


Coastal and marginal sea observing instrumentation

Tommy Bornman & Greg Cowie






Why observe the coast?

- One of the priority Future Actions for the Ocean Decade is: Ocean Observations and Forecasting Systems for Africa
- Needed for: climate change, coastal hazards, forecasts and warnings, ocean health, fisheries management, etc.

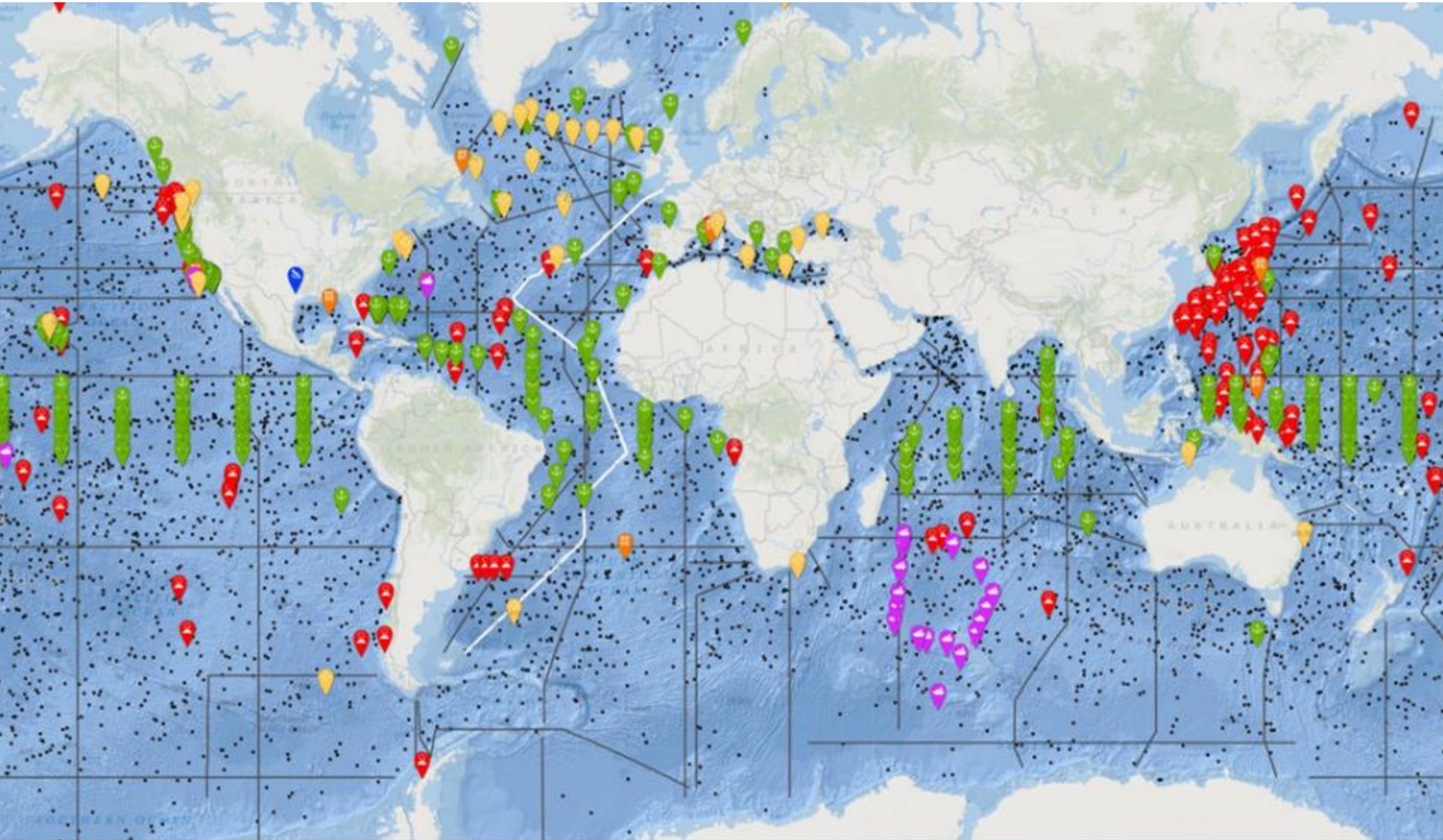
Sustainable ocean observing

- What are the most critical data required for operational purposes?
- What observations need to be conducted locally on a smaller scale for enhancement of the blue economy?
- Can this be achieved using global datasets and remote sensing products?



The Global Ocean Observing System

Ocean Observatories



DEIMS
Site | Data | Environment

ILTER
International Long-Term Ecological Research Network

frontiers in Marine Science

REVIEW

ILTER – The International Long-Term Ecological Research Network as a Platform for Global Coastal and Ocean Observation

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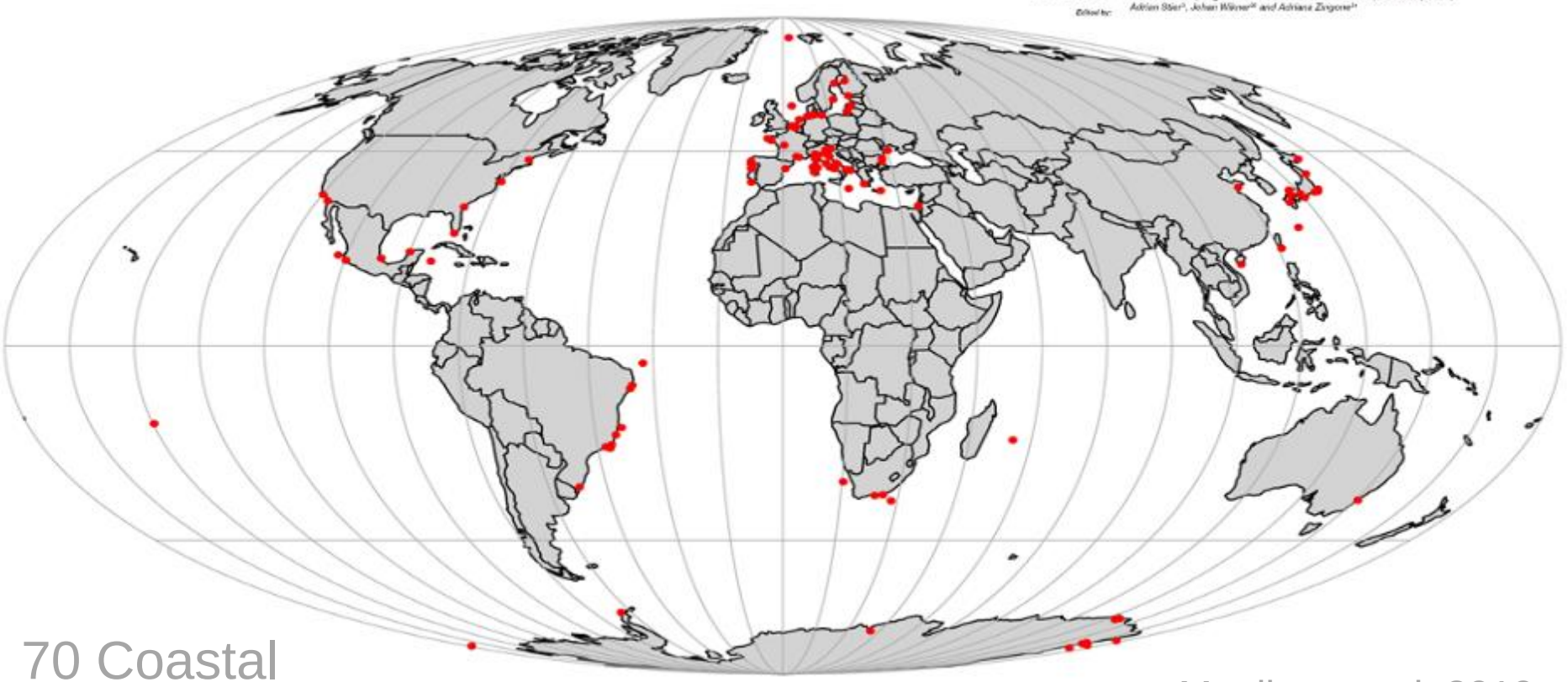
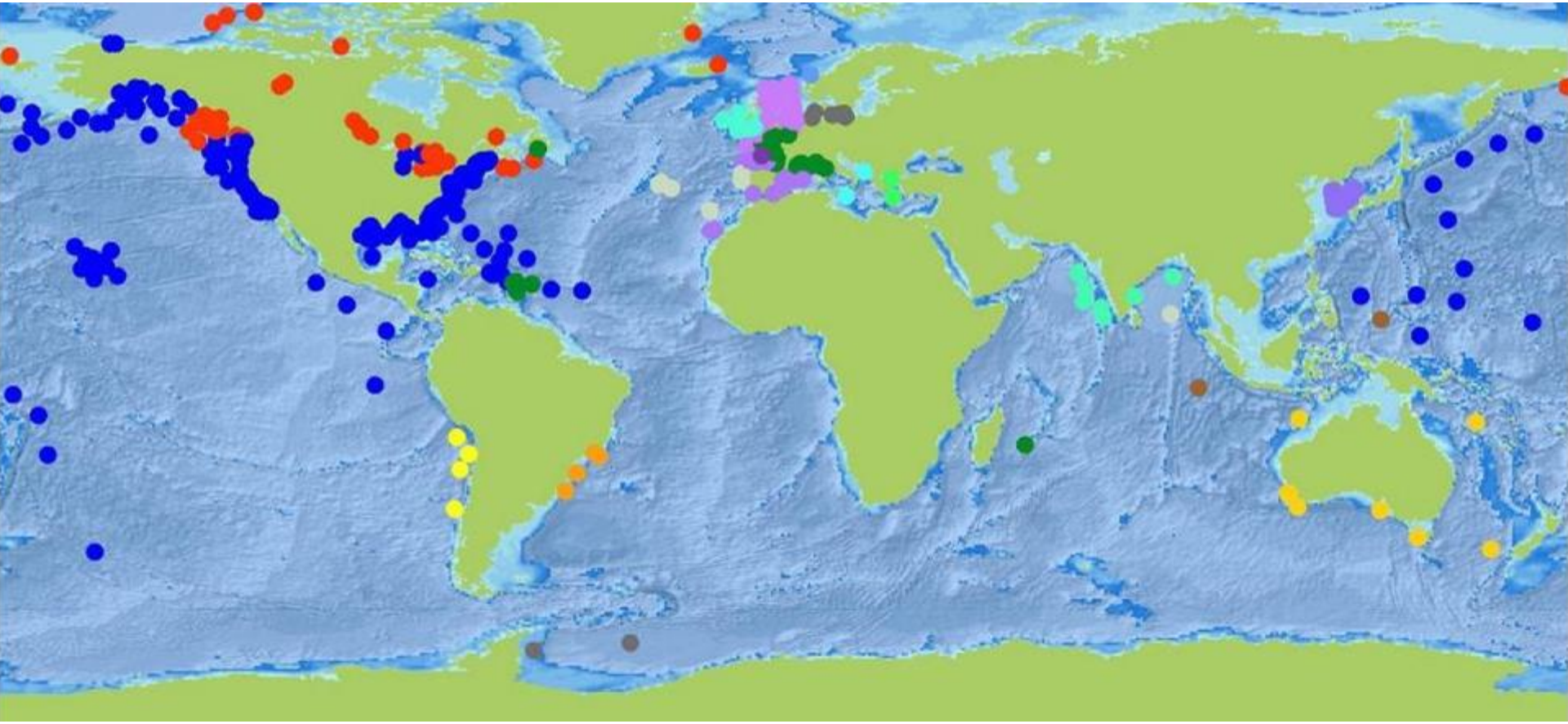


70 Coastal
60 Marine

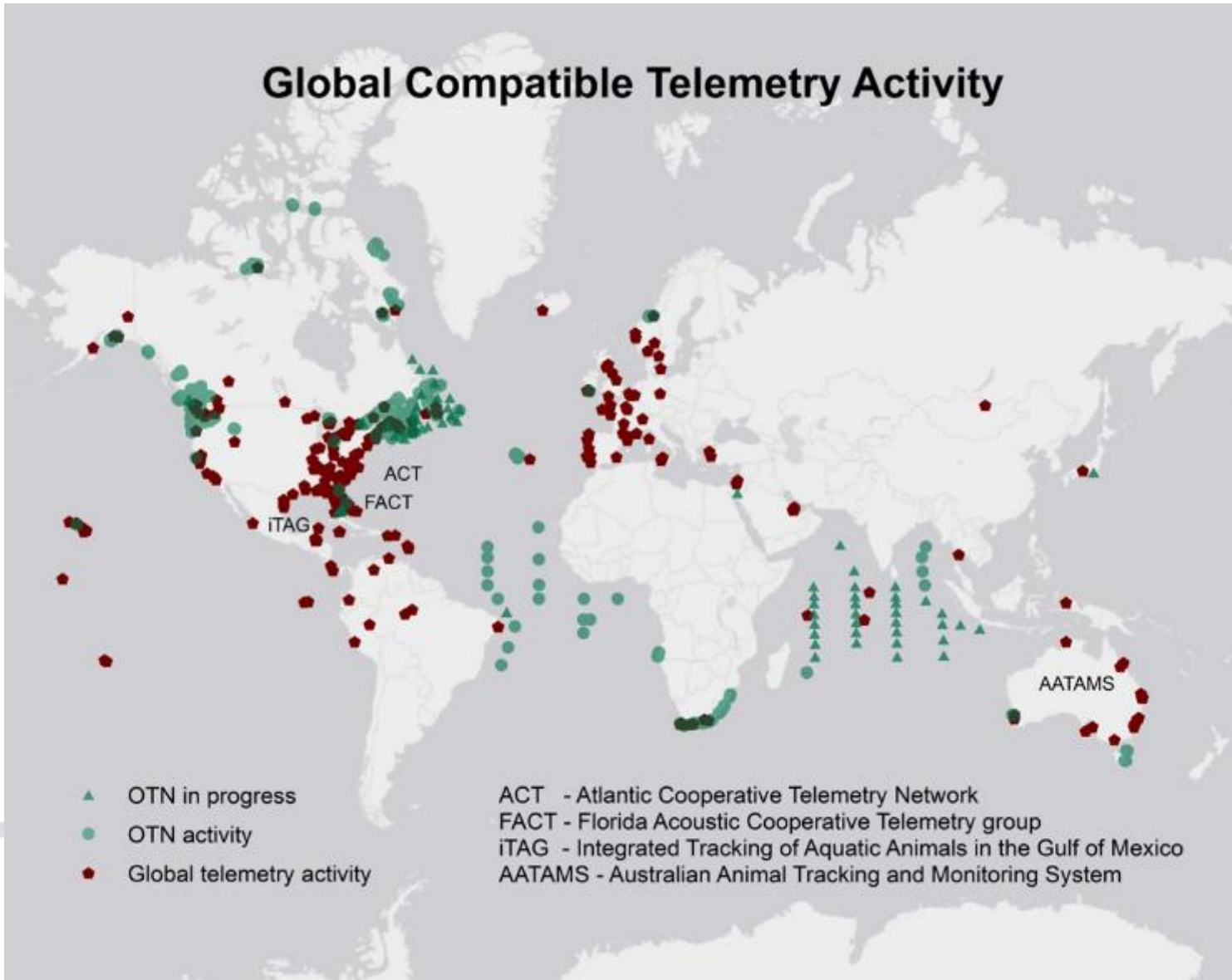
Muelbert et al. 2019

DBCP map of coastal moorings

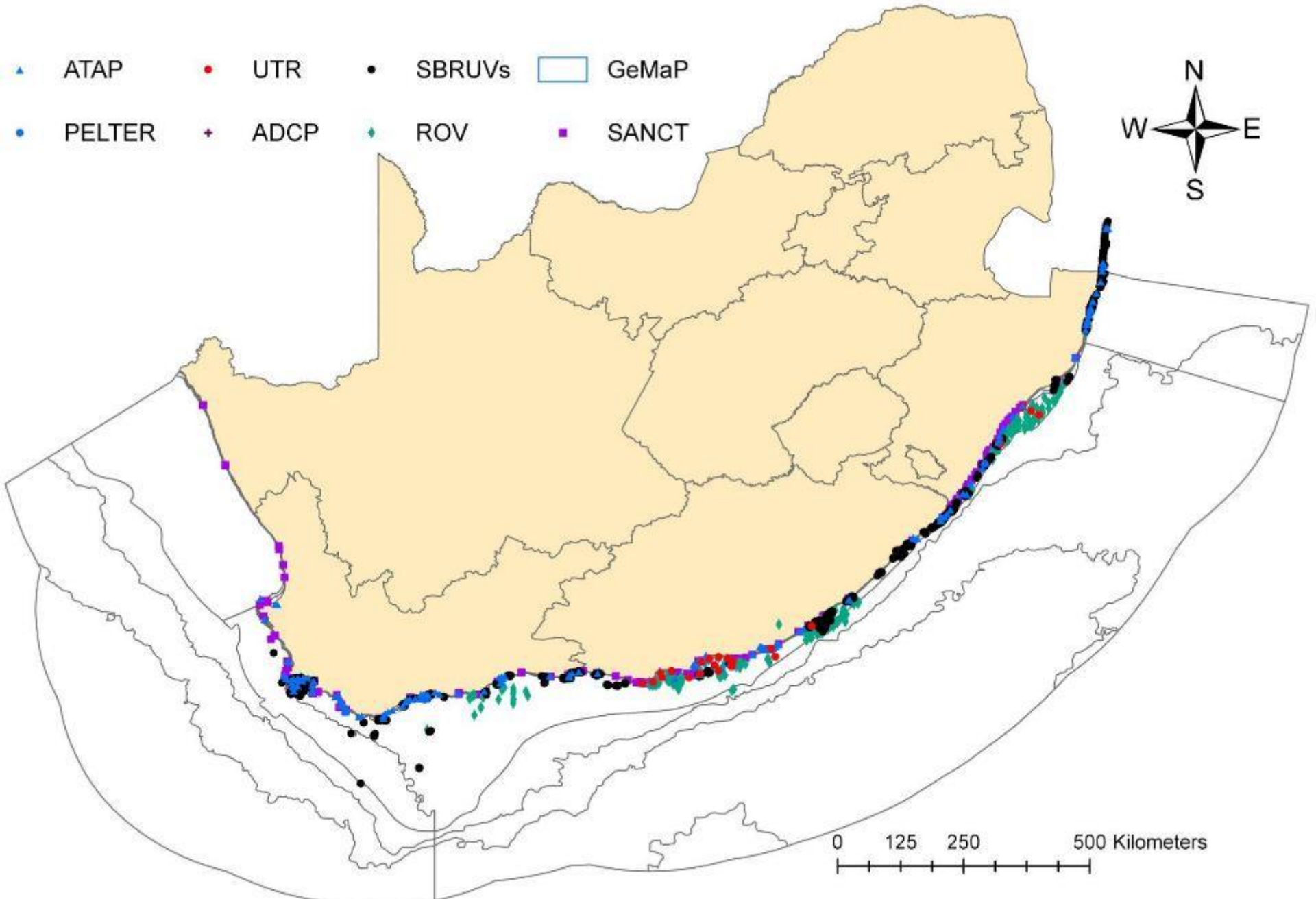


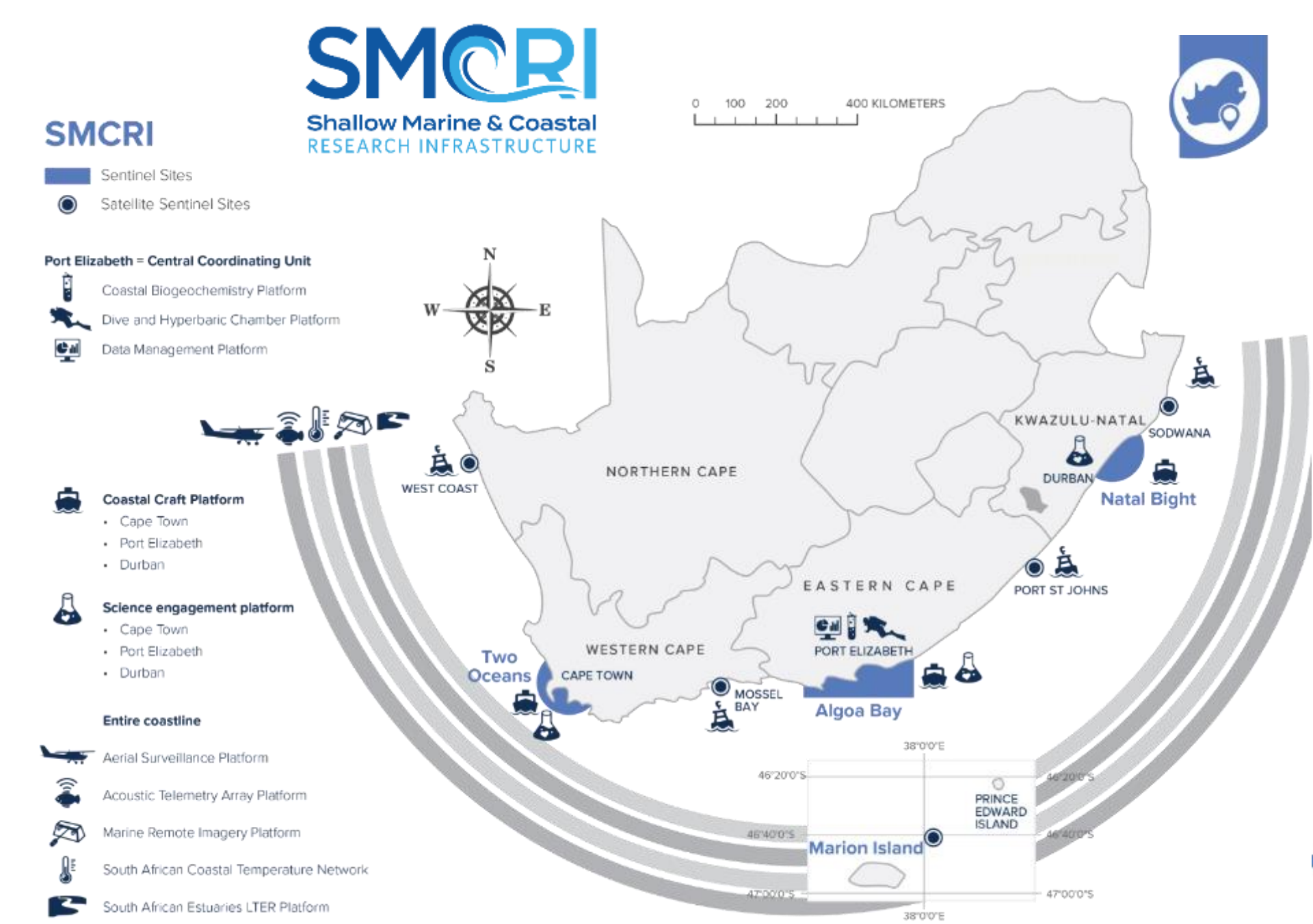
Global Sea-Level Observing System

Global Telemetry Network



Map of coastal activities (South Africa)




SMCRI
Shallow Marine & Coastal
RESEARCH INFRASTRUCTURE
SMCRI
Sentinel Sites
Satellite Sentinel Sites
Port Elizabeth = Central Coordinating Unit
Coastal Biogeochemistry Platform
Dive and Hyperbaric Chamber Platform
Data Management Platform
Coastal Craft Platform
Cape Town
Port Elizabeth
Durban
Science engagement platform
Cape Town
Port Elizabeth
Durban
Entire coastline
Aerial Surveillance Platform
Acoustic Telemetry Array Platform
Marine Remote Imagery Platform
South African Coastal Temperature Network
South African Estuaries LTER Platform
0 100 200 400 KILOMETERS
N
W
E
S
NORTHERN CAPE
KWAZULU-NATAL
SODWANA
DURBAN
Natal Bight
WEST COAST
EASTERN CAPE
PORT ST JOHNS
WESTERN CAPE
PORT ELIZABETH
Two Oceans
CAPE TOWN
MOSSEL BAY
Algoa Bay
38°0'0"E
46°20'0"S
46°40'0"S
47°0'0"S
PRINCE EDWARD ISLAND
Marion Island

NRF SAEON
National Research Foundation | South African Environmental Observation Network

SMCRI
Shallow Marine & Coastal
RESEARCH INFRASTRUCTURE

Sentinel Sites

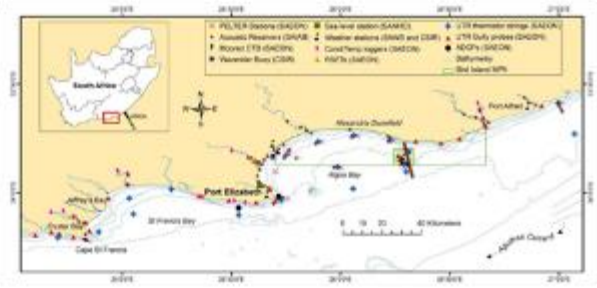
Two Oceans SS

Algoa Bay SS

Satellite SS

Natal Bight SS

Marion Island SS



Centralised

Biogeochemistry

Hyperbaric

Data Management

Distributed

Airborne Remote Sensing

SANCT

Science Engagement

Estuaries

NRF SAIAB
National Research Foundation | South African Institute for Aquatic Biodiversity

Coastal Craft

Marine Remote Imagery

Acoustic Tracking

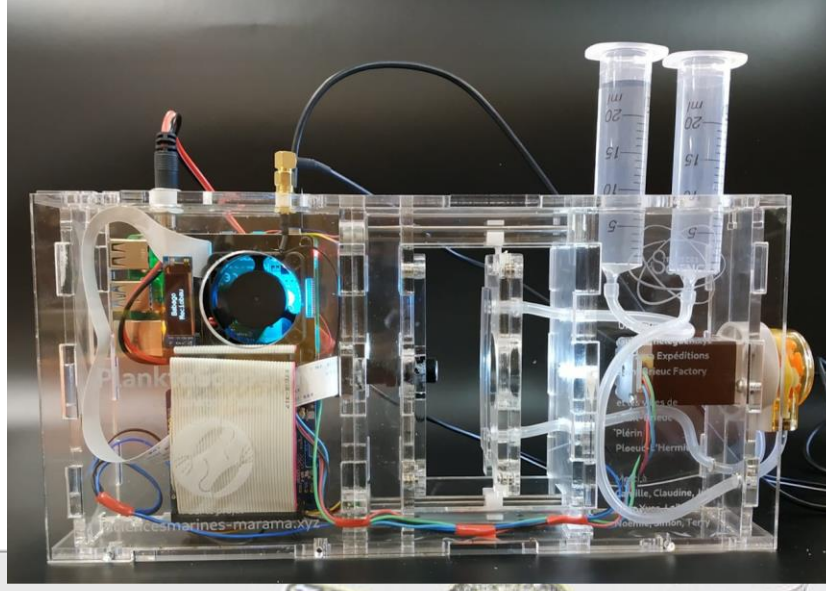
ALGOA BAY SOCIAL-ECOLOGICAL SYSTEM

- Include all coastal ecosystems, e.g. estuaries, subtidal reefs, etc.

Pelagic Ecosystem LTER

- Physical data
  - Salinity, temp, depth, turbidity, O2
- Chemical data
  - Nutrients, pH, alkalinity
- Biological data
  - Chl-a
  - Phytoplankton
  - Zooplankton
  - Ichthyoplankton

Open and frugal modular imaging platform for citizen oceanography



https://www.planktoscope.org

Infrastructure at Sentinel Sites

- Fully equipped coastal research craft & vessels
- Current, wave, salinity, telemetry, pCO2 & pH, CTD, water level and temperature sensors
- Real-time metocean Coastal Observation Moorings

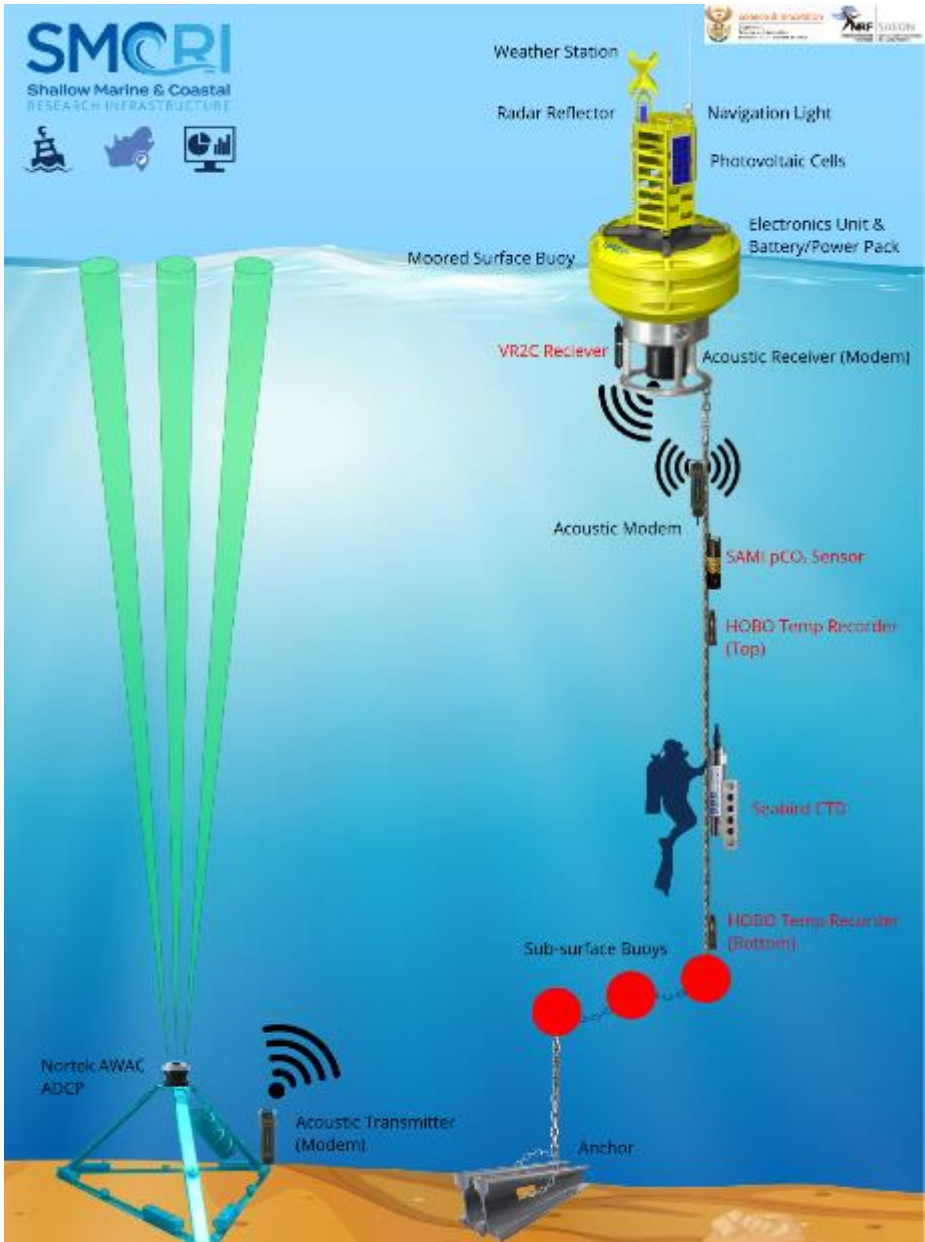
Acoustic receiver

Data Buoy

SBRUVS

CTD+Niskin Rosette

Real-time Coastal Observation Moorings



Shoal
Supporting our Oceans

Low cost mooring buoy

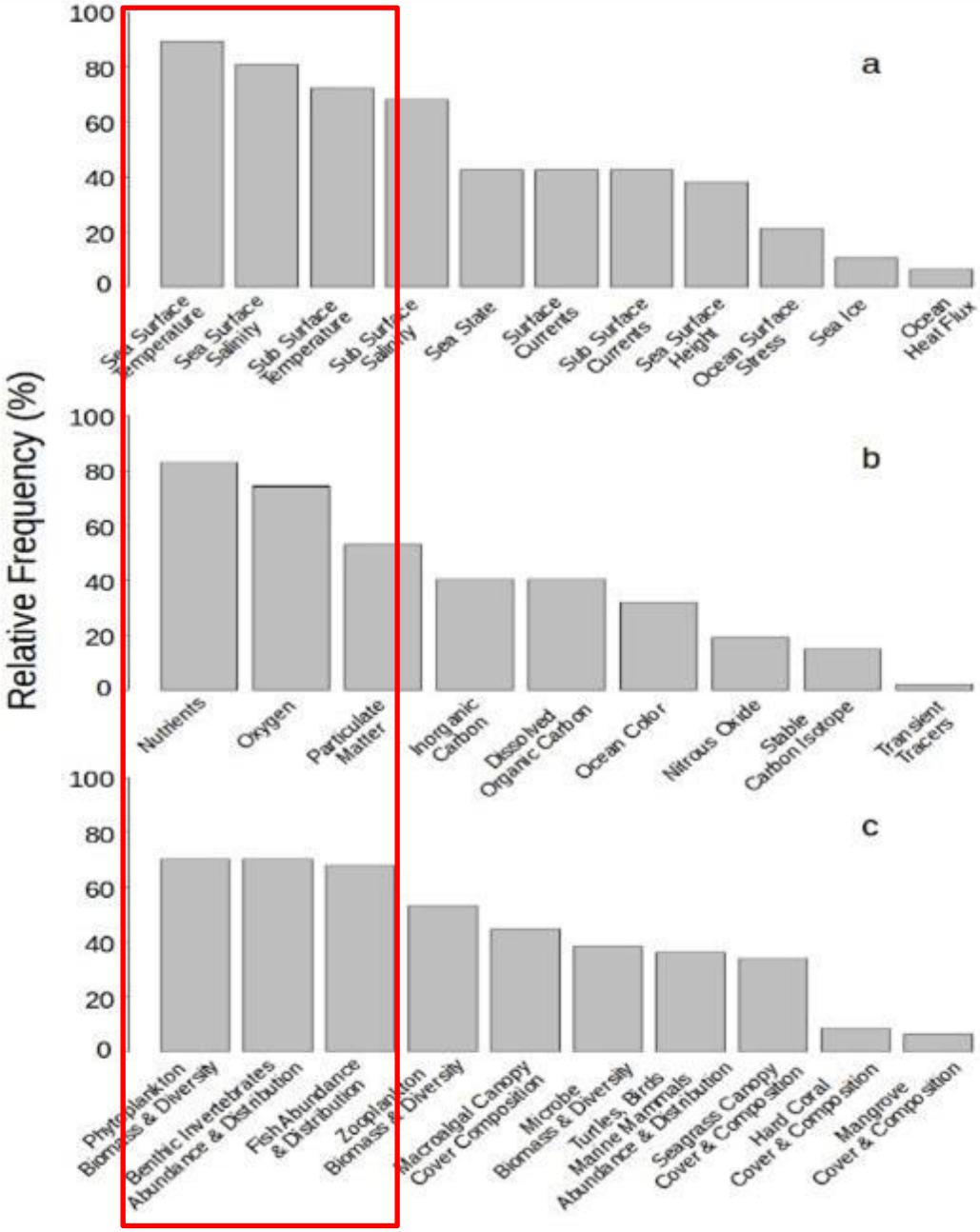
Buoy Measurements

Depth	10m
Temperature	25.6°C
pH	8.09
Salinity	34.8 ppt
Light	45%

EOV and EBV measured

- Continuous
  - Temperature; Current direction & strength; Swell; Salinity; Wind; O_2; pH; pCO_2; Chl-a
  - Tagged species movement
- Monthly
  - Coastal pelagic ecosystem: Physical; Chl-a; nutrients; phytoplankton & zooplankton biomass and community composition; microplastics, C, heavy-metals
  - Sandy beach LTER
- Quarterly
  - Estuaries pelagic ecosystem: Phys; Chl-a; nutrients, C, metals
  - Benthic LTER
- Annual
  - Sea level rise in estuaries (RSET since 2009)
  - Airborne remote sensing
  - Rocky shore LTER (DFFE O&C) (Winter & Summer)

EOVs and EBVs



National Estuaries Network

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CSIR

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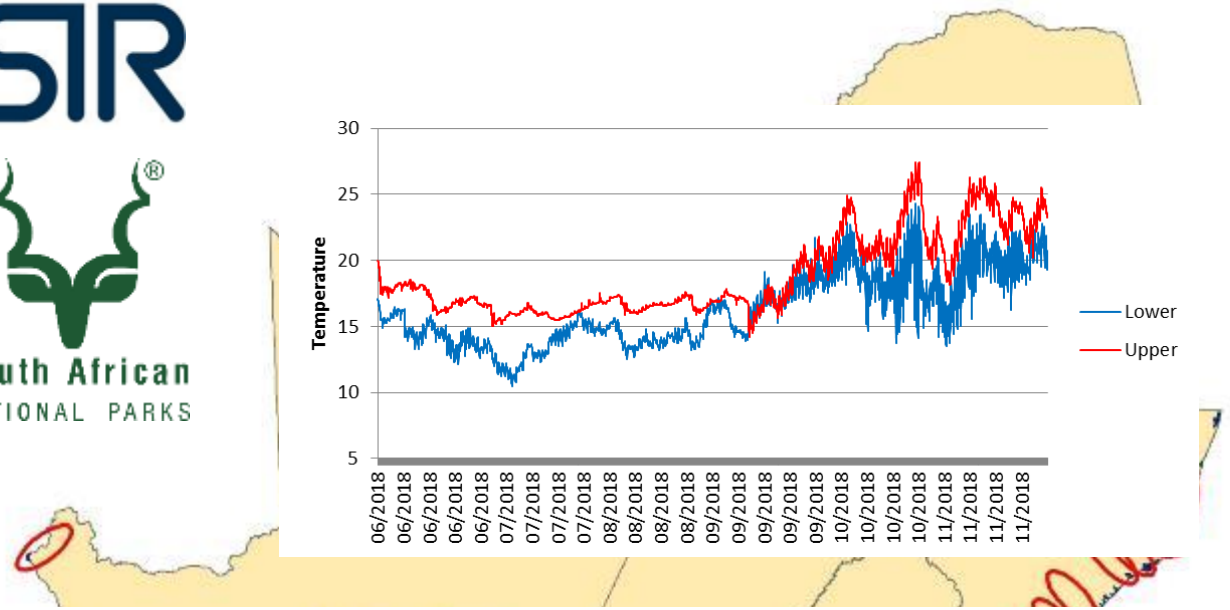
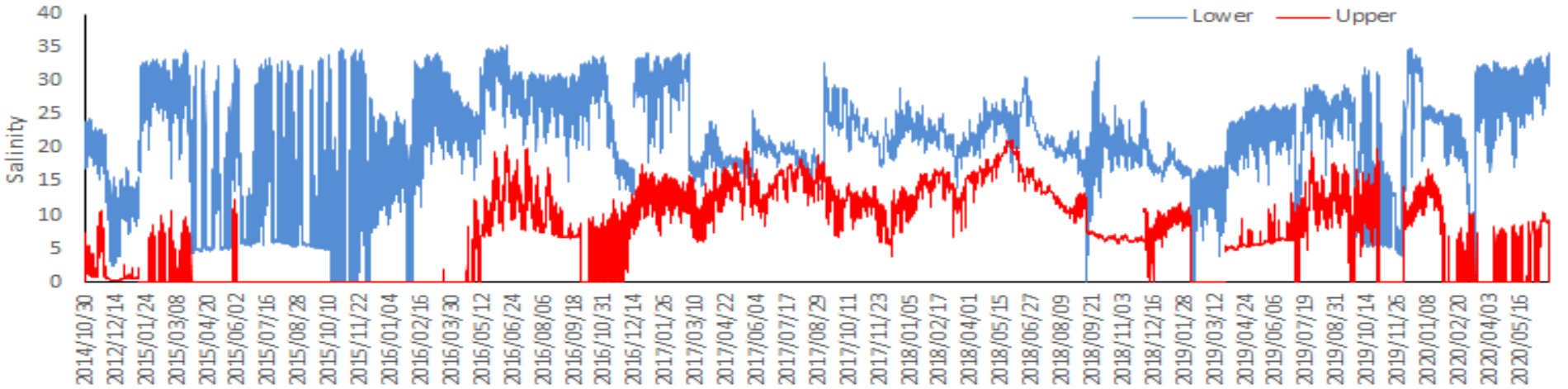
South African NATIONAL PARKS

CapeNature

iSimangaliso Wetland Park





Marine Remote Imagery Platform

- SBRUV, Jump Cameras, Deep Lander, ROV
- Contributing significantly towards MPA research and marine natural product biodiscovery
- Deep-Lander operate to 500 - 1000 m
- Developed Compact SBRUV for coastal and estuarine applications

Benthic Ecosystem LTER

Received: 9 June 2020 | Accepted: 31 July 2020

DOI: 10.1111/2041-210X.13470

PRACTICAL TOOLS

Methods in Ecology and Evolution

A field and video annotation guide for baited remote underwater stereo-video surveys of demersal fish assemblages

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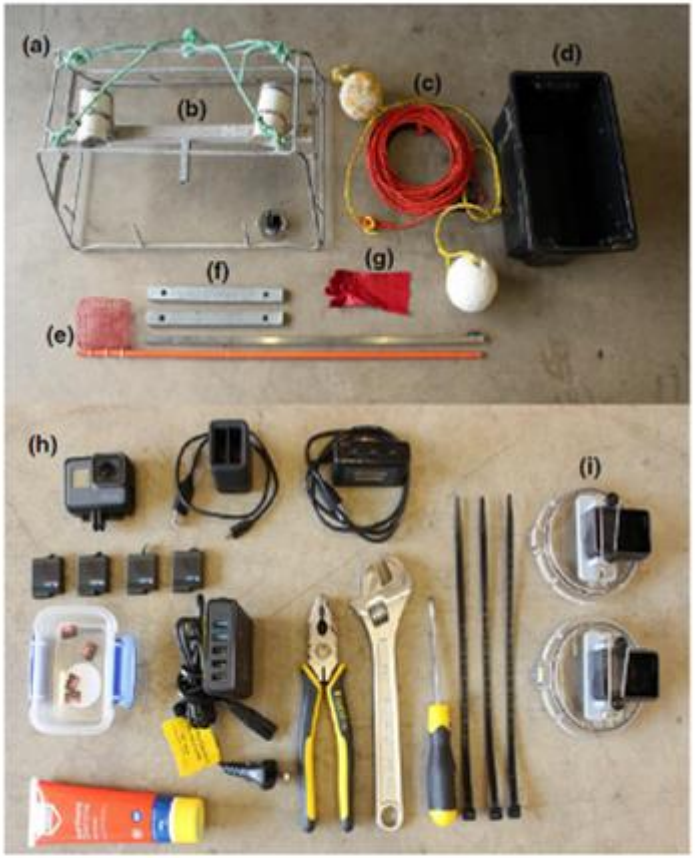


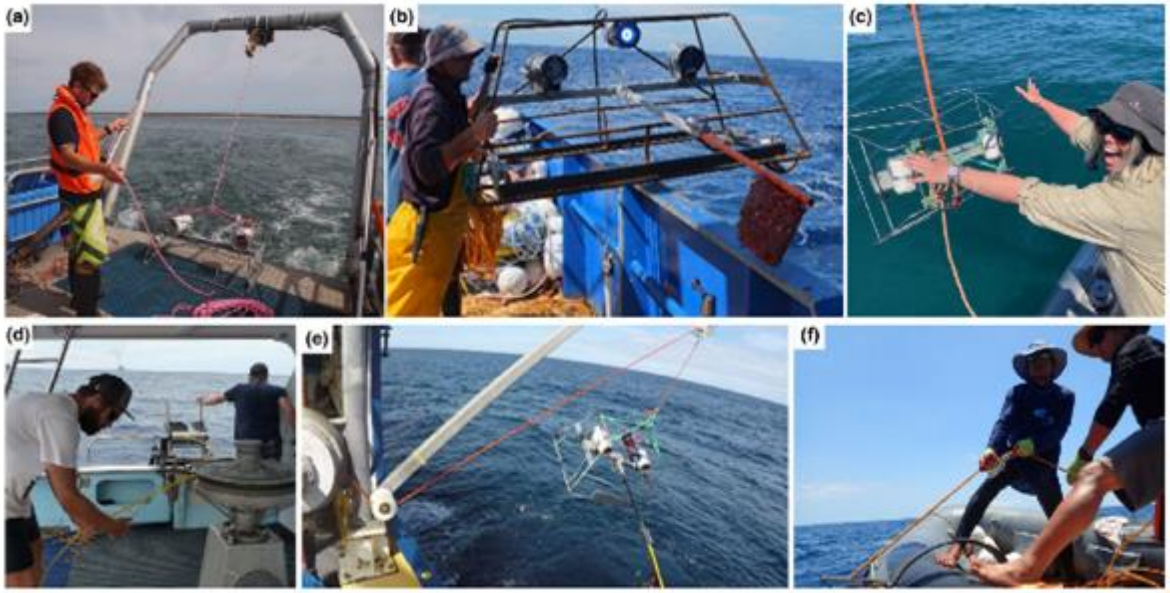
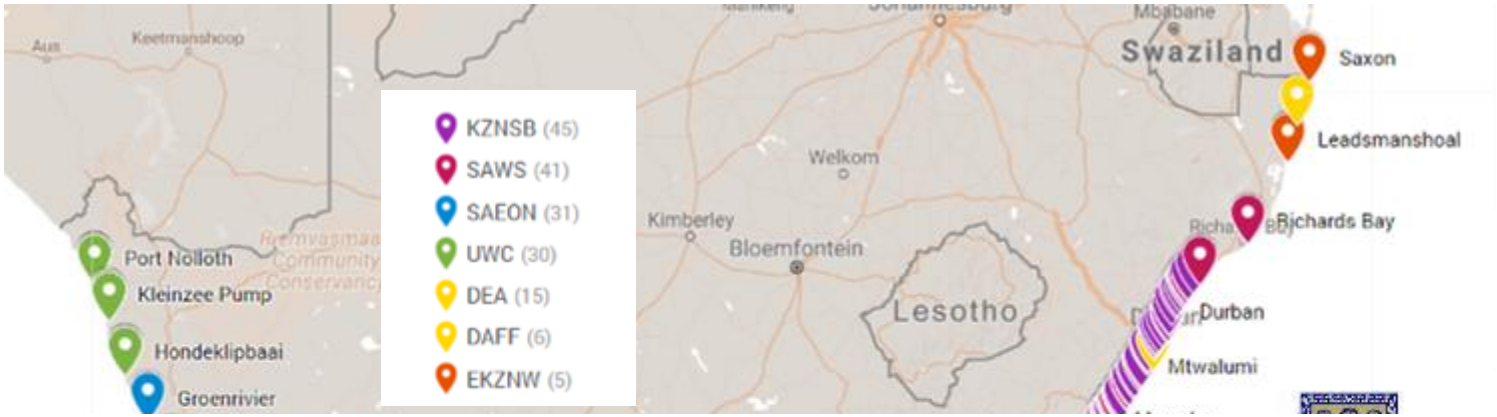


FIGURE 1 Equipment required for baited remote underwater stereo-video system surveys, including (a) mild-steel galvanized frame and bridle, (b) stereo base-bar and camera housings, (c) rope

SA National Coastal Temperature Network



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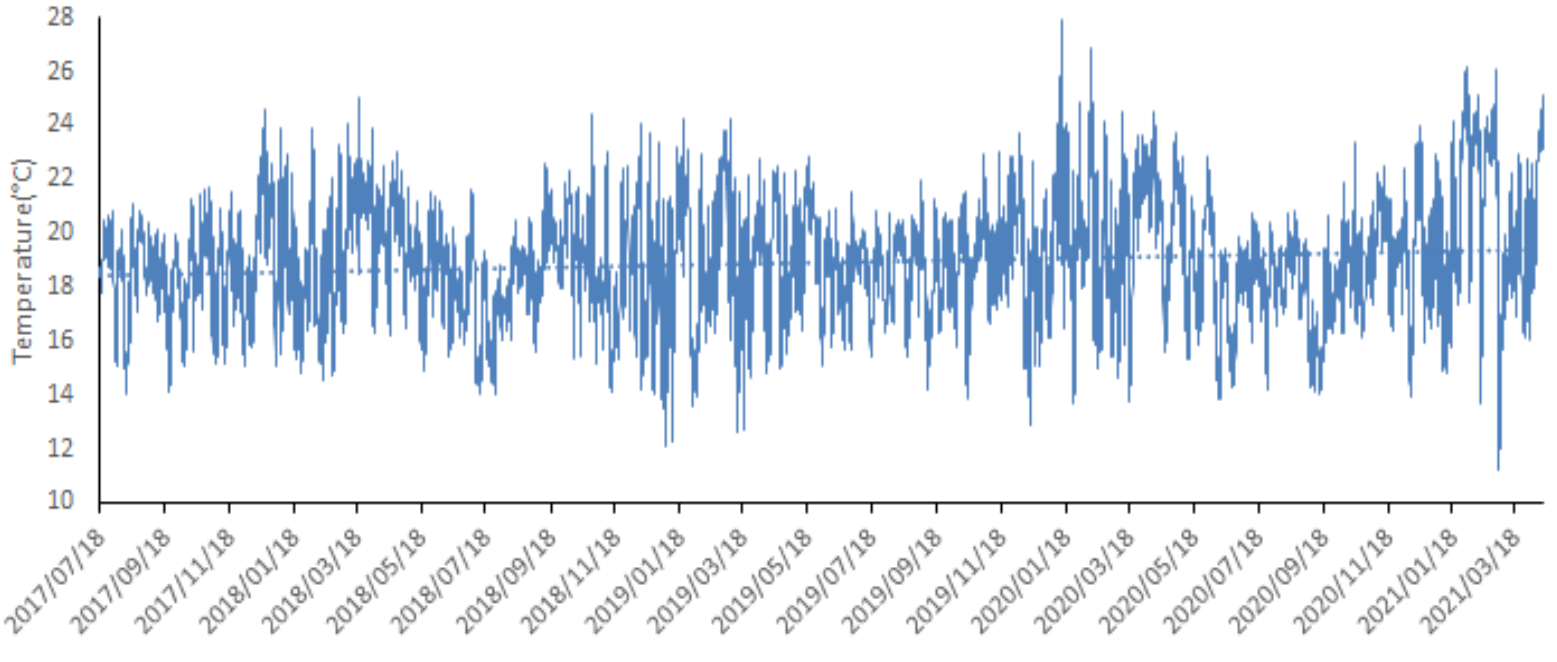
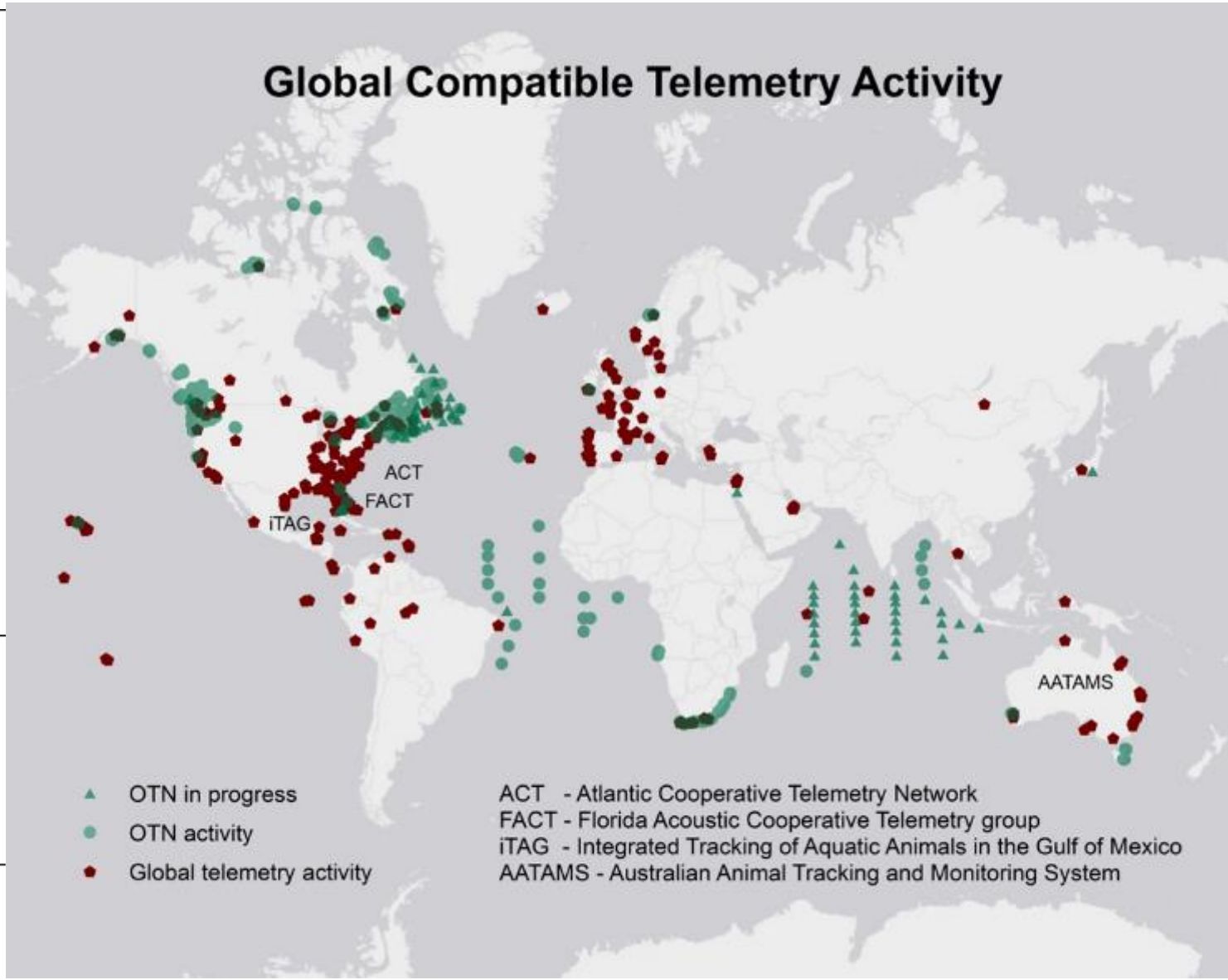


Acoustic Tracking Array Platform



Data Management Platform

- Access to the research infrastructure and platforms is on the principle of equal, open but competitive basis.
- All data collected by the DSI / NRF platforms are:
  - Free and open data by default
  - High quality and quantity (limited data gaps)
  - Conform to Data Management standards & principles



Critical requirements of an *in situ* coastal and marine Observing System

- Conform to International Best Practise and global Standard Operating Procedures to ensure integration and interoperability.
- Conform to Data Management standards and principles (**F**indable, **A**ccessible, **I**nteroperable and **R**eusable)
- Sustainability of observations. Must be responsive to societal need
- An effective regional coordination mechanism to guide both regional and national monitoring and observations


Thank
you
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