



The Global Ocean Observing System



## Workshop 8

***Connecting climate, ocean and ecosystem observation –  
Ocean observation futures***

# Implementation of the biological and ecosystem components

***Patricia Miloslavich, Nicholas Bax, Samantha Simmons, Eduardo Klein, Frank Muller-Karger, Daniel Dunn, Ward Appeltans and GOOS BioEco Panel***

<http://goosocean.org/>



UNIVERSITY of  
TASMANIA



Australian Government



AUSTRALIAN INSTITUTE  
OF MARINE SCIENCE



THE UNIVERSITY OF  
WESTERN  
AUSTRALIA



United Nations  
Educational, Scientific and  
Cultural Organization



Intergovernmental  
Oceanographic  
Commission



Identification of and requirement setting for **Essential Ocean Variables (EOVs)**

Development of EOV implementation **strategies and coordination of observations**

Promotion of standards and interoperability of **data and information products**


**FOR BIOLOGY: BUILD THE GLOBAL NETWORKS**

**Expert Panels**


**Physics**

GCOS • GOOS • WCRP  
**OOPC**

**Biogeochemistry**



**Biology and Ecosystems**

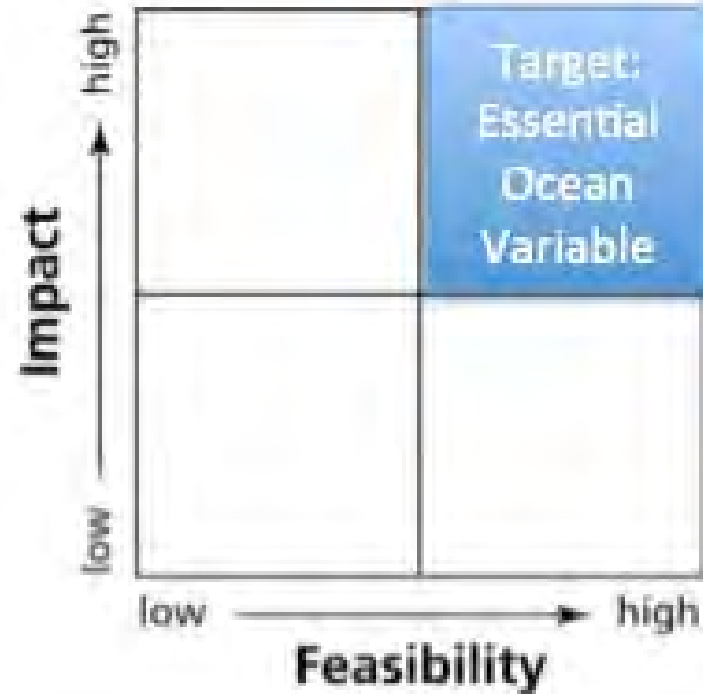



# Process to identify biological Essential Ocean Variables

*“Drivers-Pressures-State-Impact-Response”*

## Impact

- Relevant to help solve science questions and address societal needs
- Contribute to improve management of marine resources



## Feasibility

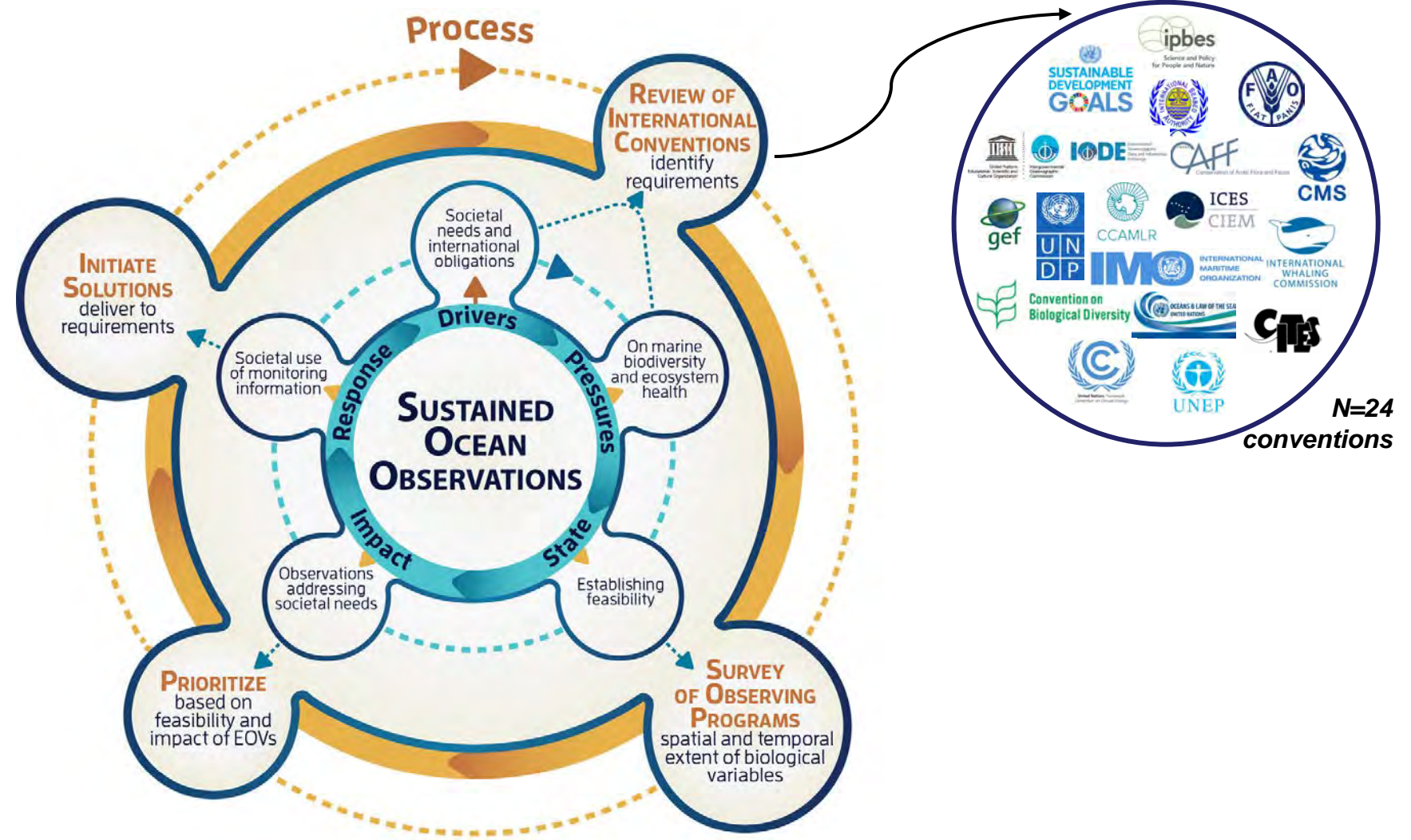
- Scientifically credible
- Technically practical, cost effective and within human capabilities

# Process to identify biological Essential Ocean Variables

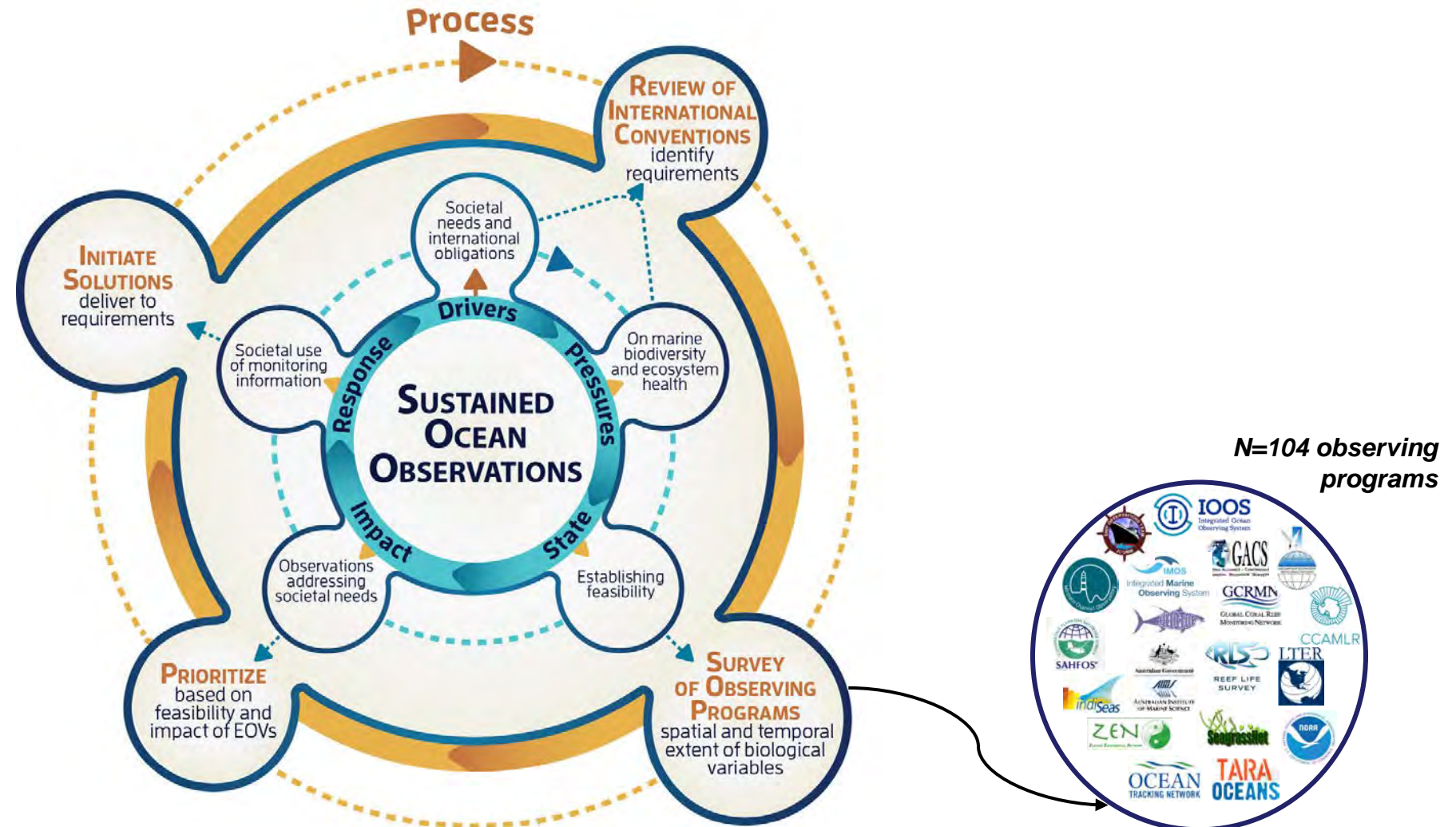
## *“Drivers-Pressures-State-Impact-Response”*



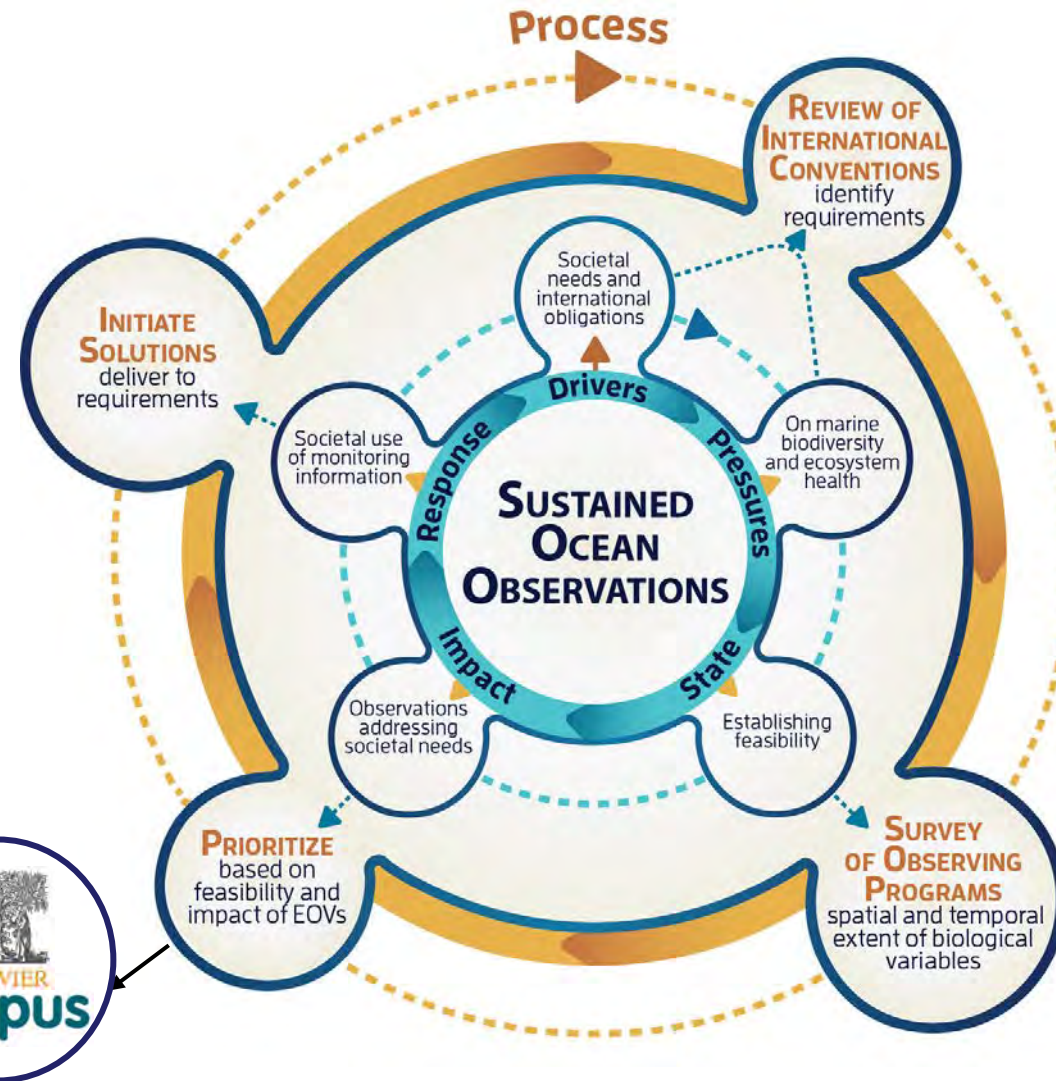
# Process to identify biological Essential Ocean Variables



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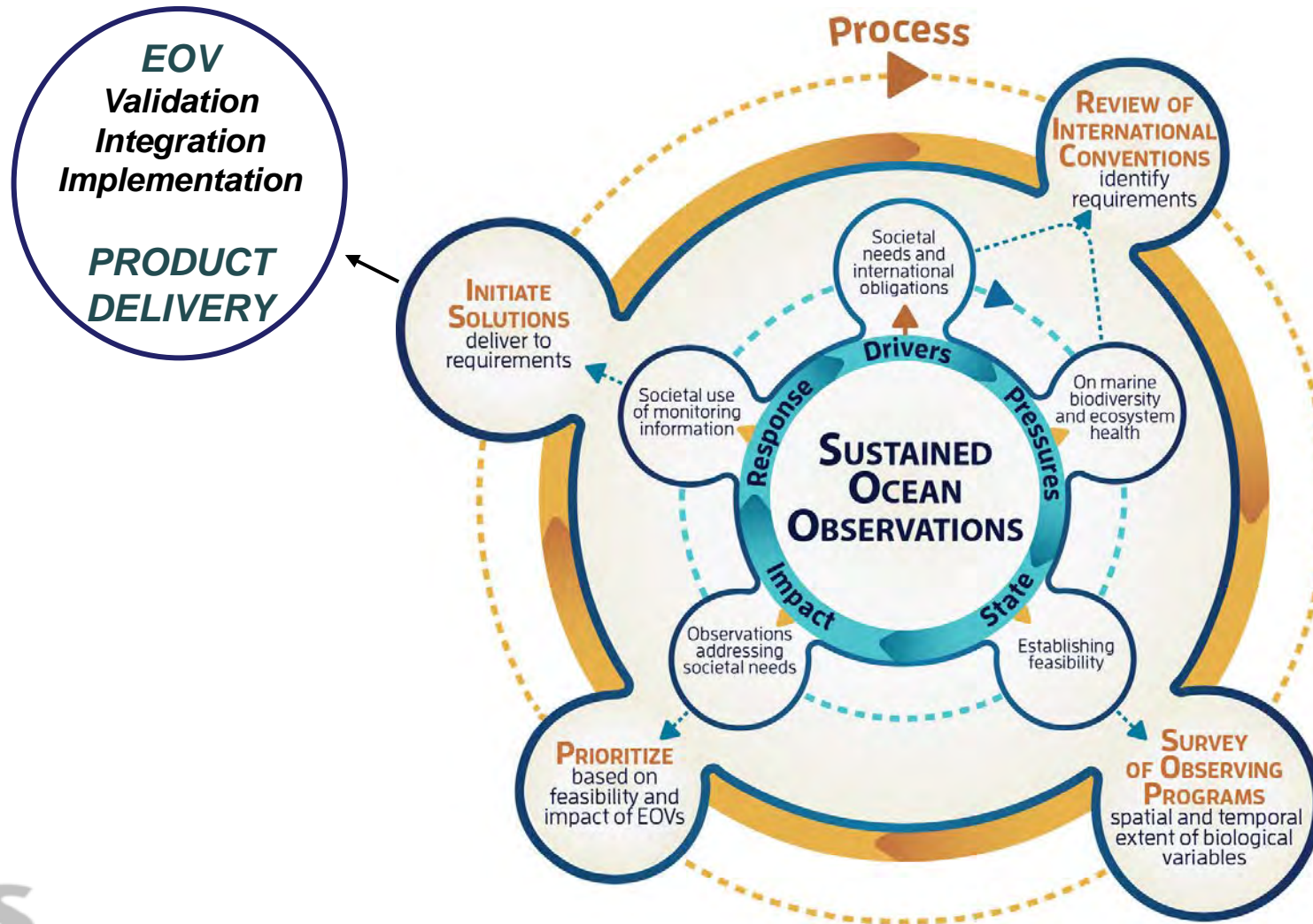


# Process to identify biological Essential Ocean Variables



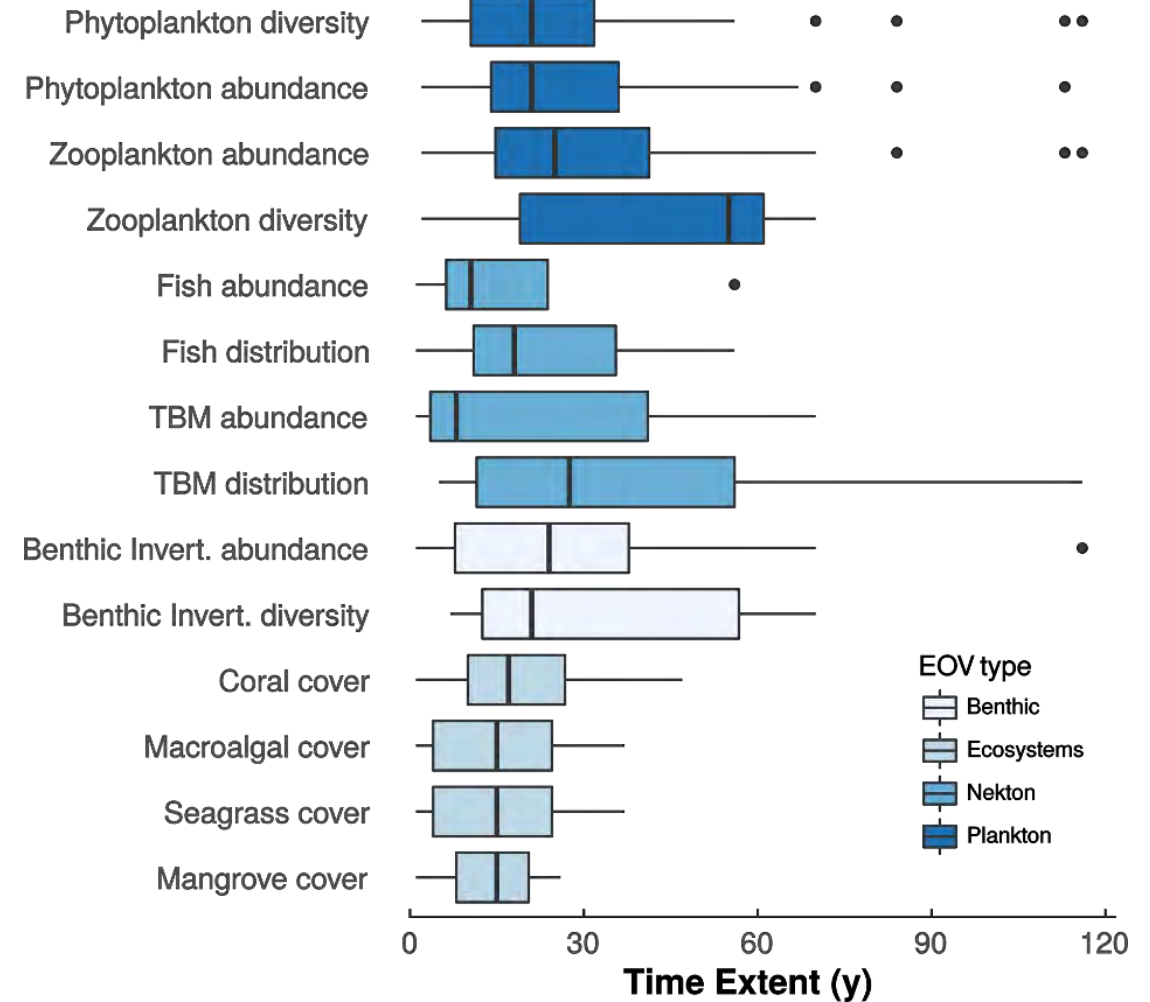
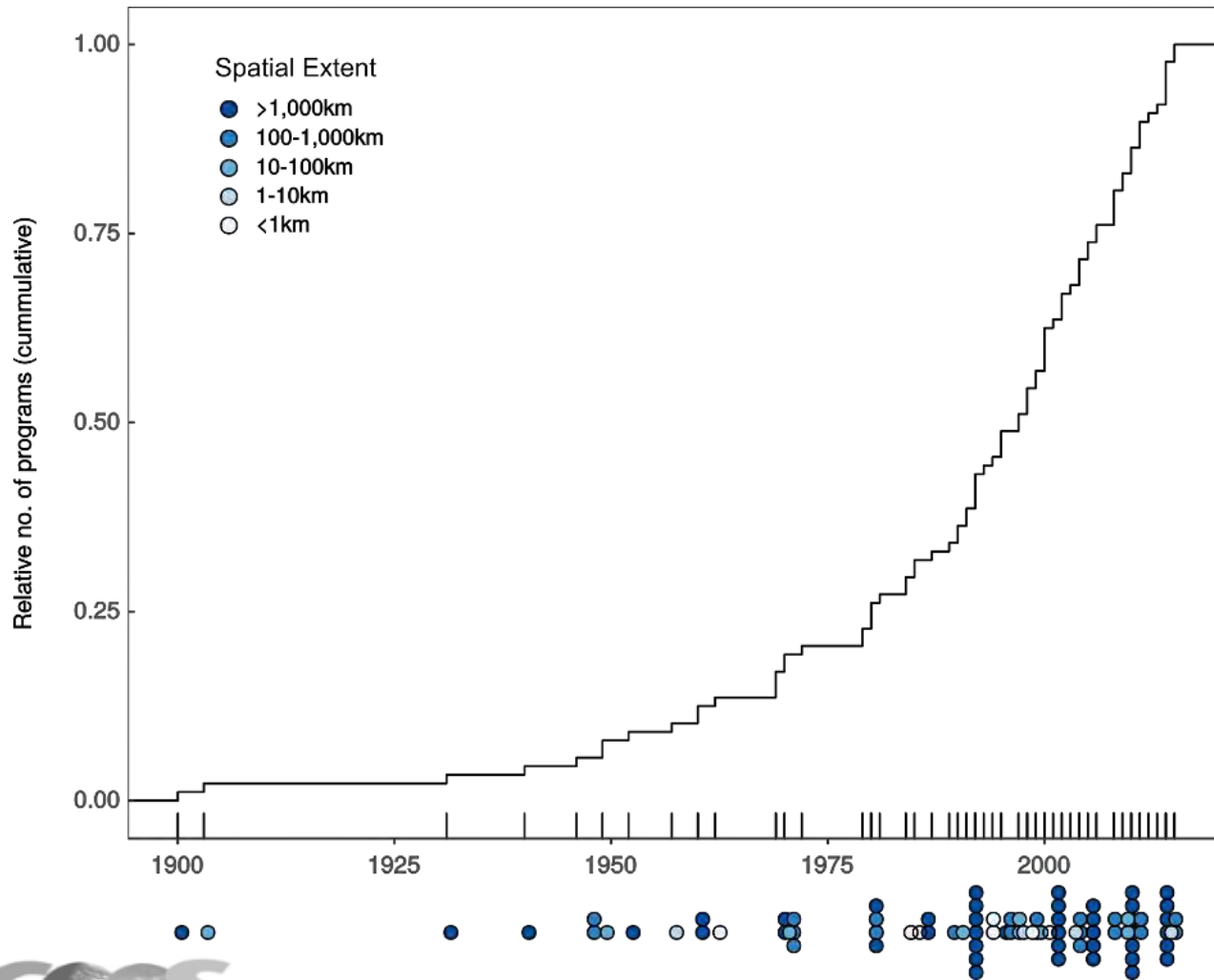
**Papers (1995-2016):**  
*Drivers:* 12000+  
*Pressures:* 65000+  
*Variables:* 7000+

# Process to identify biological Essential Ocean Variables





# Observing programs: spatial and temporal scales

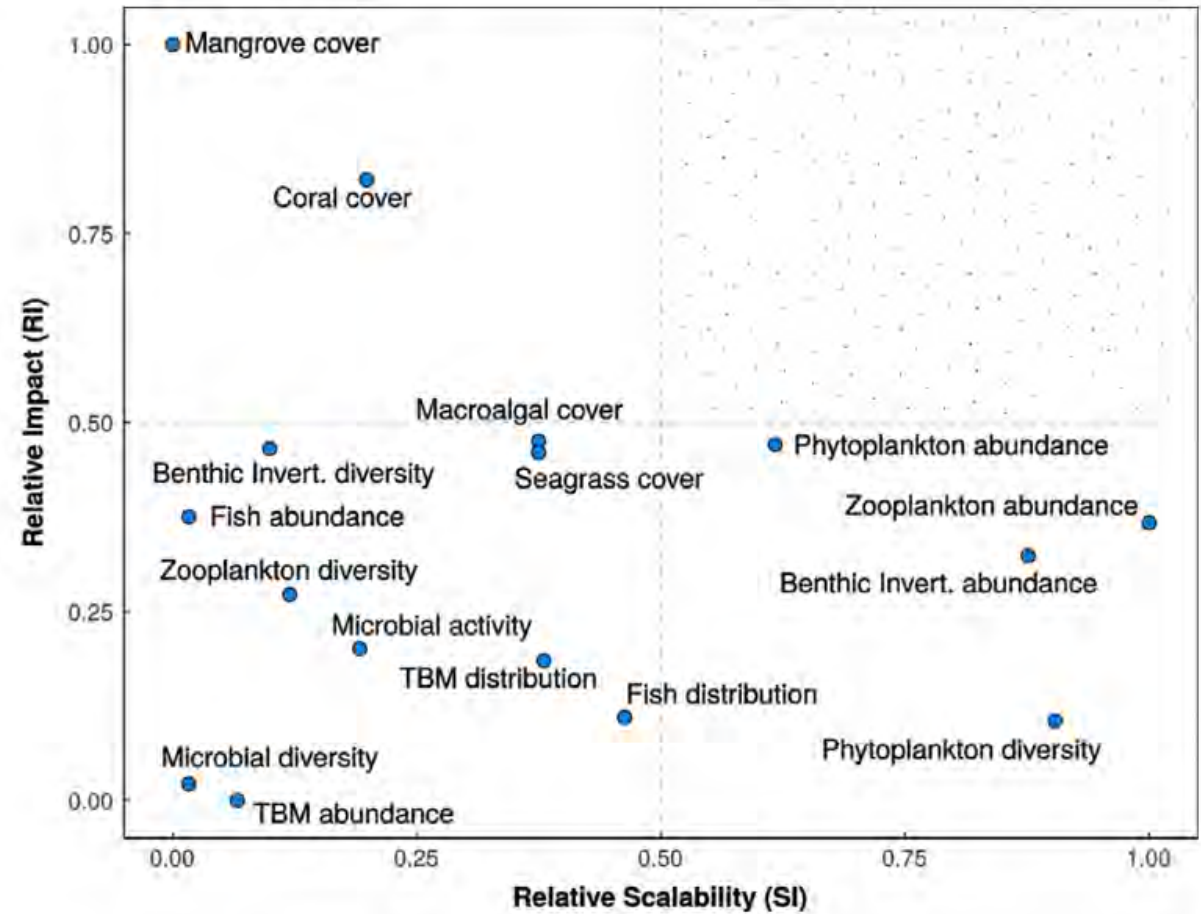
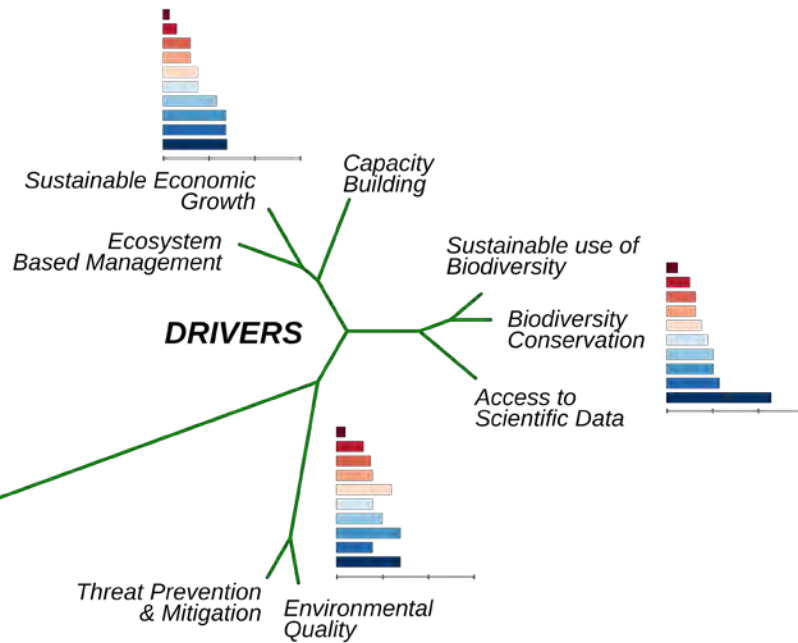
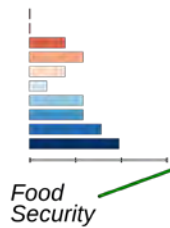


## Societal drivers and pressures (from conventions)

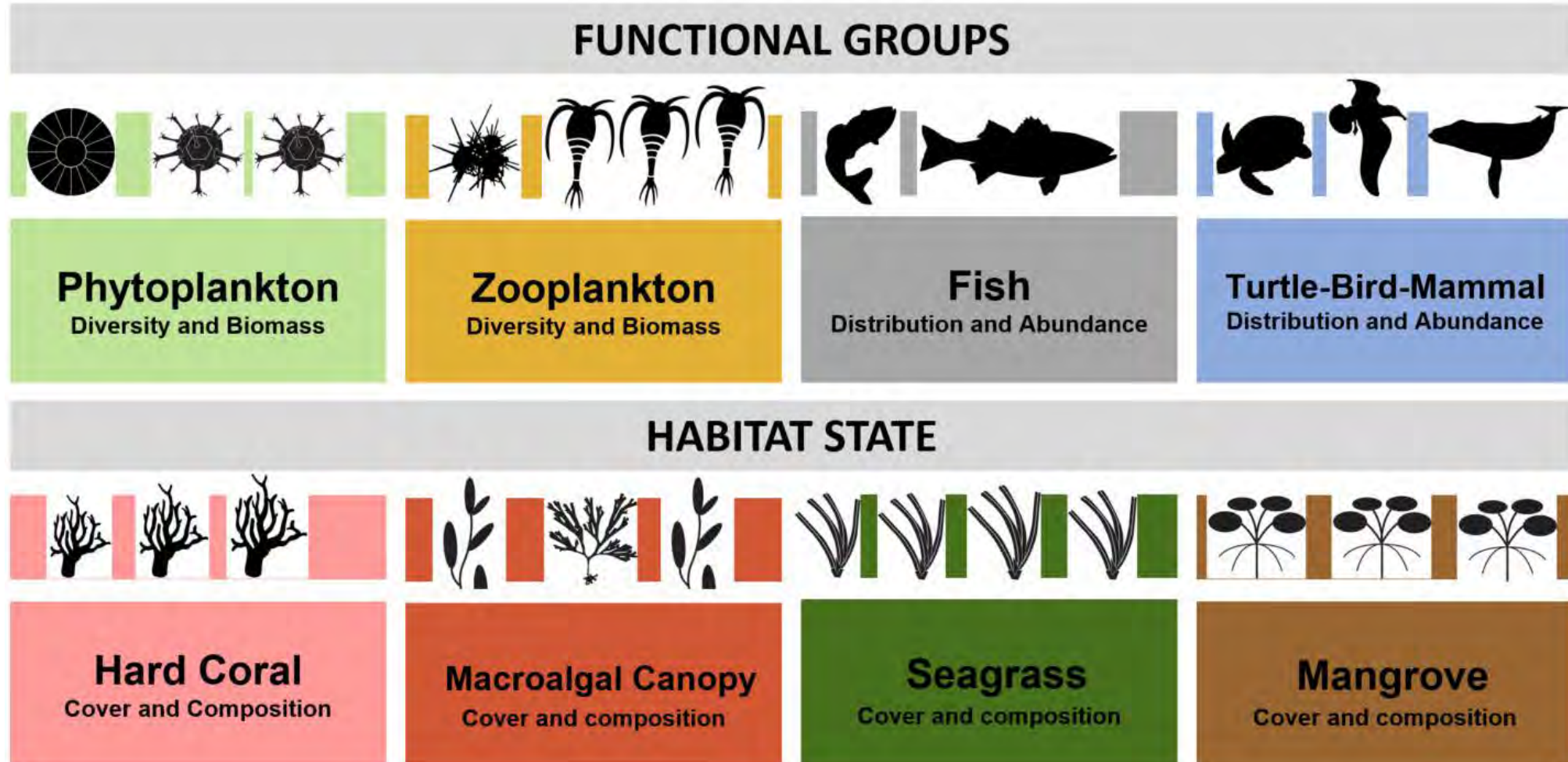
### PRESSURES

- Mining
- Noise
- Extreme Weather Events
- Ocean Acidification
- Solid Waste
- Invasive Species
- Coastal Development
- Pollution and Eutrophication
- Climate Change
- Loss of Habitat and Resources

SCALE BAR: Percentage of conventions addressing each pressure within each group of drivers



**Scalability: Weights temporal and spatial scales**



Peer reviewed specification sheets at:  
[goosocean.org/eov](http://goosocean.org/eov)

**Emerging EOVs:** *Microbial diversity and biomass*  
*Benthic invertebrate distribution and abundance*

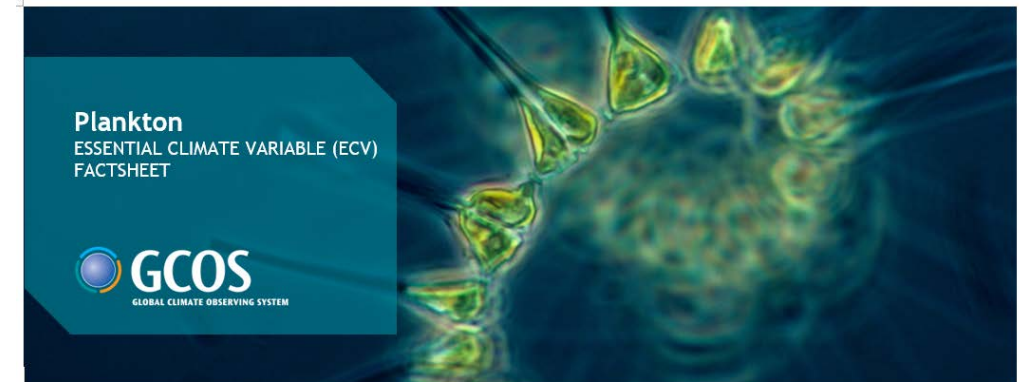


## ECV IN BRIEF

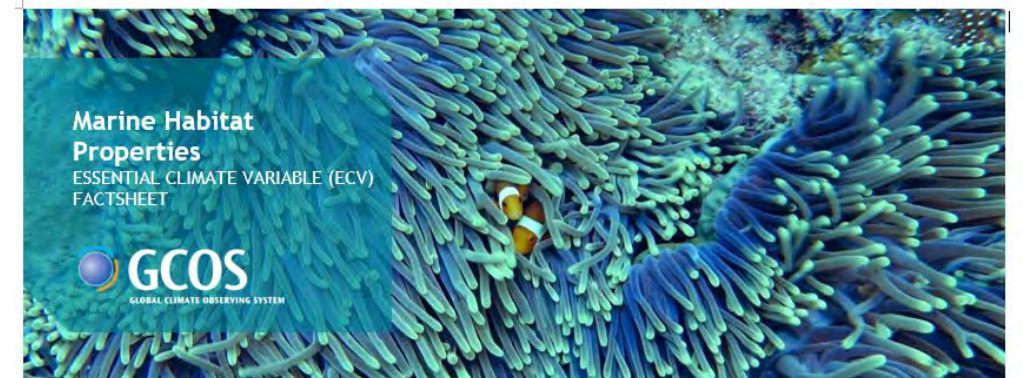
**Domain:** Ocean  
**Subdomain:** Biological/Ecosystems  
**Scientific Area:** Biosphere  
**Products:** Phytoplankton  
 Zooplankton

## ECV IN BRIEF

**Domain:** Ocean  
**Subdomain:** Biological/Ecosystems  
**Scientific Area:** Biosphere  
**Products:** Coral Reefs  
 Mangrove Forests  
 Seagrass Beds  
 Macroalgal Communities



ECV IN BRIEF

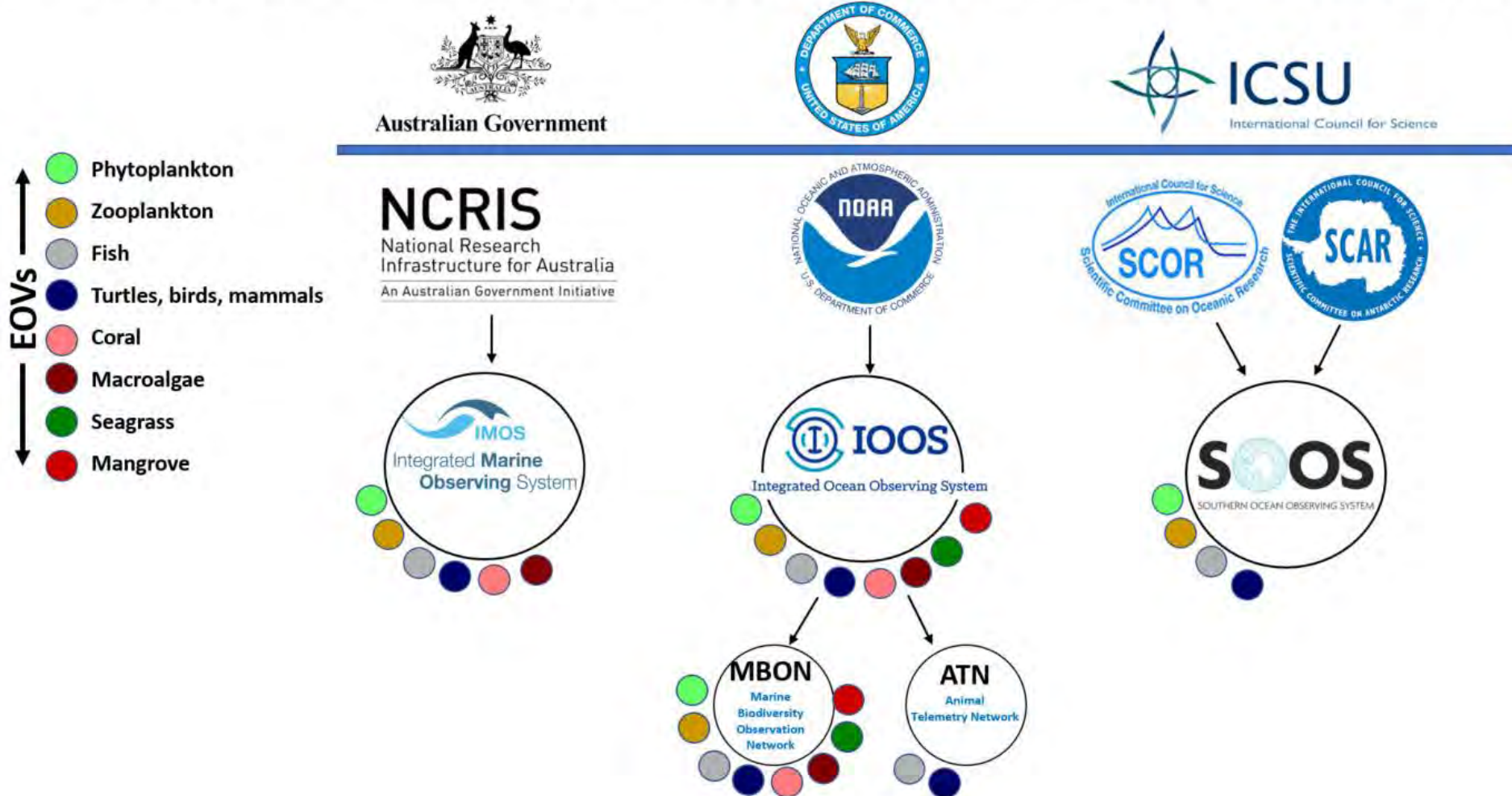


ECV IN BRIEF



PRODUCT	DEFINITION	REQUIREMENTS				
		FREQUENCY	RESOLUTION	REQUIRED MEASUREMENT UNCERTAINTY	STABILITY	STANDARDS/ REFERENCES

## Examples of links between some observing systems and GOOS BioEco EOVs



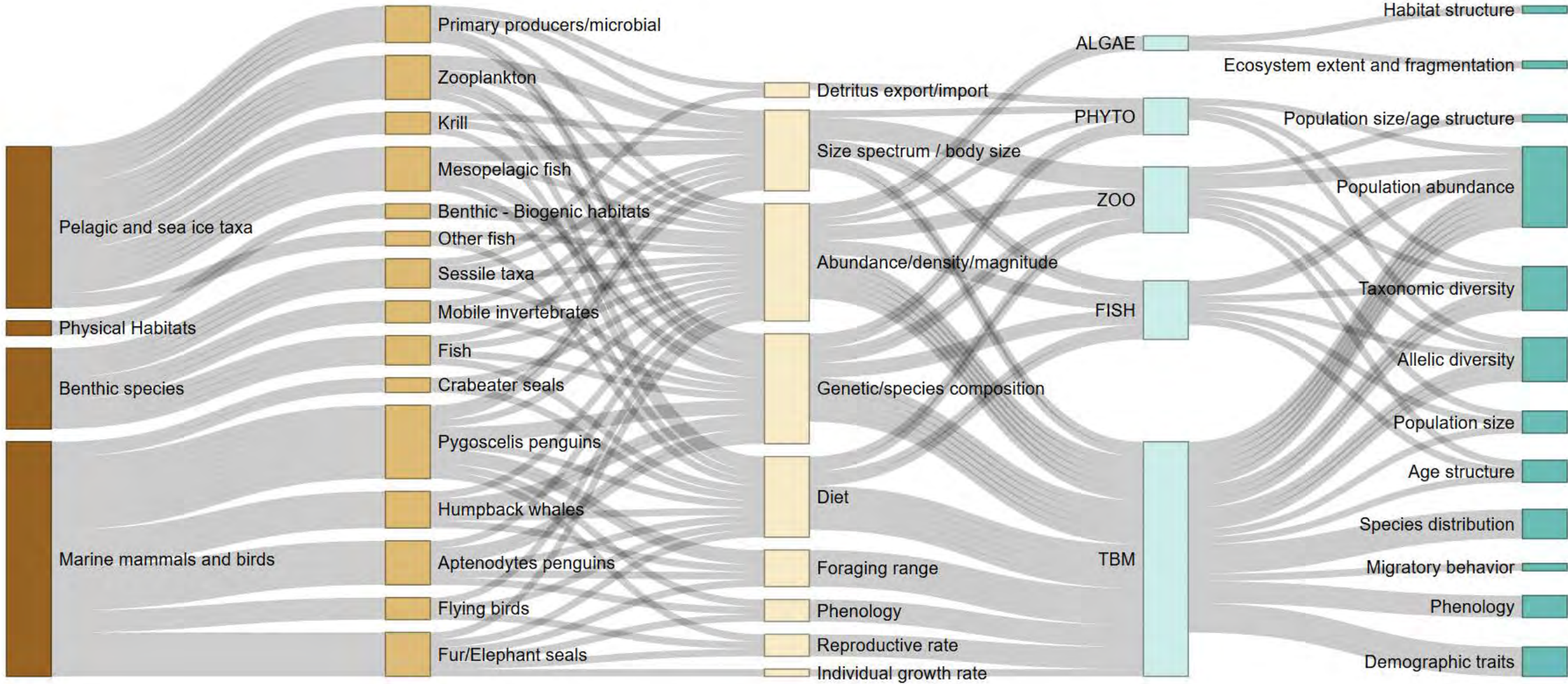
# SOOS Categories

# SOOS Ecosystem Properties

# SOOS eEOVs

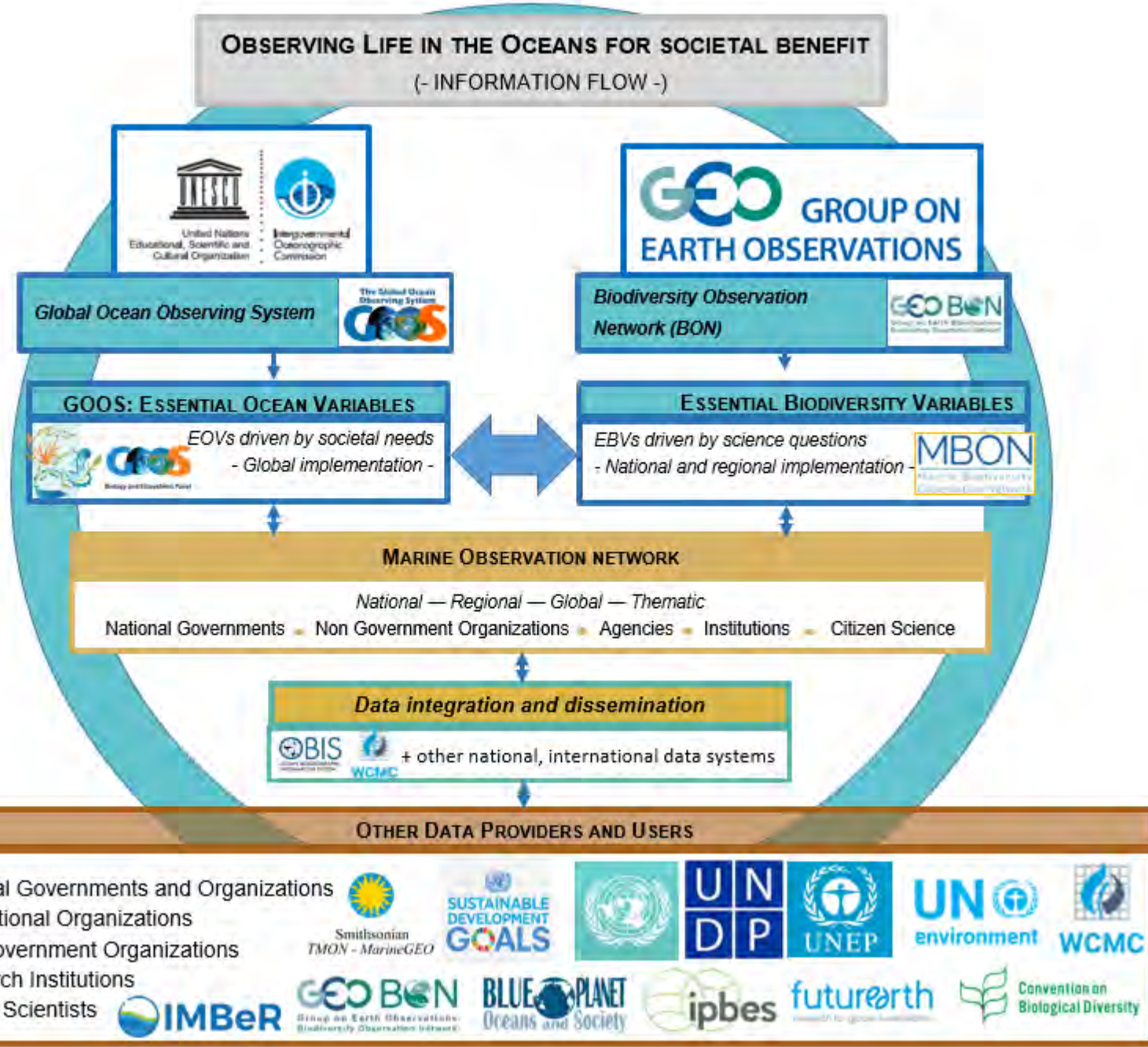
# GOOS EOVs

# GOOS subvariables



# INTEGRATION

BioEco-MBON-OBIS



## IMPLEMENTATION – drafting the plans

- global coordination and coverage
- intercomparable: best practices
- open access data
- support international reporting needs
- aiming to build a network around each EOVS

## EOVS IP Workshops

- Vision and mission
- Needs and requirements
- Capabilities
- Impact - capacity development
- Funding
- Governance



## Hard Coral



*November 2017*

*Dar es Salaam, Tanzania*



## Phytoplankton



## Zooplankton



*June 2018*

*Santa Cruz, CA, USA*



## Macroalgal Canopy



*September 2018*

*Hobart, Australia*



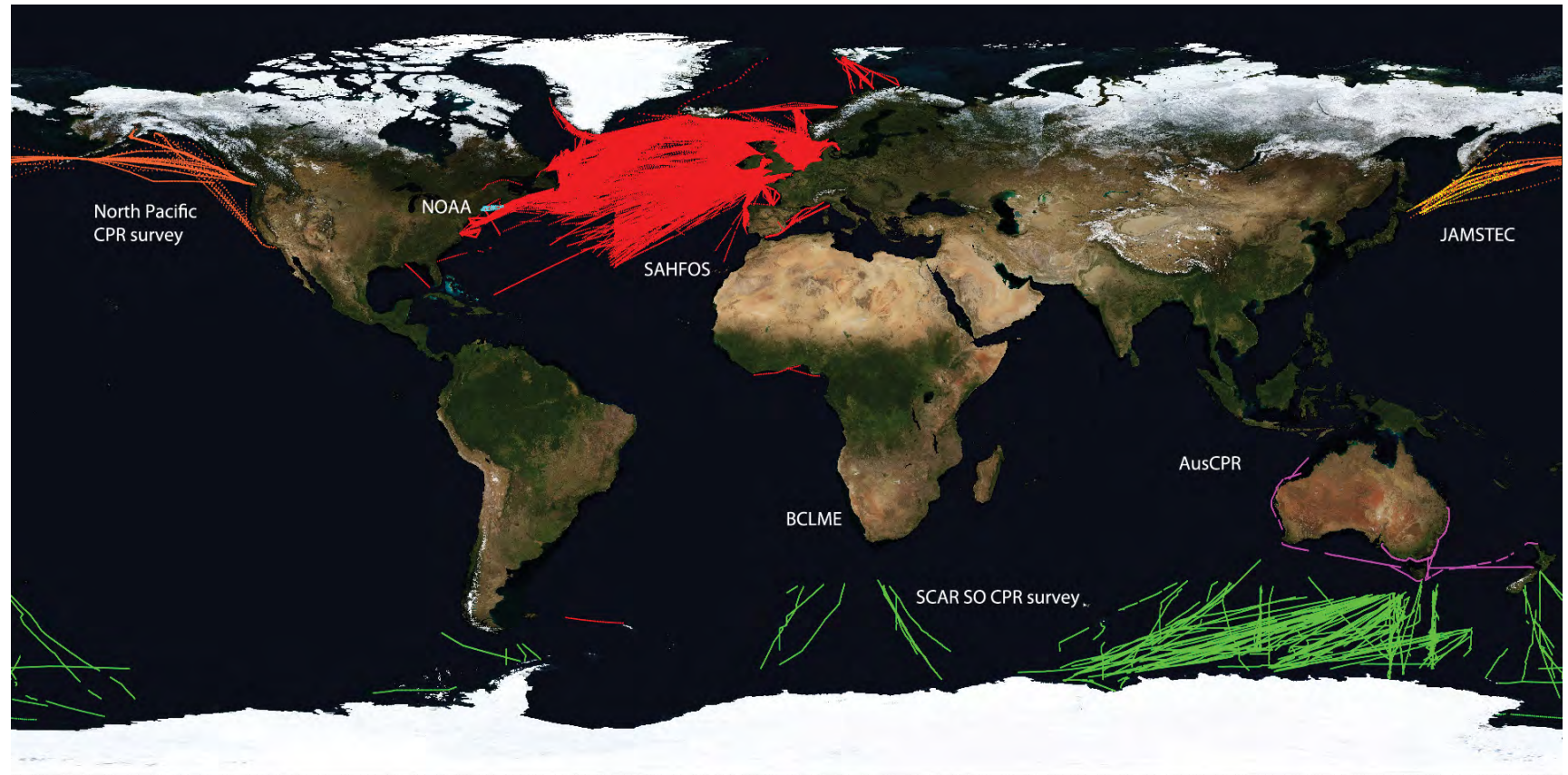
# Biological ocean networks: The Global Alliance of Continuous Plankton Recorders

## **Variables**

Zooplankton  
diversity, abundance  
and distribution

## **Duration**

80 years



5050804

Total Nautical Miles Sampled

258305

Total Samples Analysed

6647274

Total Nautical Miles Towed

3230971

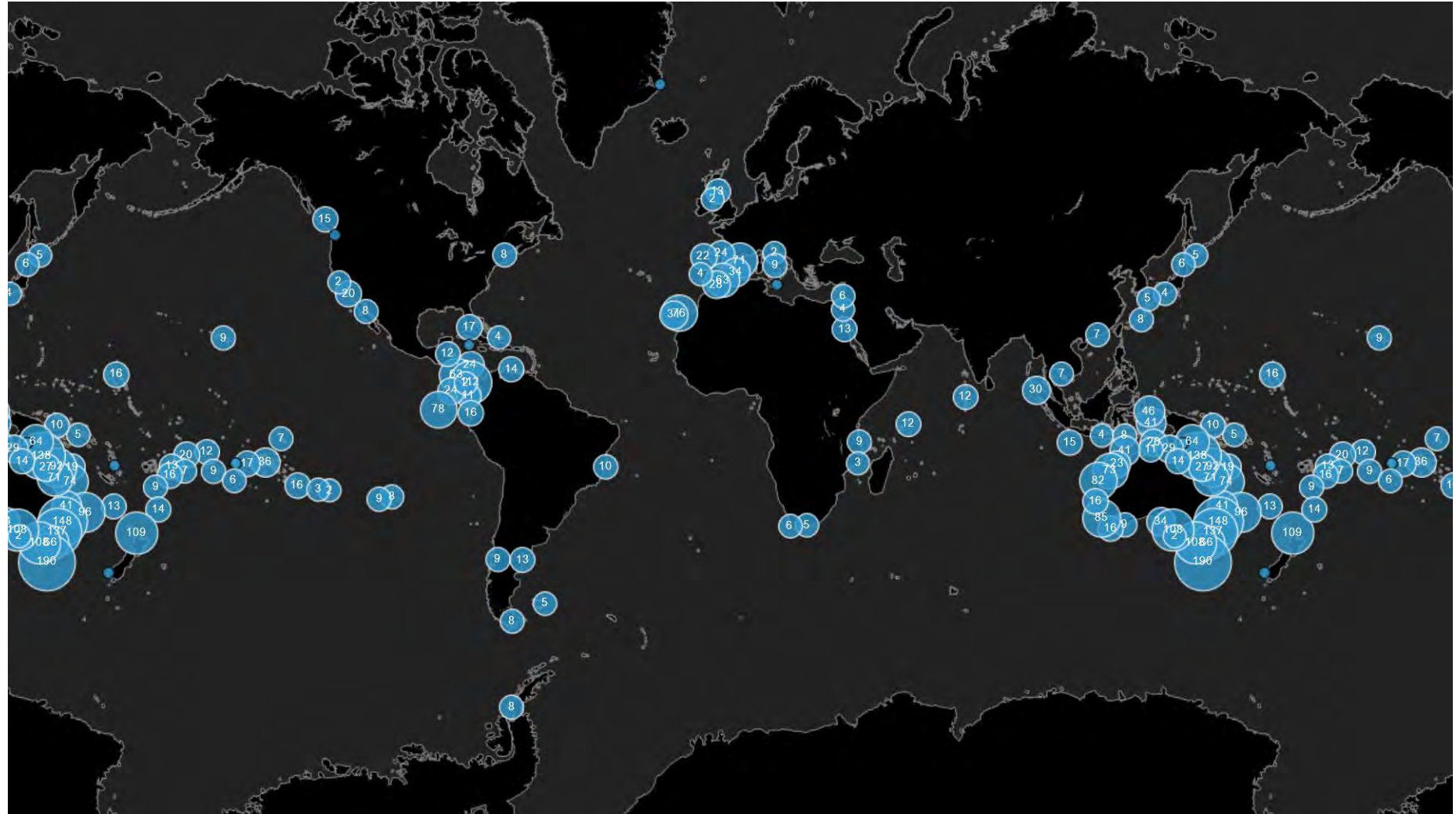
Taxonomic Abundance Entries

## ***Variables***

- Coral cover and composition
- Macroalgal cover and composition
- Fish diversity, abundance, size

## ***Duration***

10 years – Australia

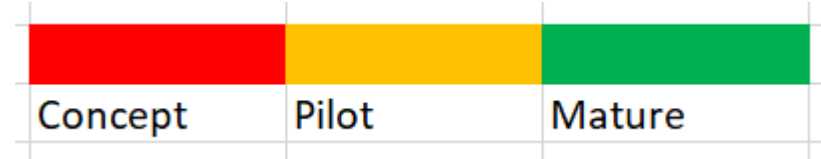


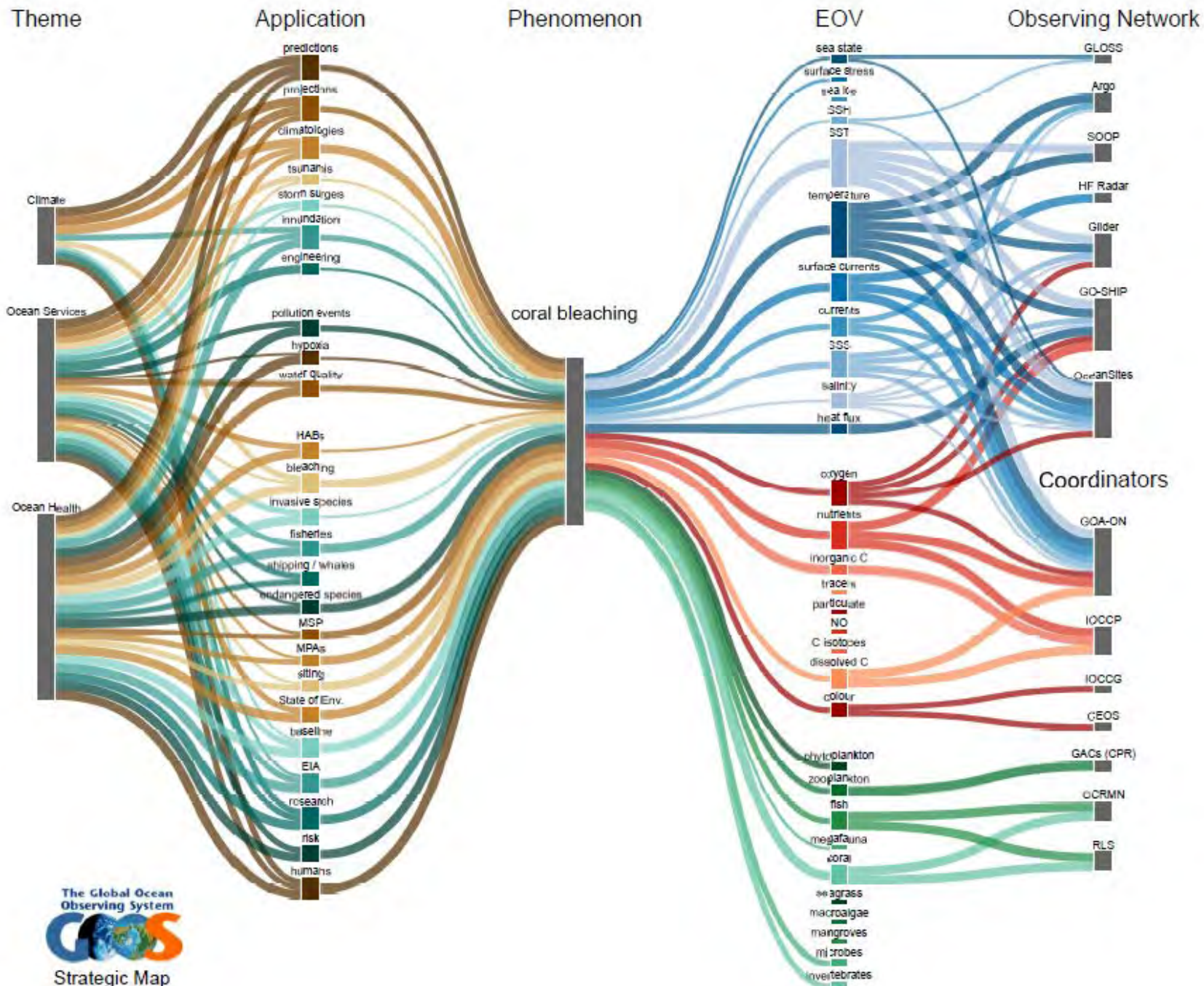


- A programme of the International Coral Reef Initiative (ICRI)
- Secretariat rotating every 2 years: 2016-18, France  
2018-20, Australia, Monaco, Indonesia
- Members: 26 countries + 37 other entities, including UNESCO-IOC, CBD, etc.
- Global and regional reports: Global reports – 1998, 2000, 2002, 2004, 2008  
Regional reports – e.g. Caribbean 2014, West Indian Ocean 2017  
Manuals and guidance
- New Implementation and Governance Plan supported by EN Environment under ICRI

# Biological ocean networks: some examples / OCG criteria

RESPONSIBLE	"NETWORK"	Global spatial scale	Temporally sustained	Globally coordinated	International data standards / open access	Contributing to (EXV) requirements	Clear mission, targets	Agreed best practices / QC	Technological readiness
ICRI	Coral GCRMN	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Yellow	Yellow
MBA (SAHFOS)	Zooplankton e.g. GACs	Yellow	Green	Green	Yellow	Green	Green	Green	Green
UTAS	RLS (Reef Life Survey)	Yellow	Yellow	Green	Green	Green	Green	Green	Green
IOC	Phytoplankton e.g. TRENDS-PO	Yellow	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow
IOC	GlobalHAB	Yellow	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow
IOCCG	Ocean colour	Green	Green	Green	Green	Green	Green	Green	Yellow
IOC	IGMETS	Green	Green	Green	Green	Green	Green	Green	Yellow
OTN, ATN, ETN, ARGOS	Animal Tracking	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow



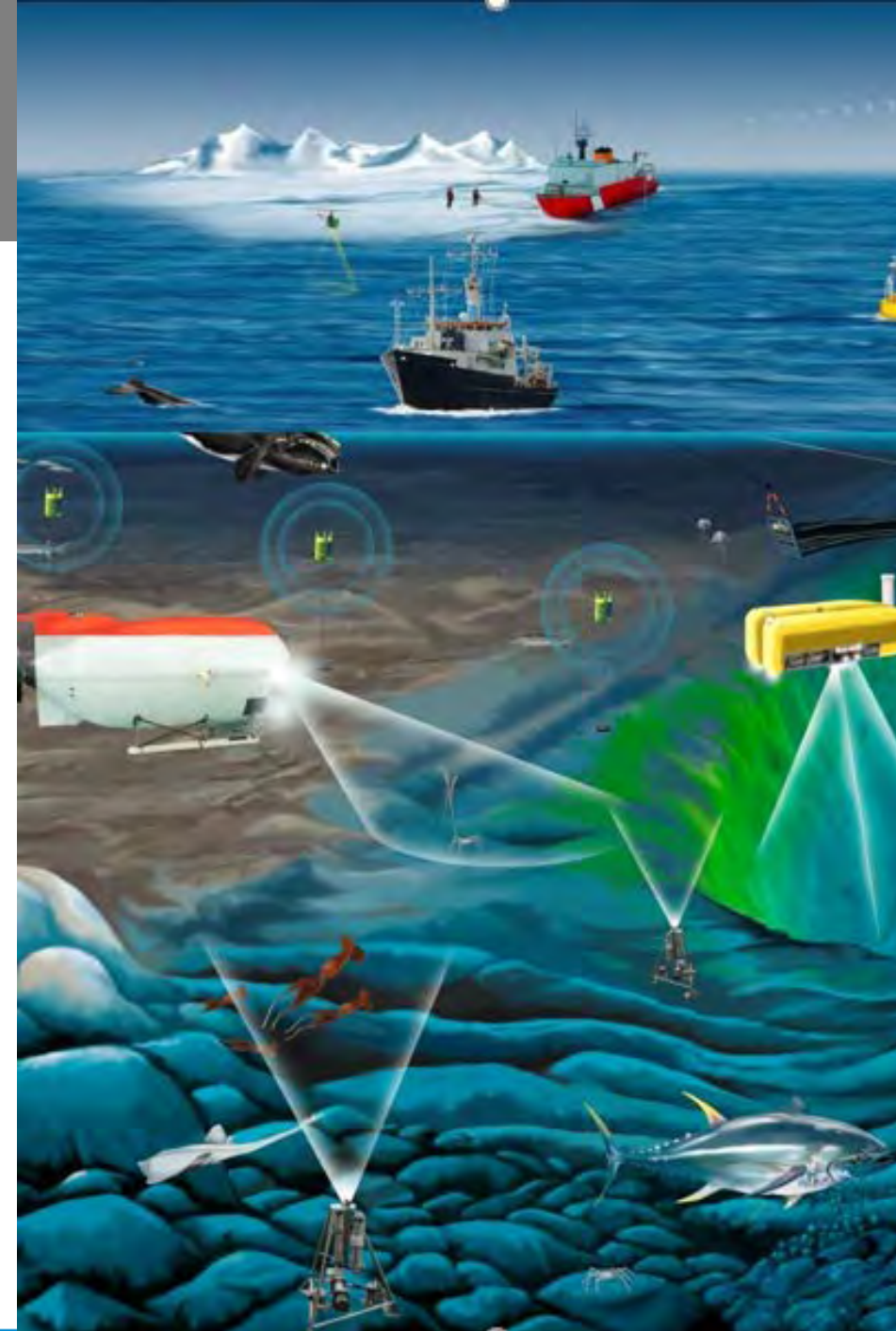




Link to strategic mapping for case example “Bleaching”

## Challenges of developing global biological EOV networks

- Communities of practice rather than networks
- Most mature networks are local/regional (IMOS in Australia, IOOS in the USA)
- Many “individual” efforts contributing to a common good
- Sustainability not global but on a case to case basis
- Heterogeneity in technology, capacity and funding – automatization very limited
- Best practices in discussion – collection of, rather than one method
- Some of the “networks” only compile data from observations rather than doing the observations (e.g. IGMETS)
- Similar efforts (e.g. Seagrass Net and Seagrass Watch) with intention to merge but need more support
- Rely on volunteer work (e.g. Reef Life Survey)



**Chairs: Nic Bax and Daniel Dunn**  
**Project Officer: Patricia Miloslavich**  
**Secretariat: Ward Appeltans**

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**Photo credit: Lisandro Benedetti-Cecchi**