PICES Annual Meeting
November 2016
San Diego, USA

Can we use zooplankton diversity to fill the global indicator gap of the Aichi Biodiversity Target 10?

Sanae Chiba[1,2], Stephen Fletcher[2],Sonia Batten[3]
JAMSTEC[1], UNEP-WCMC[2], SAHFOS[3]

Putting biodiversity at the heart of decision-making

World Conservation Monitoring Centre

UNEP WCMC

Collating Knowledge

Assessing Biodiversity

Developing tools

Valuing Natural Capital

Mapping Hotspots and Priorities

25 yrs of PICES & Ecosystem Change Studies

Drivers

Fisheries

Climate change

BGC

Eco Sys Services Biodiversity

1990s 2000s 2010s

Science Foci

Regional Mechanisms

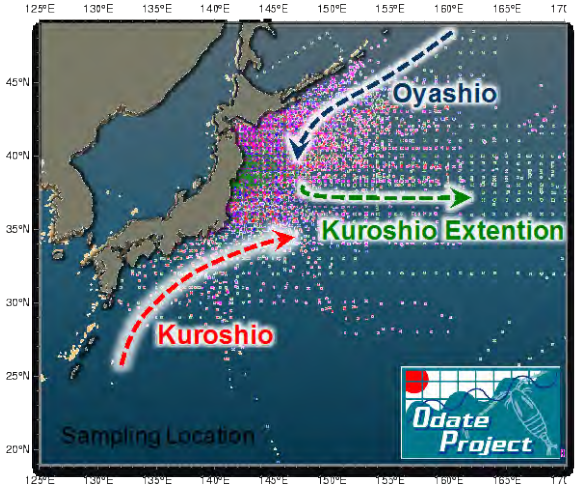
Global integration

Link to Society

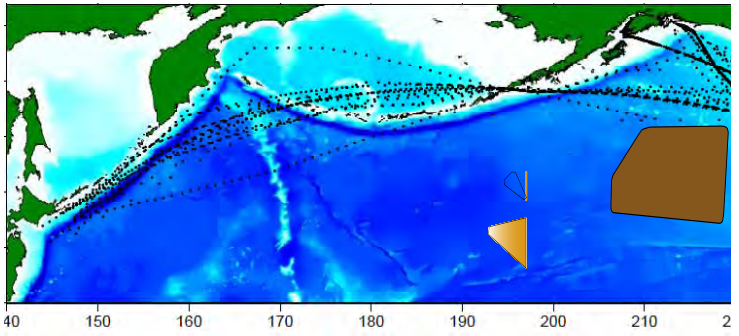
My PICES Debut

2000 2009 2016

Odate Project



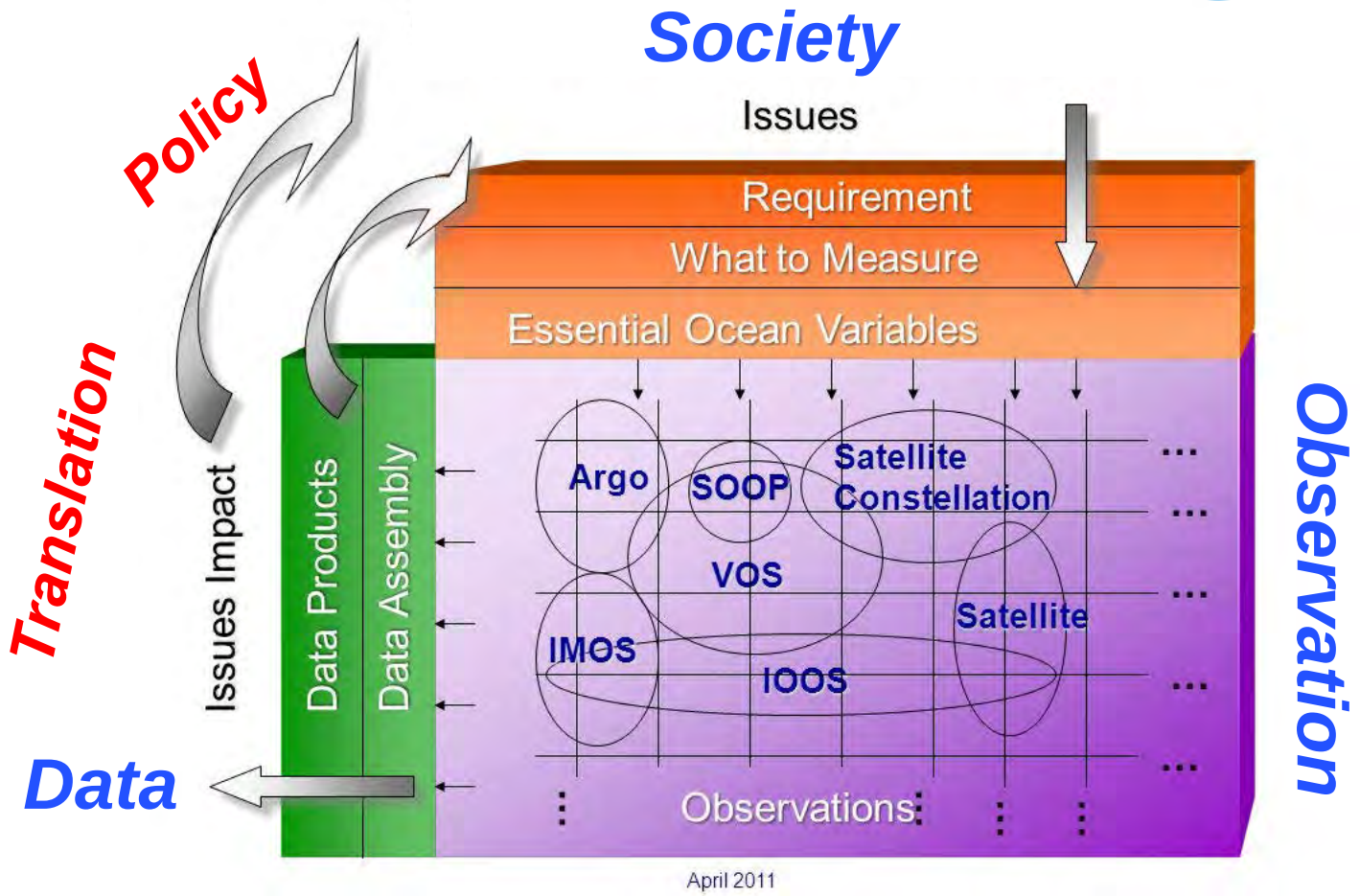
North Pacific CPR Survey



UNEP-WCMC

Framework for Ocean Observing

EOV: Essential Ocean Variable



(UNESCO 2012, doi: 10.5270/OceanObs09-FOO)

CLARISSE M. HART/HARVARD FOREST

It's time to get real about conservation

Nature 2016

Third, more scientists must get actively involved in the political process. Calling, e-mailing and writing to political leaders is a small but necessary first step. Showing up for seemingly endless political meetings is a larger but necessary follow-up. If we're not in the room, our voices won't be heard. Volunteering for local, regional, national or international groups directly involved in conservation decisions is a bigger commitment. But if not us, who? And running for elected office would logically follow. If not now, when?

Scientists studying ozone depletion and climate change have shown that getting involved directly in the decision-making process can give scientists a place at the global table and a voice to help effect political change. Scientists who both study biodiversity and want to see other species persist and thrive must follow their example. ■

How can scientists pr
Great Elephant Ce
in numbers throug
researchers for more and be
many of each species there
conserve them. This is non

Better data will not save
enormous number of indiv
and national governments,
organizations have been co
data for decades, essentially

Of course, biodiversity d
suggest priorities and to dra
species. But biodiversity d
servation decision-makin
majority of cases, they are
sions made for other reasons. The decisions last week by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to tighten trade in endangered species of sharks, parrots and pangolins shows this. Fascination, charisma and plush toys captured the imagination of the delegates, and journalism, political pressure and social-media campaigns pushed the decisions.

This week's Global Scientific Meeting in South Africa's Kruger National Park of the International Long-term Ecological Research network (ILTER) demonstrates the problem. With its long and enviable track record in integrating social dynamics into the study of ecological systems and

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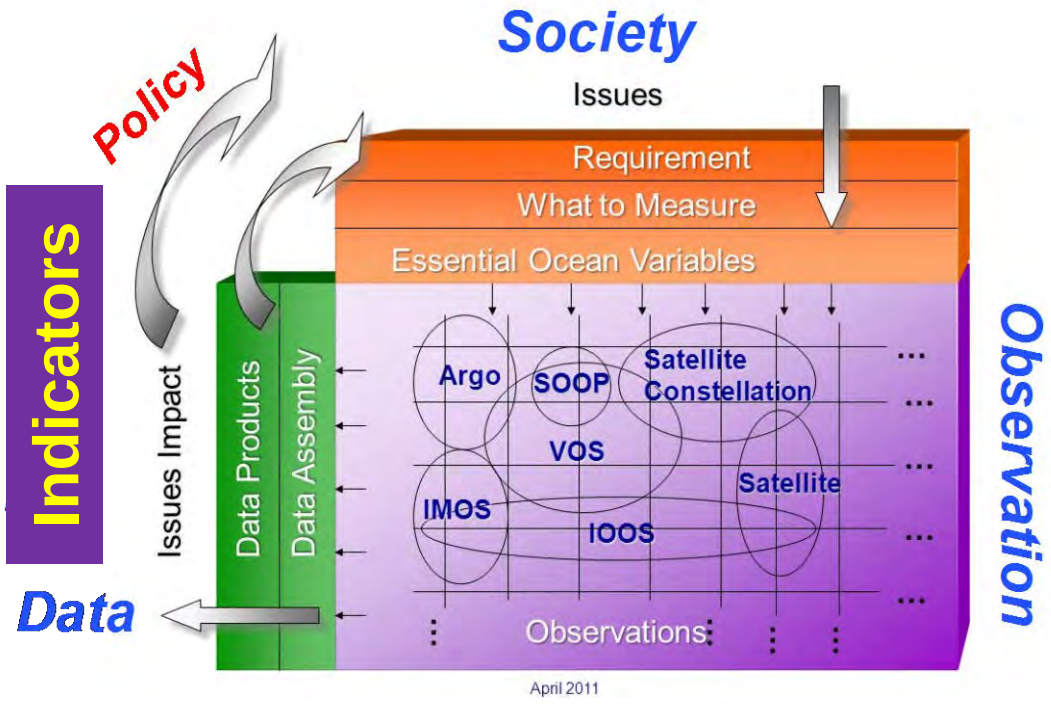
BETTER DATA WILL NOT SAVE ELEPHANTS, RHINOS OR ANY OTHER SPECIES.

spiders or snakes, or positive ones to pandas, pangolins or baby seals. Decisions about which species to save — and which to triage to extinction — are based on raw emotion, the views of many different stakeholders and myriad political calculations. As the CITES process has demonstrated, data can be marshalled to support conservation decisions with broad-based support from a range of parties. But such consensuses are increasingly hard to come by, the resulting CITES decisions still do not provide airtight protection, and as conflicts rage around the world and rapid economic growth continues to be prioritized over conservation in both developing and developed countries, biodiversity will continue to decline.

Indicators: Translation of Scientific Outcome

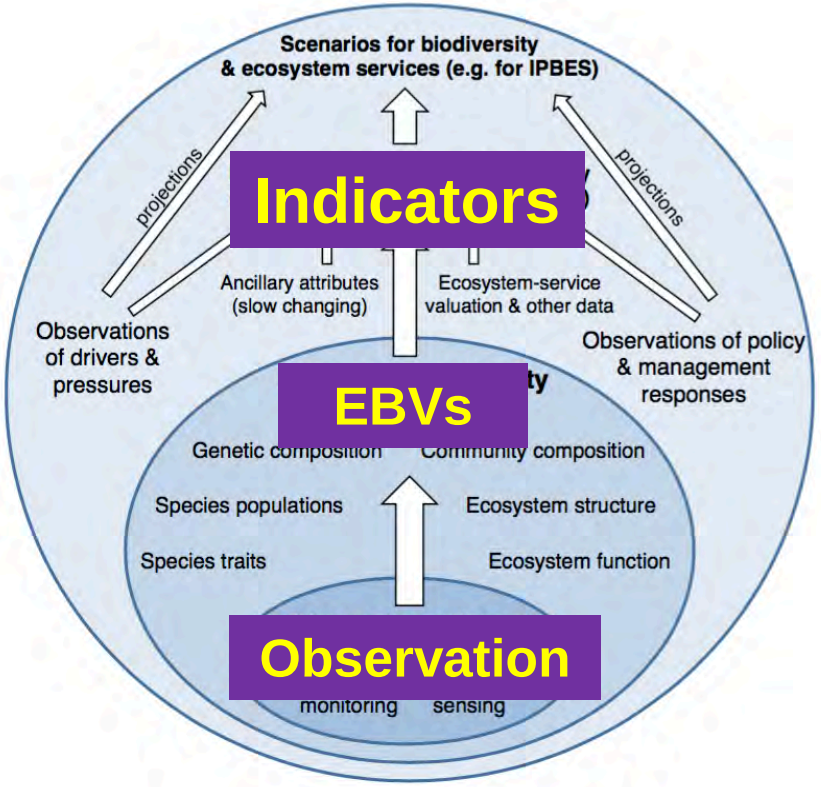
Framework for Ocean Observing

EOV: Essential Ocean Variable



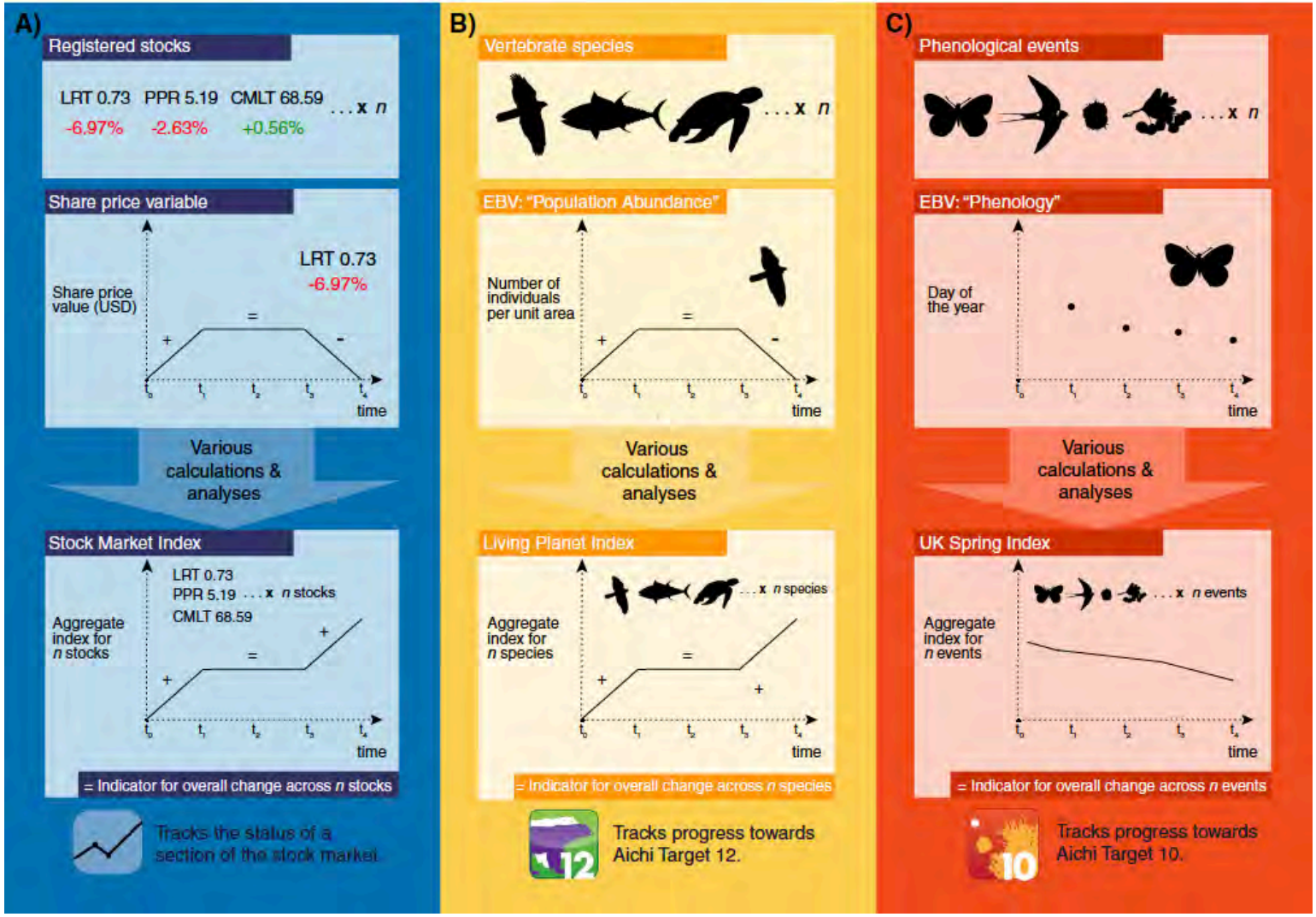
GEO BON

EBV: Essential Biodiversity Variables



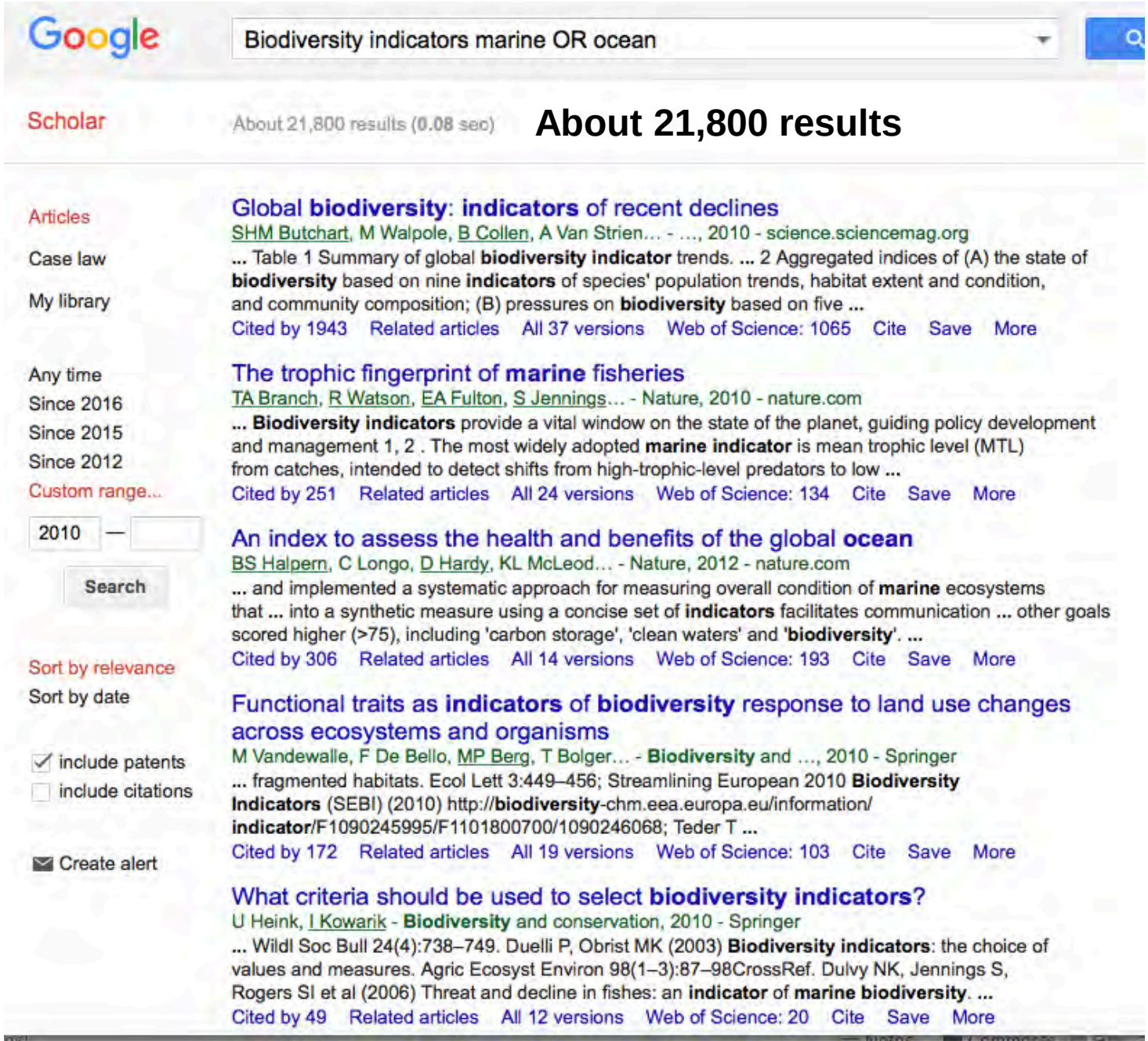
(Pereira et al., Science, 2013)

Analogy between Stock market Index and Living Planet Index



(Brummitt et al 2016, Biological Conservation)

Academic Articles on Marine Biodiversity Indicators published since 2010



Google

Biodiversity indicators marine OR ocean

Scholar

About 21,800 results (0.08 sec)

About 21,800 results

Articles

Case law

My library

Any time

Since 2016

Since 2015

Since 2012

Custom range...

2010 —

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Sort by relevance

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include citations

Create alert

Global biodiversity: indicators of recent declines

SHM Butchart, M Walpole, B Collen, A Van Strien... - ..., 2010 - science.sciencemag.org

... Table 1 Summary of global **biodiversity indicator** trends. ... 2 Aggregated indices of (A) the state of **biodiversity** based on nine **indicators** of species' population trends, habitat extent and condition, and community composition; (B) pressures on **biodiversity** based on five ...

Cited by 1943 Related articles All 37 versions Web of Science: 1065 Cite Save More

The trophic fingerprint of marine fisheries

TA Branch, R Watson, EA Fulton, S Jennings... - Nature, 2010 - nature.com

... **Biodiversity indicators** provide a vital window on the state of the planet, guiding policy development and management 1, 2 . The most widely adopted **marine indicator** is mean trophic level (MTL) from catches, intended to detect shifts from high-trophic-level predators to low ...

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An index to assess the health and benefits of the global ocean

BS Halpern, C Longo, D Hardy, KL McLeod... - Nature, 2012 - nature.com

... and implemented a systematic approach for measuring overall condition of **marine** ecosystems that ... into a synthetic measure using a concise set of **indicators** facilitates communication ... other goals scored higher (>75), including 'carbon storage', 'clean waters' and '**biodiversity**'. ...

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Functional traits as indicators of biodiversity response to land use changes across ecosystems and organisms

M Vandewalle, F De Bello, MP Berg, T Bolger... - **Biodiversity** and ..., 2010 - Springer

... fragmented habitats. Ecol Lett 3:449–456; Streamlining European 2010 **Biodiversity Indicators** (SEBI) (2010) http://**biodiversity**-chm.eea.europa.eu/information/**indicator**/F1090245995/F1101800700/1090246068; Teder T ...

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What criteria should be used to select biodiversity indicators?

U Heink, I Kowarik - **Biodiversity** and conservation, 2010 - Springer

... Wildl Soc Bull 24(4):738–749. Duelli P, Obrist MK (2003) **Biodiversity indicators**: the choice of values and measures. Agric Ecosyst Environ 98(1–3):87–98CrossRef. Dulvy NK, Jennings S, Rogers SI et al (2006) Threat and decline in fishes: an **indicator** of **marine biodiversity**. ...

Cited by 49 Related articles All 12 versions Web of Science: 20 Cite Save More

Good Global Indicators are:

- **Well align to specific foci**
- **Scientifically credible**
- **Easy to understand (for non-scientist)**
- **Indicate present state and temporal trend**
- **Ideally Global**

Biodiversity Indicators Partnership

MIND THE GAP!

CAN YOU HELP US TO FILL THE REMAINING GAPS IN THE GLOBAL INDICATOR FRAMEWORK FOR THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020?

List of Aichi Target components for which no specific indicators have been identified*:

1	Trends in public engagement with biodiversity
2	Trends in extent to which biodiversity and ecosystem service values are incorporated into reporting systems
4	Trends in extent to which biodiversity and ecosystem service values are incorporated into organizational accounting and reporting
5	Trends in fragmentation of forest and other natural habitats
6	Trends in proportion of depleted, target and bycatch species with recovery plans
7	Trends in proportion of production of aquaculture under sustainable practices
	Trends in extinction risk and populations of forest-specialist species in production forest
9	Trends in identification and prioritization of IAS
	Trends in the distribution and populations of IAS
	Trends in impacts of IAS on ecosystems
10	Trends in responses to reduce pressures on coral reefs
	Trends in extent and condition of other vulnerable ecosystems impacted by climate change or ocean acidification
	Trends in pressures on other vulnerable ecosystems impacted by climate change or ocean acidification
	Trends in responses to reduce pressures on other vulnerable ecosystems impacted by climate change or ocean acidification
11	Trends in areas of particular importance for ecosystem services conserved
13	Trends in genetic diversity of socio-economically as well as culturally valuable species
14	Trends in restoration of ecosystems that provide essential services
15	Trends in ecosystem resilience
18	Trends in the practice of traditional occupations (decision X/43)
	Trends in which traditional knowledge and practices are respected through their full integration, safeguards and the full and effective participation of indigenous and local communities in the national implementation of the Strategic Plan

*A full list of the Aichi Biodiversity Targets is available online: **https://www.cbd.int/sp/targets/***

http://www.bipindicators.net/gaps

Quick guide to the
Aichi Biodiversity Targets
Pressures on vulnerable ecosystems reduced

By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning

Element 10.1

Multiple anthropogenic pressures on **coral reefs** are minimized, so as to maintain their integrity and functioning

Element 10.2

Multiple anthropogenic pressures on **other vulnerable ecosystems** impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning

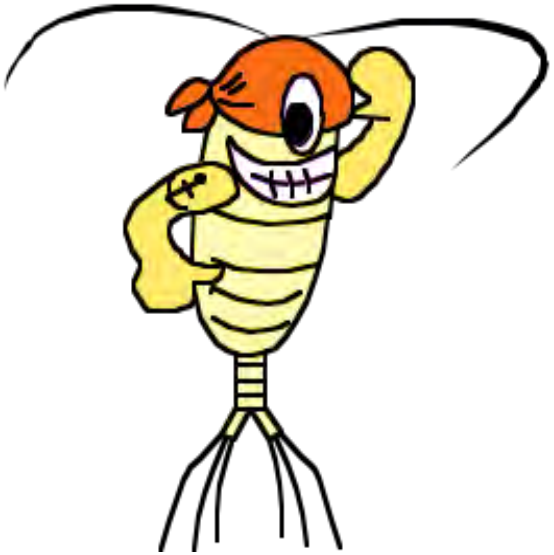
Indicator type	*Indicator*	*Potential Indicator*
PRESSURE X		
STATE O ←	• Living Planet Index of reef-dependent spp. • Red List Index of reff-building coral spp.	• Global coral health (NOAA Coral Reef Watch) • Global coral reel cover (U Queensland) • Number of countries reporting coral bleaching (ReefBase)
RESPONSE X		
PRESSURE X		
STATE X ←		Cumulative human impact on marine ecosystem (Halpern et al. 2008)
RESPONSE X		

Online Survey

MIND THE GAP!

CAN YOU HELP US TO FILL THE REMAINING GAPS IN THE GLOBAL INDICATOR FRAMEWORK FOR THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020?

Strength of Zooplankton Data against BIP Criteria

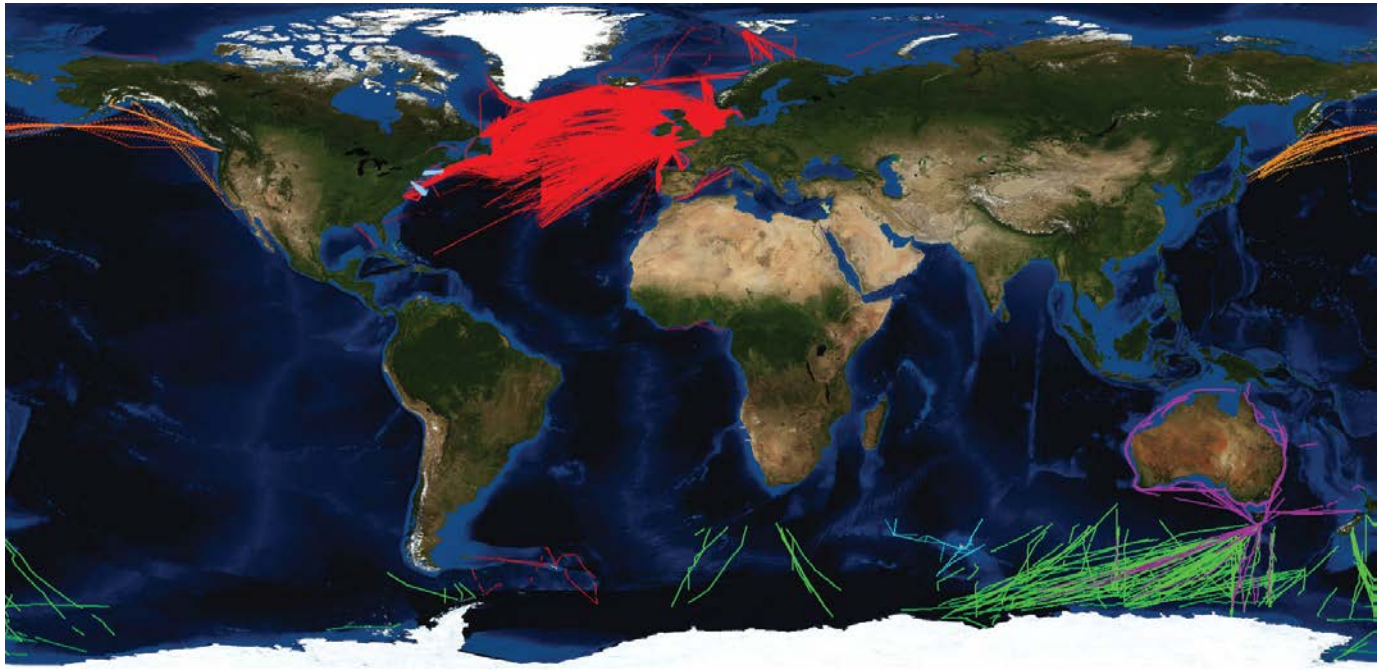


Strengths

Advantages
Capabilities
Resources, Assets, People
Marketing - reach, distribution, awareness

Good Temporal and Spatial Coverage
(quasi-global, many time-series > 10 yrs)
CPR: Standardized observation and analytical methods

GACS
GLOBAL ALLIANCE OF CONTINUOUS PLANKTON RECORDER SURVEYS



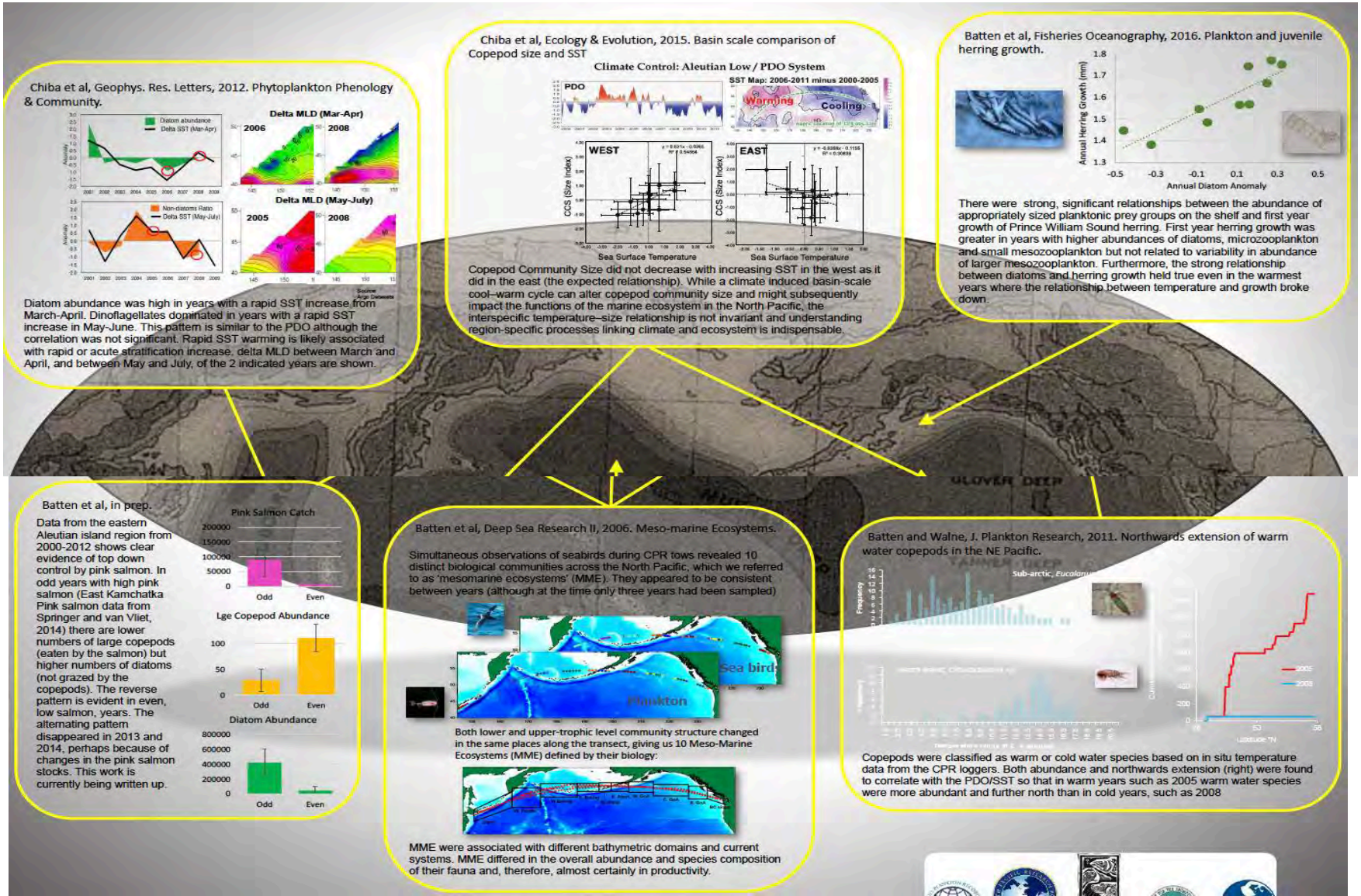
Strengths

Advantages
Capabilities
Resources, Assets, People
Marketing - reach, distribution, awareness

Scientifically Credible

S1 Poster

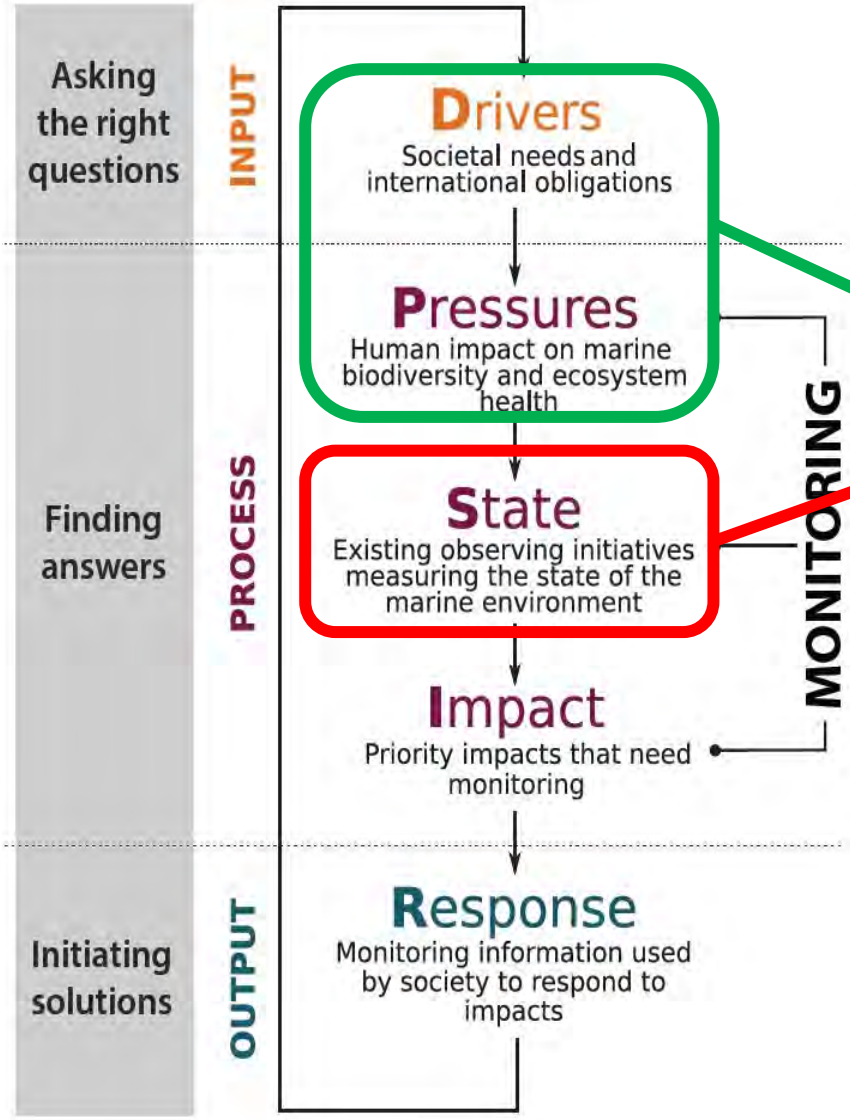
Highlights from 16 years of the North Pacific CPR program, a PICES MONITOR project. S. Batten, S. Chiba, T. Yoshiki, H. Sugisaki



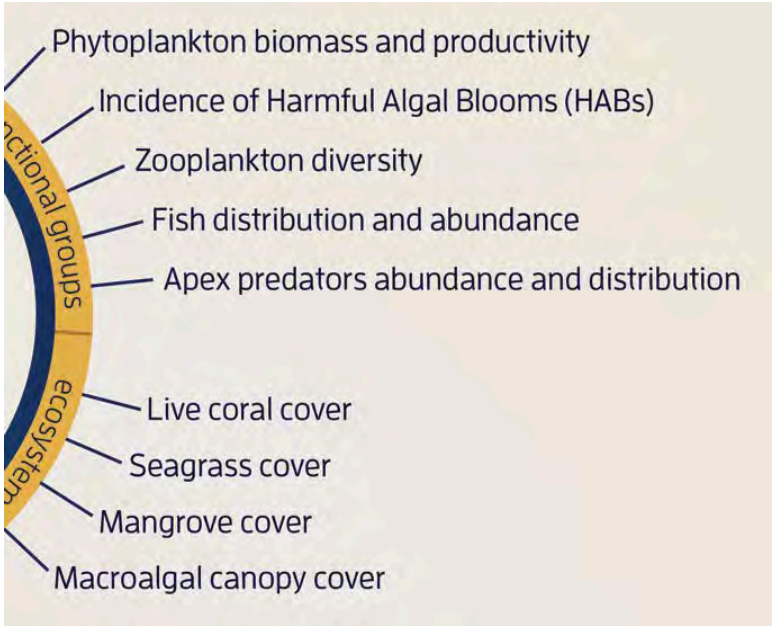
Priority Setting for GOOS EOVs

Strengths
Advantages
Capabilities
Resources, Assets, People
Marketing - reach, distribution, awareness

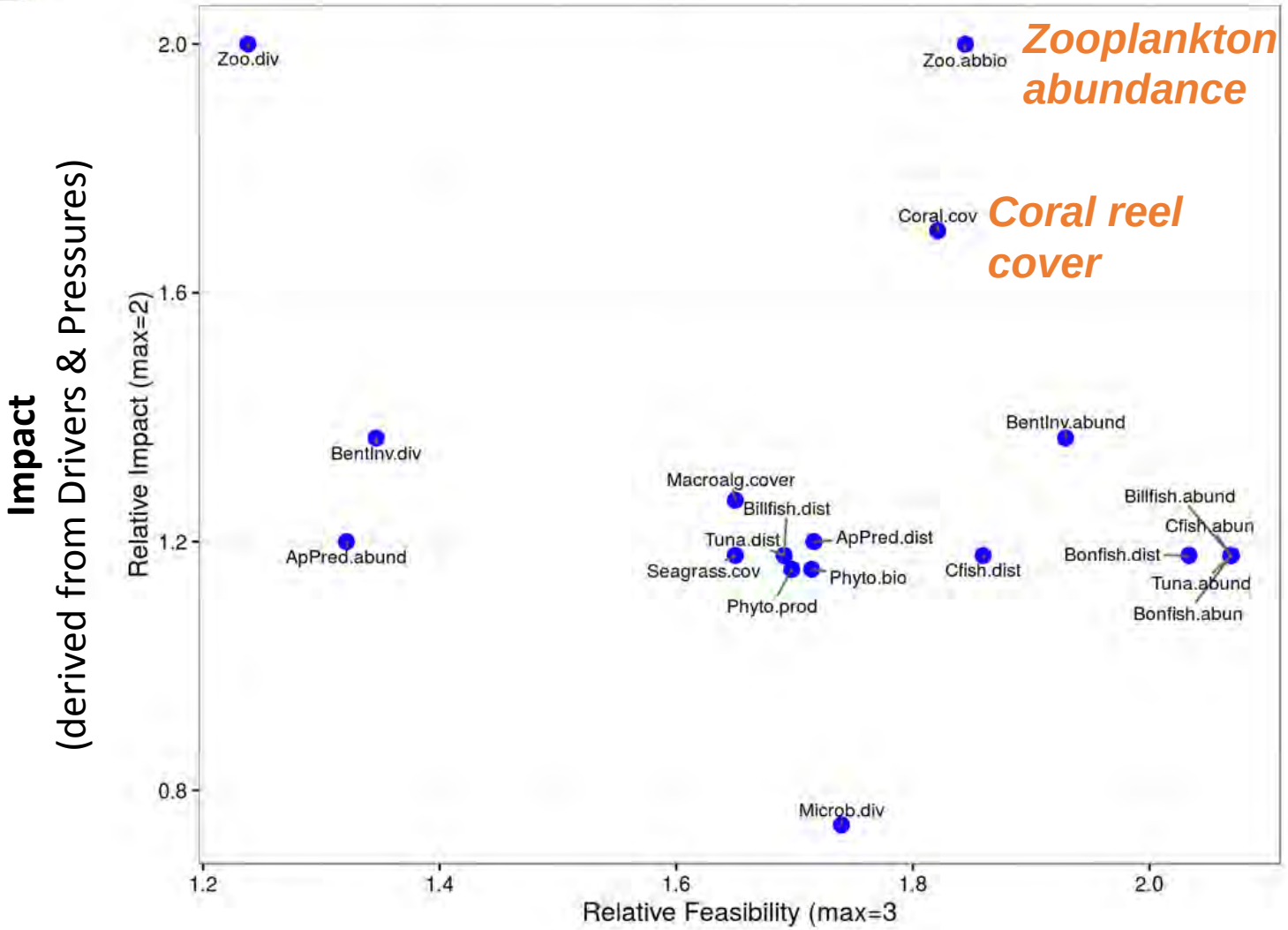
The Global Ocean Observing System



GOOS-BEP Candidate EOVs



Priority Setting for GOOS EOVs: Impact vs Feasibility



Impact
(derived from Drivers & Pressures)

Feasibility of Observation
(derived from "State" survey)

(Paper in preparation)

High score against BIP Indicator Criteria

Table 1 Zooplankton Diversity Indicators vs. BIP Global Indicator Criteria. The Criteria is based on Tittensor et al. 2014).

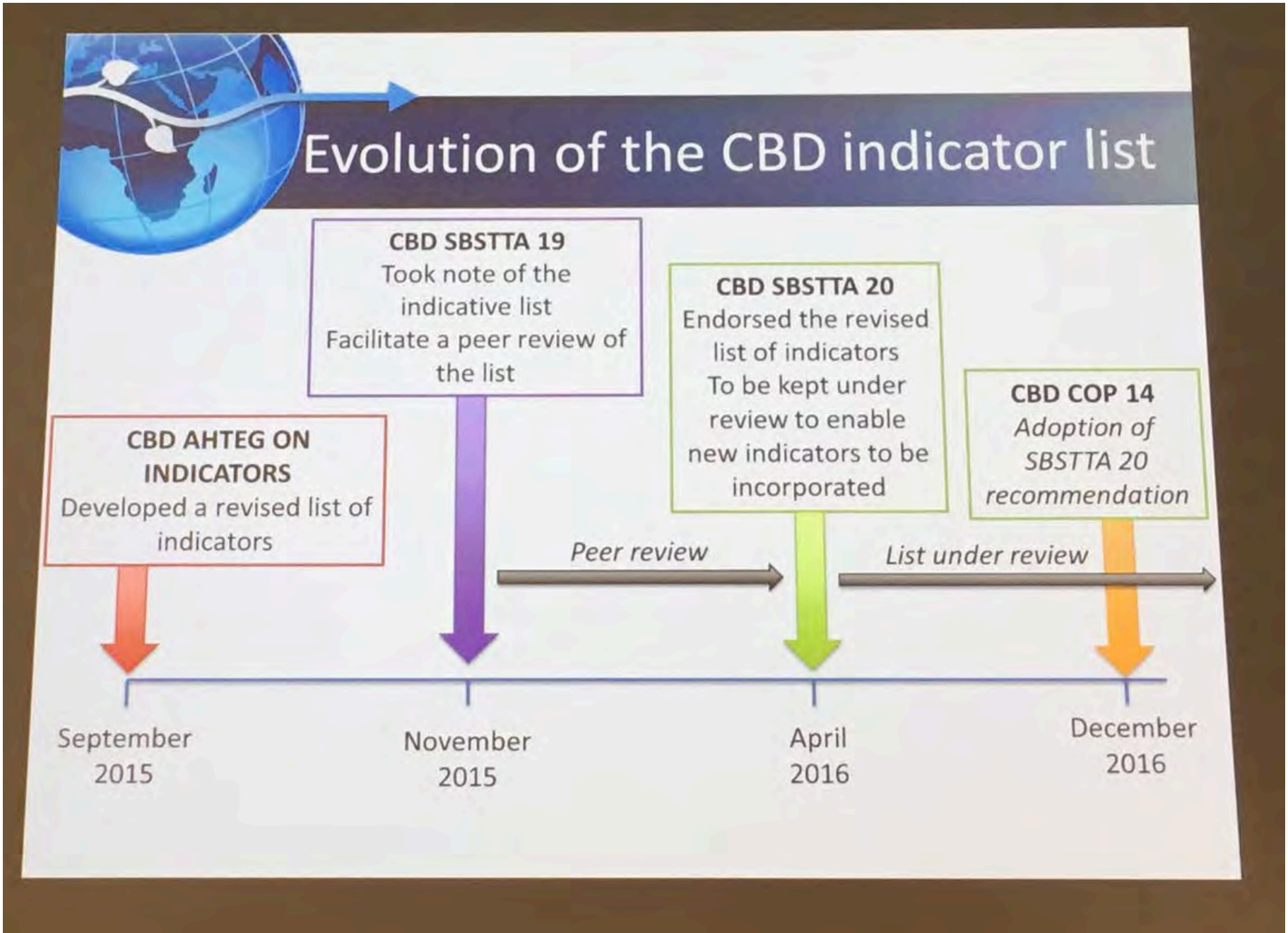
Zooplankton Diversity Indicators		**Total Abundance**	**Species Richness**	**Size Index**	**Community Structure (Principal Component)**	**Abundance of target species/taxa**	**Morphological & physiological condition of shelled plankton**
What to indicate (on current status and long-term trend)		Biological Productivity, Food supply for fish, birds & mammals.	Biodiversity, Ecosystem health	Food quality for fish, birds & mammals	Food quantity for fish, birds & mammals, Biogeographic al shift, etc.	Productivity of top predator, deterioration of environment, etc.	Impacts of Ocean Acidification
BIP Global Indicator Criteria	Relevance/Alignment (Low – Mid – High)	High	High	High	High	High	High
	Scientific Credibility **"Published?"** (Low – Mid – High)	High	High	High	High	High	Low – Middle (method not published yet)
	Temporal Coverage: end data point **2010~**	Yes	Yes	Yes	Yes	Yes	Potentially Yes
	Temporal Coverage: at least **5** data points	Yes	Yes	Yes	Yes	Yes	Potentially Yes
	Geographic Coverage **"Global ideally"**	Quasi - global	Quasi - global	Quasi - global	Quasi - global	Quasi – global or Regional	Quasi - global
	BIP Category ABC	?	?	?	?	?	?

Online Survey Summary, September 16, 2016

Aichi Target	Generic indicator	Suggested indicators through the online consultation	Operational (o) or under development (d) or idea (I)	Funding required for global indicator (Y/N)	Easy to update? Y/N)	Alignment to element (H/M/L)	Spatial coverage (H/M/L)	Indicator category
10	Trends in extent and condition of other vulnerable ecosystems impacted by climate change or ocean acidification	Mortality, bleaching and necrosis events – UNEP MAP	O (sub-global)	Y	?	H	M (21 Mediterranean countries)	Sub-global indicator of potential future interest for dissemination
		Phenology of reproductive events of selected marine species (fishes, marine turtles, seabirds, flowering of P. oceanica) – UNEP MAP	O (Sub-global)	Y	?	H	M (21 Mediterranean countries)	Sub-global indicator of potential future interest for dissemination
		Episodic Marine Species Outbreaks (blooms) – UNEP MAP	O (Sub-global)	Y	?	H	M (21 Mediterranean countries)	Sub-global indicator of potential future interest for dissemination
		Zooplankton diversity (1. total abundance/biomass, 2. size structure, 3. abundance of key species, 4. species richness, etc.) - Global Alliance of Continuous Plankton Survey (GACS) a	O	N => Y, to set the protocol to implement	? => Y once the protocol is set	H	H	Ready for global use (yet still need to set the protocol to implement)
		Coral Reef Watch (http://coralreefwatch.noaa.gov/satellite/index.php)	D	?	?	H	H	Global indicator under active development
		Elevational shifts in mountain plant/vegetation and animal species – Walter Jetz	I	Y	?	H	H	Idea with future potential
		Live Coral cover – David Obura	D	?	?	?	?	?

Partnership with BIP

The institutions producing indicators that meet the criteria will be invited to join the BIP


Evolution of the CBD indicator list
CBD AHTEG ON INDICATORS
Developed a revised list of indicators
CBD SBSTTA 19
Took note of the indicative list
Facilitate a peer review of the list
Peer review
CBD SBSTTA 20
Endorsed the revised list of indicators
To be kept under review to enable new indicators to be incorporated
List under review
CBD COP 14
Adoption of SBSTTA 20 recommendation
September 2015
November 2015
April 2016
December 2016

Next Steps

1. Develop the tentative indicator ideas to fully empirical ones

Zooplankton Diversity Indicators	**Total Abundance**	**Species Richness**	**Size Index**	**Community Structure (Principal Component)**	**Abundance of target species/taxa**	**Morphological & physiological condition of shelled plankton**
What to indicate (on current status and long-term trend)	Biological Productivity, Food supply for fish, birds & mammals.	Biodiversity, Ecosystem health	Food quality for fish, birds & mammals	Food quantity for fish, birds & mammals, Biogeographic al shift, etc.	Productivity of top predator, deterioration of environment, etc.	Impacts of Ocean Acidification

2. Establish operational protocols to regularly report indicator values among GACS (and zooplankton observation network?) to BIP and more.

Need Funding! … as always...

Benefits of being BIP Partner :Future Opportunities

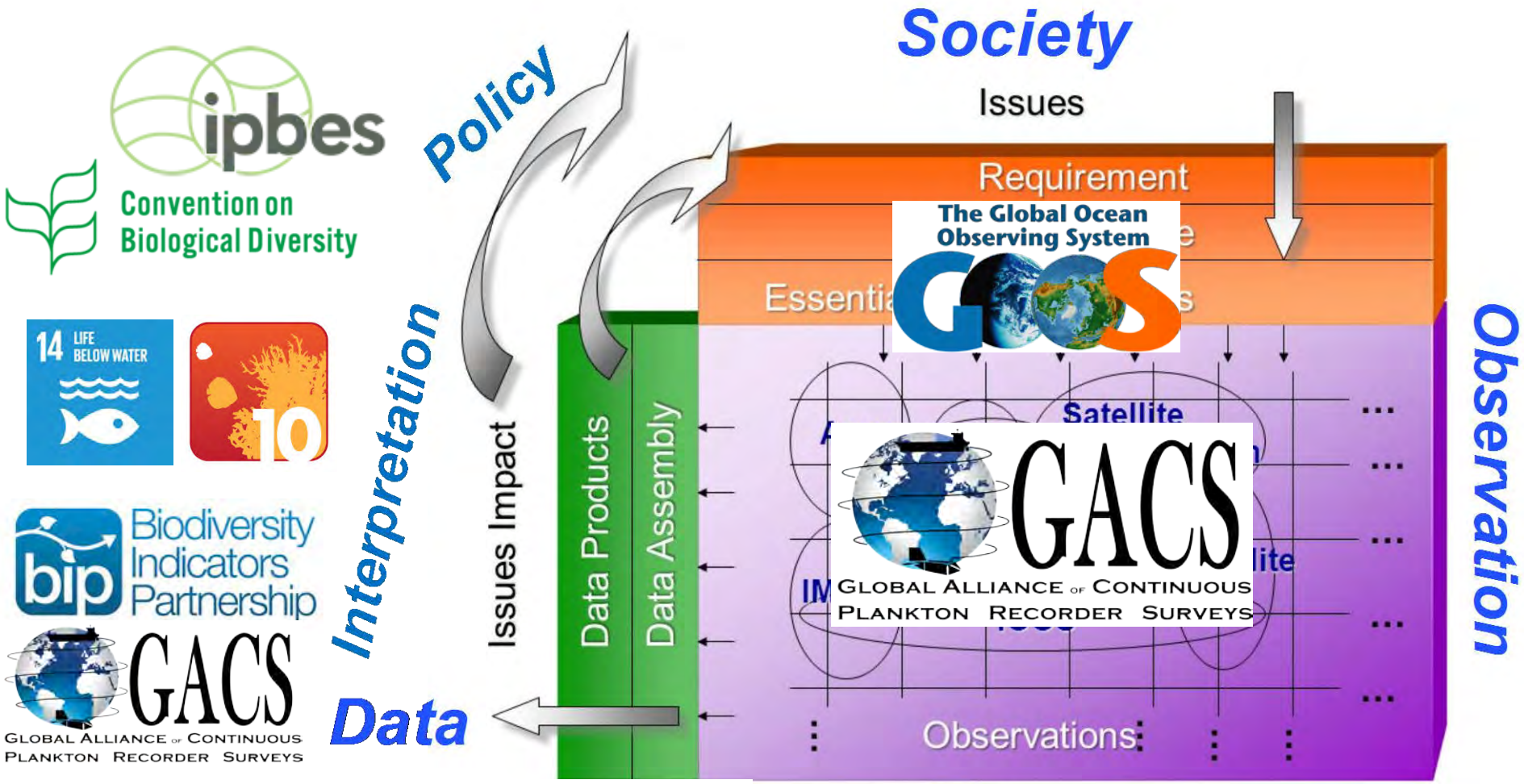
Support for the implementation of **the Strategic Plan for Biodiversity 2011-2020 and more…**

Support in the **production of multilingual indicator communication materials** (subject to resources), which can be used by Partners to highlight their indicators and the role of their indicators in supporting global mandated processes.

Participation in BIP Technical Meetings and help to shape the future of the BIP. Technical meetings provide an opportunity for indicator partners to network and come together to identify opportunities for collaborative work and fundraising.

Opportunity via the BIP to have indicator(s) **published in future editions of the Global Biodiversity Outlook, the flagship publication of the CBD,** and to be brought to the attention of other relevant processes and initiatives, such as **IPBES.**

Framework for Ocean Observing



SCO 2012, doi: 10.5270/OceanObs09-FOO)

Opportunities

Market developments
Business and product development

And…

Strengthen communication bw/ communities of **conservation biology** and **oceanography**

Biodiversity Indicators Partnership

MIND THE GAP!

Online Survey for Potential Global Indicators (July 2016)
(https://www.surveymonkey.co.uk/r/GQ8PH9Y)

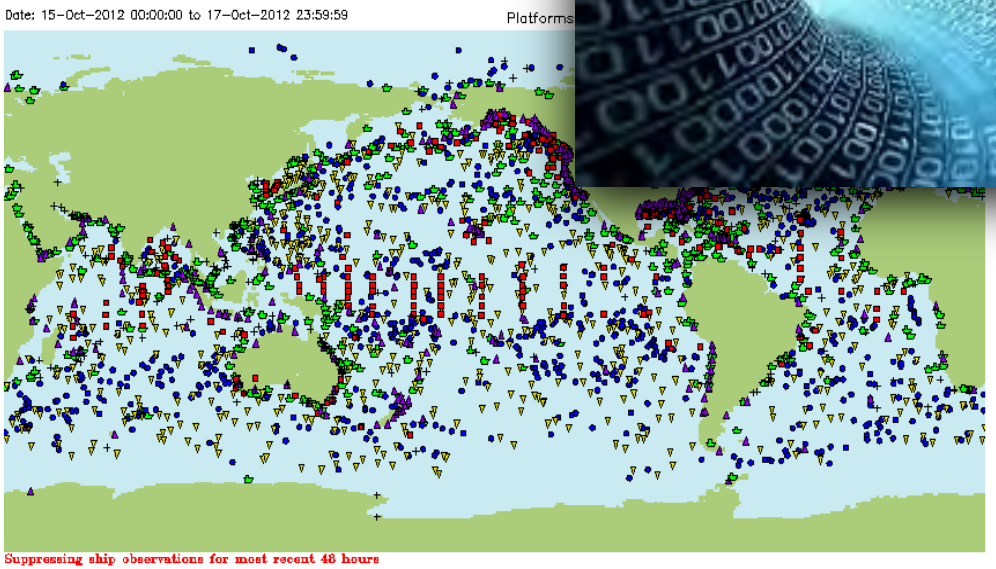
10

Trends in responses to reduce pressures on coral reefs
Trends in extent and condition of other vulnerable ecosystems impacted by climate change or ocean acidification
Trends in pressures on other vulnerable ecosystems impacted by climate change or ocean acidification
Trends in responses to reduce pressures on other vulnerable ecosystems impacted by climate change or ocean acidification

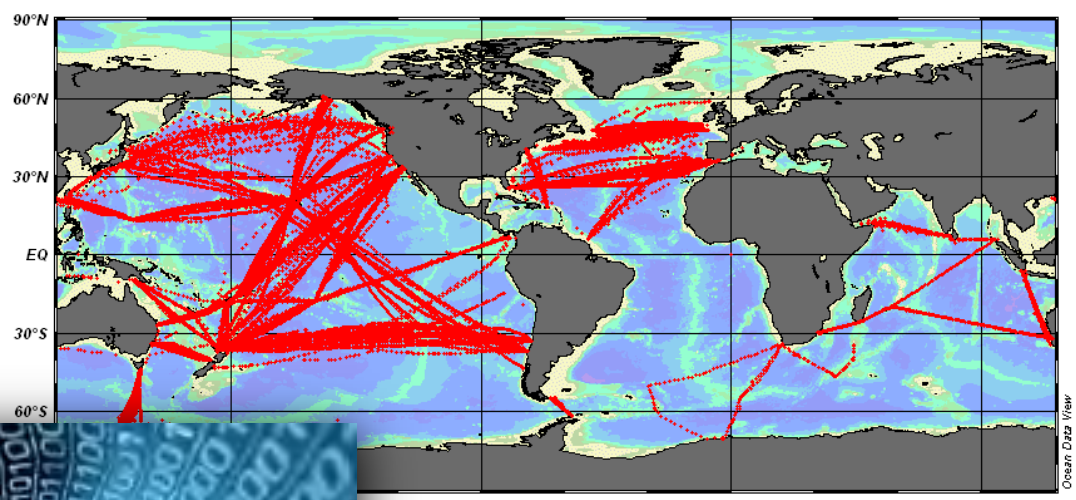
→ **State Indicator: Zooplankton Global Indicators (CPR plus), proposed**

→ **Pressure Indicator e.g. OA Global Indicator?**

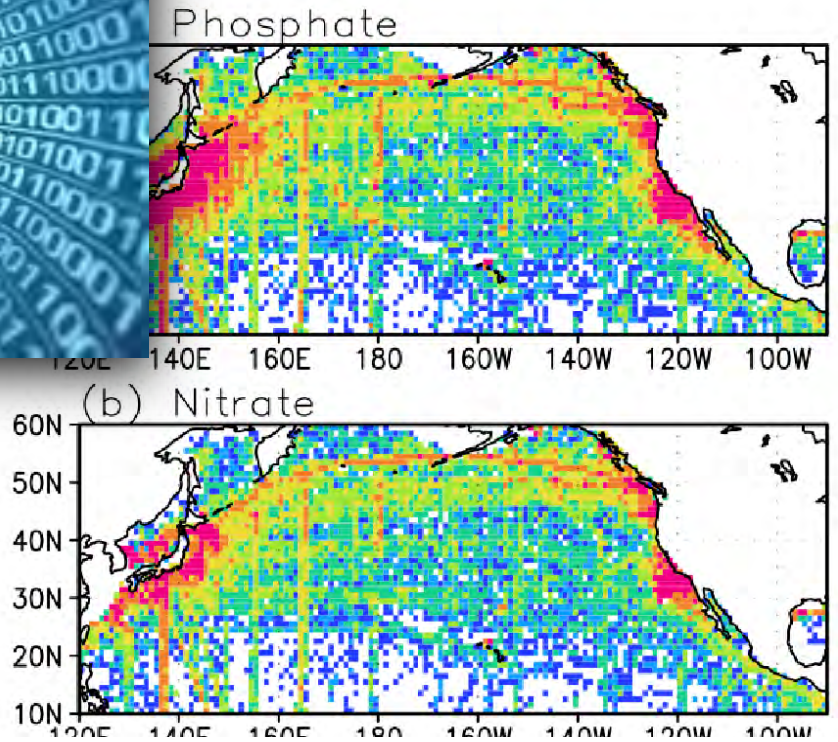
http://portal.goa-on.org/Explorer



https://ioos.noaa.gov/community/global/



https://www.nodc.noaa.gov/woce/woce_v3/wocedata_2/ewoce/data/woce-uot/index.html



Yasunaka et al. GRL 2016


25
Happy
Anniversary