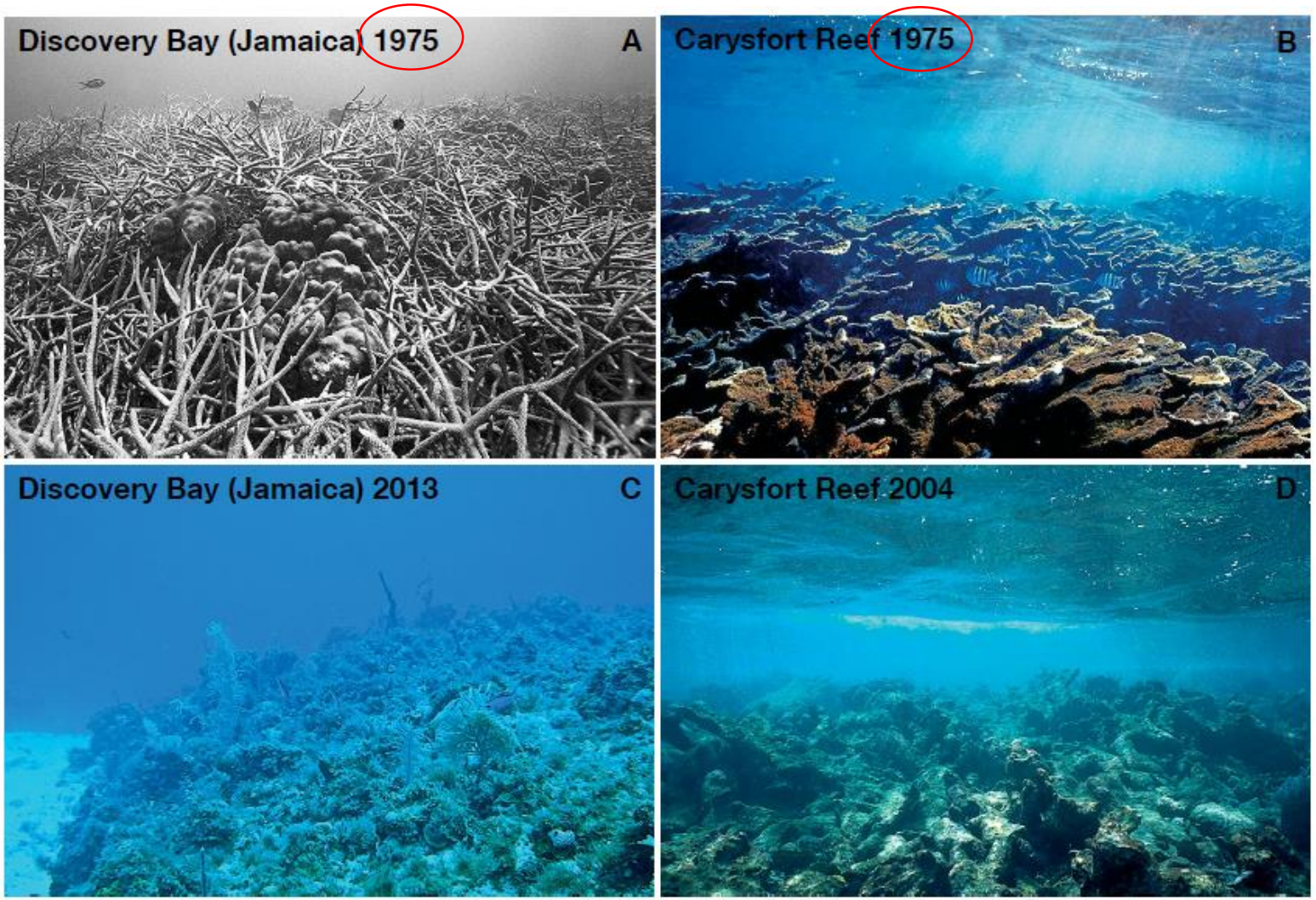


FIGURE 2. Phase shift from dominance by corals to dominance by macroalgae on the shallow fore-reefs in the northern Florida Keys and north coast of Jamaica. (A) Discovery Bay, Jamaica in 1975 and (C) the same location in 2013. (B) Carysfort Reef within the Florida Keys National Marine Sanctuary in 1975 and (D) in 2004 ((A, B, D by Phillip Dustan, and C by Robert Steneck).

Imagen tomada de Jackson *et al.* (2014)

Ecosystem services and wellbeing at risk: Coral cover and complexity losses

San Andrés Island pictures taken from (Zea *et al.*,1998)

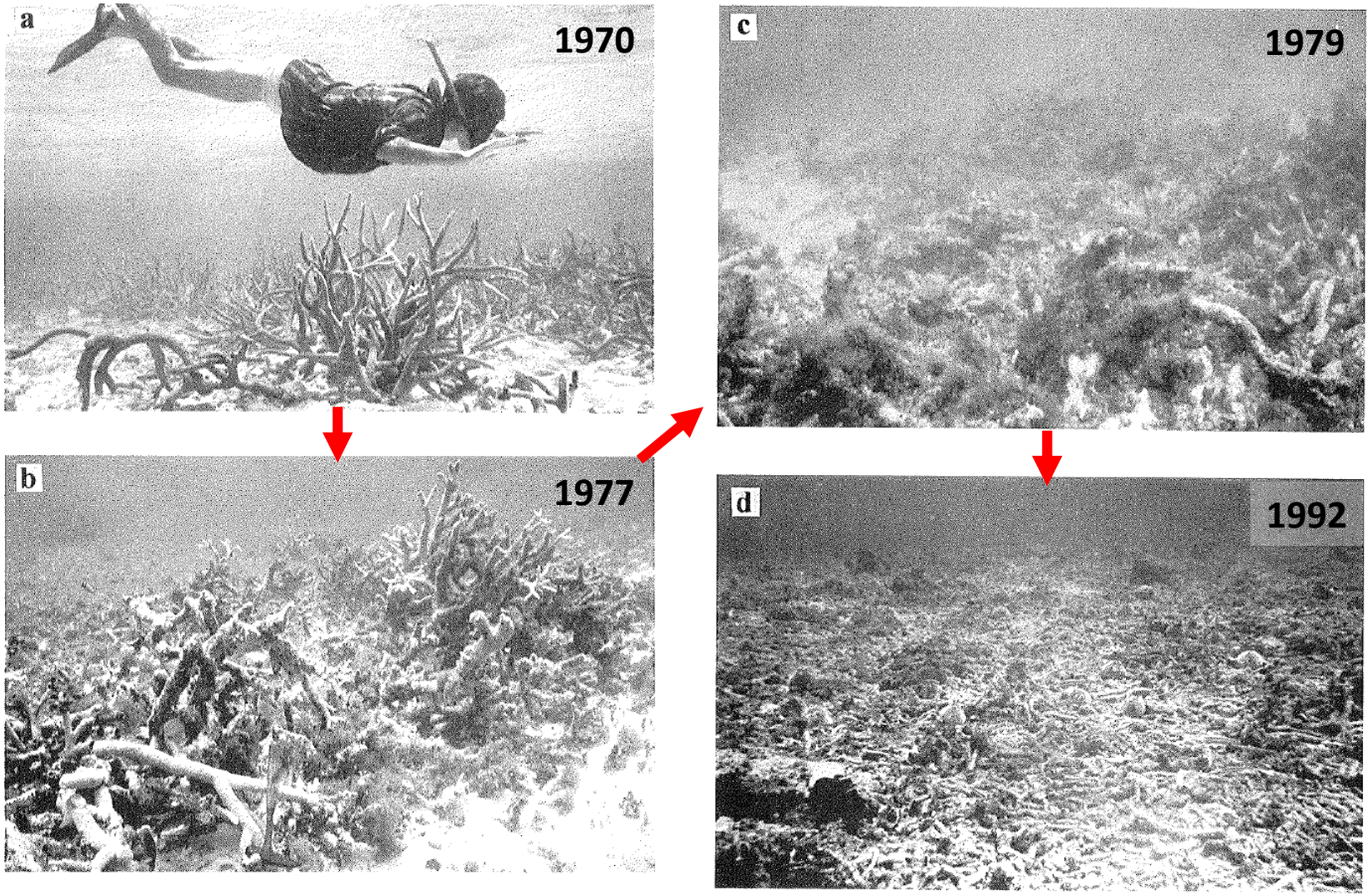


Figure 5 (continued on the next page). *Acropora cervicornis* stands in the northern lagoonal basin of San Andrés, 1-2 m in depth. **(a)** 1970, live, healthy thickets. **(b)** 1977, partly necrose and covered by filamentous algae.

Figure 5 (continued from the previous page). **(c)**. 1979, more than 80% of coral tissues dead. **(d)** 1992. 100% mortality and collapse of skeletons.


Coral cover and complexity losses, causes coastal erosion, houses damage or removal, livelihoods and wellbeing at risk

Coral reefs protects beaches that attracts tourism and benefits thousands of families at the Archipelago

NACIONAL Antioquia Atlántico Bolívar Boyacá Cundinamarca Cauca Magdalena Meta Santa

LA CIFRA VIENE EN AUMENTO DESDE EL 2016

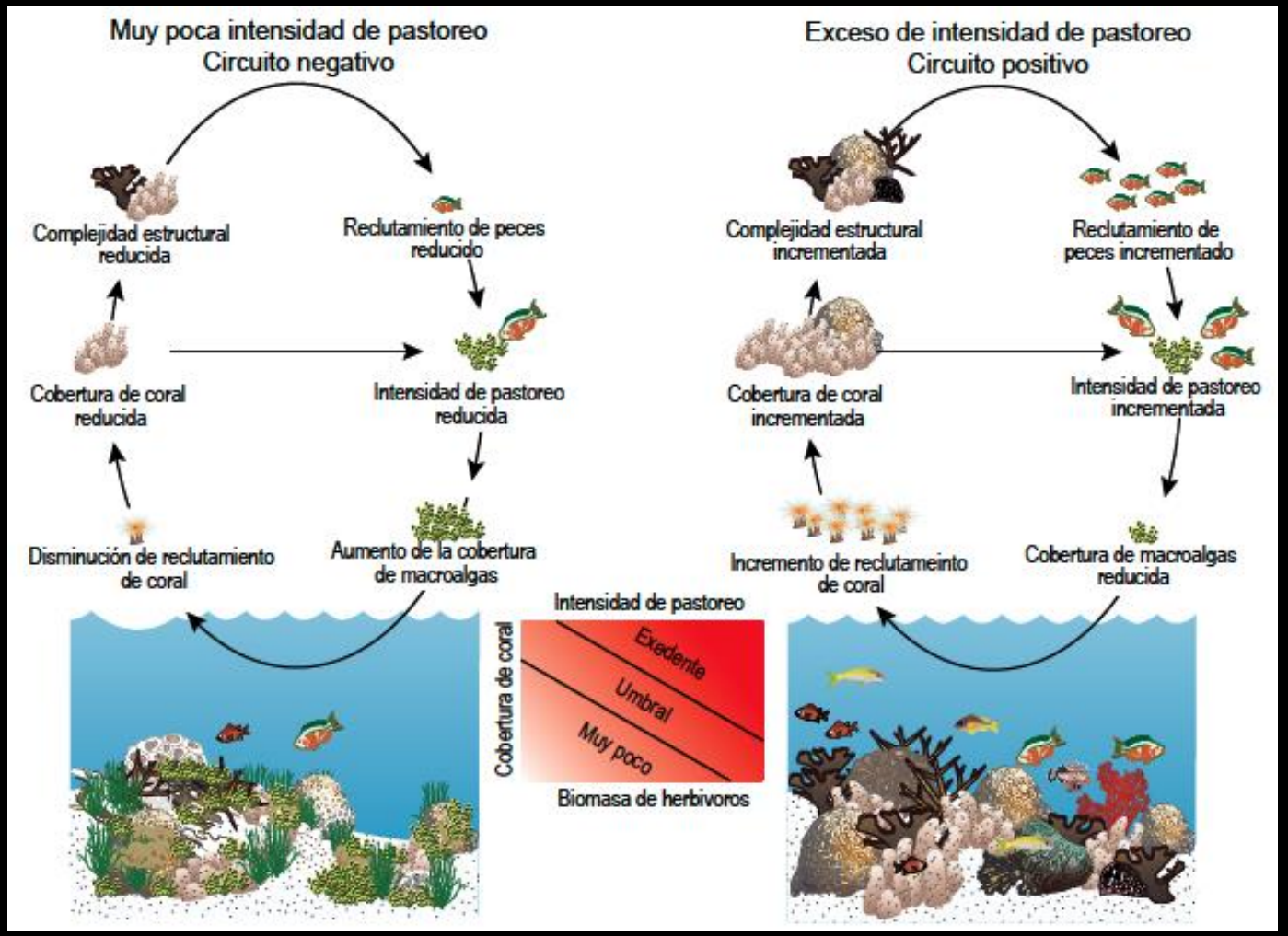
San Andrés superó el millón de visitantes por segundo año consecutivo

Nacional 16 Ene 2019 - 11:12 AM
Por: - Redacción Nacional

Más de $109 mil millones de pesos recibió el departamento sólo con el recaudo de la Occre. Parte de este dinero, según la Gobernación, se invierte en infraestructura pública turística.

Caution!!!: To much masive tourism and non sustainably practices could affect ecosystems , and brings negative consecuenses for the tourisim industry and economy

Parrot fishes helps protecting coral reefs



Fuente: Mumby *et al., (*2014)

Familia Labridae - Scaridae

Scarus coelestinus

Scarus taeniopterus

Sparisoma chrysopterum

Scarus coeruleus

Scarus vetula

Sparisoma radians

Scarus guacamaia

Sparisoma atomarium

Sparisoma rubripinne

Scarus iseri

Sparisoma aurofrenatum

Sparisoma viride

Lista de peces conocidos del Archipiélago de San Andrés, Providencia y Santa Catalina – (Bolaños *et.,al* 2016)

Reef complexity and fish communities

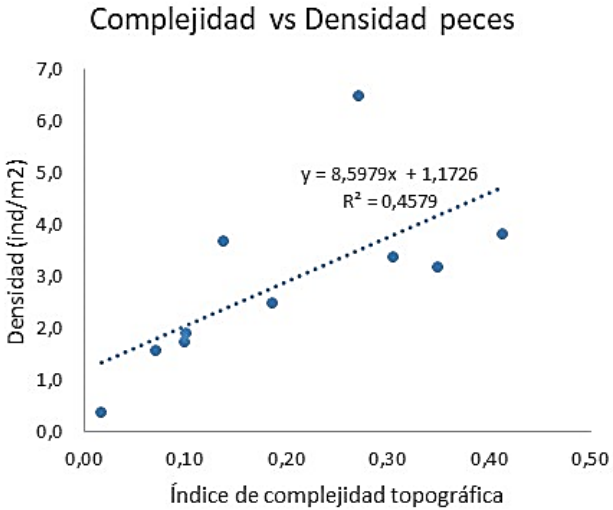
(results from Expedition 2017, I.C. Serranilla)

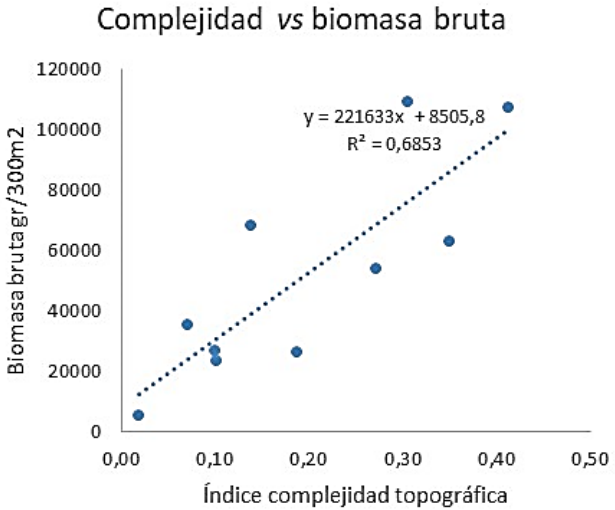
Sampling at 10 different sites, evaluation of possible relationship between reef complexity and fish communities

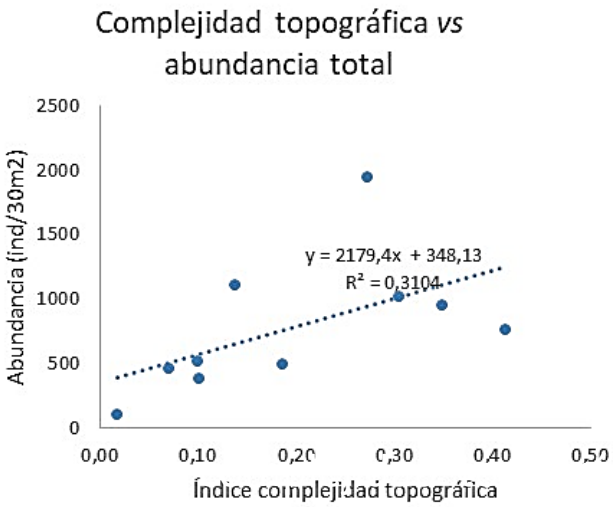
Table: Average complexity index-CI per site (from 0 to 1)

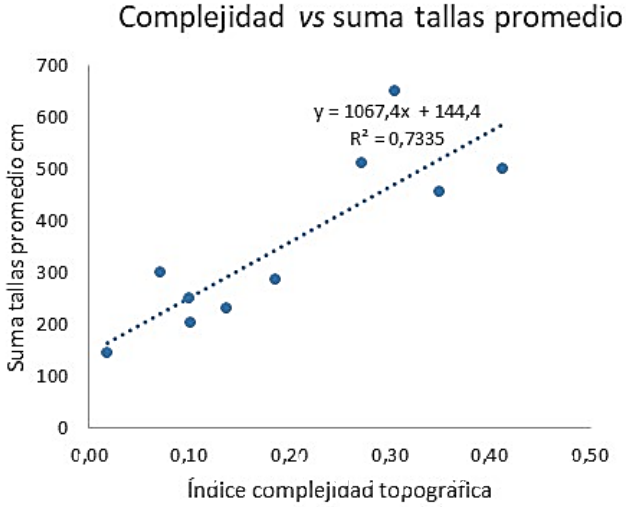
Site	Mean CI
ES1	0,14
ES2	0,10
ES3	0,27
ES4	0,07
ES5	0,02
ES6	0,41
ES7	0,10
ES8	0,19
ES9	0,31
ES10	0,35

Coral reefs complexity, biodiversity and food provision









Figures from: (Castaño *et al.*, on press)

Coral reefs and sustainability: complexity losses or gains…and consequences for food provision

Rogers *et al.* (2014) predicted **reductions by three (3) folds on fishing productivity** related with losses on reef structural complexity**.**

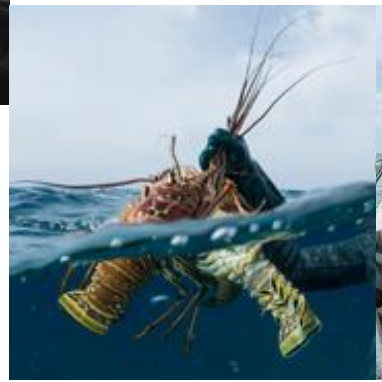
If we protect coral reefs we could also increase fishing productivity…

Current Biology *24*, 1000–1005, May 5, 2014 ©2014 Elsevier Ltd All rights reserved http://dx.doi.org/10.1016/j.cub.2014.03.026

Vulnerability of Coral Reef Fisheries to a Loss of Structural Complexity

Alice Rogers,[1,2,*] Julia L. Blanchard,[3] and Peter J. Mumby[1,2,*]
[1]Marine Spatial Ecology Lab, School of Biological Sciences and ARC Centre of Excellence for Coral Reef Studies, University of Queensland, St Lucia, QLD 4072, Australia
[2]College of Life and Environmental Sciences, University of Exeter, Exeter, EX4 4PS, UK
[3]Department of Animal and Plant Sciences, University of Sheffield, Alfred Denny Building, Western Bank, Sheffield S10 2TN, UK

and (4) what are the implications for reef fi
of transitioning from a high- to low-complexi
we present is parameterized for a Carit
However, the framework we introduce quar
function of structural complexity to the prod
and could easily be adapted for use in
ranging from mangroves [12, 13] to Afric
15], where habitat structure also influences
predation risk.



Picture from: https://www.semana.com/nacion/articulo/corte-de-la-haya-acepta-dos-contrademandas-de-colombia-a-nicaragua/547363

Coral reefs protect islands, other ecosystems as beaches important for tourism and biodiversity (as fishes, humans and sea turtles).

Greater protection of the maritime territory is required, investment for control, surveillance, research and better policies that protect marine ecosystems are needed.

Sea turtle *Caretta caretta* hatching at Albuquerque island, Seaflower expedition 2018, Video courtesy from Paola Echeverry, DIMAR, 2018.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To invest on marine ecosystems is profitable in relation to the benefits that it brings to our country and the Caribbean region
Invest on coral reefs and marine ecosystems is to invest on our own wellbeing, for us and for our children
Coral reefs provides seafood, coastal protection and beaches that are necessary for wellbeing and for economy specially at Caribbean insular territories, our sustainability depends on it

Aknowledgements: Thanks to Universidad Nacional de Colombia Sede Caribe, Colciencias, CEMarin, professors Adriana Santos, Amilcar Cupul, Comisión Colombiana del Océano, Armada Nacional and all institutions that support Seaflower expeditions, *Seaflower* and people from San Andrés and Old Providence

Thank you all !!!

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Fotografía Julián Prato

Fotografía Diana Castaño