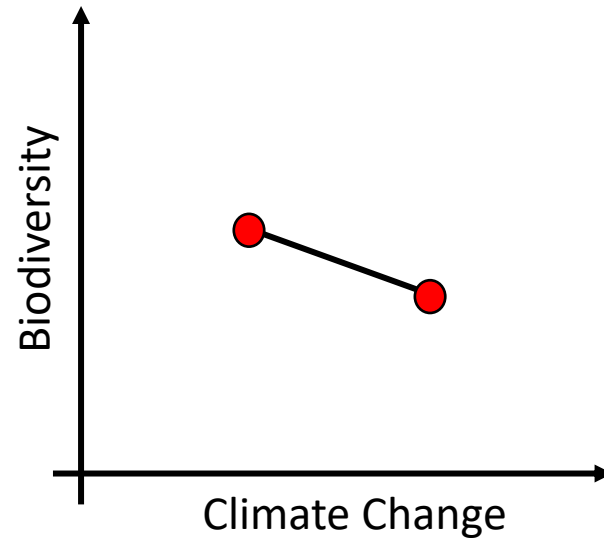


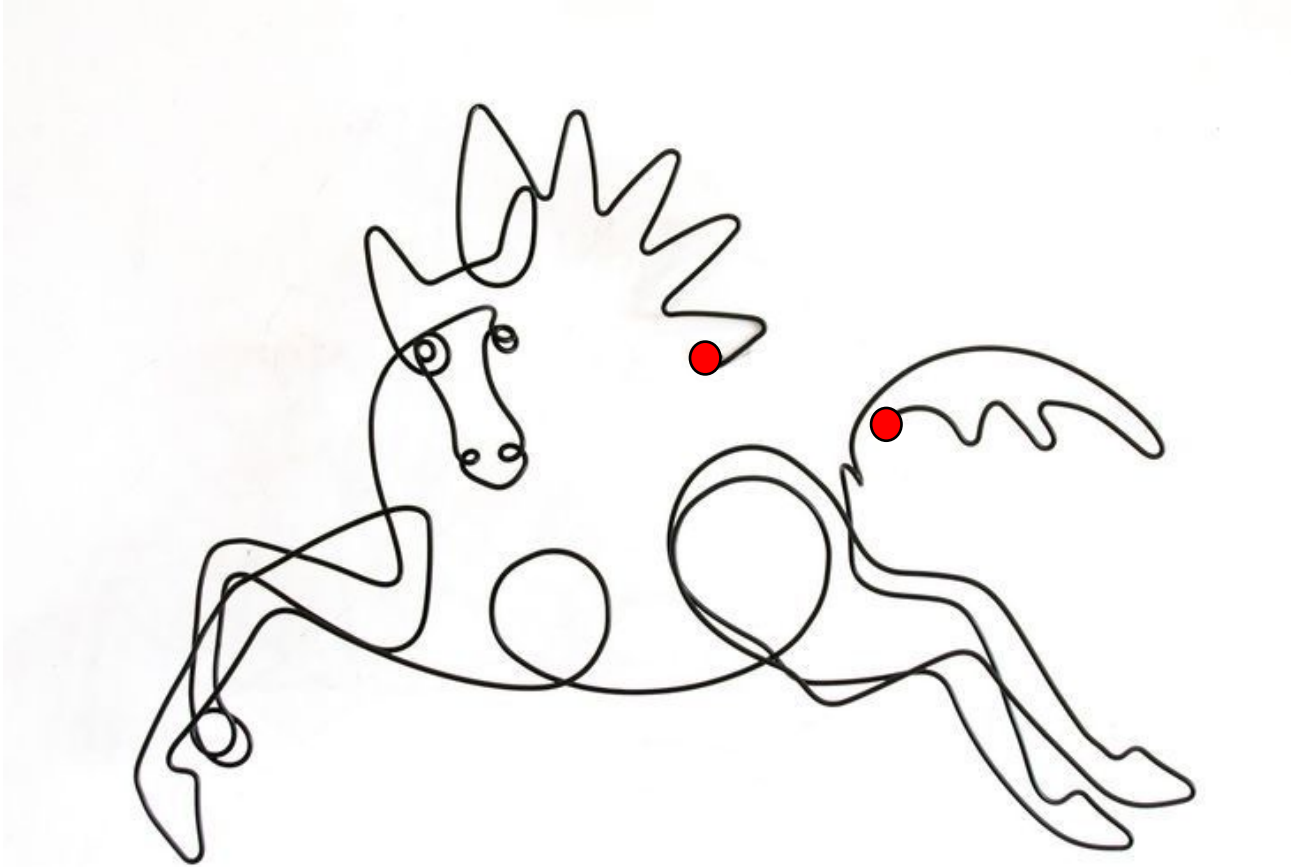
Islands, Walls, and Bridges:

Reflections of an environmental scientist connecting dots in Panama



Environmental scientists are pretty good at connecting dots,
striving for creativity and parsimony (but not too much!)

Islands, Walls, and Bridges: Reflections of an environmental scientist connecting dots in Panama



But I (we) often miss what others see... welcome to Fluid Futures!

Art by: P. Picasso

What I saw (with the help of many others) on a sabbatical across Panama
Goal: To study climate impact on ecosystems on 2 types of islands
Some human-made, others being slowly human-destroyed.



Panama, the Land Bridge

The Panamanian Isthmus formed ~3 million years ago.

Connecting two large continents opened door to novel species interactions.



Bridges make good metaphors (and Panama loves them!)

Panama, the Ocean Wall

Also separated the two largest oceans in the tropics and created very different conditions between Atlantic (Caribbean) and Pacific.



The BioMuseum
(Ocean Exhibit)



The BioMuseum
(Frank Gehry, Arch.)

Walls... not so popular a metaphor (but also interesting?!)

Oh, and Panama the Canal... and oh the many islands it made!

This most notorious feature of Panama also formed new islands (and cracked the wall between oceans). In 1920s, the Smithsonian Institute started long-term monitoring of tropical ecology on newly submerged Barro Colorado Island. It remains one of the few places in the tropics where we have a long-term view of ecological responses to geographic isolation and climatic change.

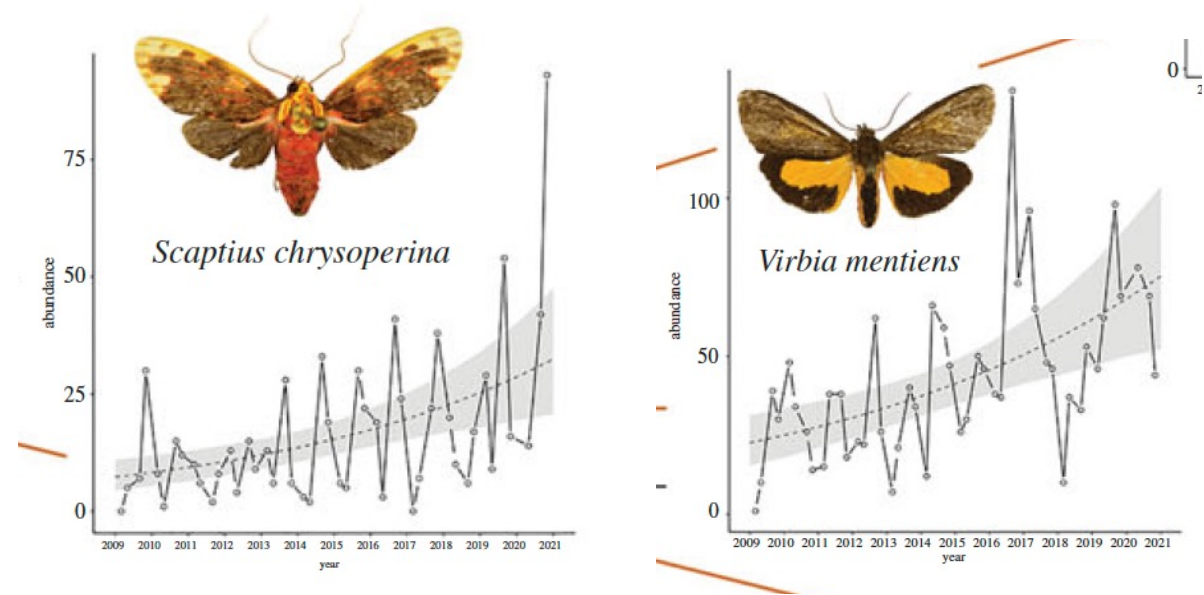


Photo by: unknown

Tropical Insects, Bucking the Trend?

Insect populations mostly on the rise, but there are some in decline. Why?

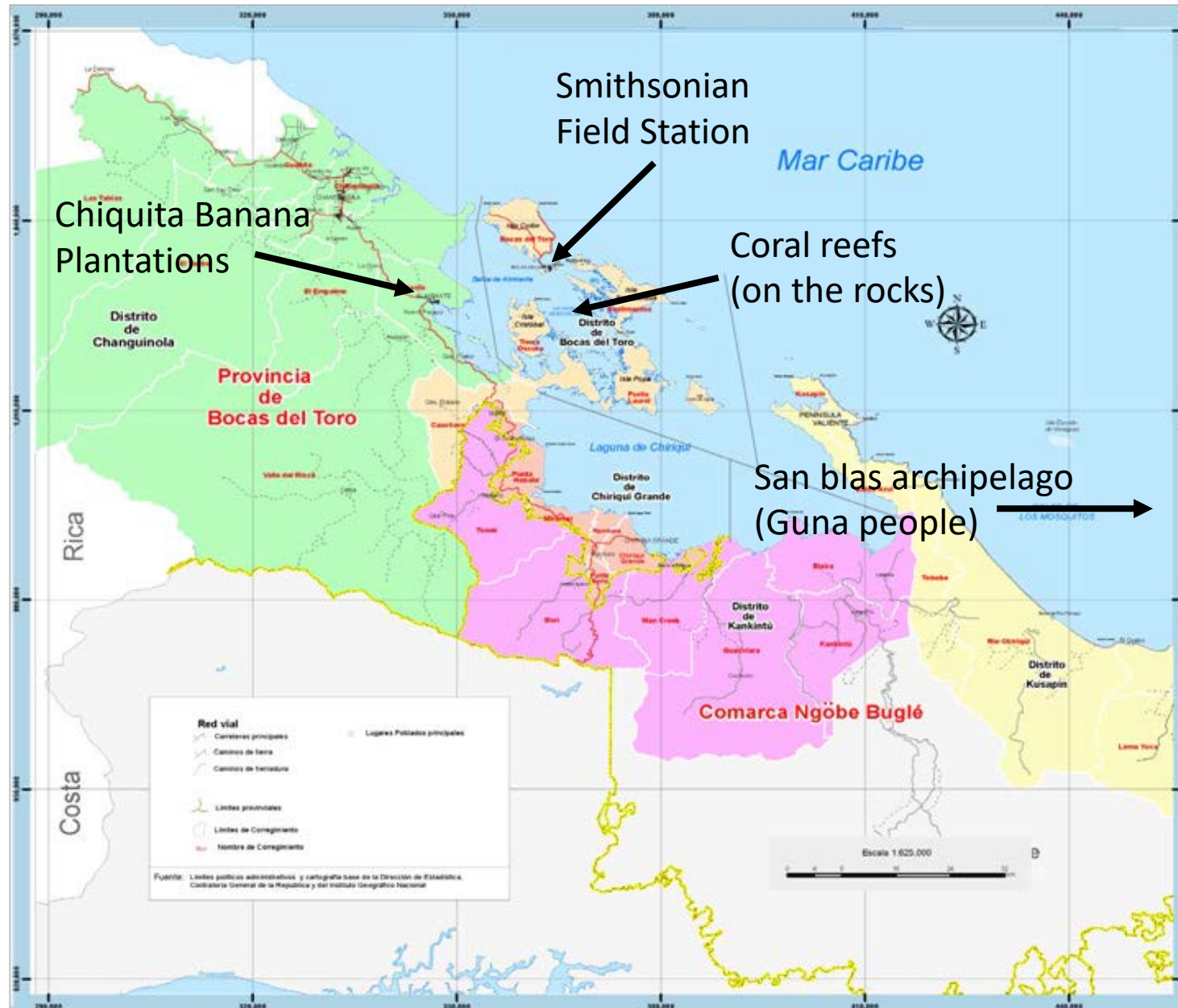
Collections: Abundance, size, color, and DNA barcoding.



Appears to be a decadal response to climate warming, but long-term reversal lies ahead.

From cabinet of Yves Bassett (STRI).

Bocas del Toro



Major economic drivers are banana conglomerates (United Fruit Company) and tourism

Map from:

“Coastal Resources of Bocas del Toro, Panama: Tourism and Development Pressures and the Quest for Sustainability”

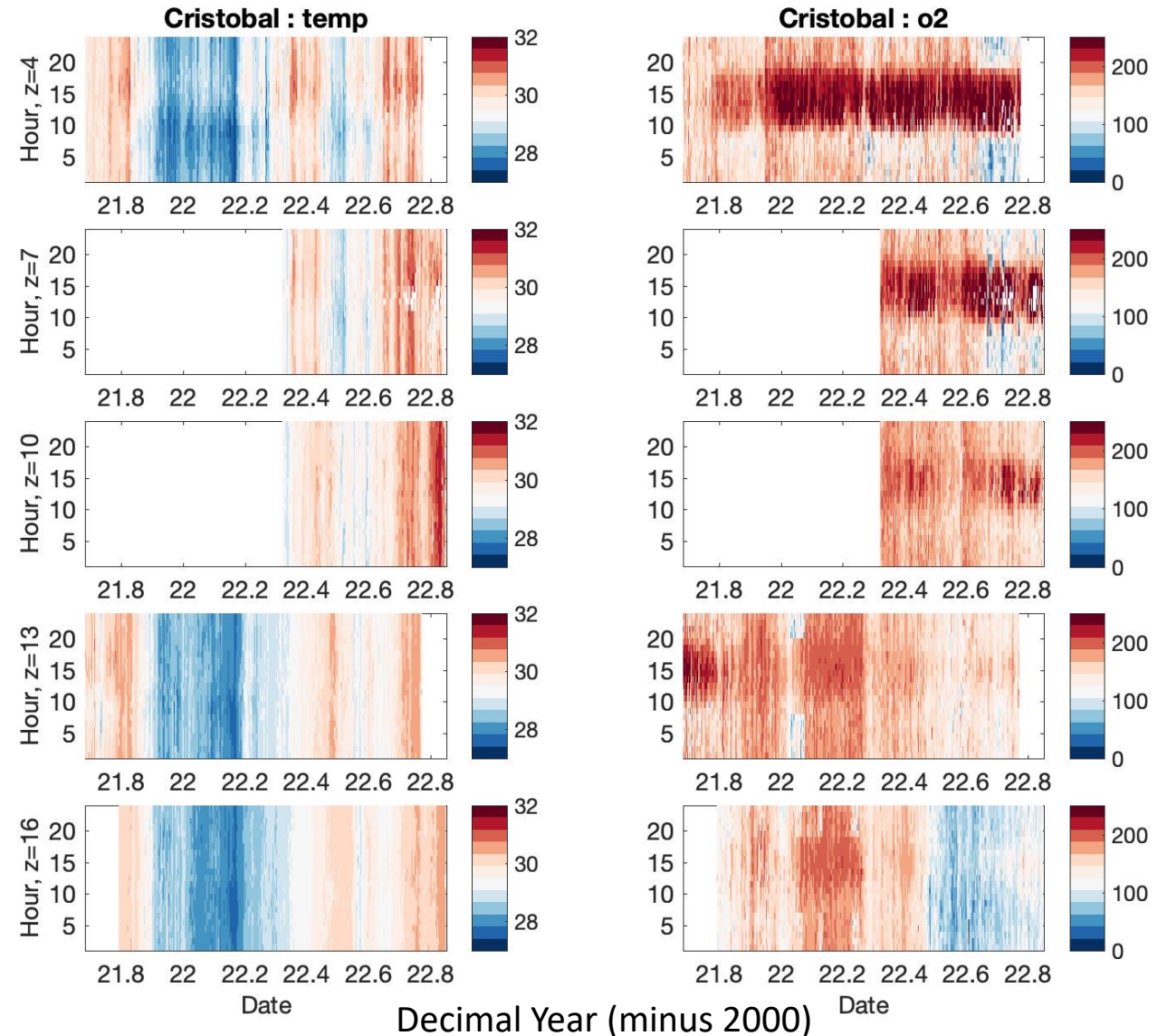
By Suman and Spalding
[Univ. Miami, 2018]

Islands (of resilience) in a Sea of disrepair

Cristobal is a reef site with relatively good water quality and healthy coral reefs far from Almirante river.



Healthy branching *Acropora cervicornis* (foreground, left) seen during routine replacement of sensors measuring temperature and oxygen hourly at 5 depths from 6 reef sites throughout Almirante Bay since 2021.



Island of despair within an Island of delights

In the center of the island,
A housing development had
just been completed,
though not yet inhabited.

It's a 25 minute bus ride
from town (if you can get a
seat).

We saw these on the
mainland as well, esp.
around a major cement
plant (but far from anything
else).

Locals told us it was built by
Panamanian gov't to house
migrant community.



Photo: Oct 2022

Crossing the bridge

Research trip to measure adaptation of Pacific vs Atlantic species to distinct climate created by the Wall



Unspecified midwestern oceanographer attempts (fails) collecting marine animals



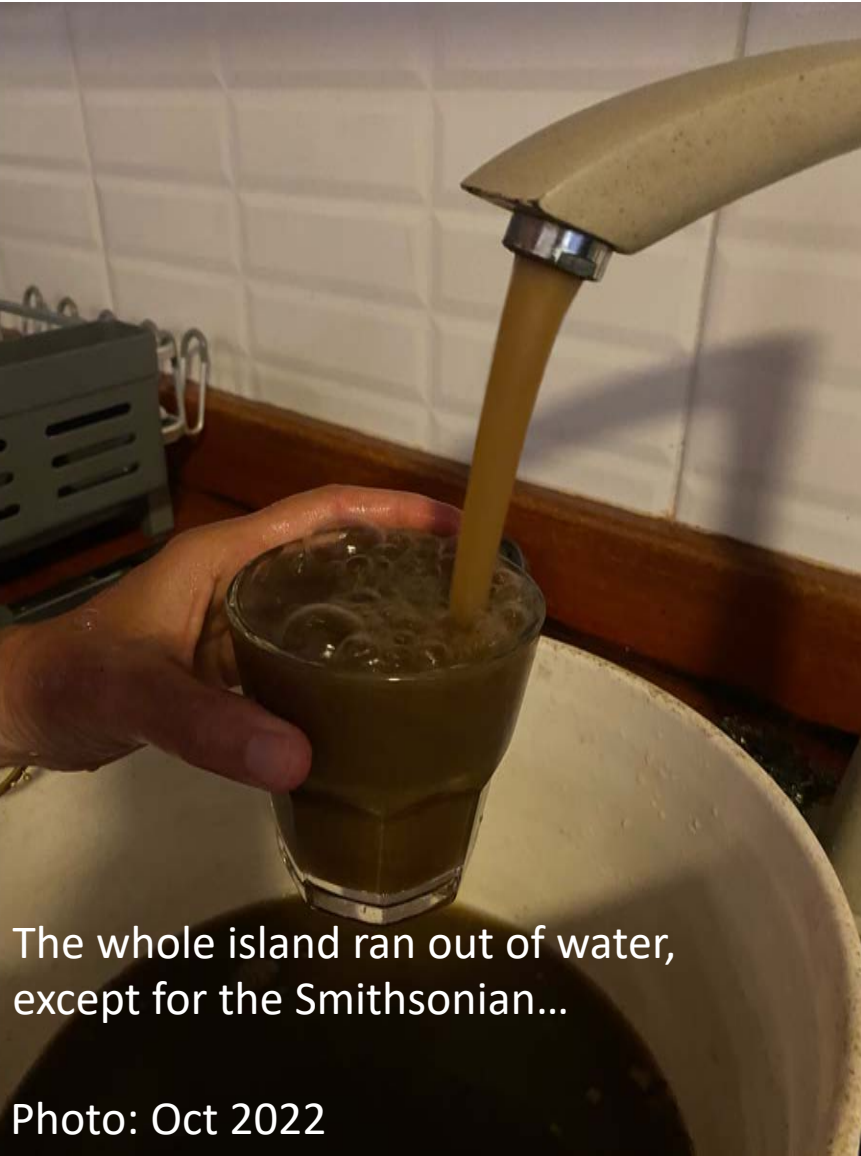
Marine invertebrate whisperers get great data (on shoestring budget).
Noelle (left) just joined HMEI as post-doc!



Back to Bocas/ Isla Colon

And disturbing climate realities...

(Water, water every where
Not a drop to drink)



The whole island ran out of water,
except for the Smithsonian...

Photo: Oct 2022



Photo: Oct 2022

Islands within Islands



Top image:
STRI Self-portrait
(stri.si.edu)

A beautiful place to do research! Large capacity water purification system.



Bottom image:
Outside looking in
(bocas.com)

A foreboding entrance with 24hr guard booth, barbed-wire fence

A little bit of science

Boccas field station, an ideal place to analyze the Pacific vs Atlantic data...

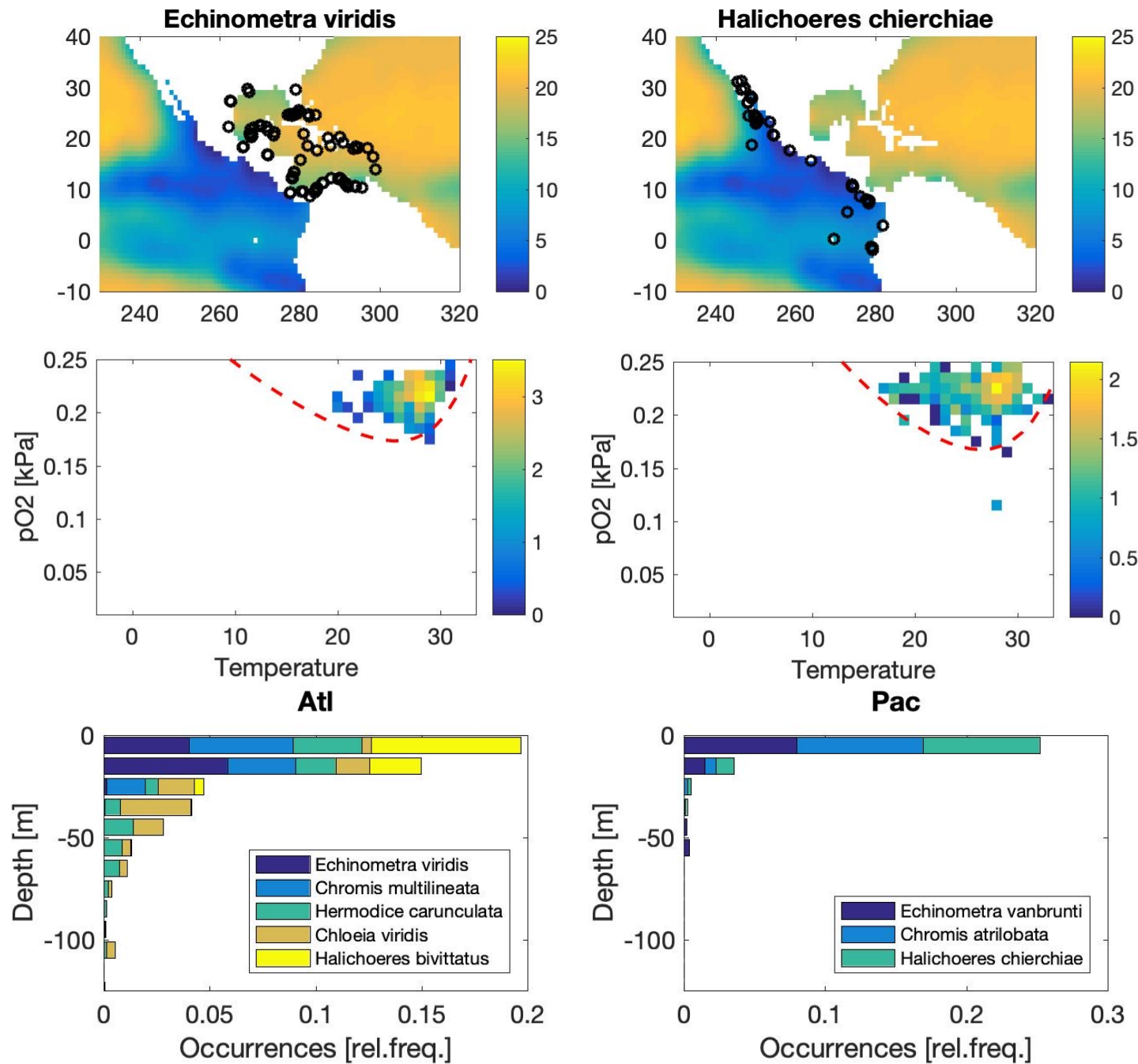


Figure 3.

Geographic distribution of an Atlantic and Pacific species, plotted on a map of annual mean oxygen (O_2) at 100m depth. The environmental conditions (Temperature, O_2) in each location where the species has been observed is extracted from ocean climate data. The number of occurrences under each combination of T/ pO_2 is shown (lower panels) as a habitat cluster in environmental 'state-space', and has been shown to reflect physiological tolerance [Deutsch et al. 2020].

Climate change and the islands it destroys



THE WALL STREET JOURNAL.

By [José de Córdoba](#)

Nov. 5, 2022 8:00 am ET

SIGN IN

SUBSCRIBE



WORLD

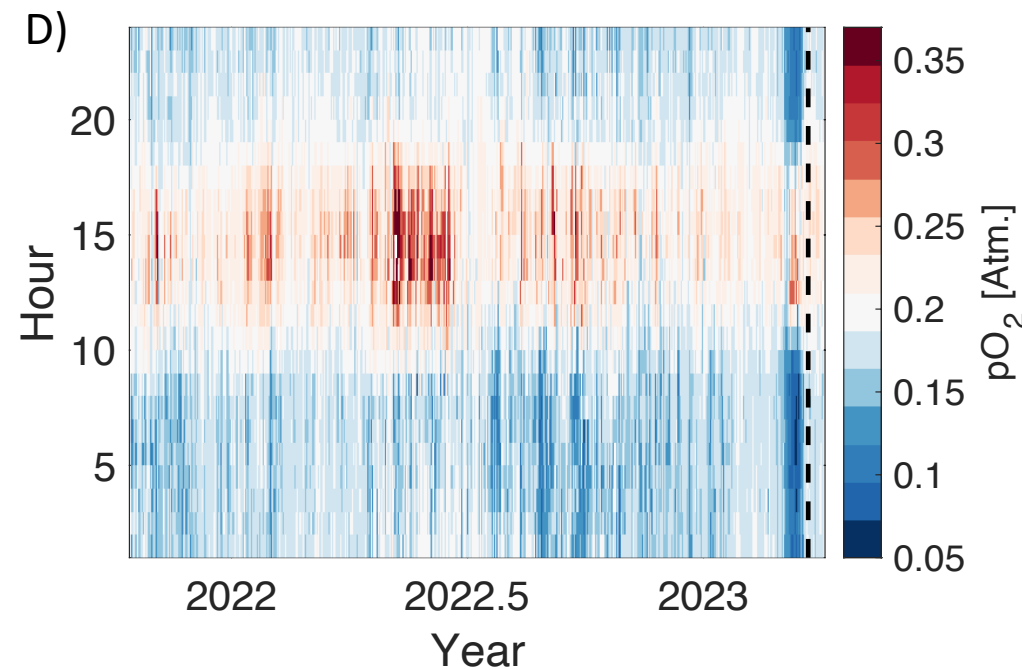
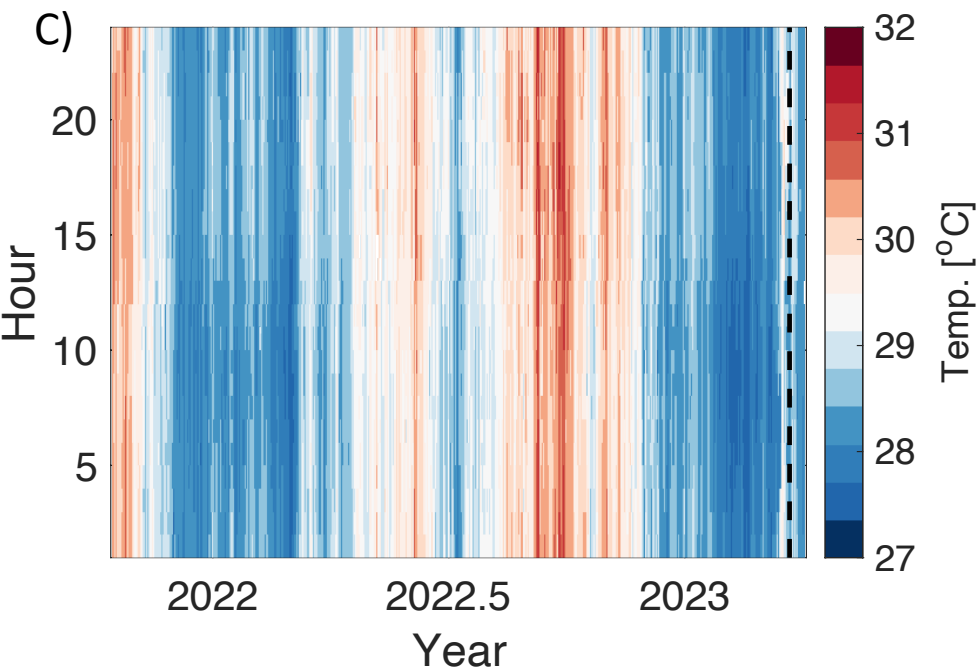
Rising Caribbean Sea Pushes Indigenous Group Off Island

Community plans move to a new Panama subdivision, and climate scientists say their entire archipelago will be submerged in decades



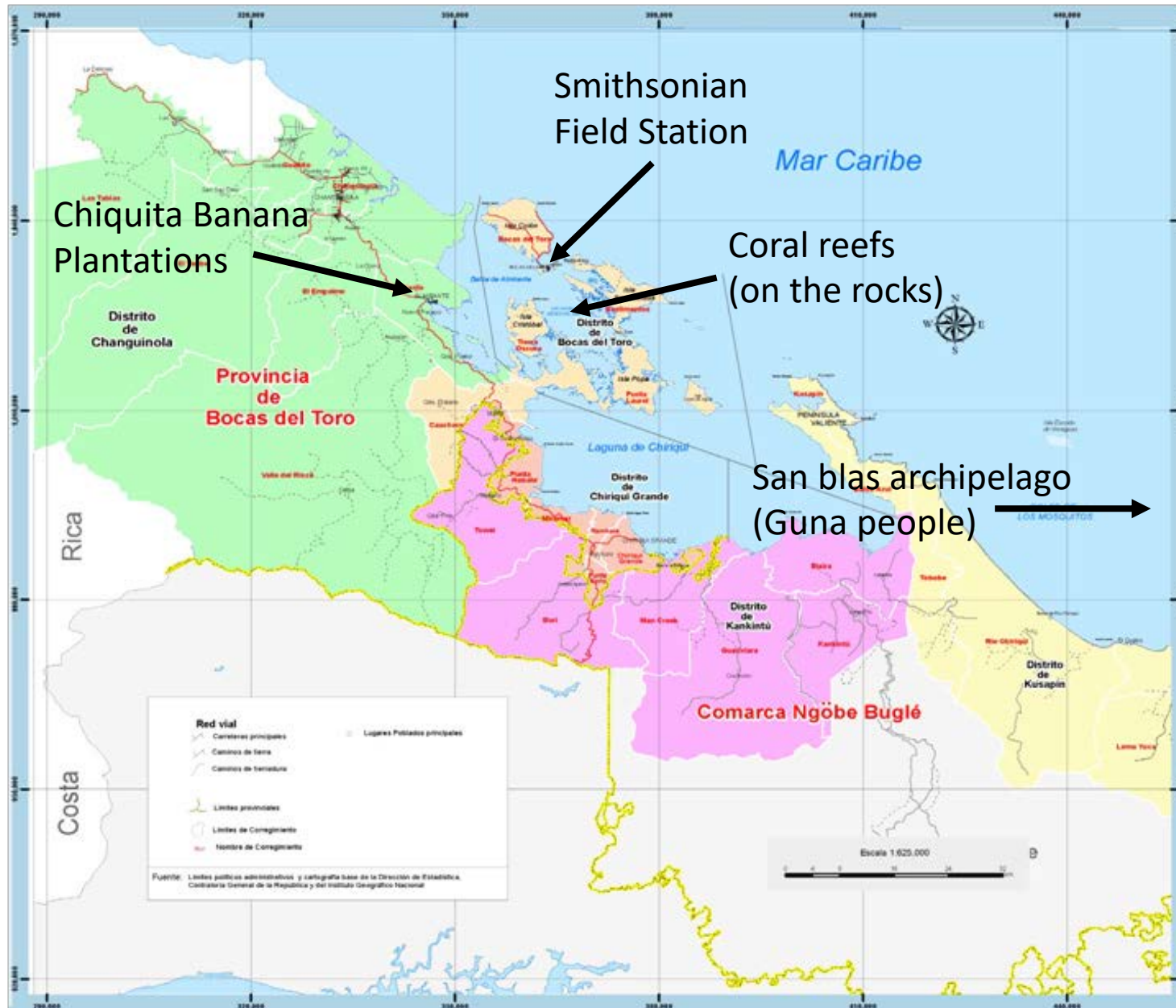
And another
one down

Same massive
Acropora
coral from
October (left)
became
extremely
bleached in
late April and
died by May
(right).



Cause of
death: low
oxygen.

Bocas del Toro



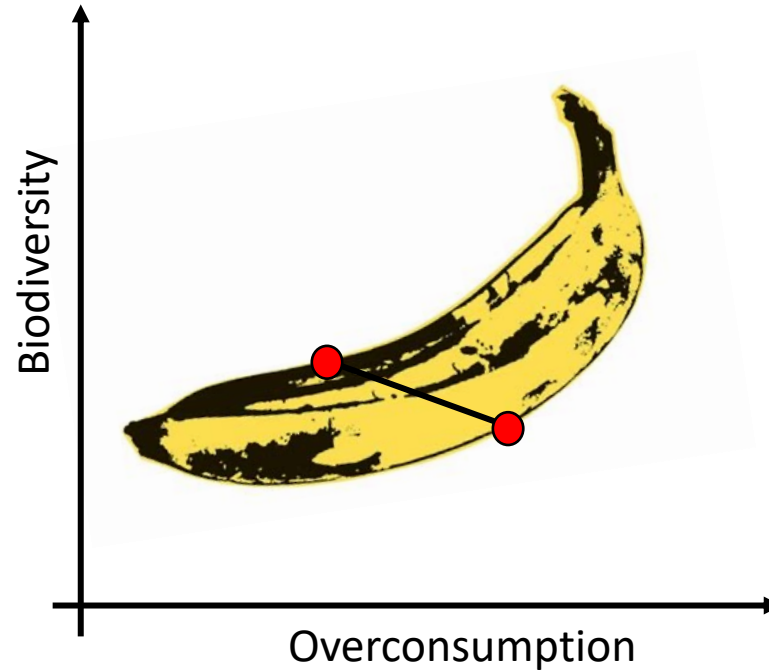
A major source of pollution to Almirante Bay comes from the Chiquita banana plantations on the mainland.

Ecosystems in the vicinity of the main river discharge are dominated by bacteria and jellyfish.

Reefs are essentially dead.

Islands, Walls, and Bridges:

Reflections of an environmental scientist connecting dots in Panama



Same dots, different interpretation (with artistic license)... thanks Fluid Futures!