

# A Marine Biodiversity Observation Network Pole-to-Pole of the Americas in support of conservation and sustainable use of living resources in the sea



**MBON**  
Marine Biodiversity  
Observation Network

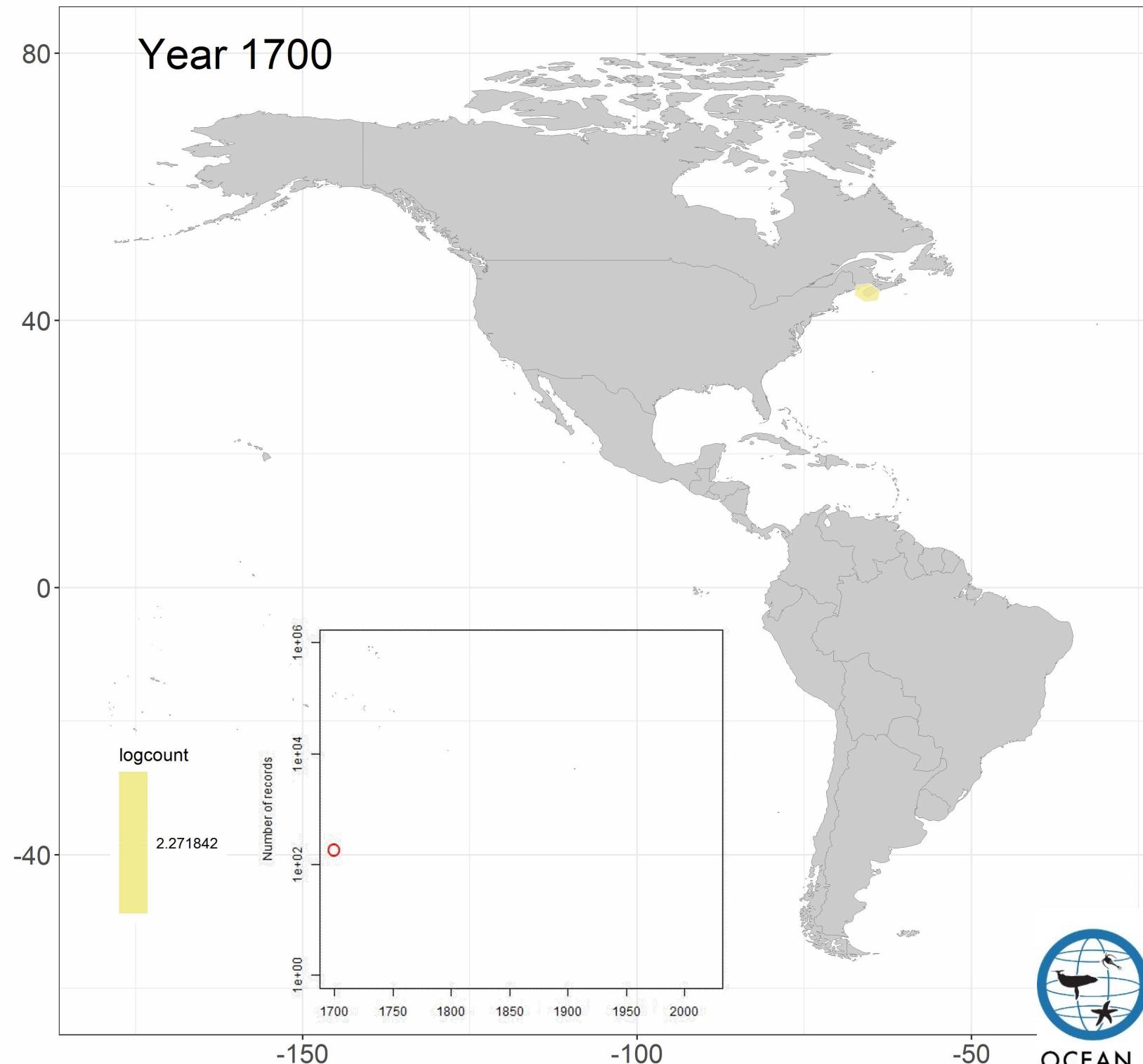


The project is supported by the National  
Aeronautics and Space Administration (NASA)  
grant 80NSSC18K0318

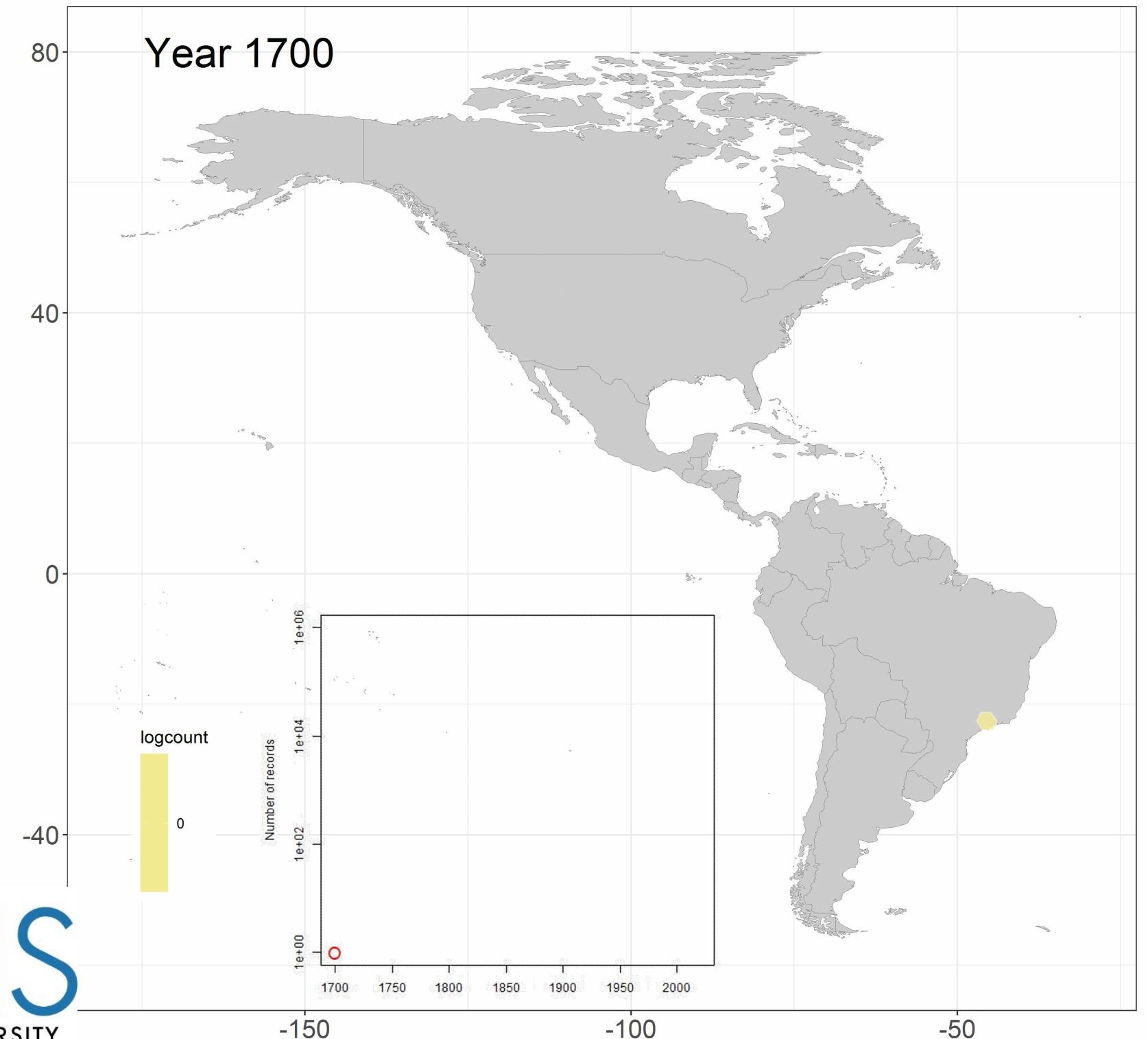
Enrique Montes (enrique.montes@noaa.gov)  
U. Miami Cooperative Inst. for Marine & Atmospheric Studies  
NOAA Atlantic Oceanographic and Meteorological Laboratory  
<https://marinebon.org/p2p/>

# Biodiversity records in the Americas

Mollusca



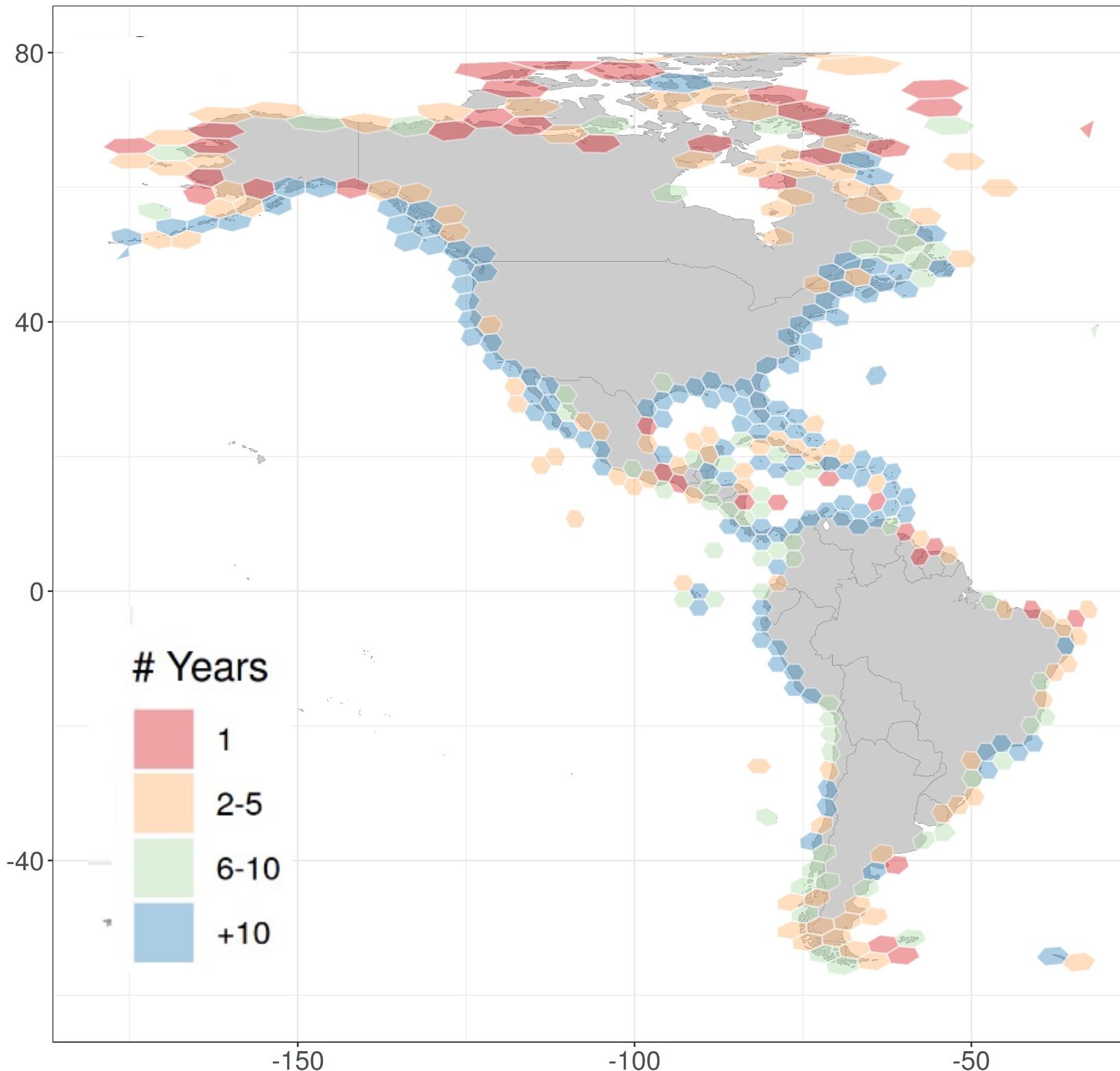
Plants



Records within the 50m isobath

# Biodiversity records in the Americas

Annelids + echinoderms + molluscs + plants



1. Uneven biodiversity observations
2. Observations are often not comparable
3. Lack of time series records



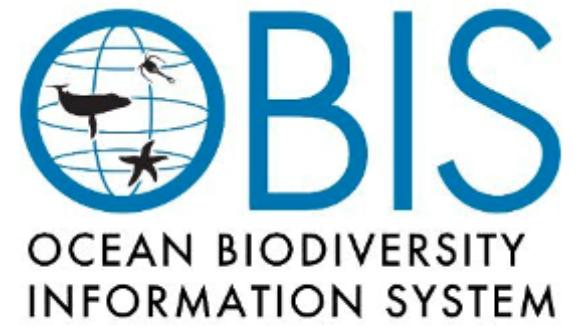
## MBON Pole to Pole of the Americas

People working together to observe marine biodiversity and understand how and why it changes for the benefit of society

- Standardized methodologies and data workflows
- Data and knowledge sharing
- Technology sharing and transfer
- Capacity building



Darwin  
Core



**GOOS**  
Biology and Ecosystems Panel

EOV's



# Capacity Building – Data Workflows

## Standardized field protocols

The screenshot shows a search results page for 'Ocean Best Practices'. The search term 'MBON POLE TO POLE' is highlighted. The results list two items:

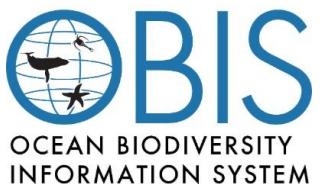
- Sampling protocol for assessment of marine diversity on rocky shores.** (Modified from the SARCE South American Research Group on Coastal Ecosystems for sampling on rocky shores protocol). This entry includes a detailed description, a 'View Tags' button, and links to 'Explore Document' and 'Generate Citation'.
- Sampling protocol for assessment of marine diversity on sandy beaches.** This entry also includes a 'View Tags' button, 'Explore Document', and 'Generate Citation' links.



Training



<https://marinebon.org/p2p/>



The screenshot shows the OBIS homepage with a search bar and a list of datasets. A specific dataset is highlighted: 'MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF ARRAIÁ DO CABO - BRAZIL'. It includes a map showing the location in Brazil and a pie chart titled 'COMPOSITION' showing the distribution of various taxonomic groups.

Data sharing

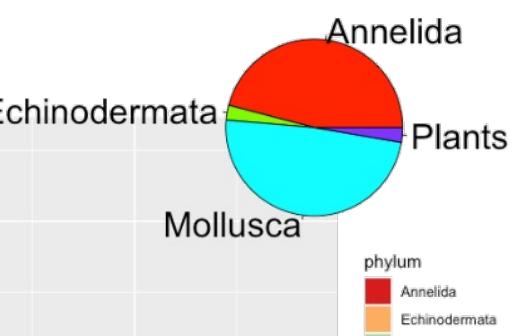
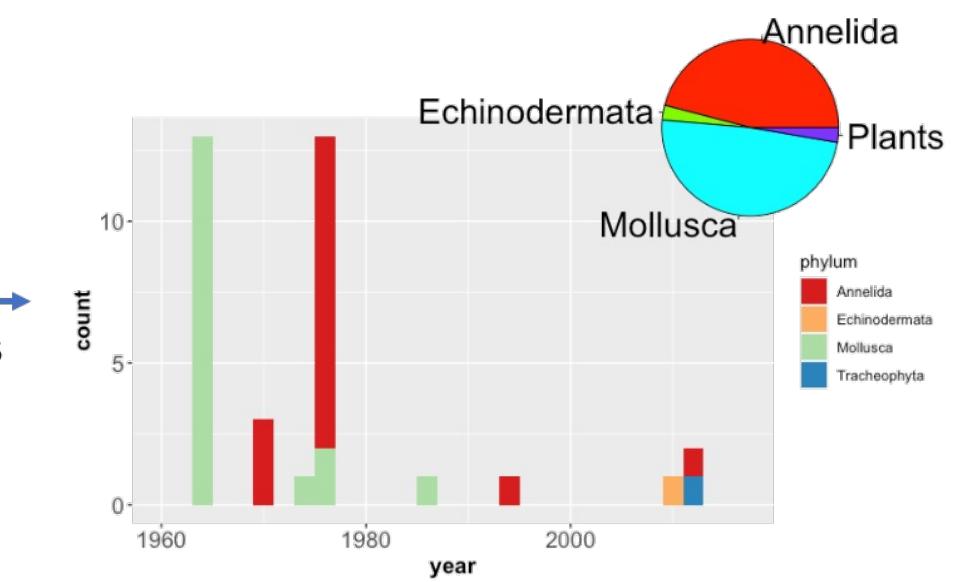
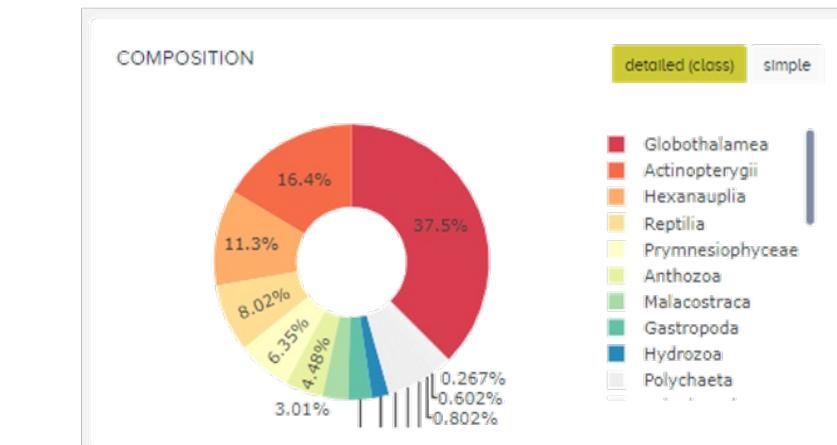
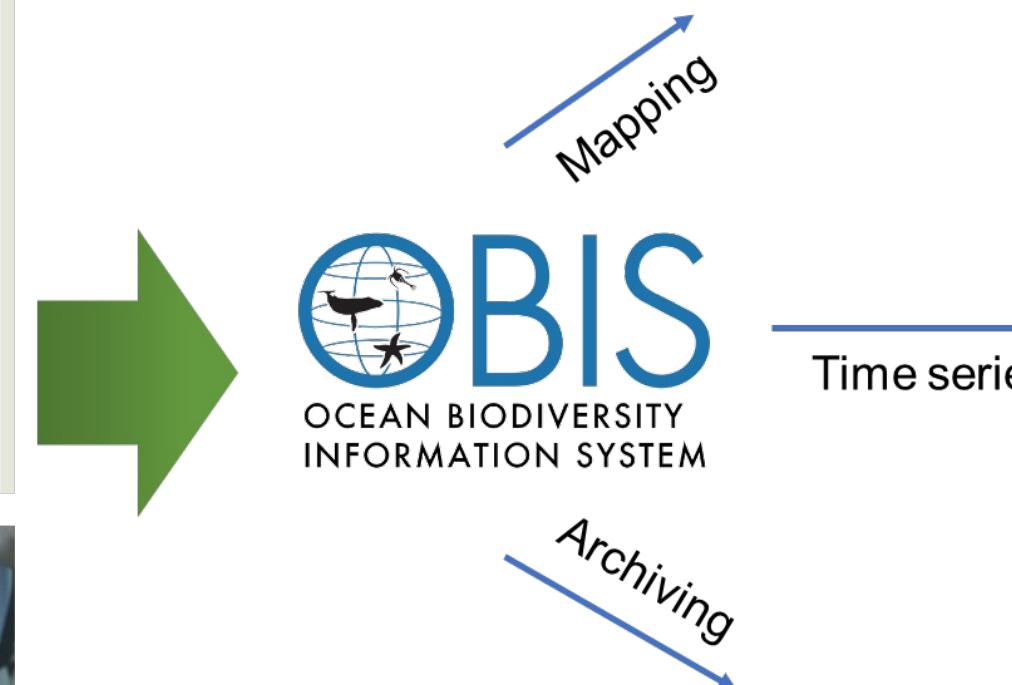
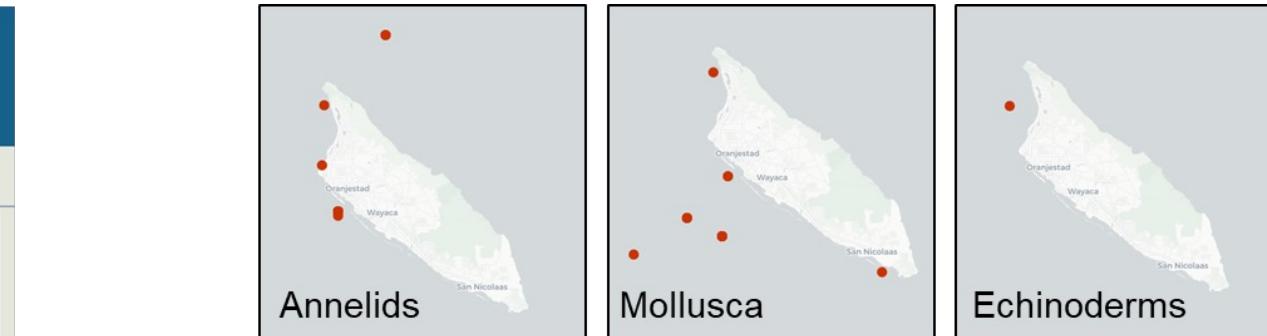
The screenshot shows the 'Methods for Data Science' section of the MBON website. It features a sidebar with 'Field Protocols' and 'Data Science' options. The main content area includes instructions for taxonomy quality control using WoRMS, and a guide for uploading data using the Integrated Publishing Toolkit. A graphic at the bottom right shows various open-source R packages.

Open-source R packages



# MBON Pole to Pole: Building Capacity in Biodiversity Monitoring

The screenshot shows the Ocean Best Practices homepage with a navigation bar: OceanBestPractices Home / MBON: Marine Biodiversity Observing Network / MBON Pole to Pole Protocols / View Item. The main content area is titled "Sampling protocol for assessment of marine diversity on sandy beaches." It includes a logo for the USF MBON GCOO IOOS OBIS, a detailed description of the protocol, and a "Resource URL" link to [https://marinebon.org/p2p/methods\\_field\\_protocols.html](https://marinebon.org/p2p/methods_field_protocols.html).



# Marine Biodiversity Workshops: *From the Sea to the Cloud*

- São Sebastião, Brazil, 6-10 agosto, 2018
- 38 participantes
- 11 países



- Puerto Morelos, México, 2-5 abril, 2019
- 35 participantes
- 12 países



# MBON Pole to Pole: Building Capacity in Biodiversity Monitoring

R<sup>Pubs</sup> by RStudio

## 1 Basic Setup

- 2 Load your data table
- 3 Read file sheets
- 4 Generate IDs
- 5 Assign codes to DATA

## DwC-A Writer

Eduardo Klein and Enrique Montes ([emontesh@usf.edu](mailto:emontesh@usf.edu))

10/7/2020

This script transforms long-format data tables used in rocky intertidal surveys of the Marine Biodiversity Observation Network Pole to Pole of the Americas (MBON Pole to Pole) into Darwin Core Archive (DwC-A) files for publishing data in the Ocean Biodiversity Information System (OBIS) following instructions from this [manual](#). It also generates an integrated file ready for data analysis.

The original R Markdown version of this document is available [here](#).

To test this script, you will need to:

- Install R software and RStudio.
- Create three folders in your working directory: Analysis, Data, IPT.
- Set your working directory to the location of these three folders (e.g. `setwd("~/your directory")`).
- Save the [The DataSheet\\_longformat\\_TEST](#) file in the "Data" folder. This is the data table that you will substitute with your own data.

Now, just copy the code chunks below and paste them into your R console.

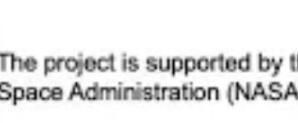
Transform your survey data tables to Darwin Core Archive files (DwC-A):

- [DwC-A Writer](#)
- [Download this test dataset to run DwC-A Writer](#)



## Data management tools of the Marine Biodiversity Observation Network Pole-to-Pole of the Americas

### MBON Pole to Pole



The project is supported by the National Aeronautics and Space Administration (NASA) grant 80NSSC18K0318

# MBON Pole to Pole Data available in OBIS



HOME ABOUT DATA MANUAL MEDIA ACTIVITIES CONTACT

Datasets

**56,938,337** OCCURRENCES

News

OBIS 2.0 released  
January 29, 2019 - OBIS [OBIS 2.0](#)

**OBIS 2.0**  
We are pleased to launch the release of the second version of the OBIS system. While the core functionality remains the same, the system has been completely re-built from the ground up. The most significant changes include a new infrastructure and technology stack, which will allow us to support more data types, better integration and more powerful tools for data analysis.

OBIS Training course, Ciudad de Mexico, Mexico, 14-18 January 2019  
January 21, 2019 - Carolina Peralta, Diana Ugalde and Julian Pizarro [OBIS training](#)

 18 researchers and students from Mexico participated in the OBIS training course held in Mexico City, Mexico, 14-18 January 2019. This week long course was organized by OBIS and the National Autonomous University of Mexico and may also lead to the establishment of a local OBIS node in Mexico.

Report of the 7th Session of the OBIS steering group, 12-16 November 2018, Ostend, Belgium  
November 22, 2018 - OBIS [OBIS Steering Group](#) [Meeting report](#)

MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF GALAPAGOS  
Caribbean OBIS

MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF MONTEMAR  
Caribbean OBIS

MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF PUERTO MADRYN  
Caribbean OBIS

MBON POLE TO POLE: SANDY BEACH BIODIVERSITY OF YUCATAN COAST  
Caribbean OBIS

MBON POLE TO POLE: SANDY BEACH BIODIVERSITY OF BARRA DEL CHUY, URUGUAY  
Caribbean OBIS

MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF CONCEPCION CHILE  
Caribbean OBIS

MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF GORGONA ISLAND  
Caribbean OBIS

MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF FERNANDO DE NORONHA - BRAZIL  
Caribbean OBIS

MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF ARRAIAL DO CABO - BRAZIL  
Caribbean OBIS

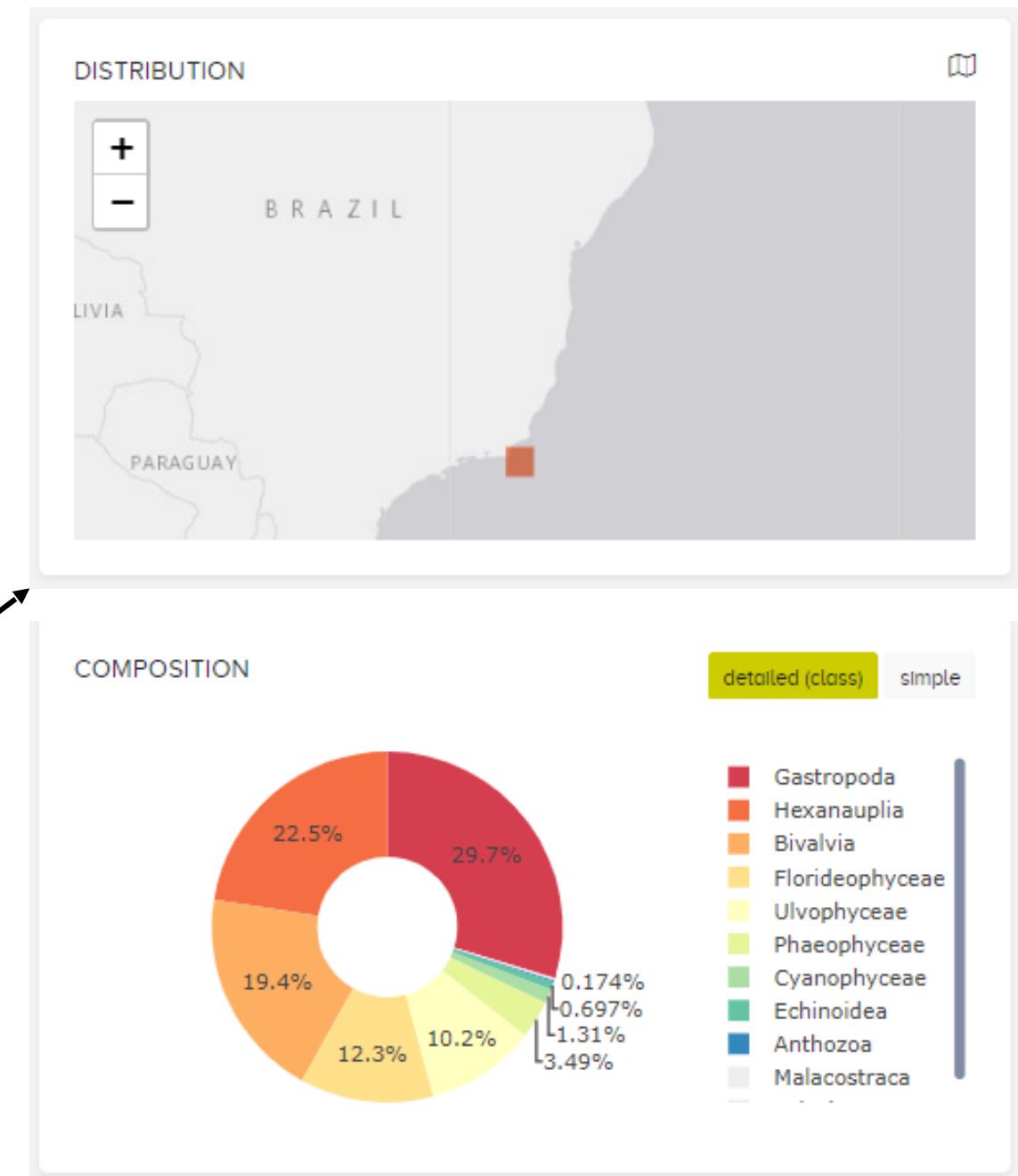
MBON POLE TO POLE: ROCKYSHORE BIODIVERSITY OF COSTA DAS ALGAS, BRAZIL  
Caribbean OBIS



HOME ABOUT DATA MANUAL MEDIA ACTIVITIES

## MBON POLE TO POLE: ROCKY SHORE BIODIVERSITY OF ARRAIAL DO CABO - BRAZIL

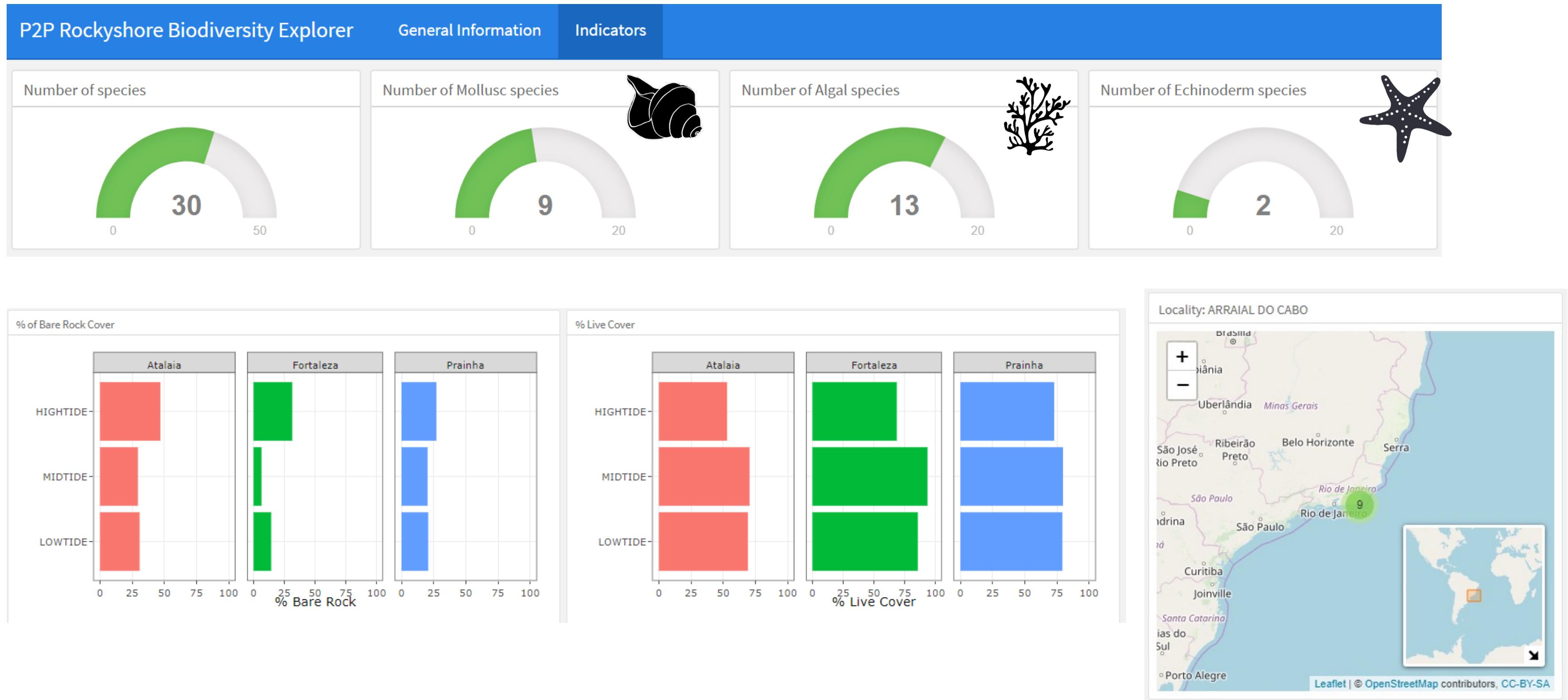
URL <http://ipt.obiis.org/mbon/resource?r=arraialcabodata>  
Repository <http://ipt.obiis.org/mbon/>  
Node Caribbean OBIS  
Published 2019-08-20 22:50



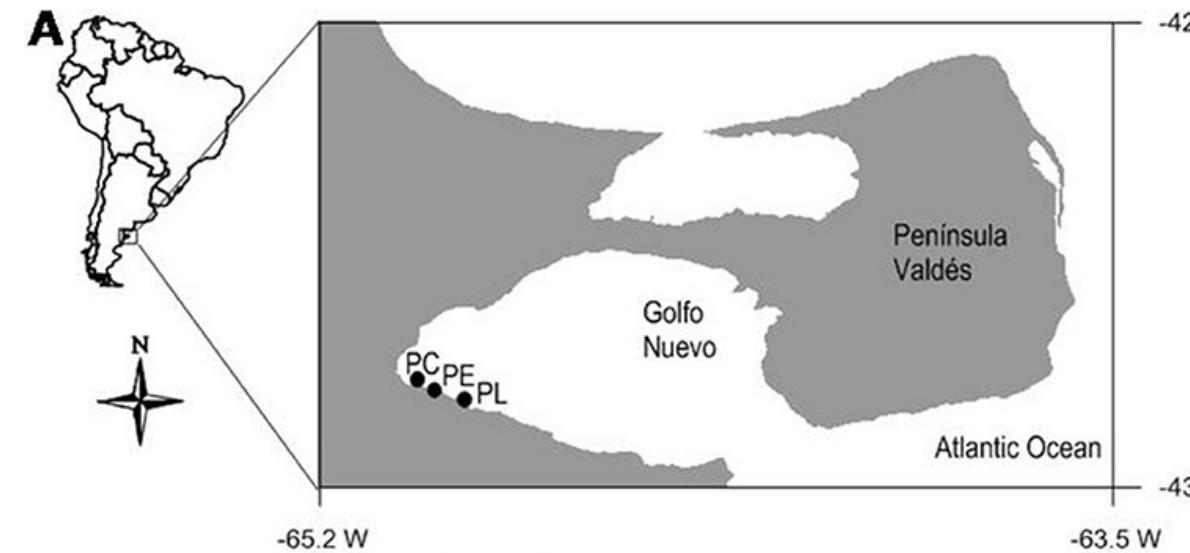
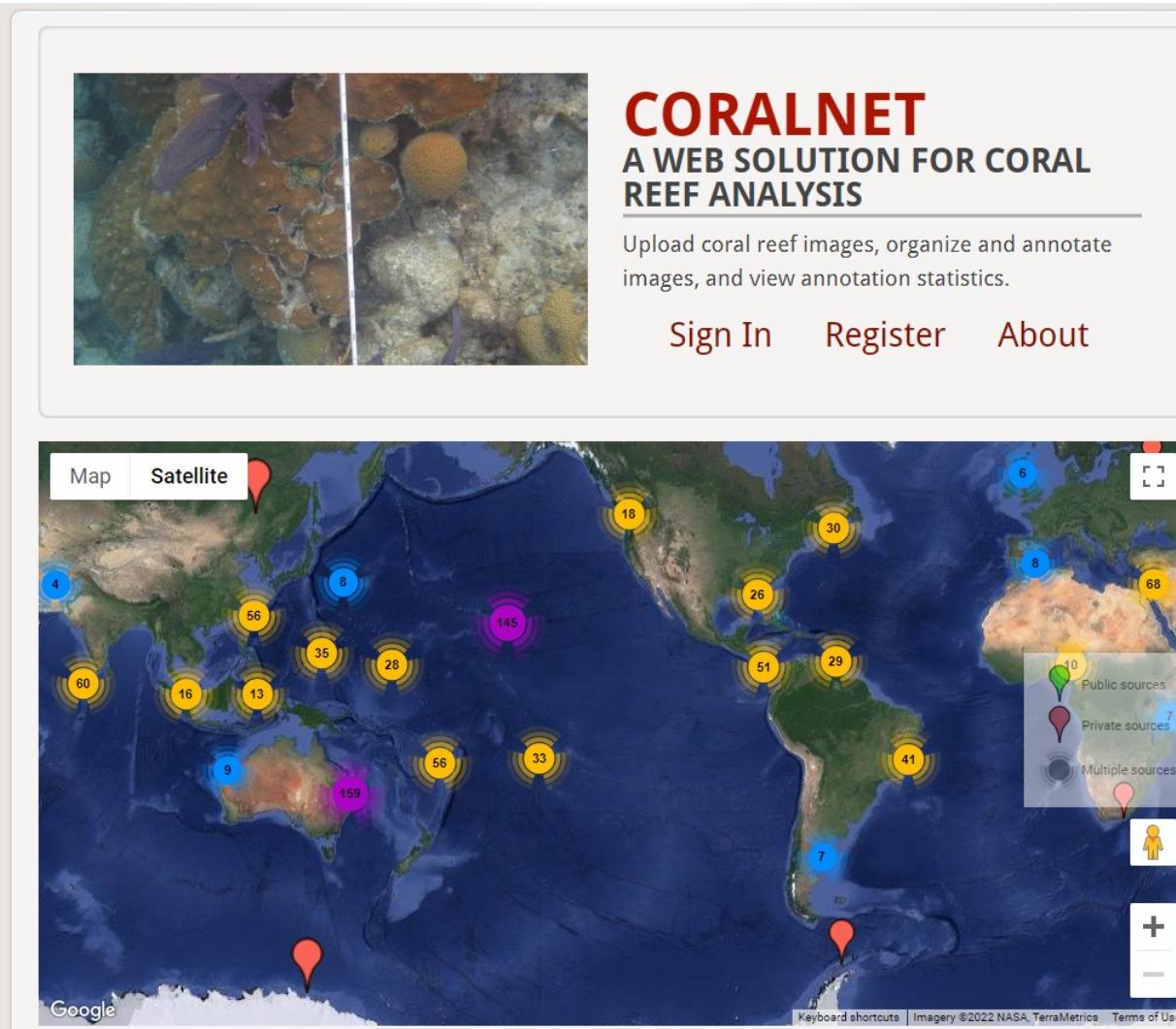
<https://www.gbif.org/en/installation/bd4746e4-c1e1-4a68-8546-10a853c64853>

# Biodiversity Indicators Dashboards

Example: Rocky shore at Arraial do Cabo – Brazil



# Machine-learning applications for biodiversity monitoring



"It took less than a year for mussel cover to drop from 90 to almost 0%"

Mendez et al 2021  
Front. Mar. Sci.  
<https://doi.org/10.3389/fmars.2021.620866>

# Using machine learning to track biodiversity change in the coastal zone

**MBON.Argentina - AR\_PM\_PC\_MT\_20181105\_Q03\_Auto.jpg**

Image Details Annotation Tool Annotation History

Settings Help Controls

Brightness: 0  
Contrast: 0  
Reset

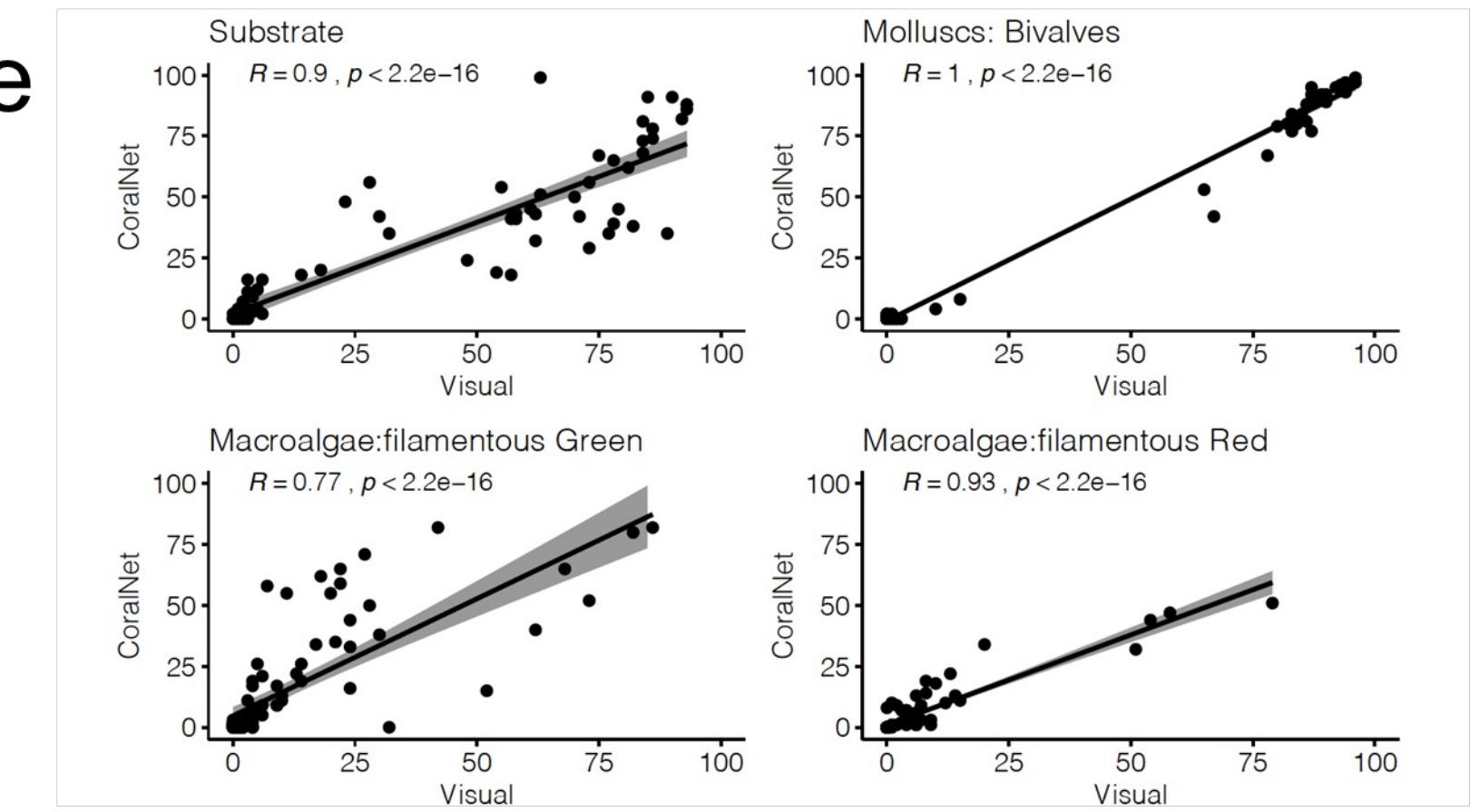
1 MEJI  
2 MEJI  
3 MEJI  
4 MEJI  
5 MEJI  
6 MEJI  
7 aBareRock  
8 aBareRock  
9 MEJI  
10 MEJI  
11 MEJI  
12 MEJI  
13 CIRRIPEDIO  
14 MEJI  
15 MEJI  
16 MEJI  
17 MEJI

ALL DONE

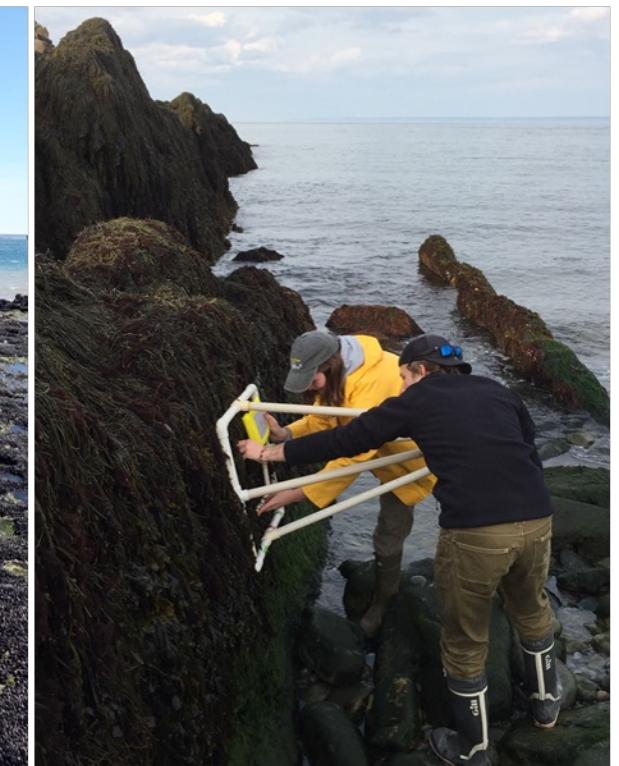
Prev | Next

Image 111 of 390

CIRRIPEDIO	DATIL	MEJI	P.imperfec	SPONGE1	TUBO	SAND	aBareRock	SHELLS	BRYOPSIS
CCA	CERAMIUM	CHAETOMORP	Cldph	COC	CODIUM	ColSin	DIRCTYOTA	ENTEROMORP	FILA
LEATHESIA	POLYSIPHON	RALFSIA	Scyto	ULVA	U.pinnatif				

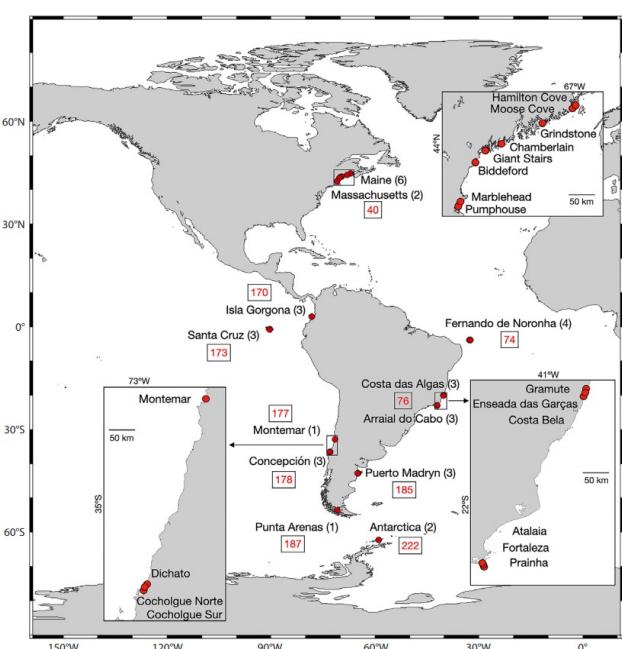
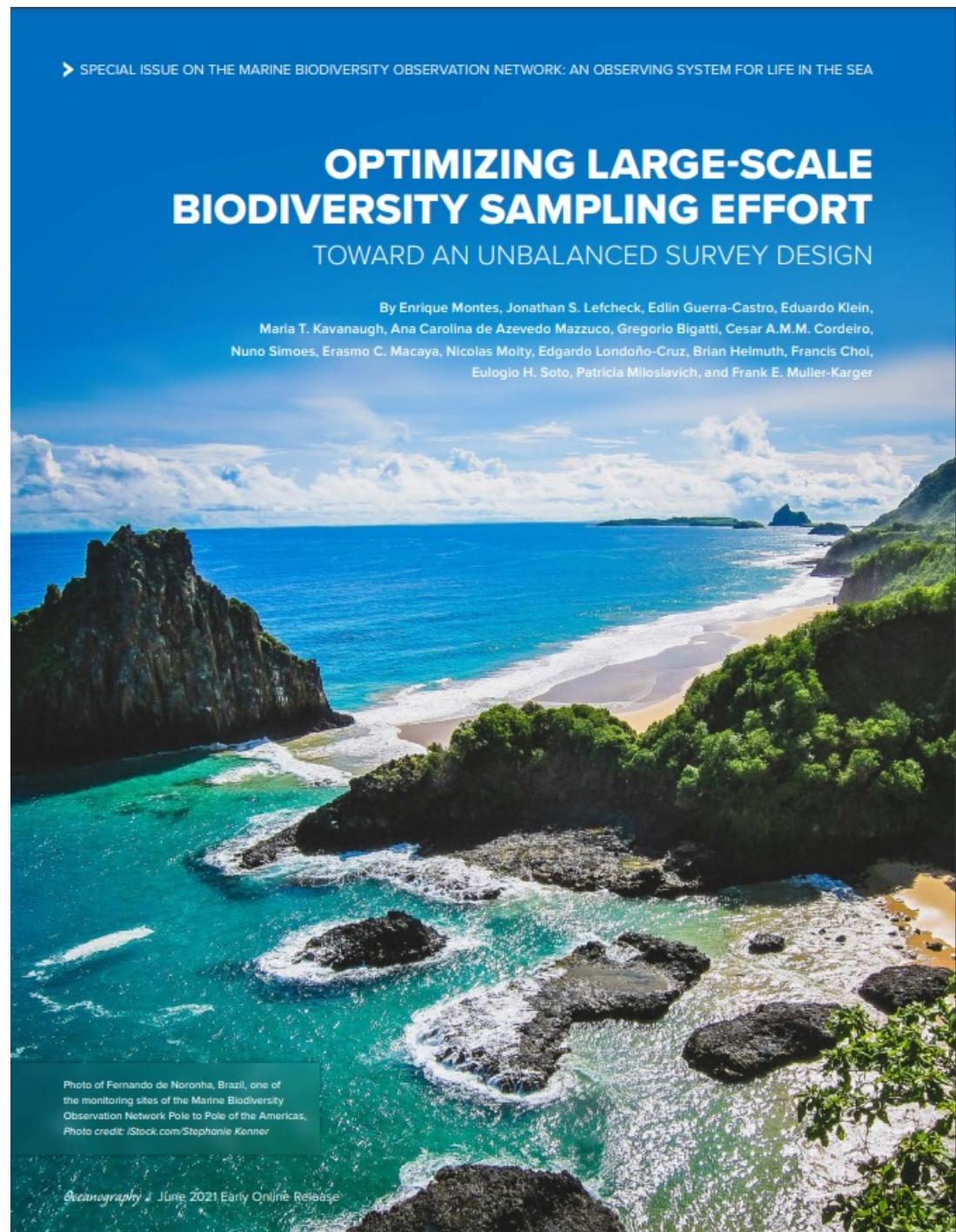


Puerto Madryn, Argentina

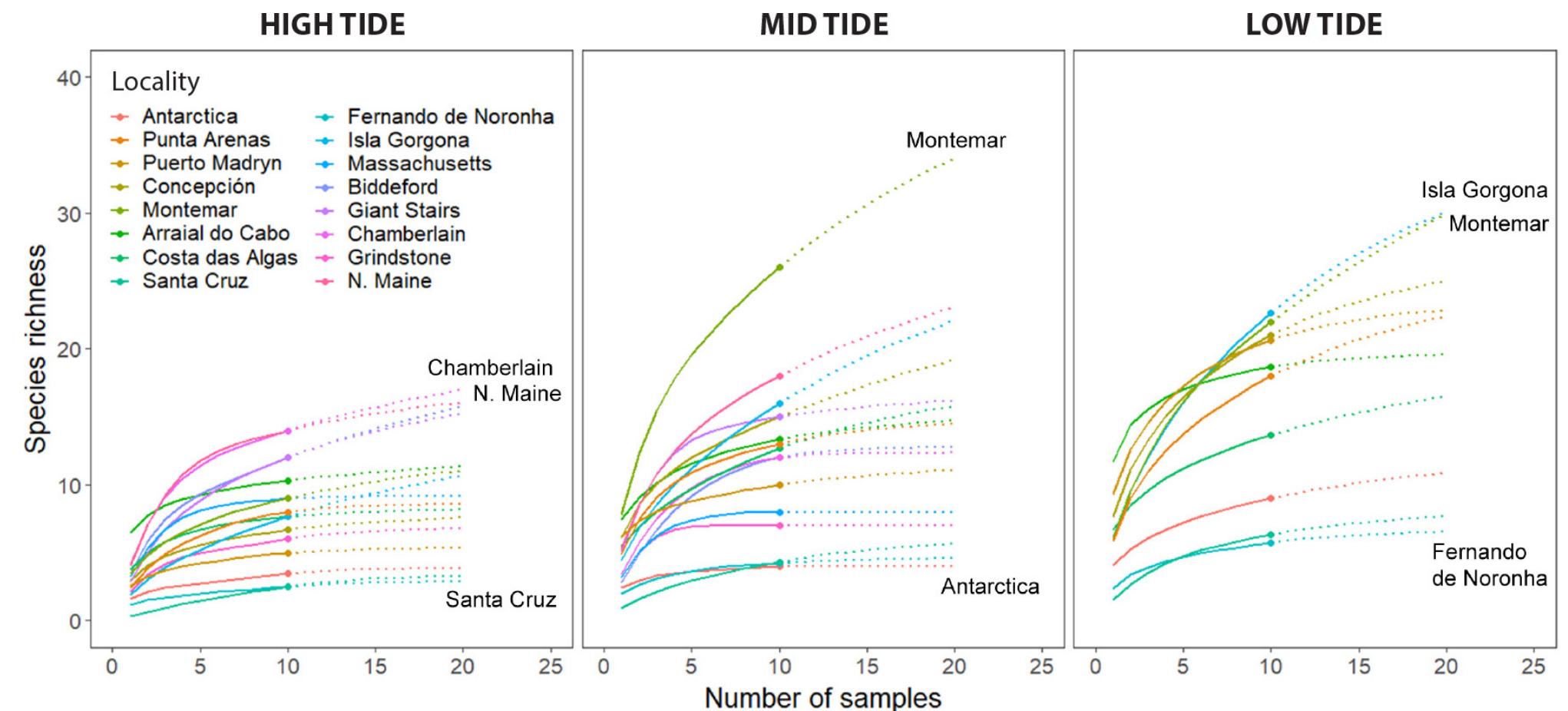
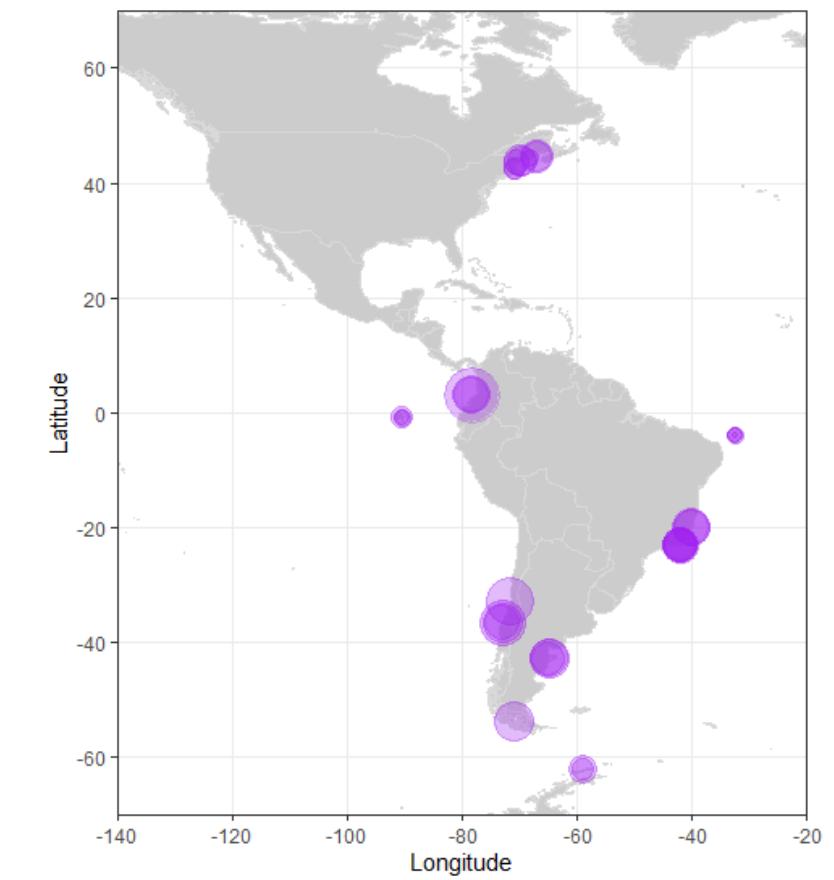


Moose Cove, Maine

# Field sampling effort optimization

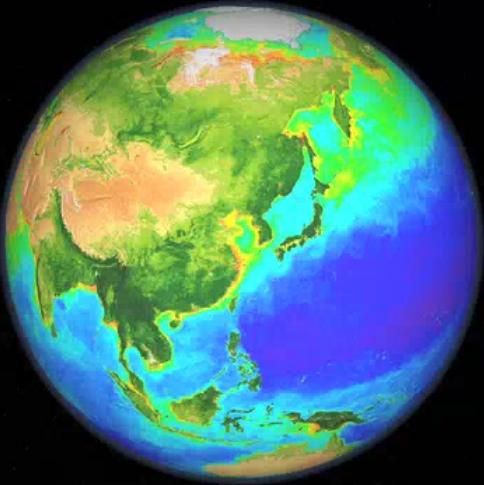


Biodiversity survey at the Cocholgue Sur locality in Concepcion, Chile.

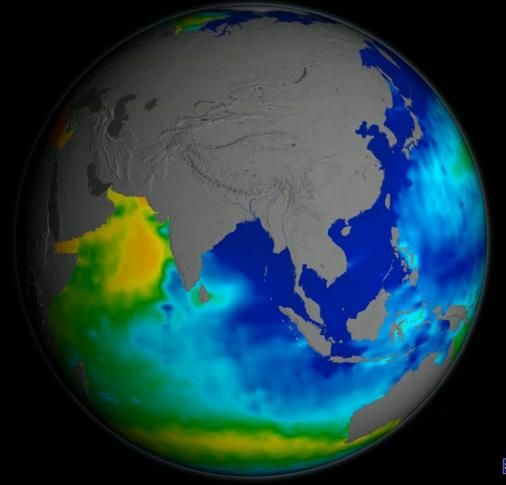


# Dynamic biogeographic seascapes

## Multiple NASA assets



Biology: Ocean Color

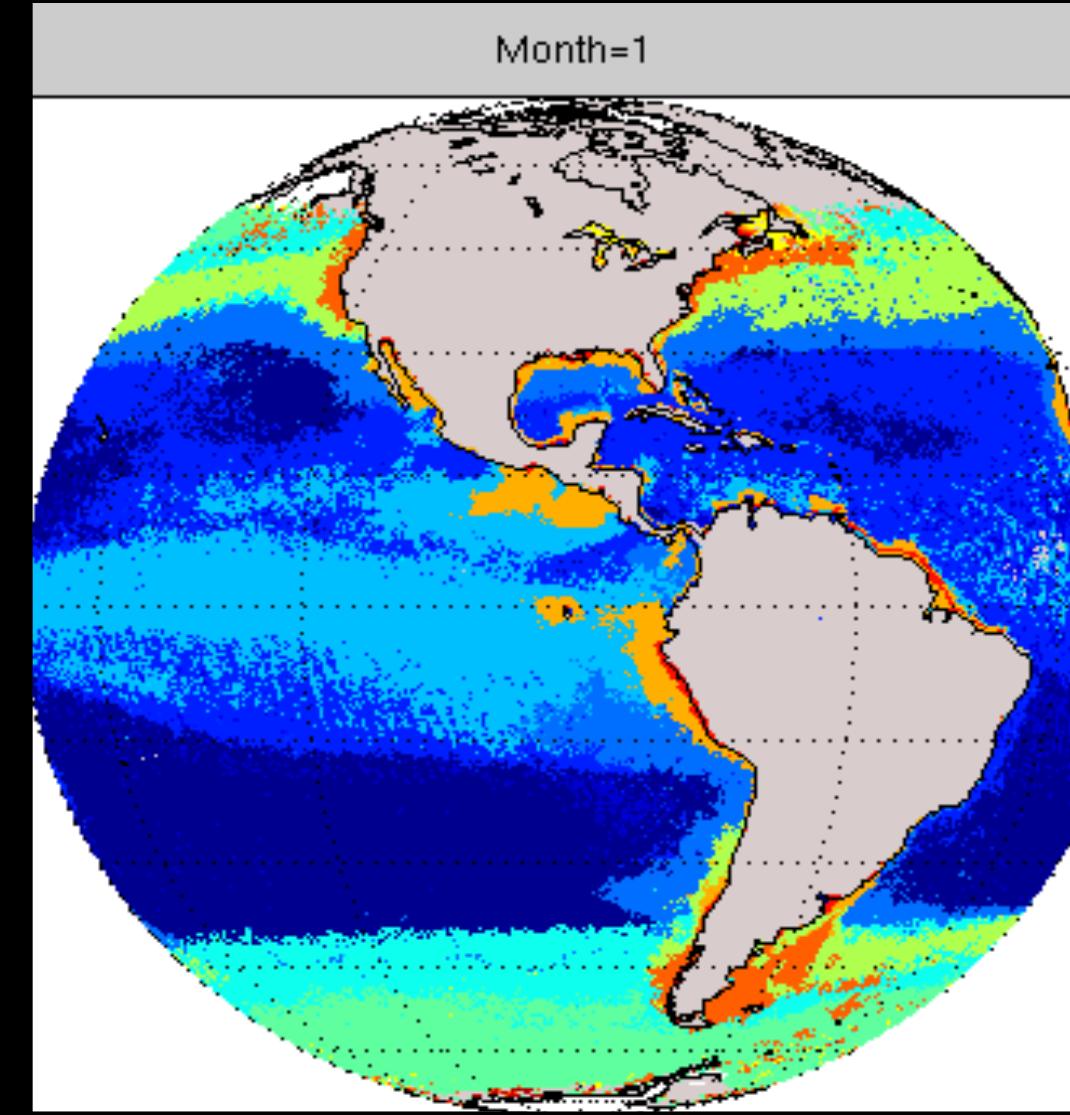


Sep 01, 2011

Physics: e.g.  
SSS, SST, winds, SSHa

Machine  
learning

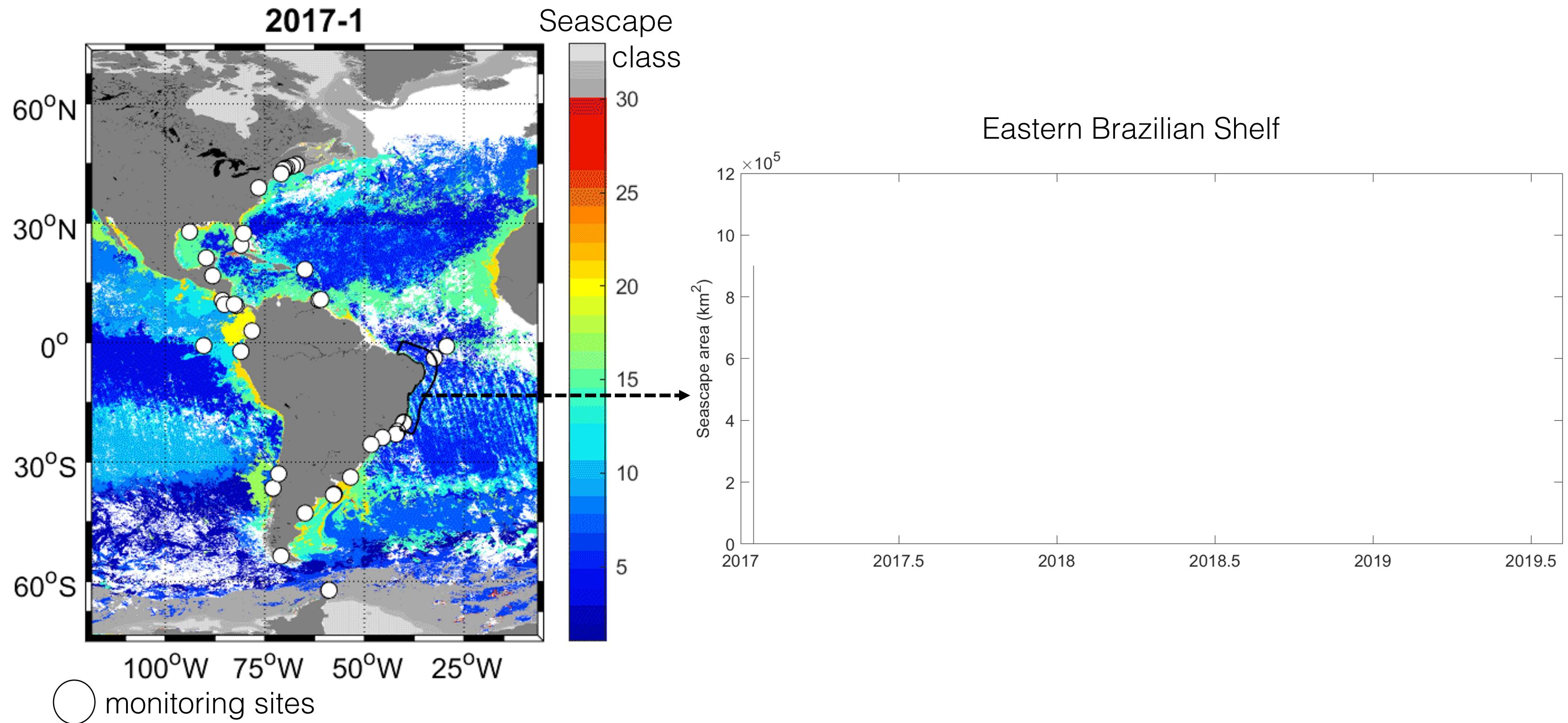
## Global dynamic classification



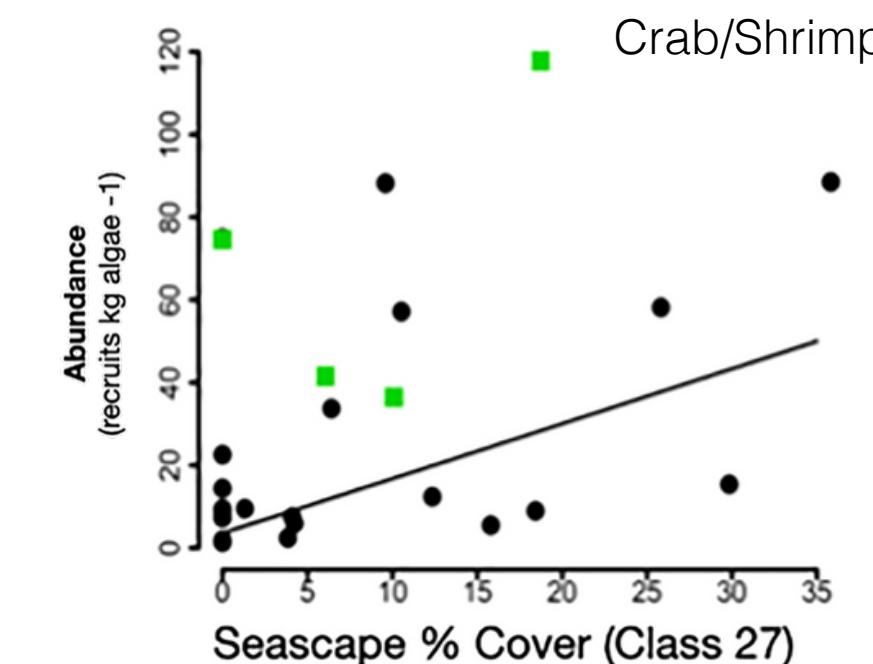
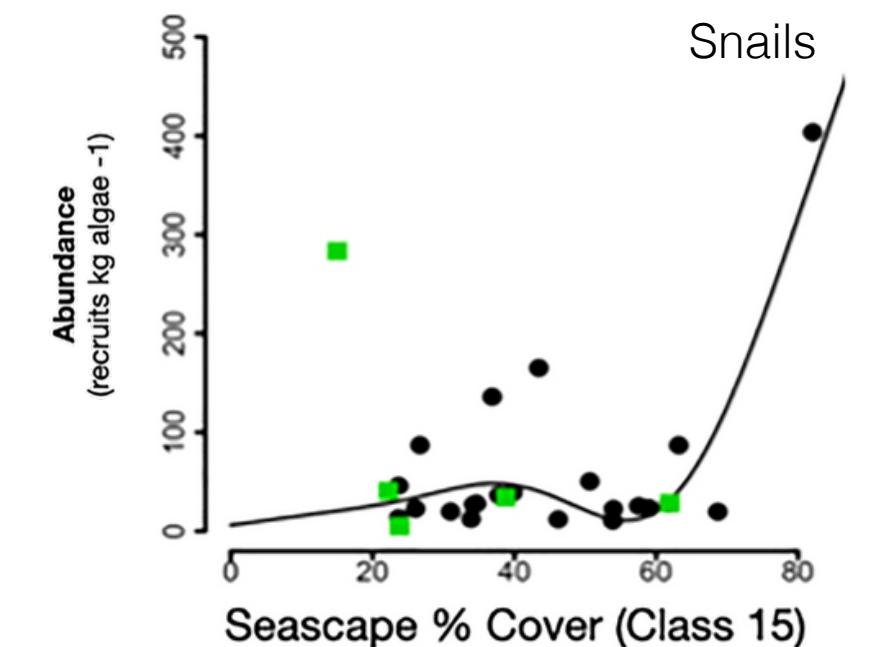
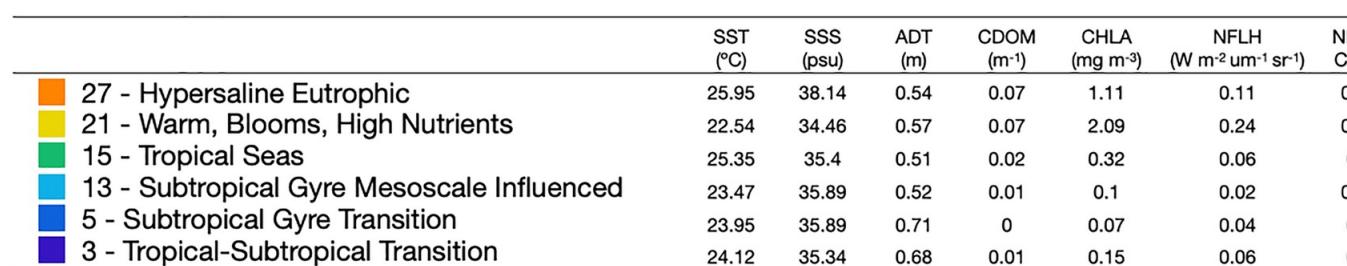
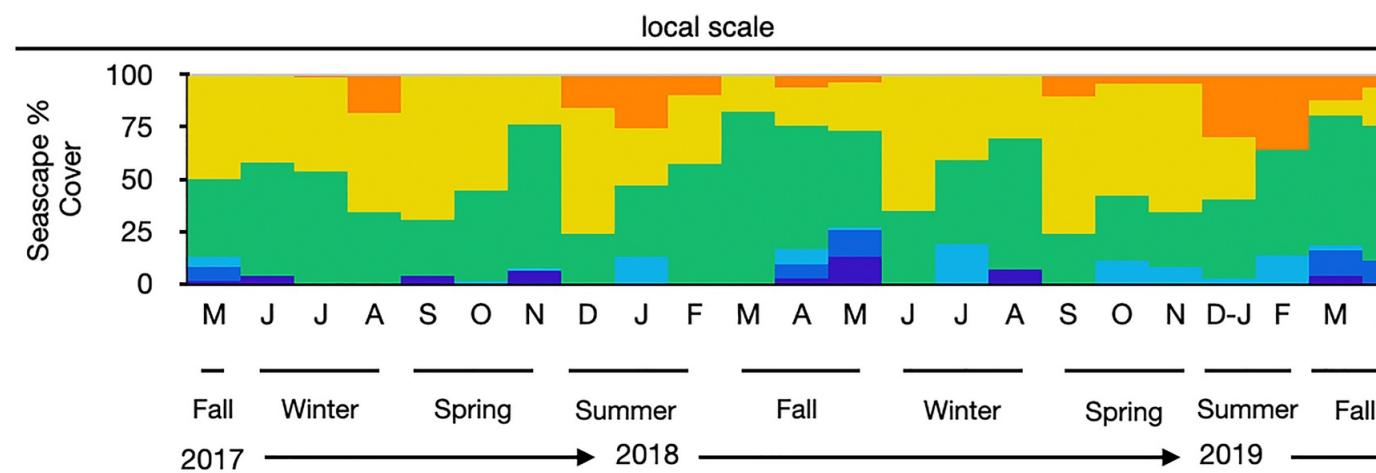
- Globally relevant variables:
  - SST, Chl-a, nFLH, ADT, SSS, CDOM, ice cover
- 8-day and monthly composites
- 5 km pixel resolution
- N= 33 (including sea ice)

# Capacity Building – Use of dynamic seascape maps

Global classification of surface waters at 5 km pixel res.



# Capacity Building – Use of dynamic seascape maps



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nature > scientific reports > articles > article

Article | Open Access | Published: 11 May 2022

## Reef larval recruitment in response to seascape dynamics in the SW Atlantic

Ana Carolina de Azevedo Mazzuco & Angelo Fraga Bernardino

Scientific Reports 12, Article number: 7750 (2022) | Cite this article

# seascapeR

The `seascapeR` package provides functions for fetching, analyzing and visualizing Seascapes, a global and regional dynamic sea water classification product derived from satellite imagery by Maria Kavanaugh (OSU).

In particular, this package is meant to help nodes in the [MarineBON.org](#) network extract Seascapes data, especially across [NOAA Sanctuaries](#), for comparison with biological data from eDNA, sound, telemetry and other observational data to evaluate how dynamic water masses relate to ecosystem function.



## Links

Browse source code at  
<https://github.com/marinebon/seascapeR/>

Report a bug at  
<https://github.com/marinebon/seascapeR/issues>

## License

[Full license](#)

[MIT + file LICENSE](#)

## Developers

Ben Best

Author, maintainer

Enrique Montes Herrera

Author

Maria Kavanaugh

Author

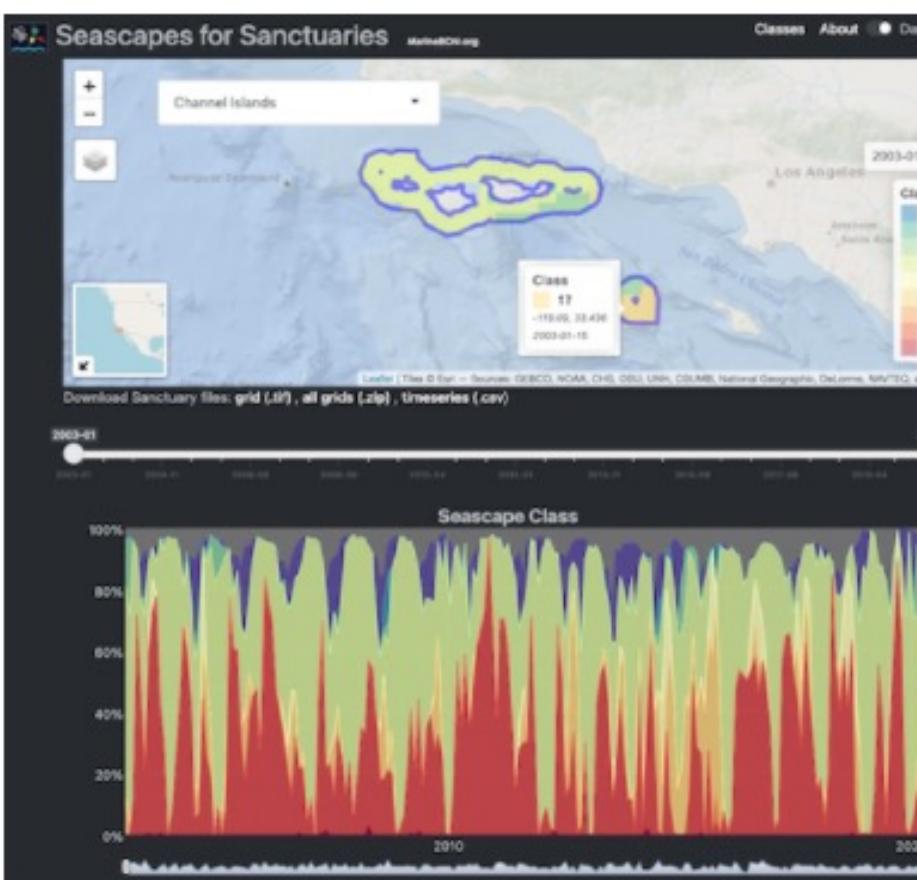
## Dev status

[pkgdown](#) [passing](#)

## Shiny app

Besides the documentation below and in [Get Started](#), to see an example of how `seascapeR` functions get used to fetch data across sanctuaries, check out the [get\\_data.R](#) script. The gathered data from this script then feeds the [Seascapes for Sanctuaries](#) app built with [Shiny](#). To see how the app generates maps and time series plots, see the app's code at [app.R](#). To see how the Seascapes definitions with accompanying relative histograms are rendered in [classes.html](#) see the source [Rmarkdown file classes.Rmd](#).

[Seascapes for Sanctuaries](#) Shiny app:



[Seascapes Classes](#) described:

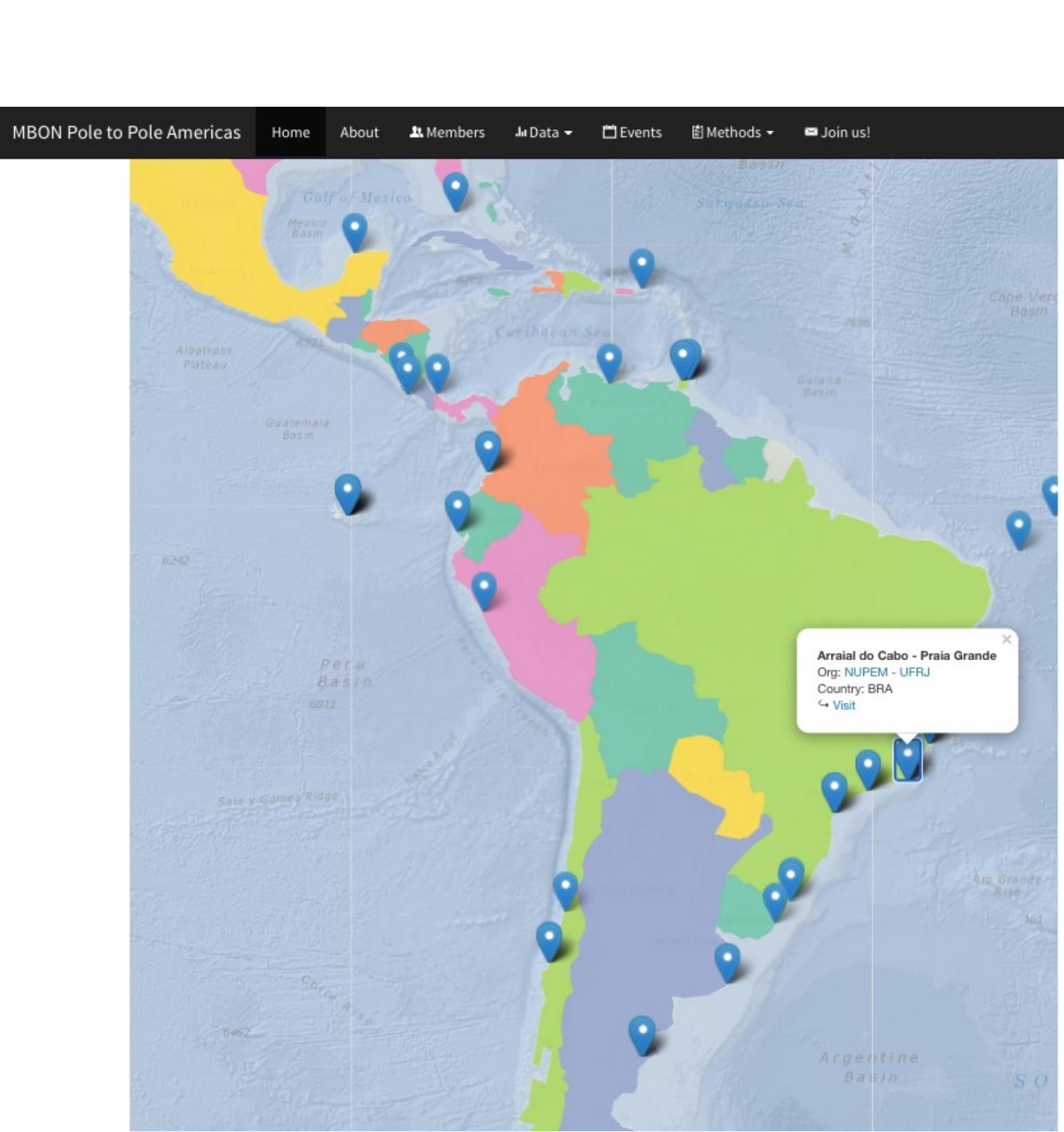
Seascape Global Classes					
1	2	3	4	5	6
7	11	12	13	14	15
16	17	18	19	20	21
22	23	24	25	26	27
28	29	30	31	32	33
34	35	36	37	38	39
40	41	42	43	44	45
46	47	48	49	50	51
52	53	54	55	56	57
58	59	60	61	62	63
64	65	66	67	68	69
70	71	72	73	74	75
76	77	78	79	80	81
82	83	84	85	86	87
88	89	90	91	92	93
94	95	96	97	98	99
100	101	102	103	104	105

1: NORTH ATLANTIC SPRING, ACC TRANSITION

Variable	Class Avg	Relative to All Classes	All Min	All Max
SST (°C) sea surface temperature in degrees Celsius	5.08		0.15	28.25
SSS (psu) sea surface salinity in Practical Salt Units	34.18		27.74	38.14
ADT (m) absolute dynamic topography in meters	-0.37		-1.15	1.10
ICE (%) ice as percent cover	0.00		0.00	90.00
CDOM (m⁻³) colored dissolved organic matter per square meter	0.01		0.00	0.07
CHLA (mg m⁻³) Chlorophyll a per cubic meter	0.21		0.04	2.09
NFLH (W m⁻² μm⁻¹ sr⁻¹) normalized fluorescence line height	0.08		0.01	0.24
NFLH:CHL normalized fluorescence line height chlorophyll component	0.37		0.05	0.79

• CLASS: 1  
• NAME: NORTH ATLANTIC SPRING, ACC TRANSITION  
• LATITUDE: SUBPOLAR  
• DOMINANT HEMISPHERE: SOUTH  
• DOMINANT SEASON: SPRING-AUTUMN

# MBON Pole to Pole site



MBON Pole to Pole Americas Home About Members Data Events Methods Join us!

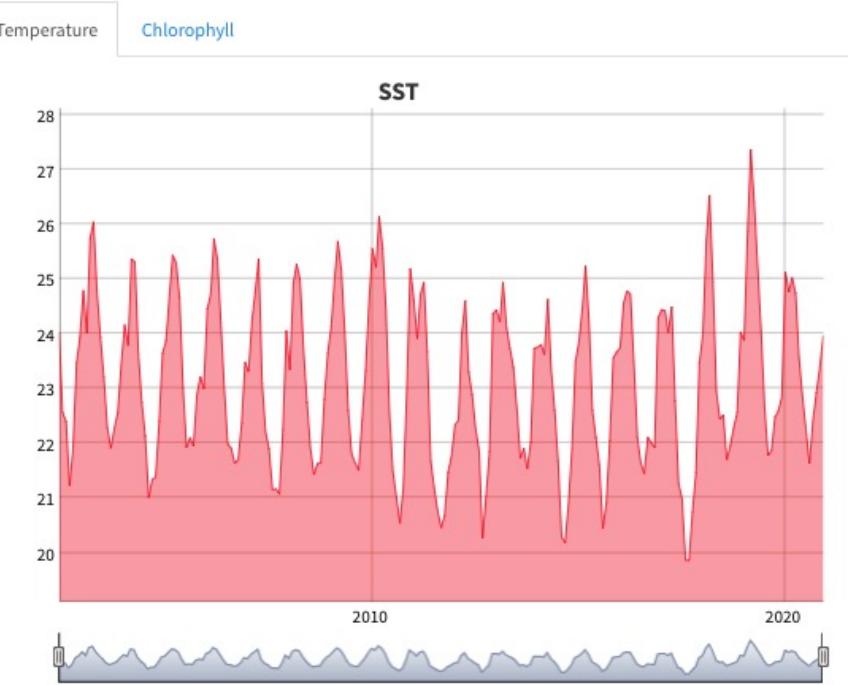
## Site: Arraial do Cabo - Atalaia

- Country: BRA
- Organization: LECAR - UFF

### Photos



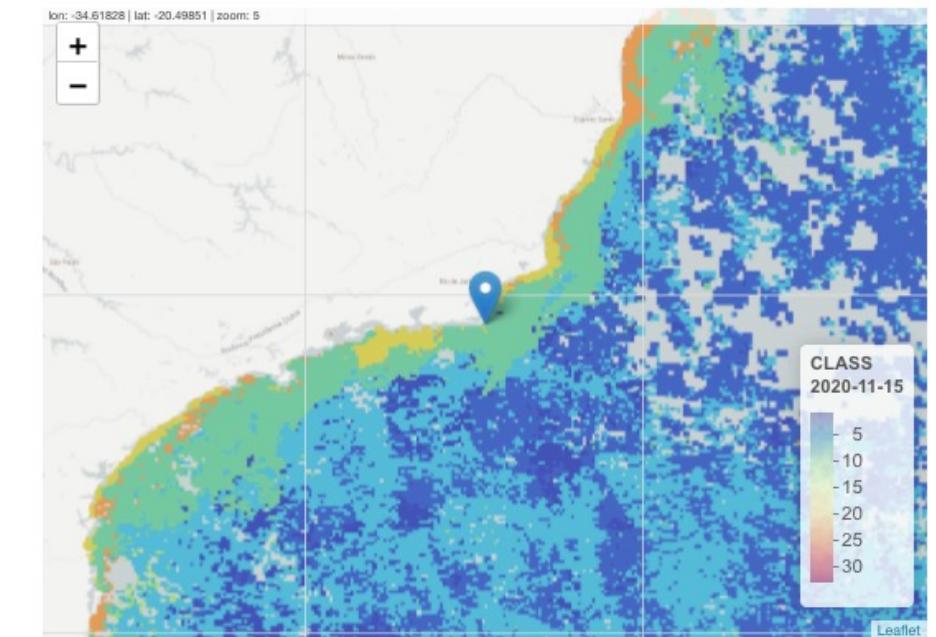
### Timeseries



## Maps

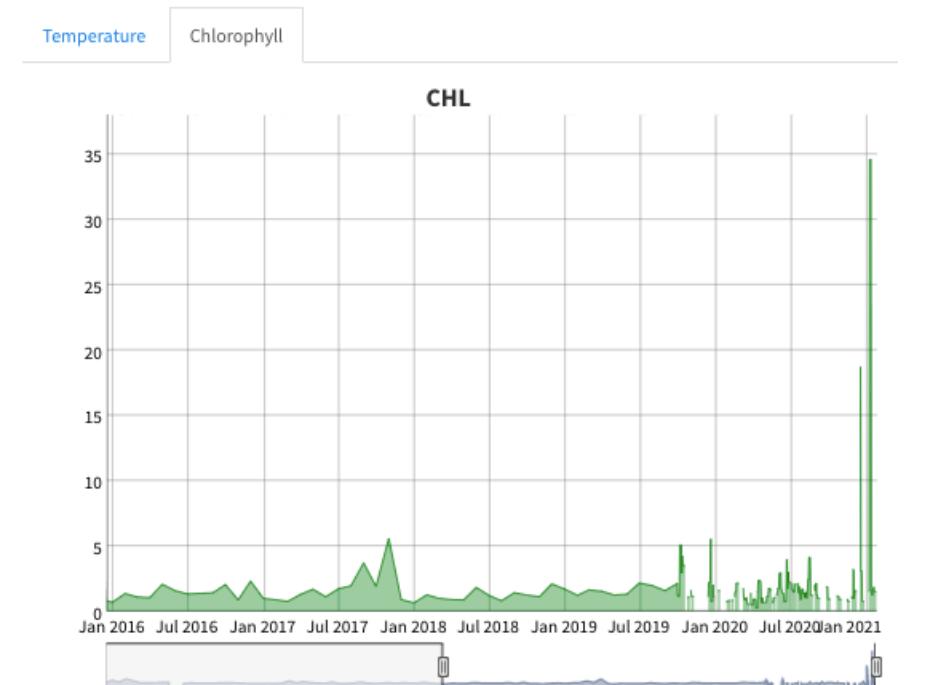
Temperature Chlorophyll Seascape

Map of the most recent (2020-11-15) seascapes around the site. Data Source: AOML CWC GOM via ERDDAP.



Read more about seascapes [here](#).

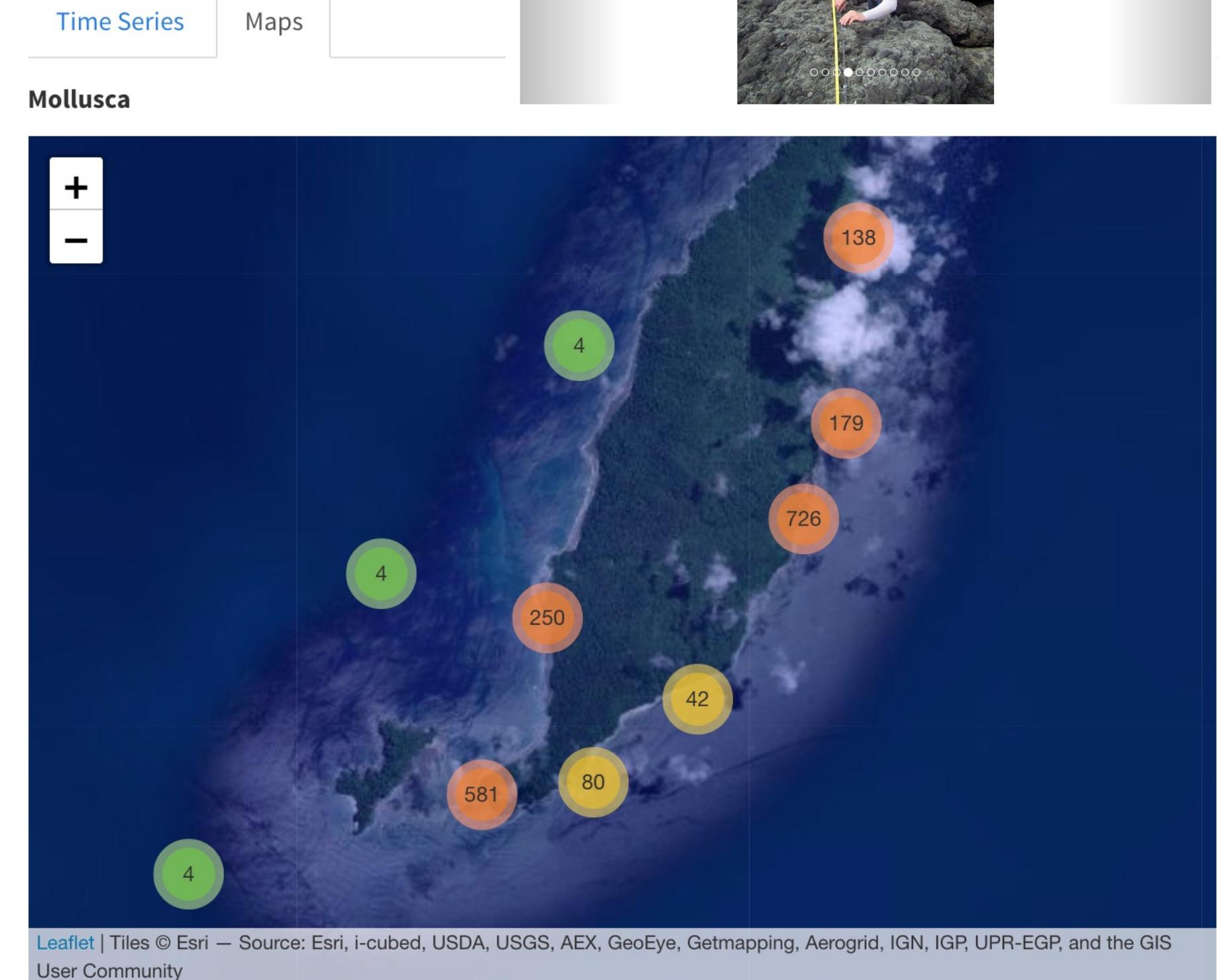
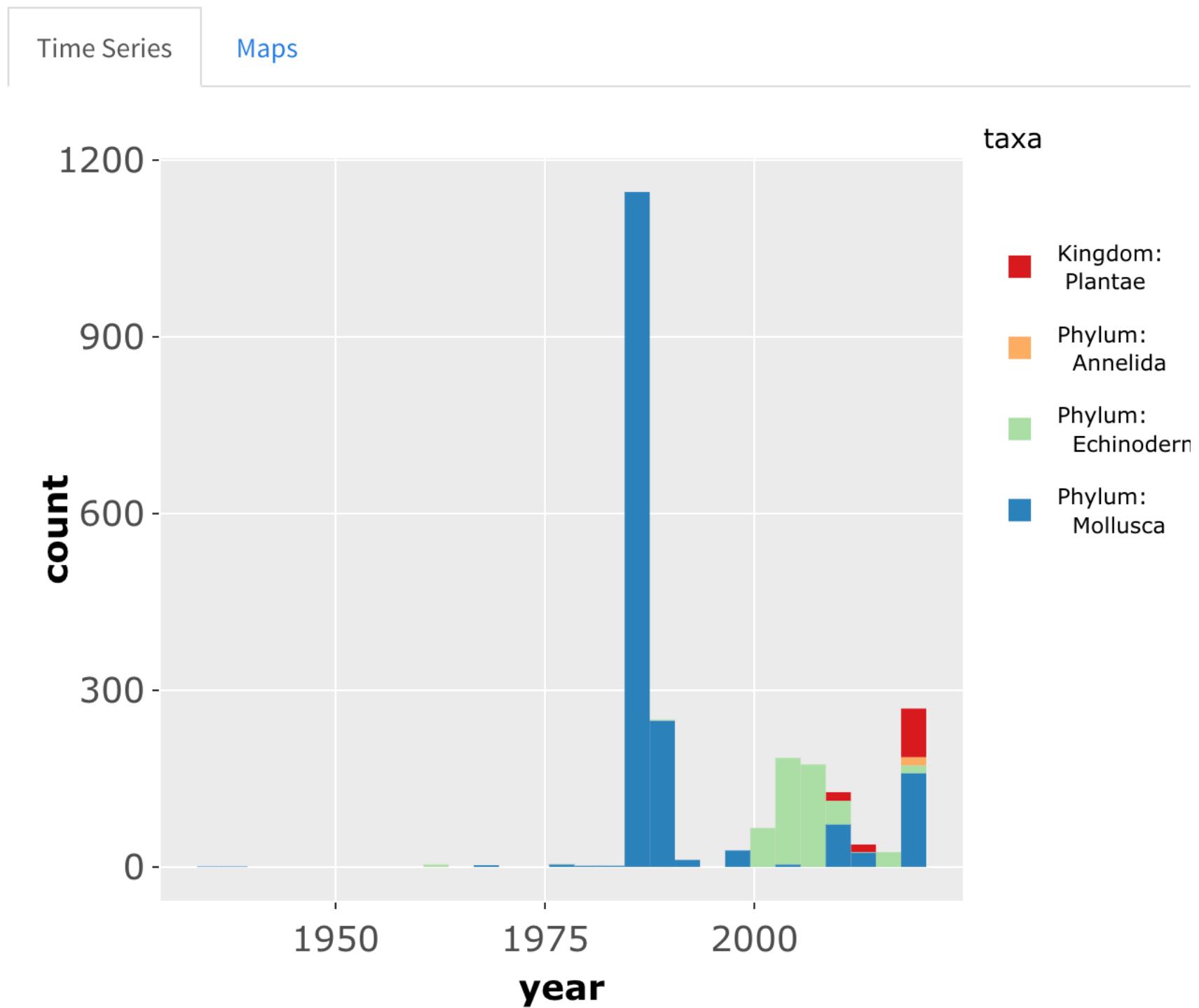
### Timeseries



Download data: [chl\\_bra-arraialdocabo-atalaia.csv](#)

# MBON Pole to Pole Website

Taxonomic records in OBIS



# *In situ* environmental monitoring: temperature records every 30 min

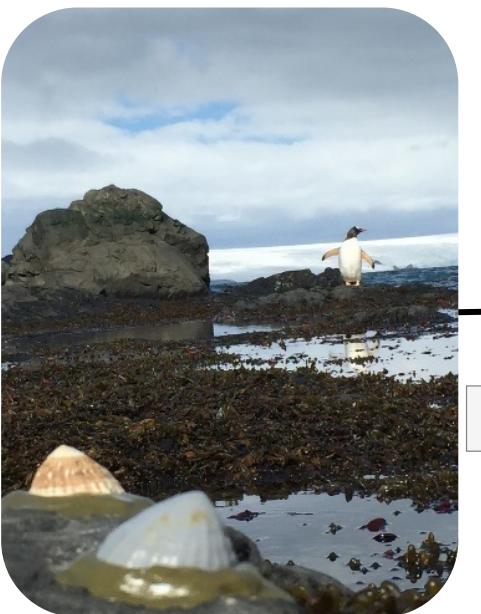
Nicolás Moity (CDF)



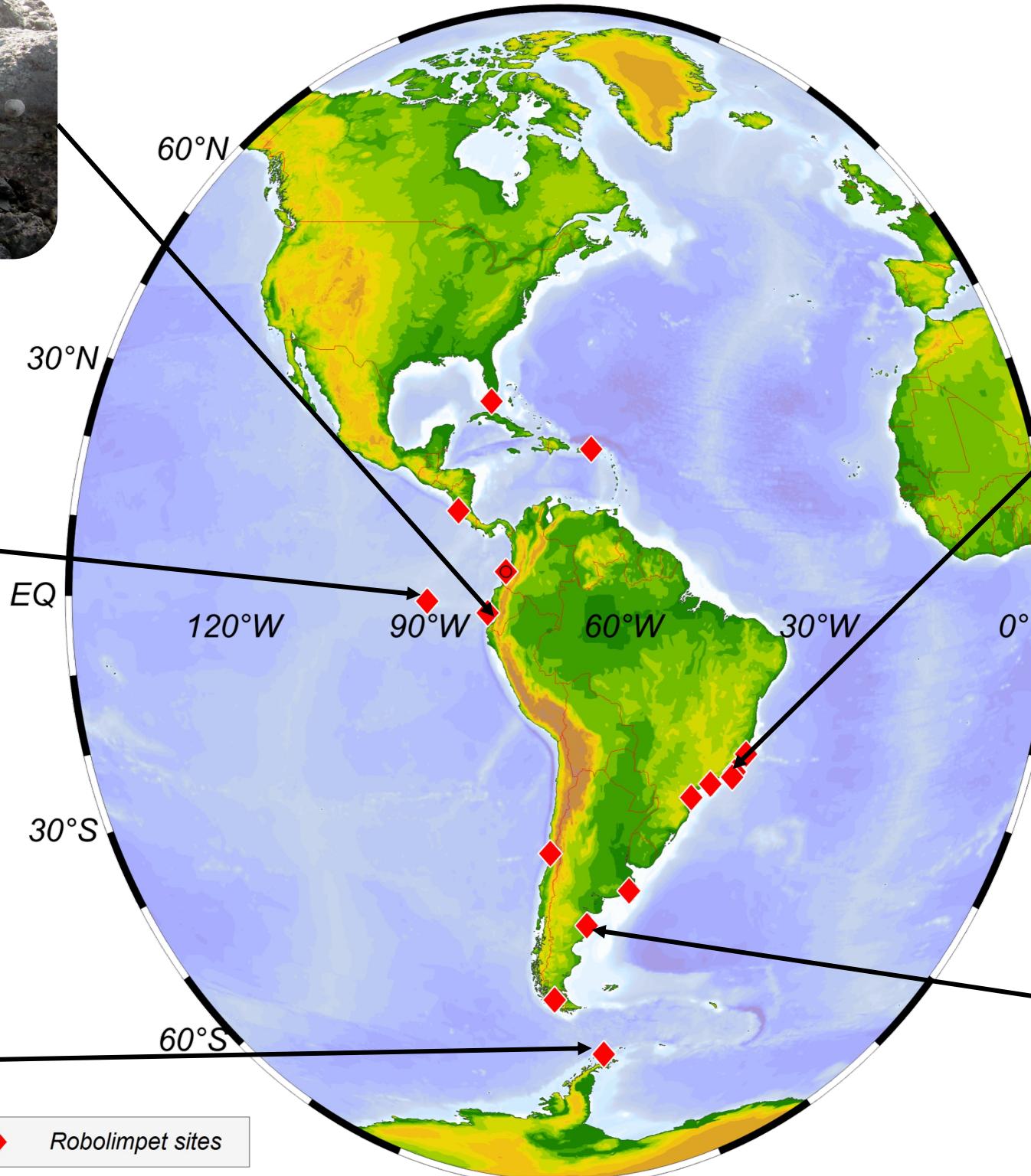
E. Londoño-Cruz (U. Valle)



Erasmo Macaya  
(U Concepcion)



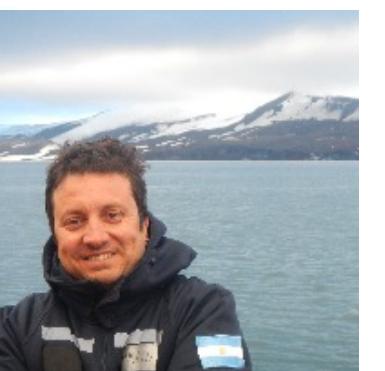
◆ Robolimpet sites



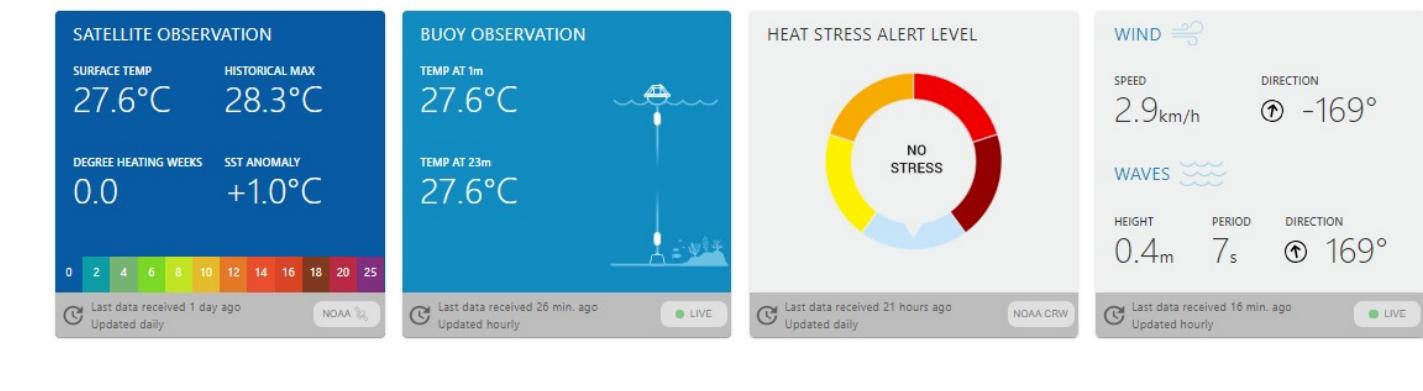
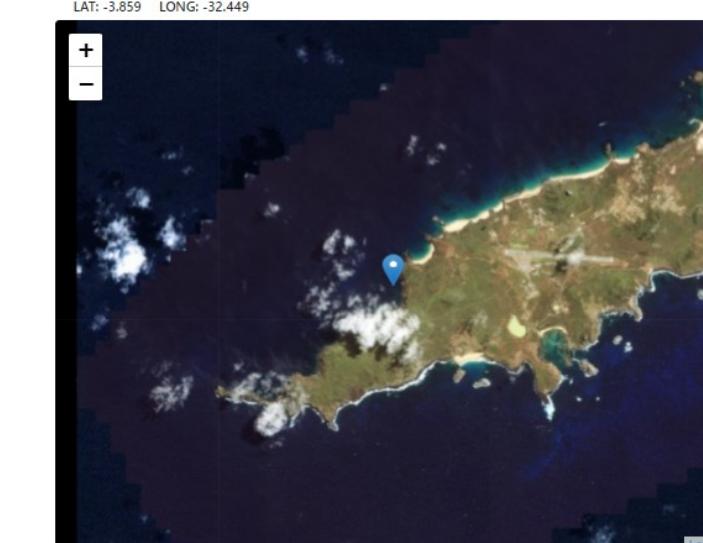
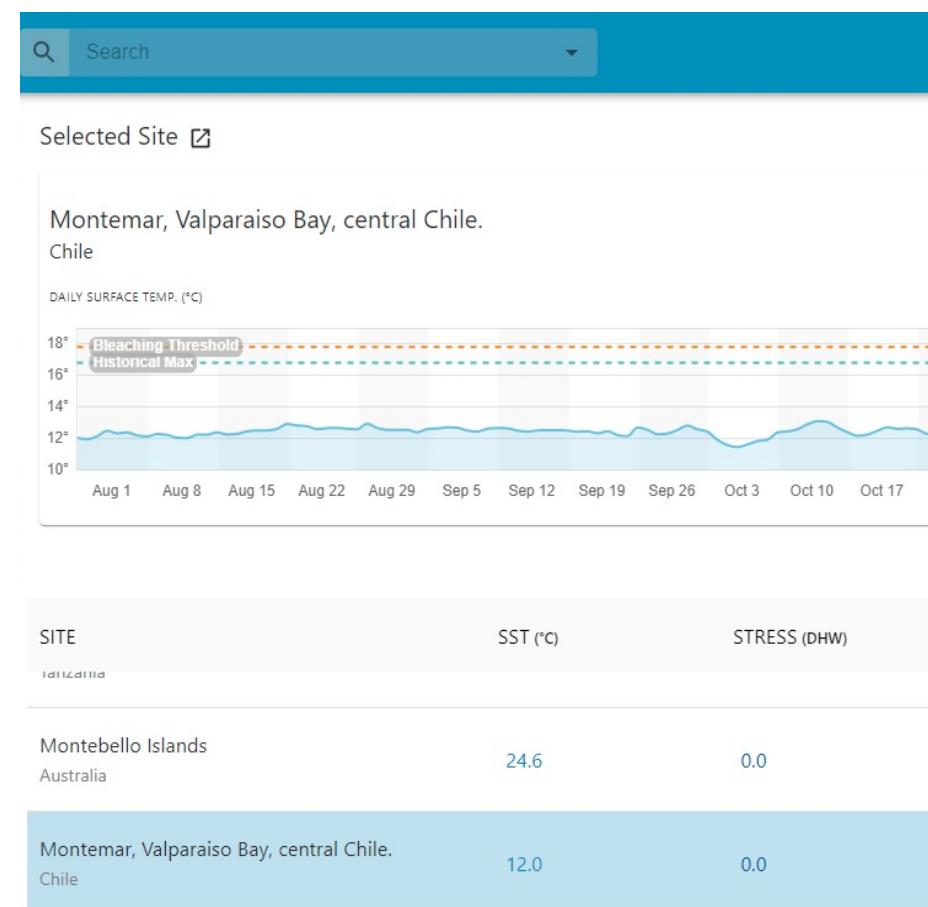
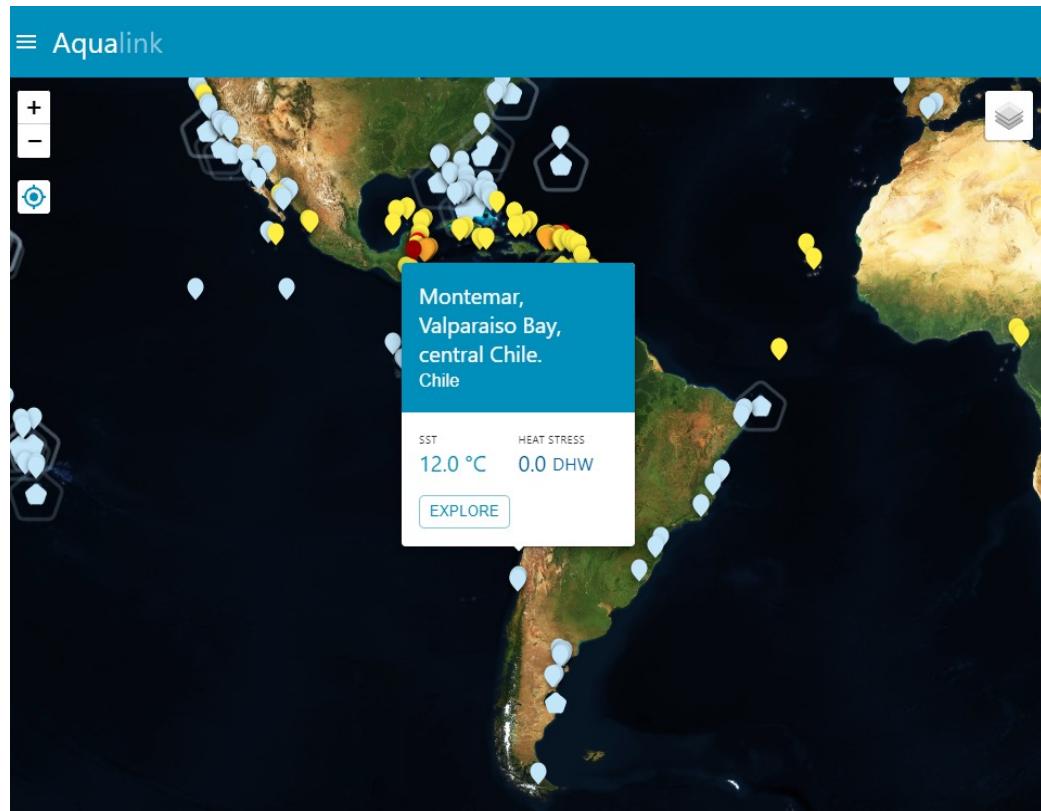
Ana C. Mazzuco  
(UFES)



Gregorio Bigatti  
(CONYCET)



# Aqualink Smart Buoys



# ALL-ATLANTIC OCEAN RESEARCH FORUM 2022

31 MAY - 2 JUNE Scientific Event  
Brasília, Brazil

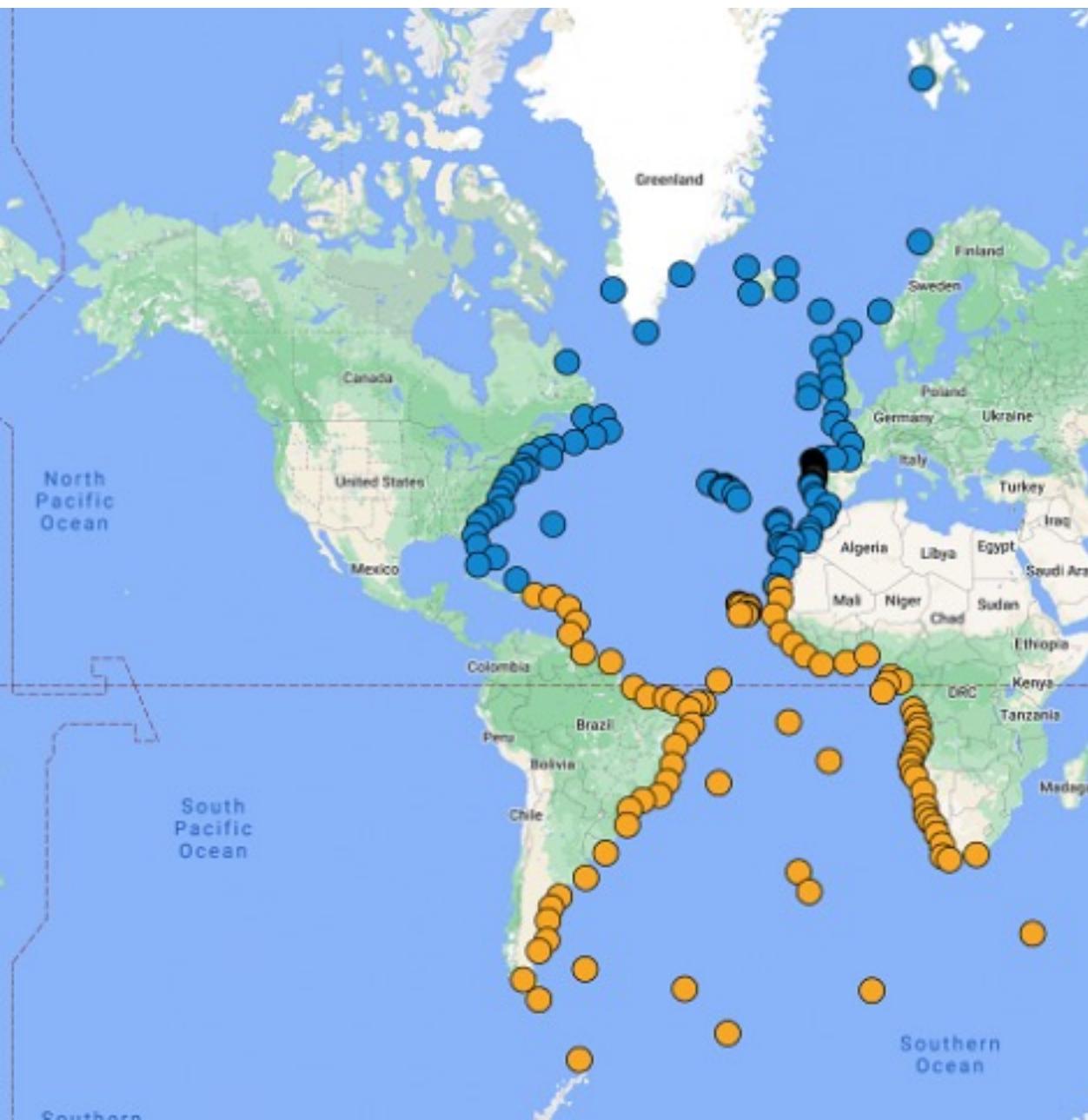
12 - 14 JULY Ministerial Event  
Washington D.C., United States of America



**MBON**  
Marine Biodiversity  
Observation Network



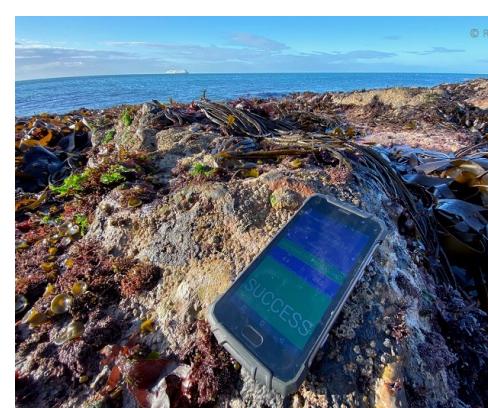
## CCTBON – Atlantic Ocean Coupled Coastal Temperature and Biodiversity Observation Network



Fernando Pádua Silva e Lima  
Position: Auxiliary Researcher  
Group: MARCHANGE  
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- Foster trans-Atlantic and trans-latitudinal collaboration
- Respond to management and policy needs
- Invest in capacity development of the south Atlantic
- Ensure national and regional government financial support for network collaborations

## MBON Pole to Pole Project

Welcome! We are developing a Community of Practice across the Americas to assess marine biodiversity and ecosystem change using field and space observations.

Learn about ongoing biodiversity monitoring efforts contributing to the network by clicking markers on the map



## Join the MBON Pole to Pole program!

We invite marine ecologists and biological oceanographers, resource managers, and conservation groups to contribute to the MBON Pole to Pole network. Groups and individuals conducting repeated sampling in one or more locations in their countries are encouraged and welcome to [join the program](#).

To participate, please fill out the form below.

**MBON Pole to Pole of the Americas**

You will be contacted upon completion of this form. Thank you!

**enriquemontes01@gmail.com** [Switch account](#)

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