

Ocean health and pollution challenges

Peter Swarzenski
IAEA, MONACO



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UPDATED AGENDA FOR THE CONFERENCE

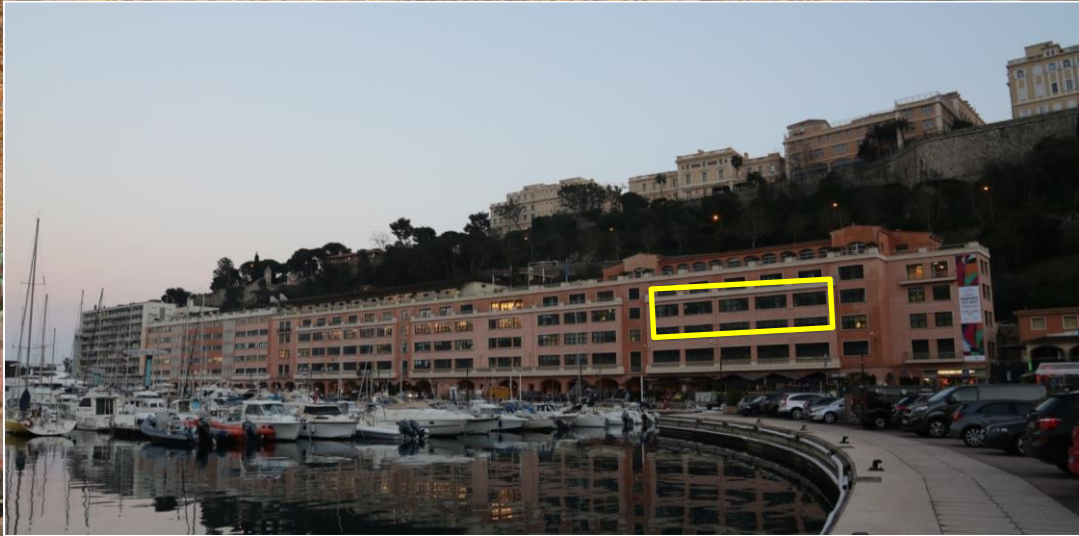
Science for
Ocean Actions

November 19-21, 2018
Bergen, NORWAY

IAEA' Monaco Labs

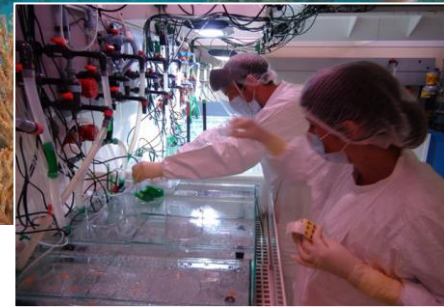


The ONLY Marine Laboratory in the UN system



IAEA' Monaco Labs

We conduct need-based research....



Coastal Pollution & Seafood Safty

Environmental Radioactivity

NUCLEAR ANALYTICAL TECHNIQUES

Climate Change & the Ocean

Threatened Habitats & Endangered Species



IAEA' Monaco Labs

Radioecology Laboratories



...from phytoplankton to small sharks...

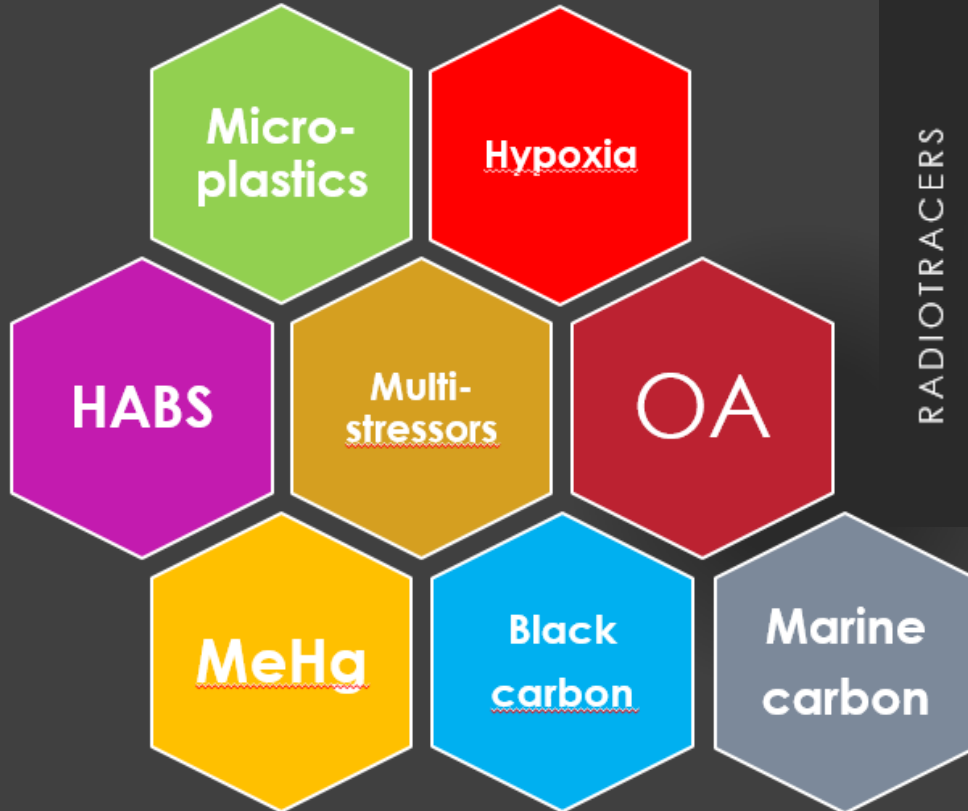


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Radioecology Laboratories



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RADIOTRACERS

γ -emitters:

^{51}Cr , ^{54}Mn , ^{57}Co , ^{65}Zn , ^{73}As , $^{110\text{m}}\text{Ag}$,
 ^{109}Cd , $^{134,137}\text{Cs}$, ^{203}Hg , ^{210}Pb ...

β -emitters:

^{14}C , ^3H , ^{45}Ca , ^{63}Ni ...

α -emitters:

^{210}Po ...



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Marine Environmental Studies Laboratories



Organic / inorganic contaminants

- Environmental monitoring
- Source and fate studies (stable- and compound-specific isotopes)
- Petroleum fingerprinting
- Trace / heavy metals (ie, mercury)
- Reference materials / Proficiency tests



Why do we care about ocean health??



**A Healthy Ocean sustainably delivers
a range of benefits to people now and in the future.**



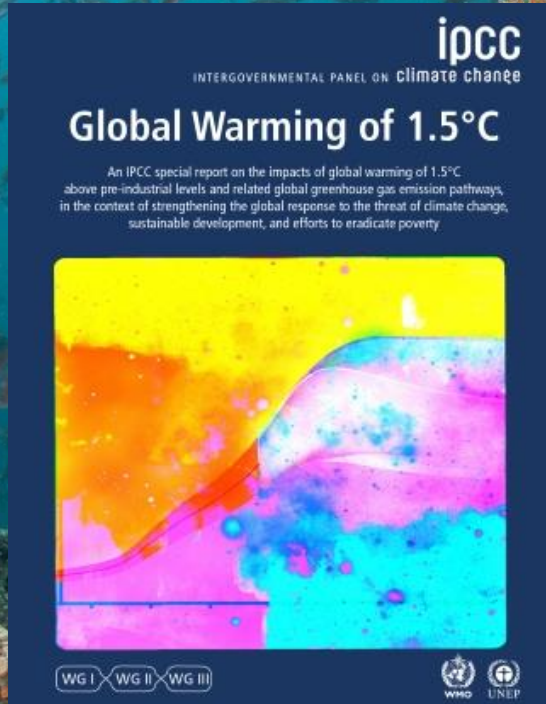
Why do we care about ocean health??



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- Seafood, habitats, energy sources, wetland protection and genetic resources.
- Regulates weather and climate, protects coasts, detoxifies and traps sediment. Wetlands mitigate storm damage.
- Provides cultural services, incl. recreational educational and aesthetic.
- Supports economic activities, incl. jobs, fisheries, food, marine transportation, trade, fuel, and energy.
- Supports nutrient cycling and primary production.

Why do we care about ocean health??



IPCC: some of the worst effects of climate change, including coastal flooding, food shortages and a mass die-off of coral reefs, is around the corner IF human greenhouse gas emissions continue at current levels

“Limiting global warming to 1.5 °C compared with 2°C would reduce impacts on ecosystems, - human health and well-being, making it easier to achieve the UN SDGs” Priyadarshi Shukla, IPCC

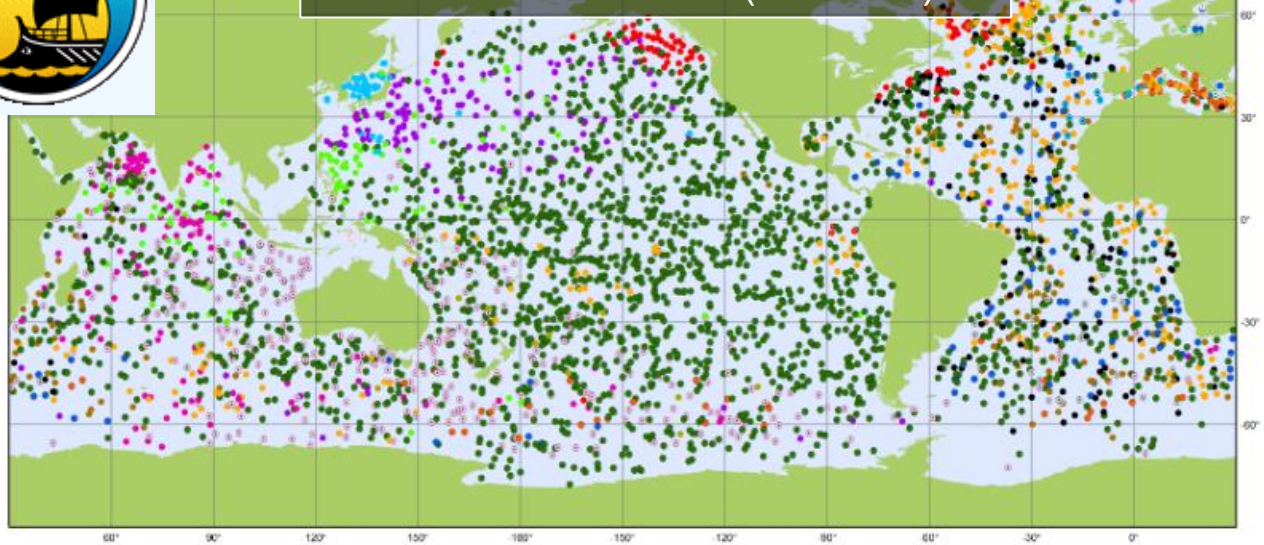
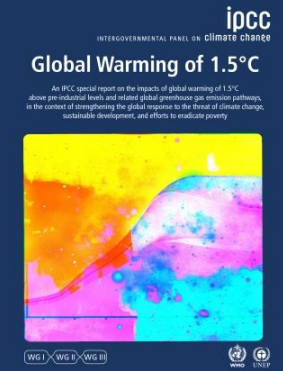
Integrated global observations: S&T



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> 90% of the Earth's warming has occurred in the ocean (+ 26 °C!!)



Argo

National contributions - 3971 Operational Floats

October 2018

Latest location of operational floats (data distributed within the last 30 days)



- | | | | | | |
|-------------------|-----------------|-----------------|--------------------|---------------------------|--------------|
| ● ARGENTINA (1) | ● EUROPE (117) | ● INDIA (134) | ● KENYA (1) | ● PERU (3) | ● USA (2223) |
| ● AUSTRALIA (351) | ● FINLAND (2) | ● INDONESIA (2) | ● MEXICO (1) | ● POLAND (9) | |
| ● BRAZIL (3) | ● FRANCE (293) | ● IRELAND (11) | ● NETHERLANDS (25) | ● KOREA, REPUBLIC OF (43) | |
| ● CANADA (98) | ● GERMANY (152) | ● ITALY (66) | ● NEW ZEALAND (12) | ● SPAIN (16) | |
| ● CHINA (98) | ● GREECE (6) | ● JAPAN (146) | ● NORWAY (9) | ● UK (149) | |

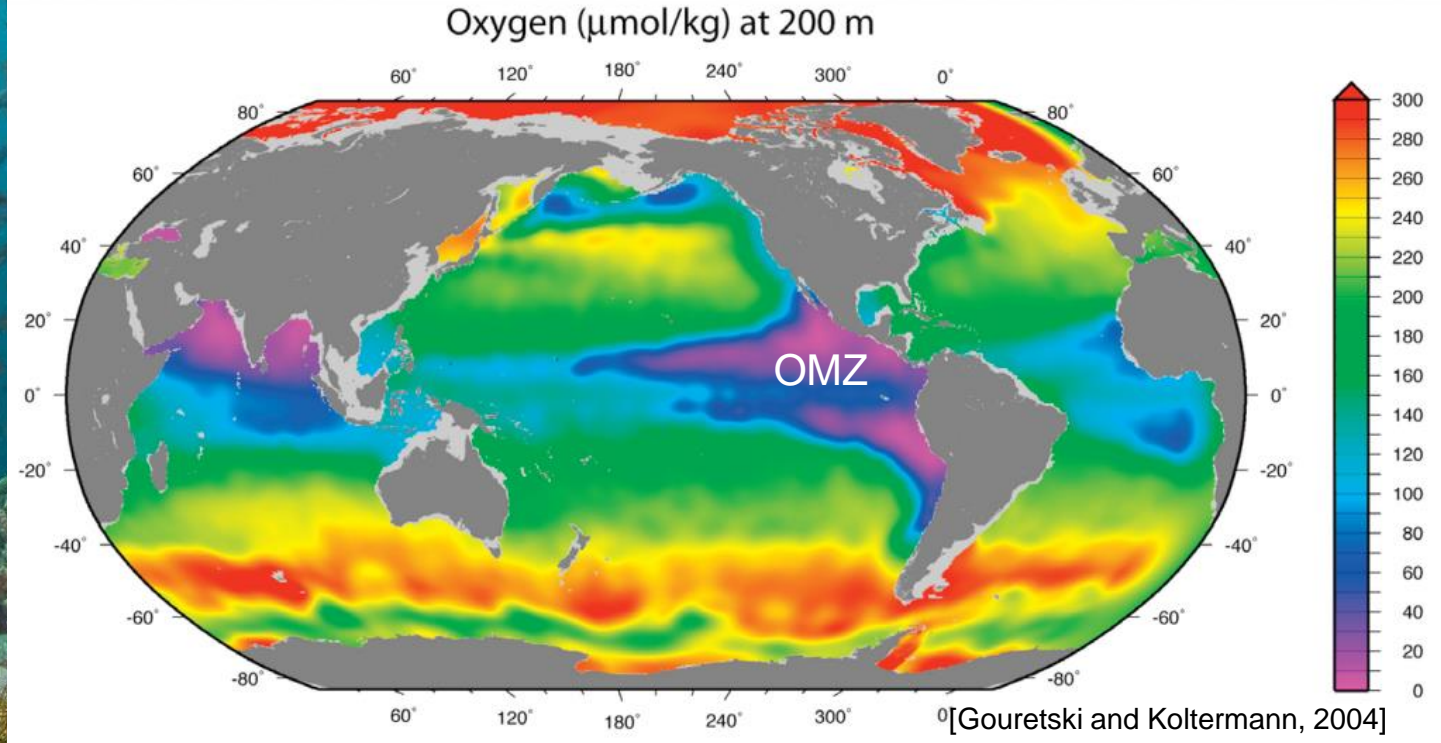


Integrated global observations: Deoxygenation



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increasing in number, volume, and intensity



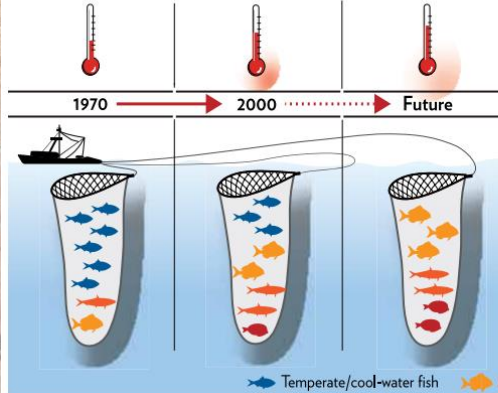
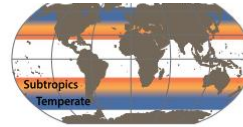
Fisheries

Global fish industry set to scale record:
\$150bn in 2017 (FAO)

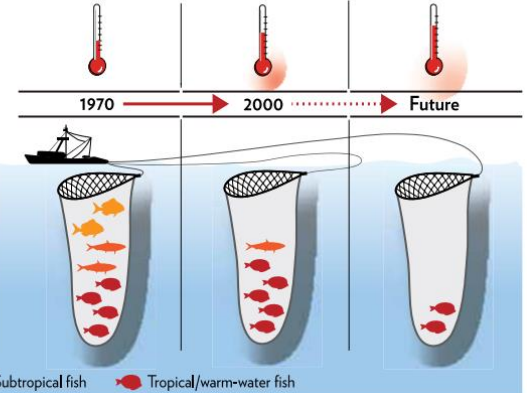
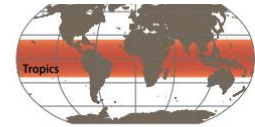


Warming oceans are reshaping fisheries

Subtropics, temperate oceans



Tropics

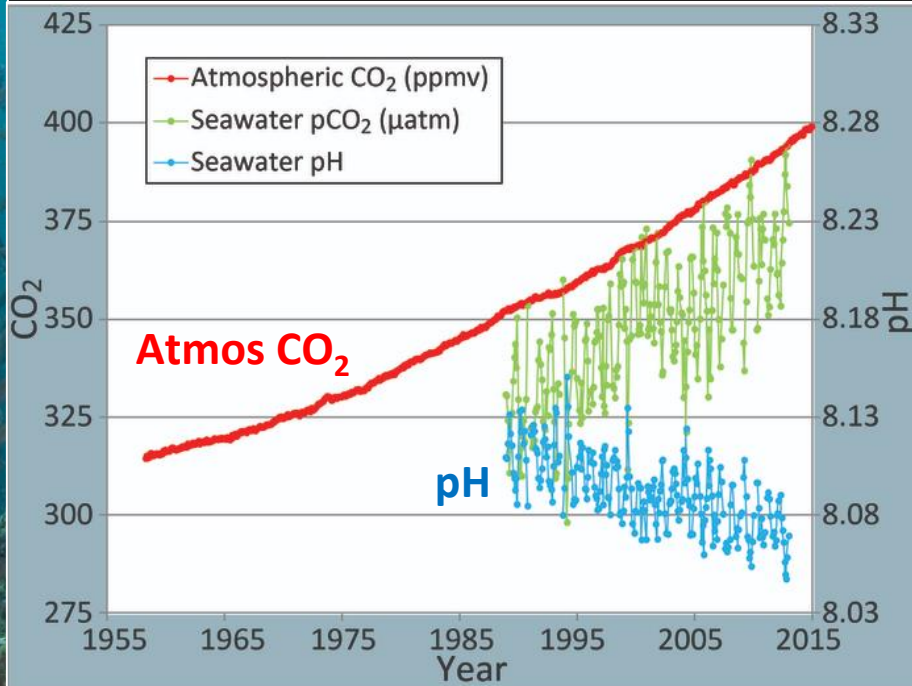


Source: Cheung, Watson, & Pauly, 2013.

Ocean Acidification

Surface ocean acidity has increased by 30% since pre-industrial times

Hawaii CO₂ in the Atmosphere and Ocean (RA Feely)



AMAP Assessment 2018: Arctic OA

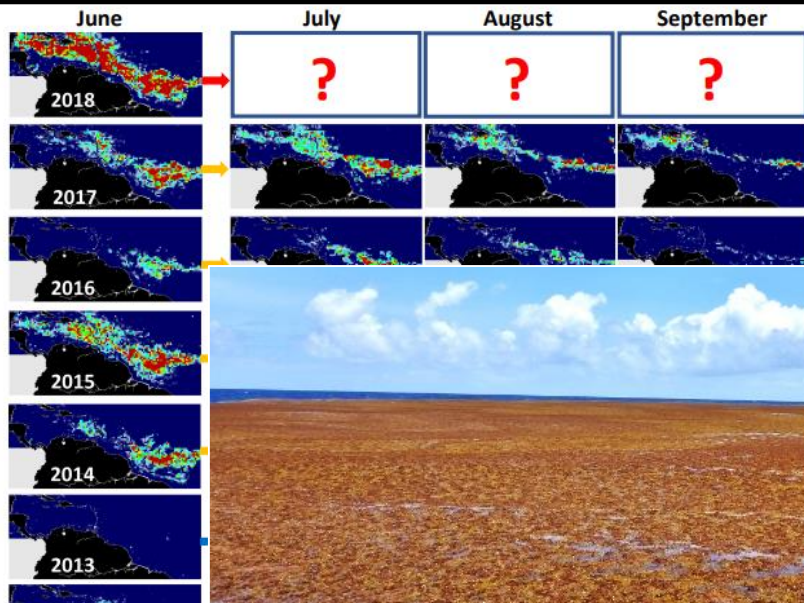


Atlantic Basin Sargassum



Predicting sargassum blooms in the Caribbean Sea

Wang & Hu 2017



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Deep drifts of Sargassum seaweed swept ashore on Guadeloupe in April. HELENE VALENZUELA/AFP/GETTY IMAGES

Mysterious masses of seaweed assault Caribbean islands

By Katie Lancin Jun. 11. 2018 . 5:20 PM

Harmful algal blooms



Toxic algae bloom blankets Florida beaches, prompts state of emergency

By Mayra Cuevas

Updated 23:18 GMT (07:18 HKT) July 1, 2016



Ciguatera fish poisoning

HEALTH ENVIRONMENT WATER QUALITY POST-HARVEST ECONOMICS

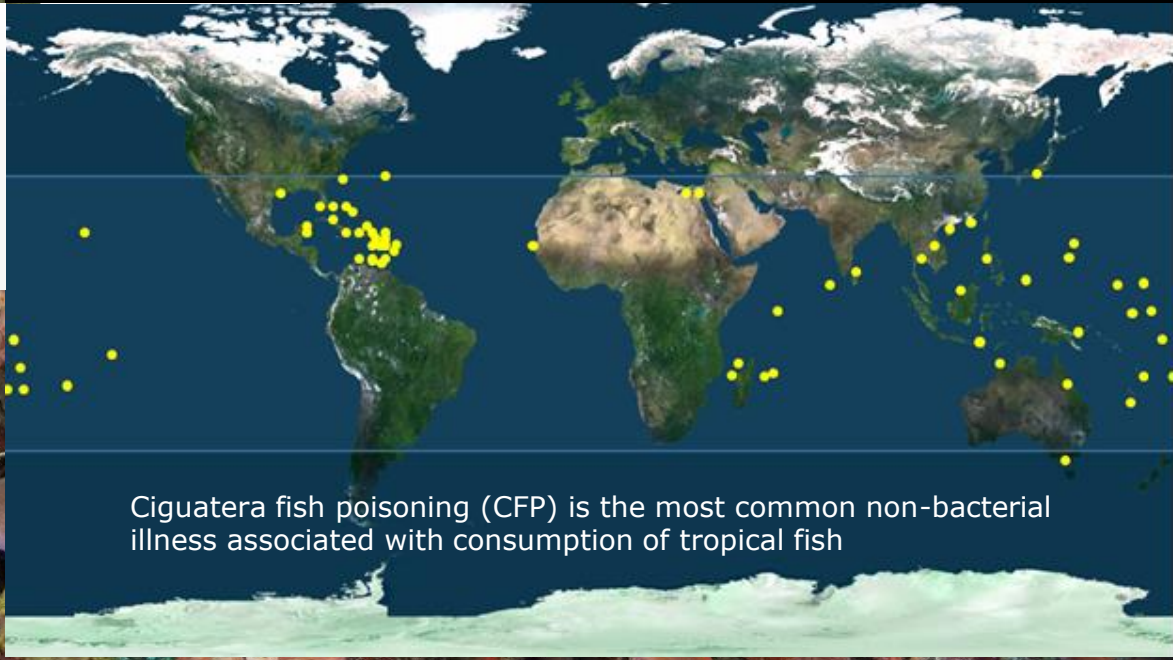
Harmful Algal Bloom Kills Millions of Salmon in Chile

Lucy Towers
03 March 2016, at 12:00am

CHILE - Harmful Algal Blooms (HABs) in southern Chile have so far caused the deaths of millions of salmon.



HAB's are a natural phenomenon that happen each year, however this bloom has been very intense due to the effect of El Niño.



US: over last decades, cum. impacts approach \$1bn
Woods Hole Oceanographic Institution

Ciguatera fish poisoning (CFP) is the most common non-bacterial illness associated with consumption of tropical fish

Pollution

shortsightedness of the
“dilution” idea



ENVIRONMENT

Shocking Photos Show Extent of Plastic Pollution in Caribbean

“I’ve never seen a photo that illustrates how bad the problem is in that area.”

When Caroline Power ventured into the Cayos Cochinos Marine Reserve off the coast of Honduras, it was as if she had come upon a crime scene.

The Ocean Health Index Framework



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benefits or 'goals'



Carbon storage



food production



sense of place



clean waters



tourism / recreation



Coastal protection



economies



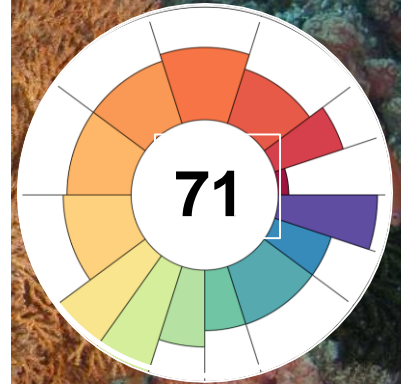
artisanal fishing



biodiversity



natural products



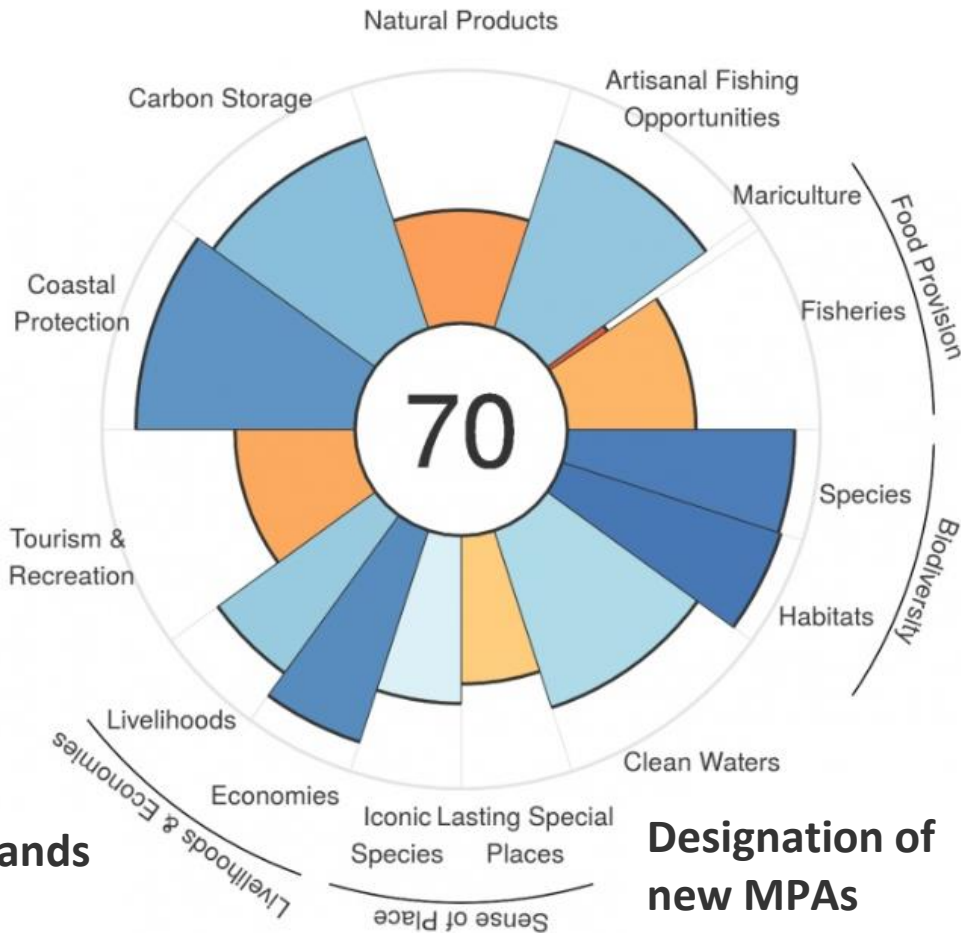
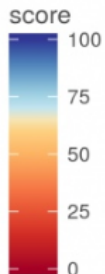
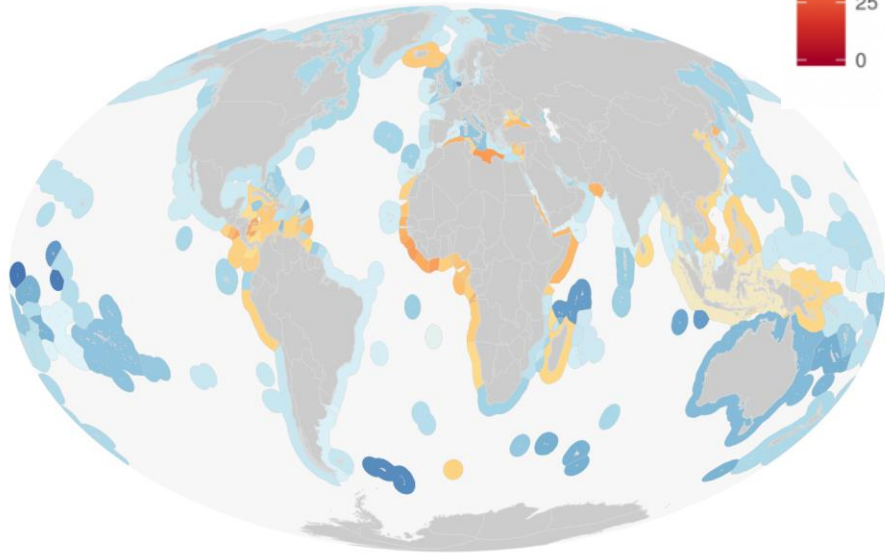
scores

<http://www.oceanhealthindex.org>

Halpern et al. 2012, Nature

2017 OHI Scores

220 coastal countries / territories (40 %)



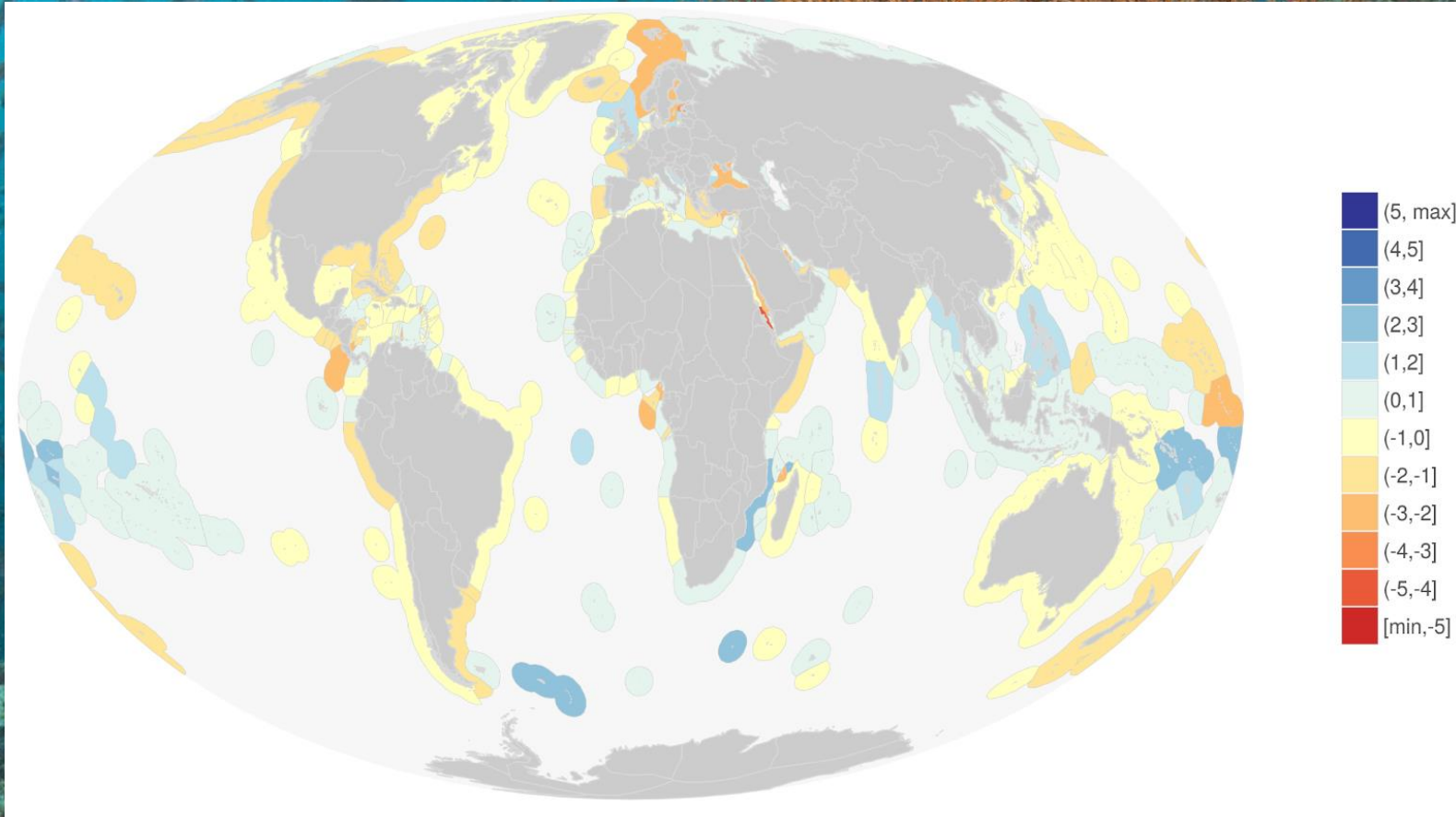
18 scored > 80, many of which are remote islands
12 scored < 50

Designation of new MPAs

2012 - 2016 Index scores average yearly change



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Ocean Health Index



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<http://www.oceanhealthindex.org>

Summary / action points

- ...observations suggest that the oceans may be on the verge of a major change that can trigger irreparable damage to marine life and ecosystems.
- But, new tools and systematic data collections allow for global assessments, that can steer policy
- Such work contributes to the SDG process: building Community of Ocean Action for SDG 14, Decade of Ocean Science



Many thanks!



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“The good news is that some of the kinds of actions that would be needed to limit global warming to 1.5°C are already underway around the world...”
Valerie Masson-Delmotte