



The Global Ocean Observing System



4th International Symposium June 4-8, 2018 • Washington, DC

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

UNIVERSITY of TASMANIA



stralian Government













http://goosocean.org/



Tasks of GOOS Expert PanelsPhysics – Biogeochemistry – Biology and Ecosystems

Expert Panels Physics GCOS · GOOS · WCRP Biogeochemistry **Biology and Ecosystems**

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





Photo credits: Dan Costa, Alistair Cheal, Eduardo Klein, Katrin Iken

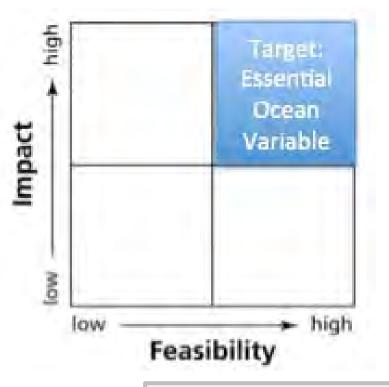


Process to identify biological Essential Ocean Variables "Drivers-Pressures-State-Impact-Response"

Impact

-Relevant to help solve science questions and address societal needs

-Contribute to improve management of marine resources



Global Change Biology

PRIMARY RESEARCH ARTICLE Open Access 🕝 🛈

Essential ocean variables for global sustained observations of biodiversity and ecosystem changes

Patricia Miloslavich 🕿, Nicholas J. Bax, Samantha E. Simmons, Eduardo Klein, Ward Appeltans, Octavio Aburto-Oropeza, Melissa Andersen Garcia, Sonia D. Batten, Lisandro Benedetti-Cecchi, David M. Checkley Jr., Sanae Chiba, J. Emmett Duffy, Daniel C. Dunn, Albert Fischer, John Gunn, Raphael Kudela, Francis Marsac, Frank E. Muller-Karger, David Obura, Yunne-Jai Shin, See fewer authors

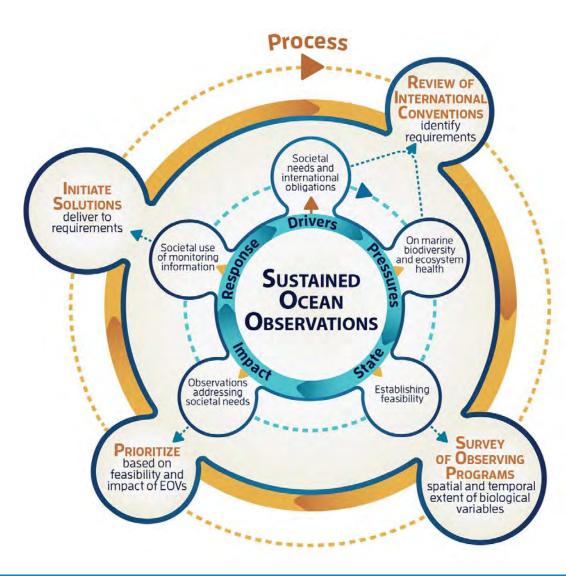
Feasibility

-Scientifically credible

-Technically practical, cost effective and within human capabilities

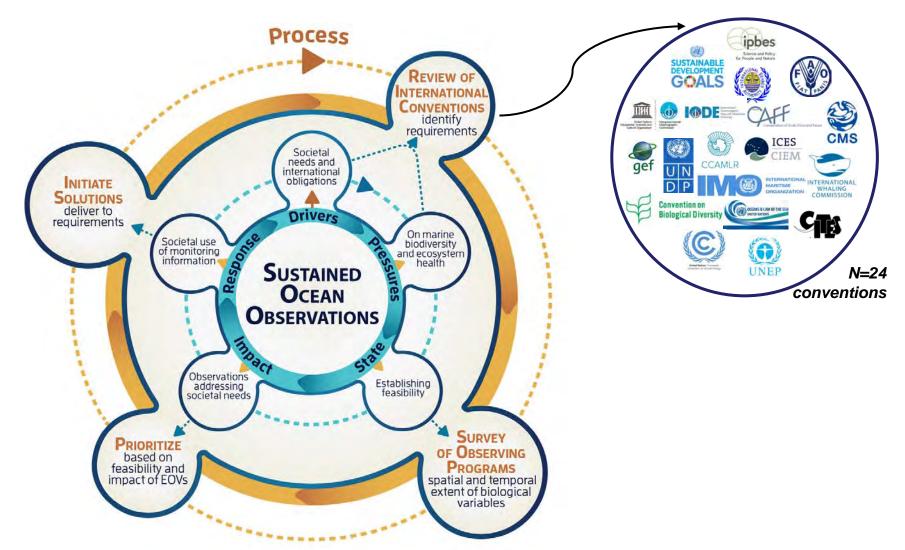






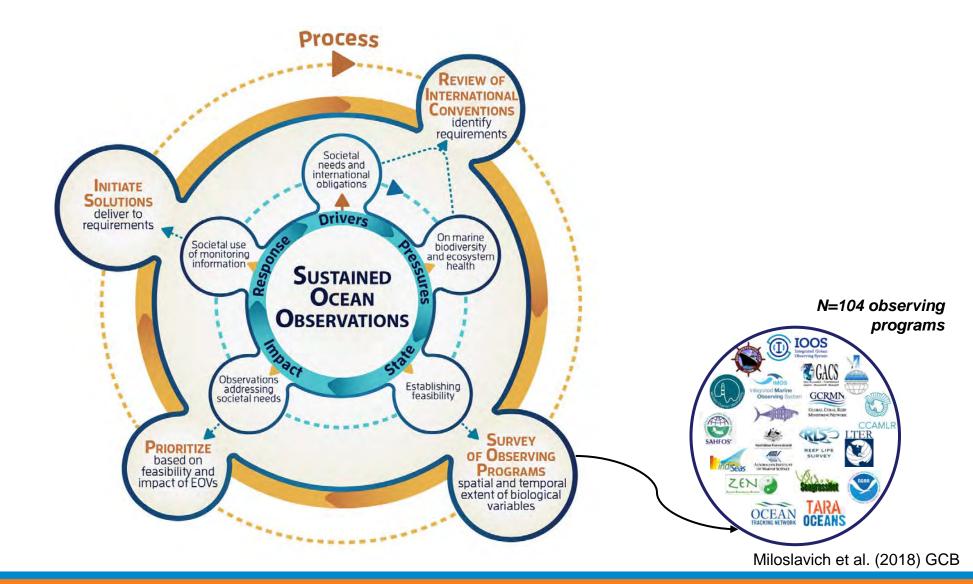






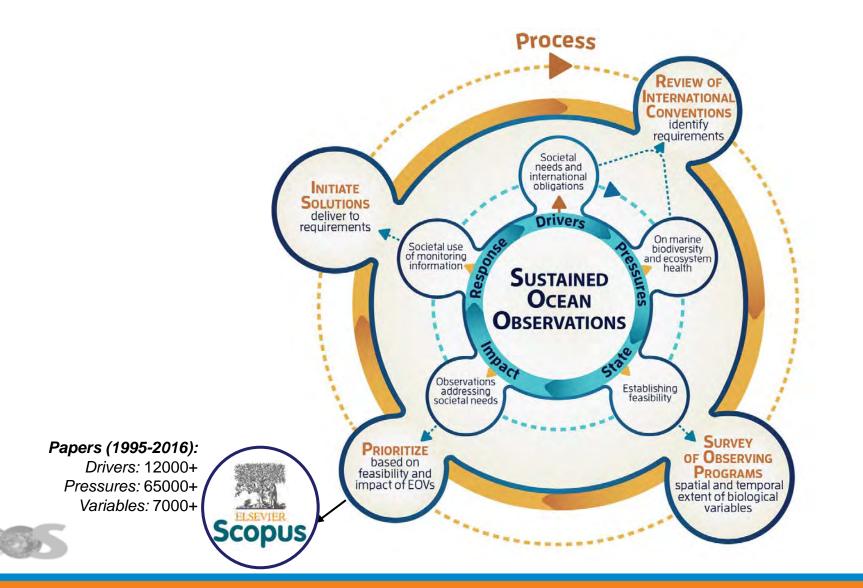




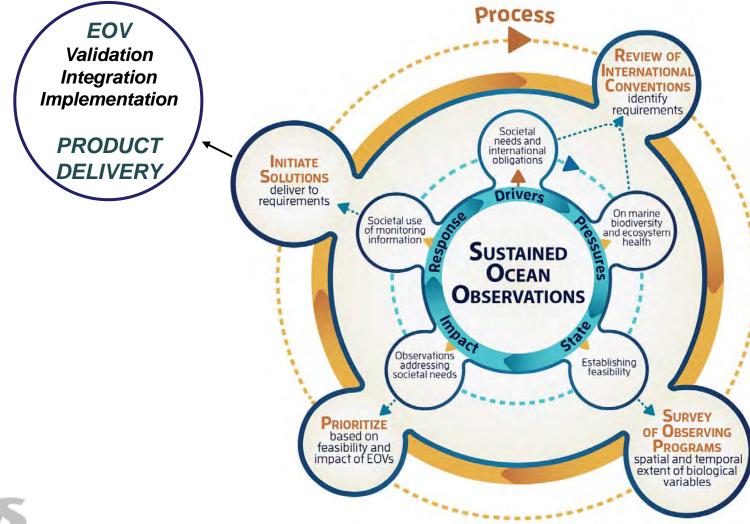






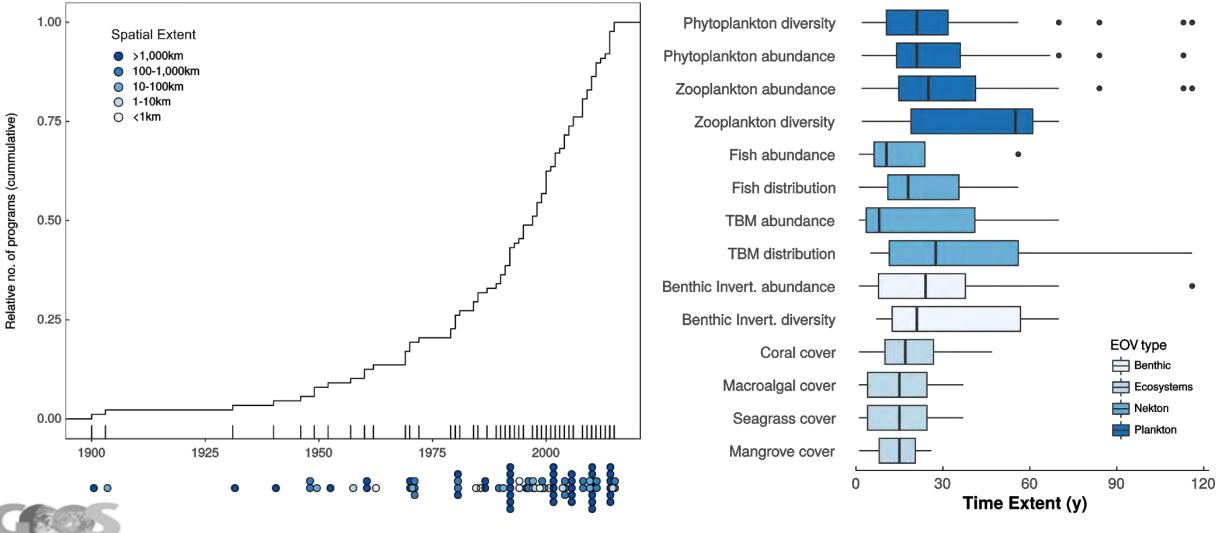






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Observing programs: spatial and temporal scales



biology and Ecosystems Panel



Impact and scalability of prioritized variables

Societal drivers and pressures Mangrove cover 1.00 (from conventions) PRESSURES Coral cover Mining 0.75 Noise Extreme Weather Events Ocean Acidification Solid Waste Relative Impact (RI) Invasive Species Capacity Building Coastal Development Sustainable Economic Pollution and Eutrophication Growth Climate Change Habitat and Resources Ecosystem Sustainable use of Macroalgal cover 0.50 Based Management Biodiversity 20 30 SCALE BAR: Percentage of conventions Benthic Invert. diversity Seagrass cover Biodiversity addressing each pressure within each group DRIVERS of drivers Conservation Fish abundance Access to Zooplankton diversity Scientific Data 0.25 Microbial activity TBM distribution Fish distribution Food Threat Prevention Microbial diversity Security Environmental Quality & Mitigation 0.00 **TBM** abundance 0.00 0.25 0.50

Relative Scalability (SI)

Phytoplankton abundance

Benthic Invert. abundance

Phytoplankton diversity

1.00

0.75

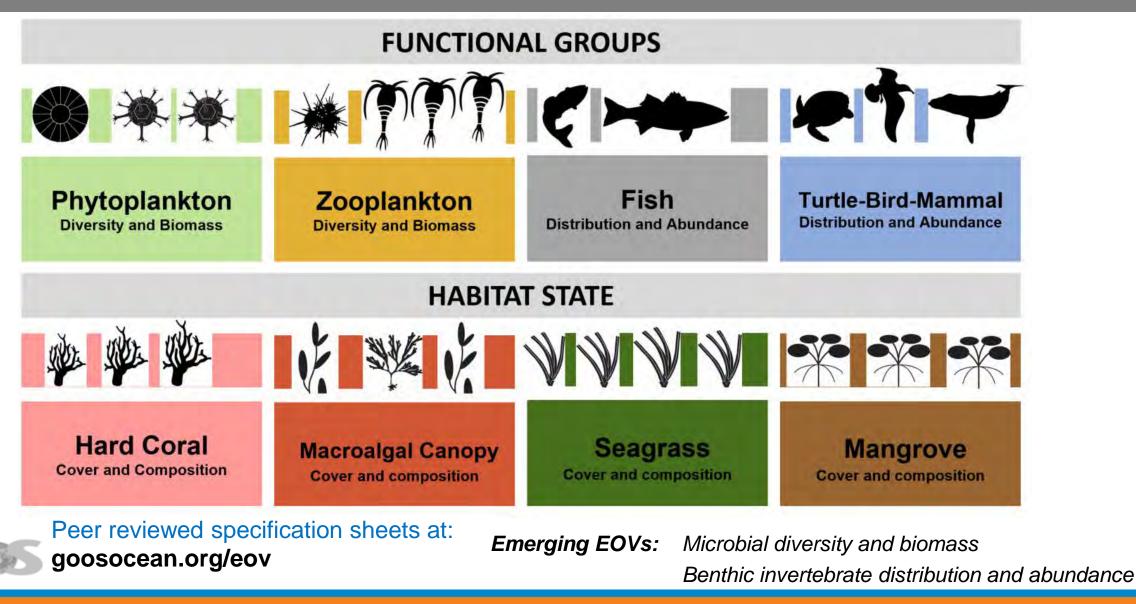
Zooplankton abundance

Scalability: Weights temporal and spatial scales





GOOS Biological / Ecological Essential Ocean Variables





Value of EOVs for the global <u>CLIMATE</u> observing system GCOS

ECV IN BRIEF



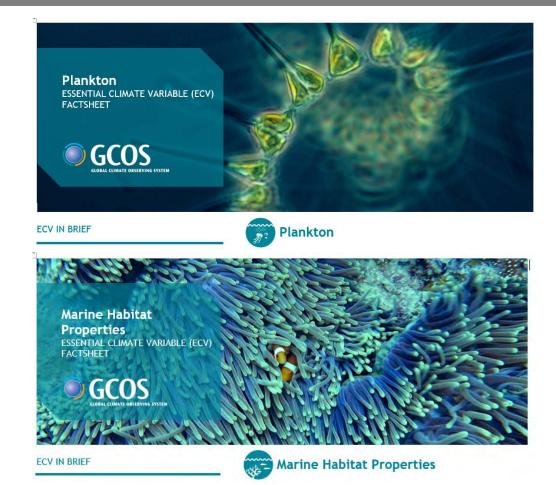
Domain: O Subdomain: B Scientific Area: B Products: PI

Ocean Biological/Ecosystems a: Biosphere Phytoplankton Zooplankton

ECV IN BRIEF

Domain: Subdomain: Scientific Area: Products:

Ocean Biological/Ecosystems Biosphere Coral Reefs Mangrove Forests Seagrass Beds Macroalgal Communities





PRODUCT

DEFINITION

FREQUENCY

CY RESOLUTION

REQUIRED MEASUREMENT UNCERTAINTY

REQUIREMENTS

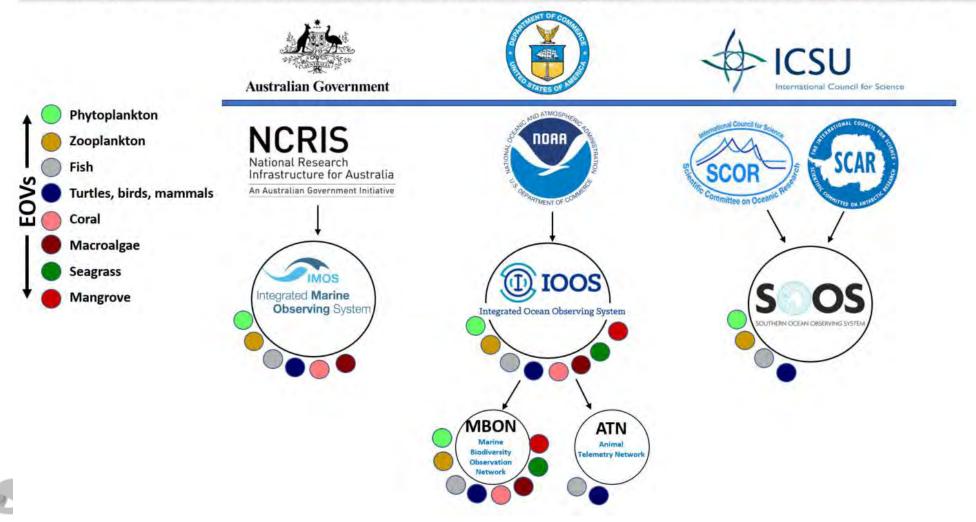
STABILITY

STANDARDS/

REFERENCES



Examples of links between some observing systems and GOOS BioEco EOVs



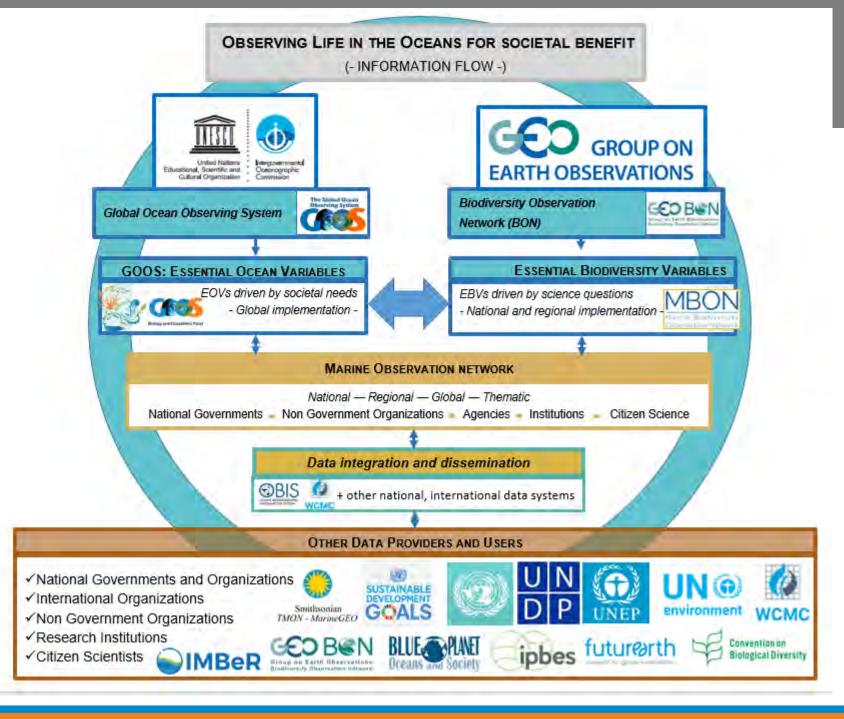
	S Ecosystem roperties	SOOS eEOVs	GOOS EOV	s GOOS subvariab	
	Primary producers/micr	robial	ALGAE	Habitat structure	
	Zooplankton	Detritus export/import	Eco	system extent and fragmentation	
	Krill		РНҮТО	Population size/age structure	
	Mesopelagic fish	Size spectrum / body s	size	H	
Delegia and easily have	Benthic - Biogenic habit	tats	ZOO	Population abundance	
Pelagic and sea ice taxa	Other fish	Abundance/density/ma	agnitudo		
	Sessile taxa	Abundance/defisity/file	-	Taxonomic diversity	
Physical Habitats	Mobile invertebrates		FISH		
	Fish			Allelic diversity	
Benthic species	Crabeater seals	Genetic/species comp	osition		
	Pygoscelis penguins			Population size	
				Age structure	
	Humpback whales	Diet		Species distribution	
Marine mammals and birds	Aptenodytes penguins	Foraging range	ТВМ	Migratory behavior	
	Flying birds	Phenology		Phenology Demographic traits	
	Fur/Elephant seals	Reproductive rate			





INTEGRATION

BioEco-MBON-OBIS





Building the global ocean observing system

IMPLEMENTATION – drafting the plans

-global coordination and coverage

- -intercomparable: best practices
- -open access data

ogy and Ecosystems Pane

-support international reporting needs

-aiming to build a network around each EOV

EOV IP Workshops

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







November 2017 Dar es Salaam, Tanzania





September 2018 Hobart, Australia



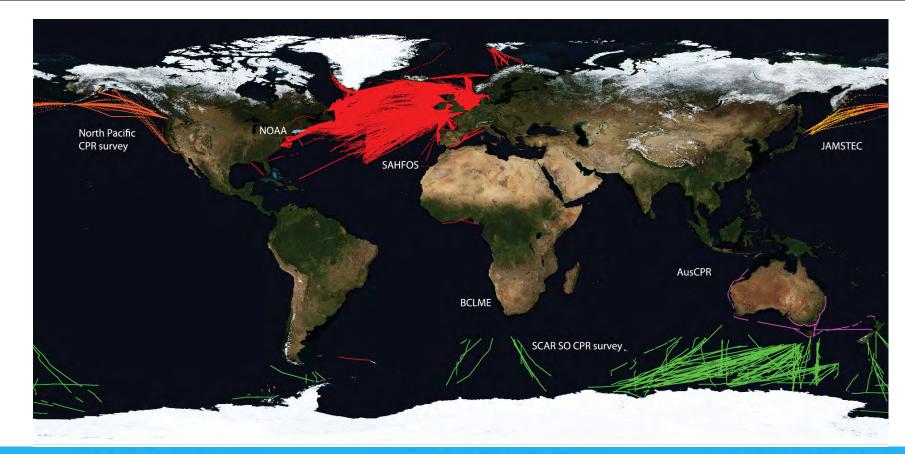
Biological ocean networks: The Global Alliance of Continuous Plankton Recorders

Variables

Zooplankton diversity, abundance and distribution

Duration

80 years



5050804

258305

6647274

3230971

Total Nautical Miles Sampled

Total Samples Analysed

Total Nautical Miles Towed

Taxonomic Abundance Entries

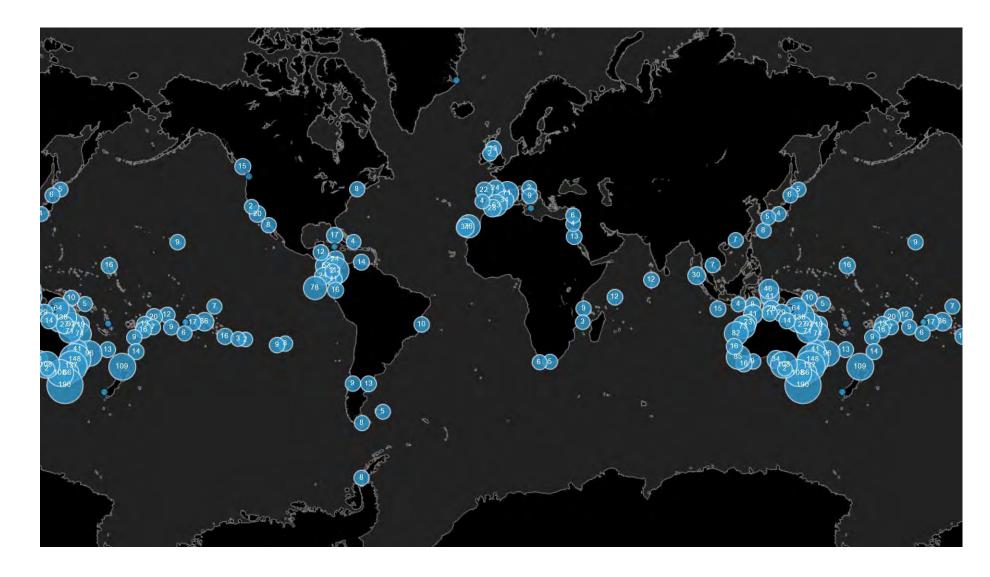


Variables

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

Duration

10 years – Australia







Biological ocean networks: The Global Coral Reef Monitoring Network

• A programme of the International Coral Reef Initiative (ICRI)



Secretariat rotating every 2 years: 2016-18, France

2018-20, Australia, Monaco, Indonesia

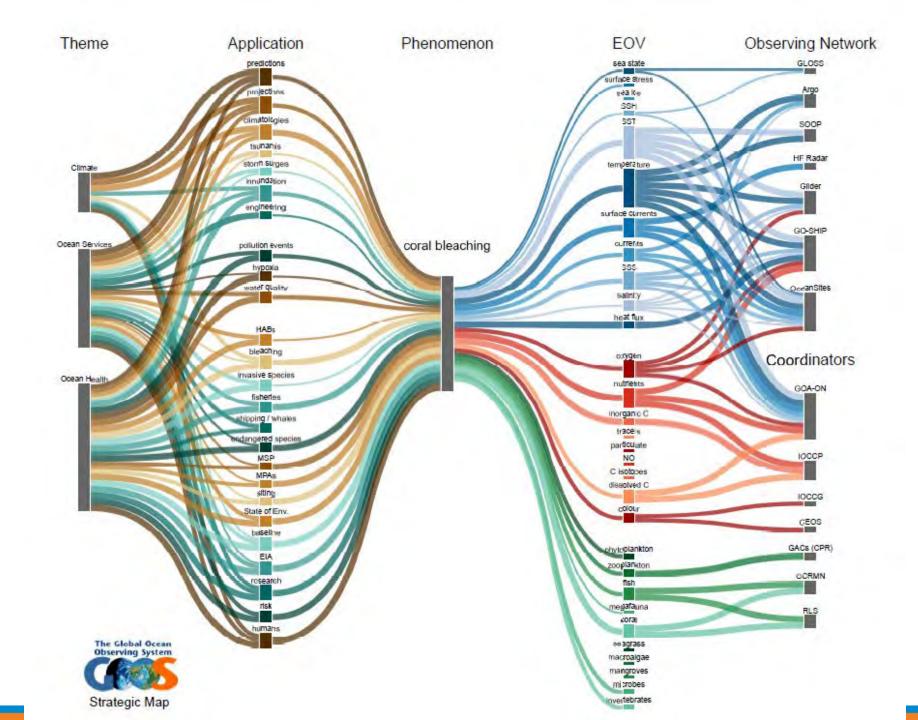
- Members: 26 countries + 37 other entities, including UNESCO-IOC, CBD, etc.
- Global and regional reports: Global reports 1998, 2000, 2002, 2004, 2008
 Regional reports e.g. Caribbean 2014, West Indian Ocean 2017
 Manuals and guidance
- New Implementation and Governance Plan supported by EN Environment under ICRI





Biological ocean networks: some examples / OCG criteria

					International	1			
					data	Contributing	Clear	Agreed best	
		Global	Temporally	Globally	standards /	to (EXV)	mission,	-	Technological
RESPONSIBLE	"NETWORK"			coordinated	_		-	QC	readiness
	Coral	Spatial Scale	Justanica		open access	requirements	turgets		reduitess
ICDI									
ICRI	GCRMN								
MBA	Zooplankton								
(SAHFOS)	e.g. GACs								
	RLS								
UTAS	(Reef Life Survey)								
	Phytoplankton								
IOC	e.g. TRENDS-PO								
IOC	GlobalHAB								
IOCCG	Ocean colour								
IOC	IGMETS								
OTN, ATN,									
ETN, ARGOS	Animal Tracking								
C. Buss	F					Concer	pt Pil	lot Ma	lature



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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)





GOOS BioEco Panel and collaborators http://goosocean.org/

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

Sonia Batten (SAHFOS – Canada), Lisandro Benedetti-Cechi (UP – Italy), Dave Checkley (Scripps – USA), Sanae Chiba (JAMSTEC – Japan), Emmett Duffy (Smithsonian – USA), Albert Fischer (IOC – France), John Gunn (AIMS – Australia), Eduardo Klein (USB – Venezuela), Raphael Kudela (UCSC – USA), Francis Marsac (IRD – France), Frank Muller-Karger (USF – USA), David Obura (CORDIC – Kenya), Yunne Shin (IRD – France), Samantha Simmons (MMC – USA)

Photo credit: Lisandro Benedetti-Cecchi