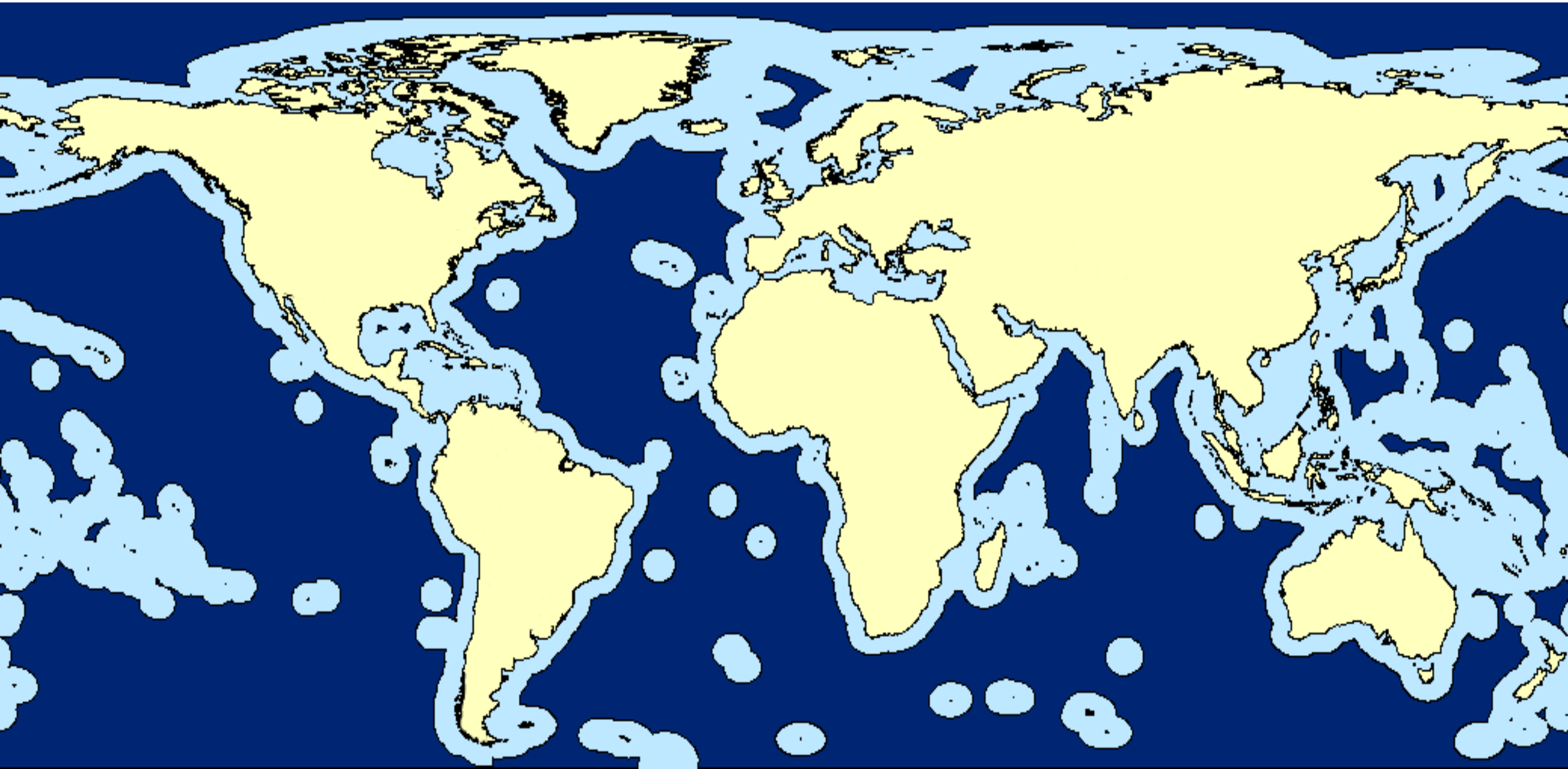
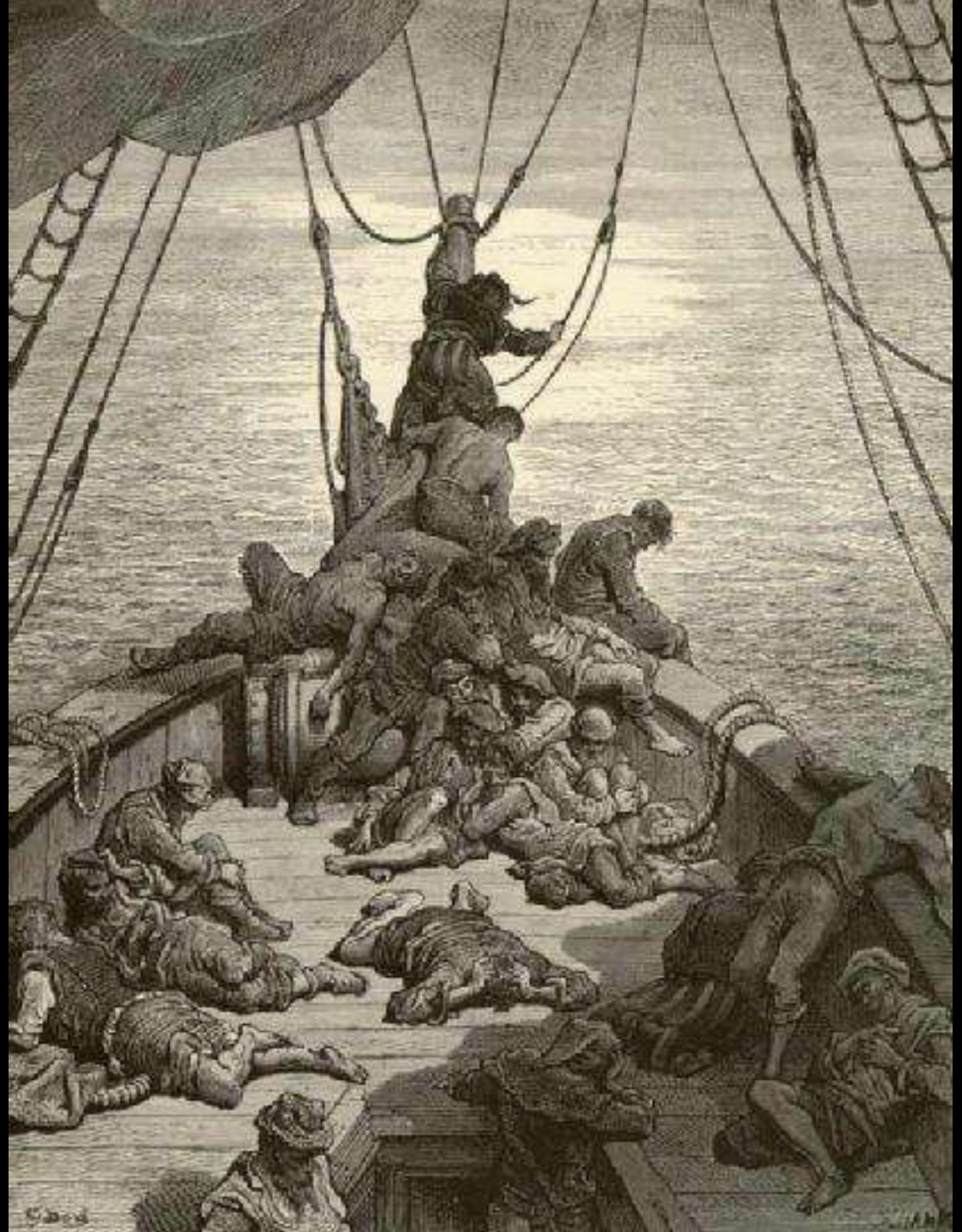
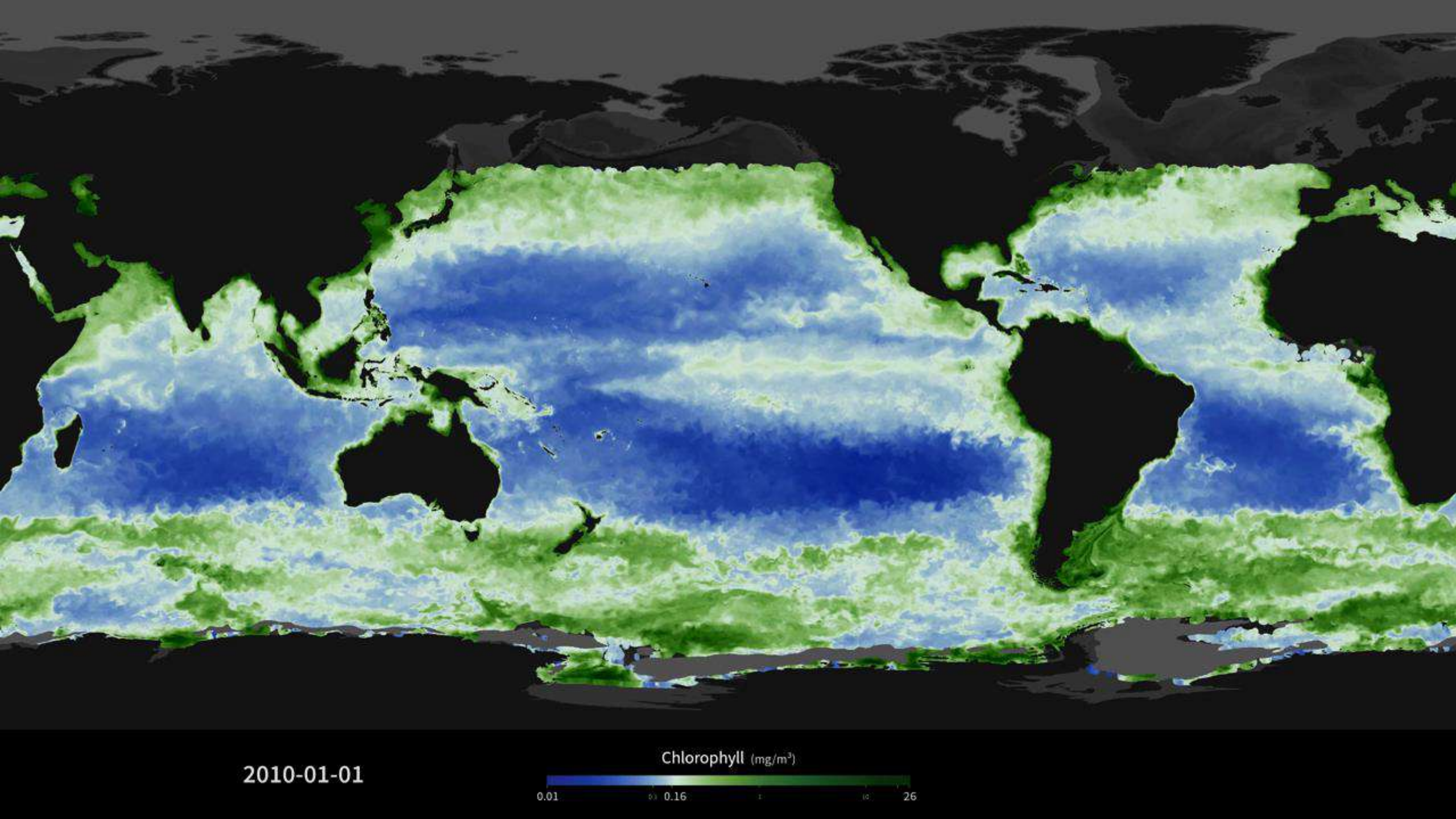
Protecting the ocean's final frontiers – the high seas and deep ocean

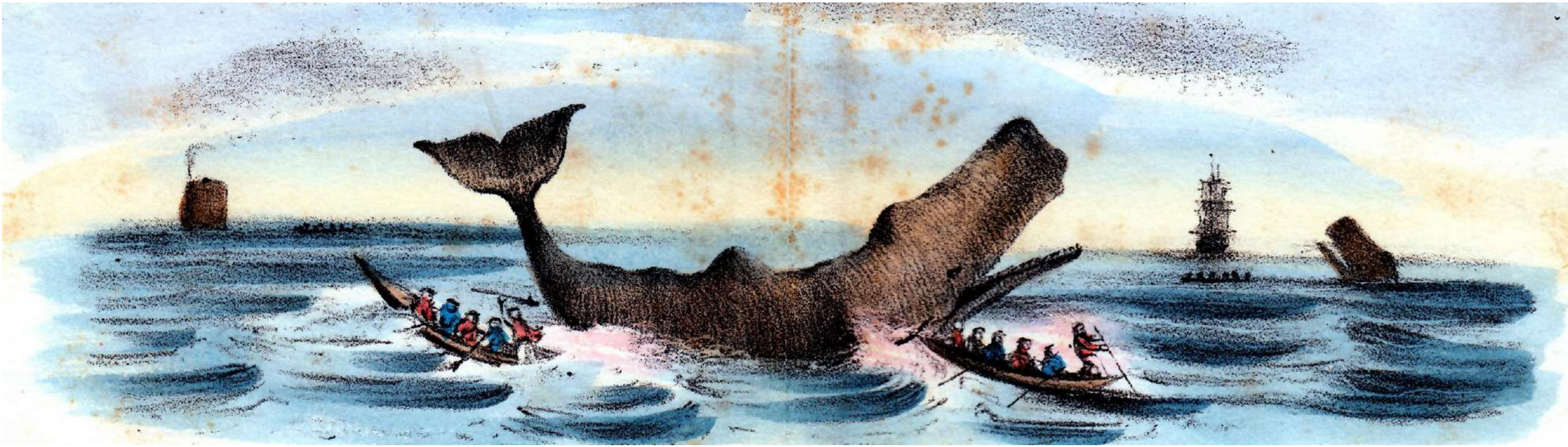
Callum Roberts
University of York

The high seas = 61% of the oceans and 43% of the surface of the Earth





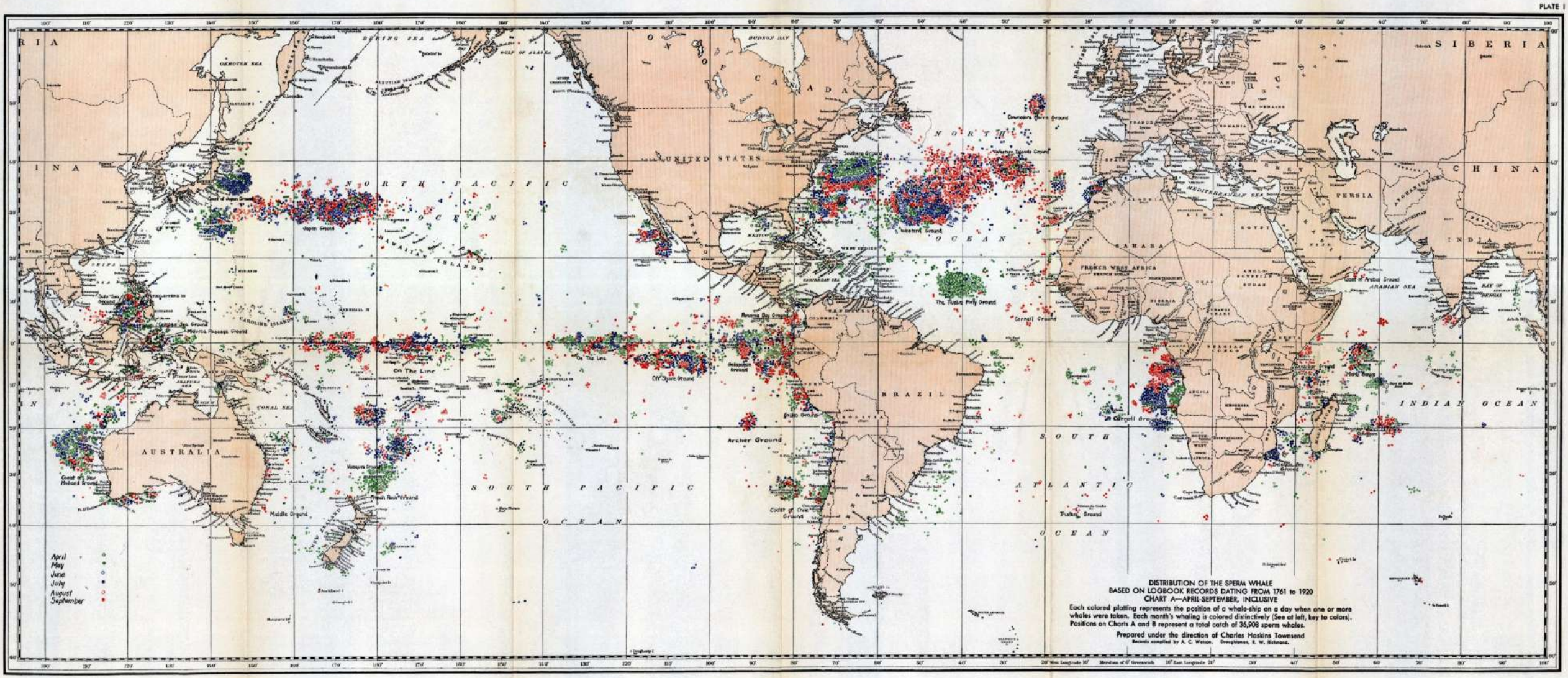

2010-01-01
Chlorophyll (mg/m³)
0.01
0.1
0.16
1
10
26



Distribution of Sperm Whale catches (Oct-Mar) from 1751-1920

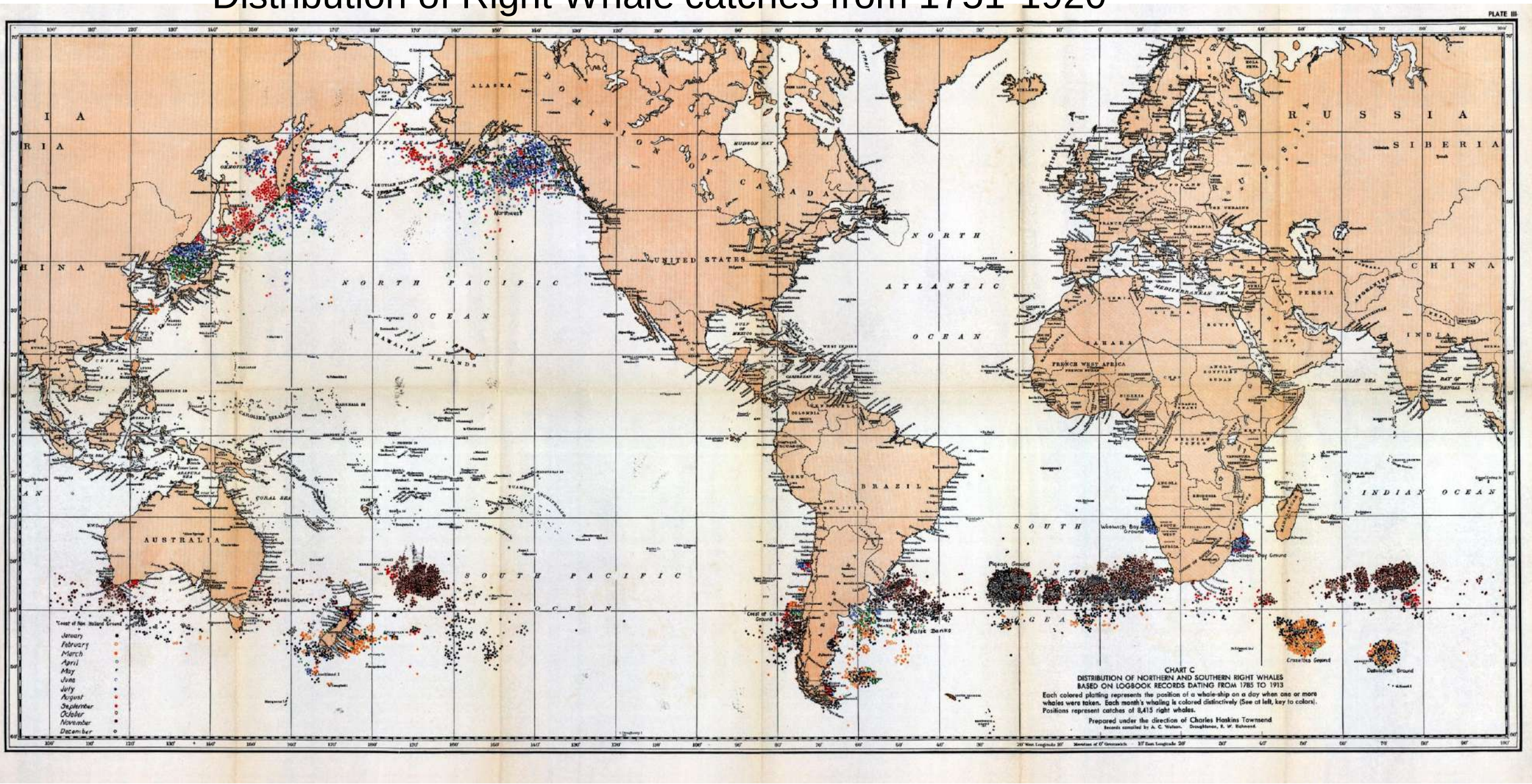
Charles Haskins Townsend (1935) Zoologica 19: 1-50

Distribution of Sperm Whale catches (Apr-Sept) from 1751-1920



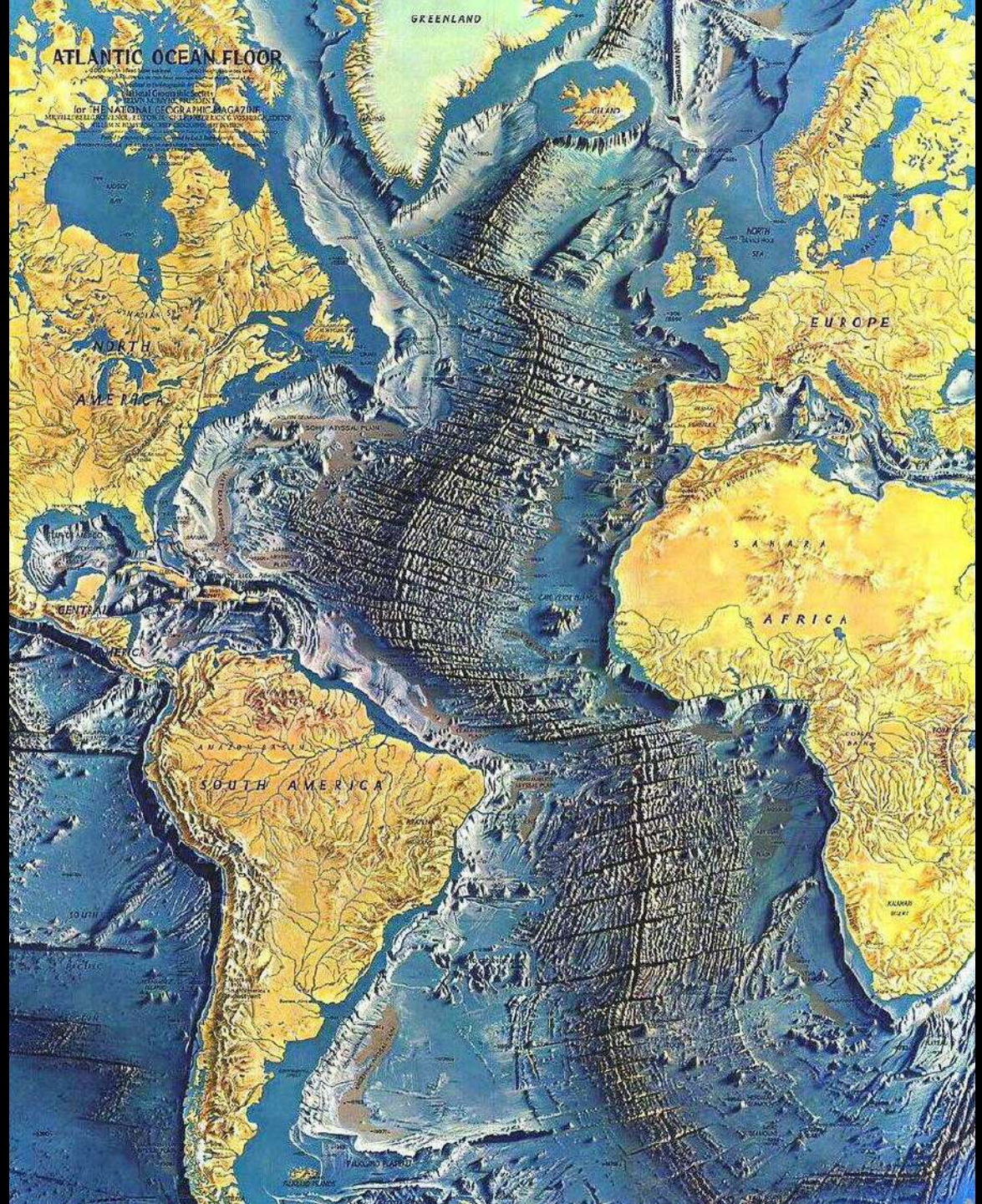
Charles Haskins Townsend (1935) Zoologica 19: 1-50

Distribution of Right Whale catches from 1751-1920

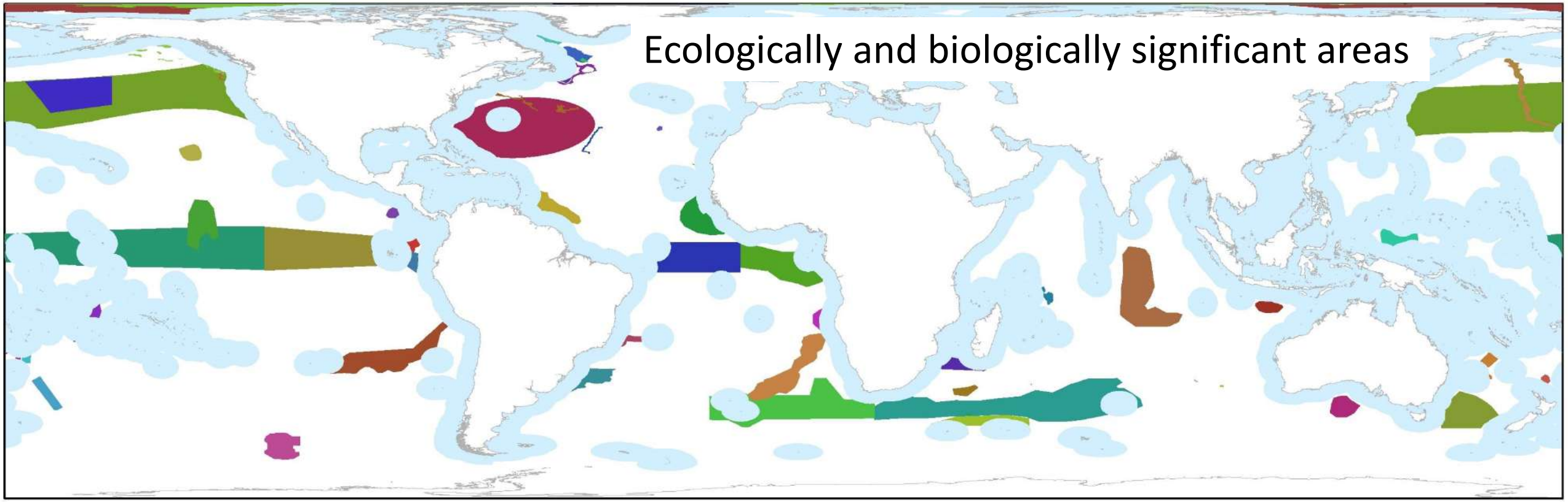


Charles Haskins Townsend (1935) Zoologica 19: 1-50

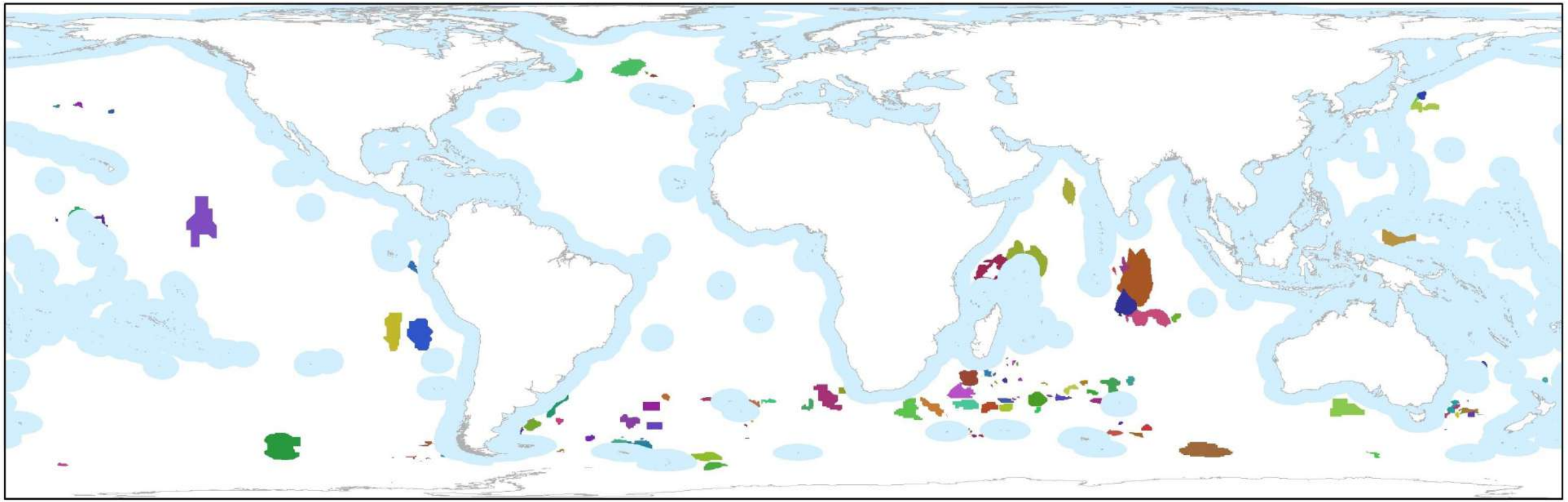
Bruce Heezen and Marie Tharp 1968



Ecologically and biologically significant areas



- Abrolhos bank and Vitória-Trindade Chain
- Agulhas Front
- Amazonina-Orinoco Influenced Zone
- Atlantic Equatorial Fracture Zone
- Atlantis Seamount
- Banks of Northern Brazil and Fernando de Noronha
- Benguela Upwelling System
- Central Indian Basin
- Cobb-Eickelberg Seamount Chain
- Coral Seamount and fracture zone feature
- Corridor Marino
- Costa Rica Dome
- Due South of Great Australian Bight
- Central Louisville Seamount Chain
- Ua puakaoa seamounts
- South Tasman Sea
- SW Caroline Islands and northern New Guinea
- Kadavu and the Southern Lau Region
- Kermadec-Tonga-Louisville Junction
- Monowai Seamount
- Equatorial High-Productivity Zone
- East Broken Ridge Guyot
- Emperor Seamount Chain and Northern Hawaiian Ridge
- Equatorial Front and Carnegie Ridge
- Equatorial Productivity Zone
- Focal foraging areas for Hawaiian albatrosses
- Fools Flat
- Galapagos
- Great Meteor seamount
- Hydrothermal Vent Fields
- Juan de Fuca Ridge Hydrothermal Vents
- Labrador Sea Deep Convection Area
- Nazca and Salas y Gomez
- New England and Corner Rise Seamounts
- North Pacific Transition Zone and bordering currents
- Orphan Knoll
- Prince Edward Islands, Del Cano Rise and Crozet Islands
- Rusky
- Sargasso Sea
- Saya de Malha Bank
- Seabird Foraging Zone in the Southern Labrador Sea
- Slopes of the Flemish Cap and Grand Bank
- South of Java Island
- Southeast Shoal on the Tail of the Grand Bank
- Southern Brazilian Sea
- Subtropical Convergence Zone
- Système du « Canyon de Timiris » de Mauritanie
- Walters Shoal



Important bird areas

UN CONVENTION ON THE LAW OF THE SEA (UNCLOS) 1994

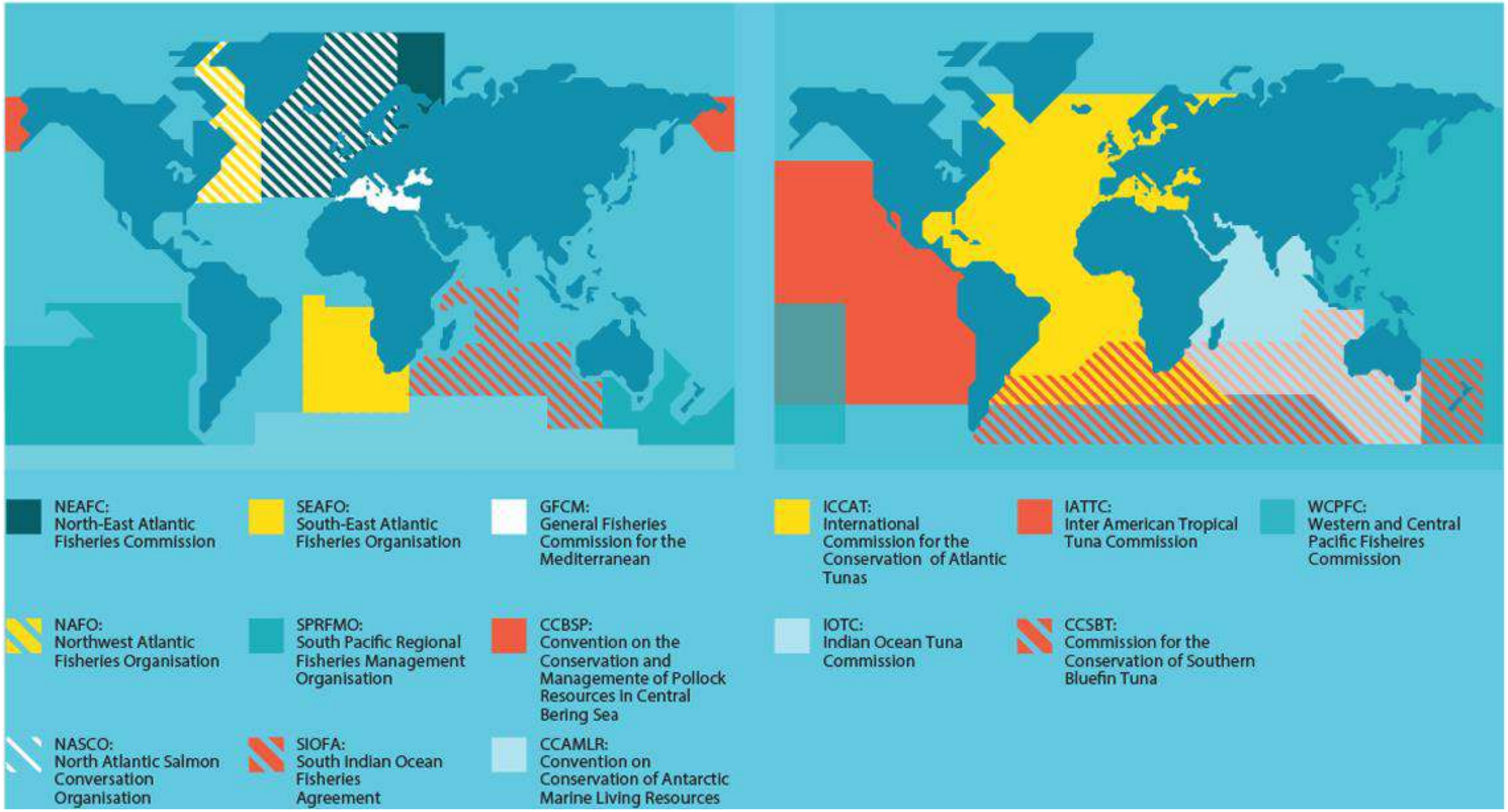
- **Freedom to:**
  - Fish
  - Navigate
  - Lay submarine cables and pipelines
  - Conduct marine scientific research
  - Construct artificial islands
  - Authorize vessels to fly national flag

+

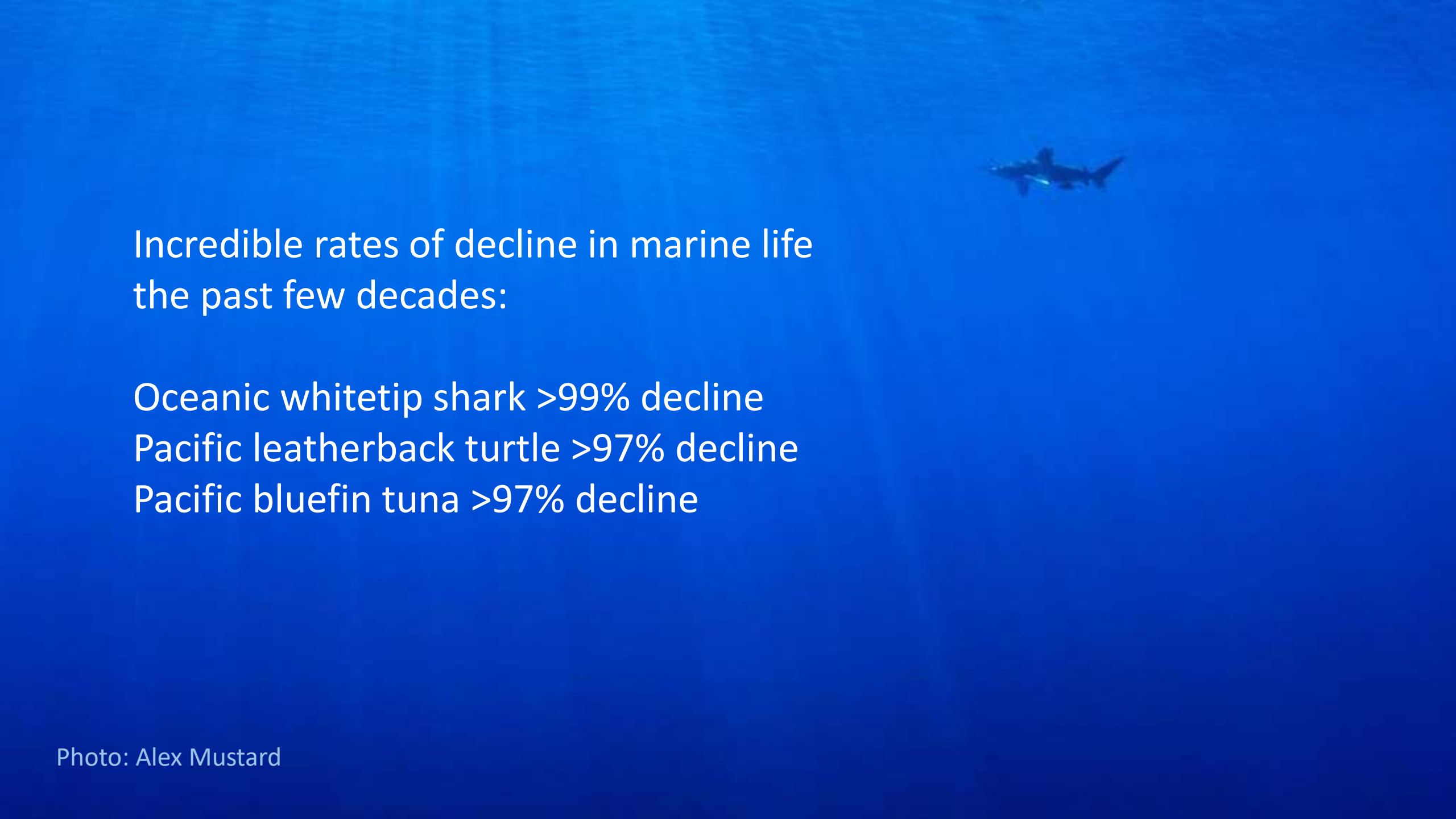
- **Duty to:**
  - Conserve marine living resources
  - Protect and preserve marine environment, including rare or fragile ecosystems and habitat…
  - Cooperate
  - Control flag vessels and citizens
  - Comply with other international legal obligations

Non-tuna Regional Fisheries Management Orgs

Tuna RFMOs



Source: whofishesfar.org

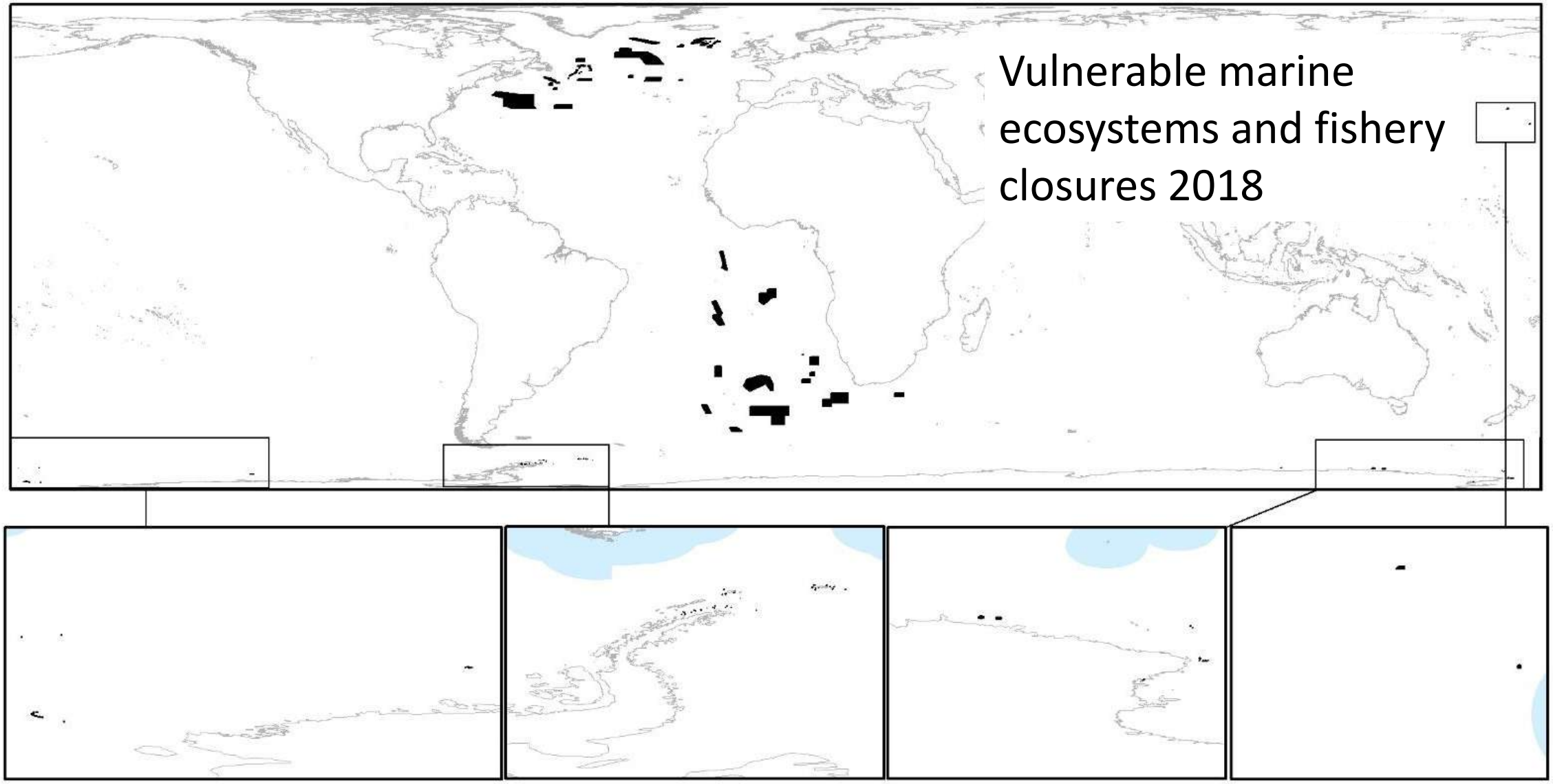


Incredible rates of decline in marine life the past few decades:

Oceanic whitetip shark >99% decline
Pacific leatherback turtle >97% decline
Pacific bluefin tuna >97% decline

Photo: Alex Mustard

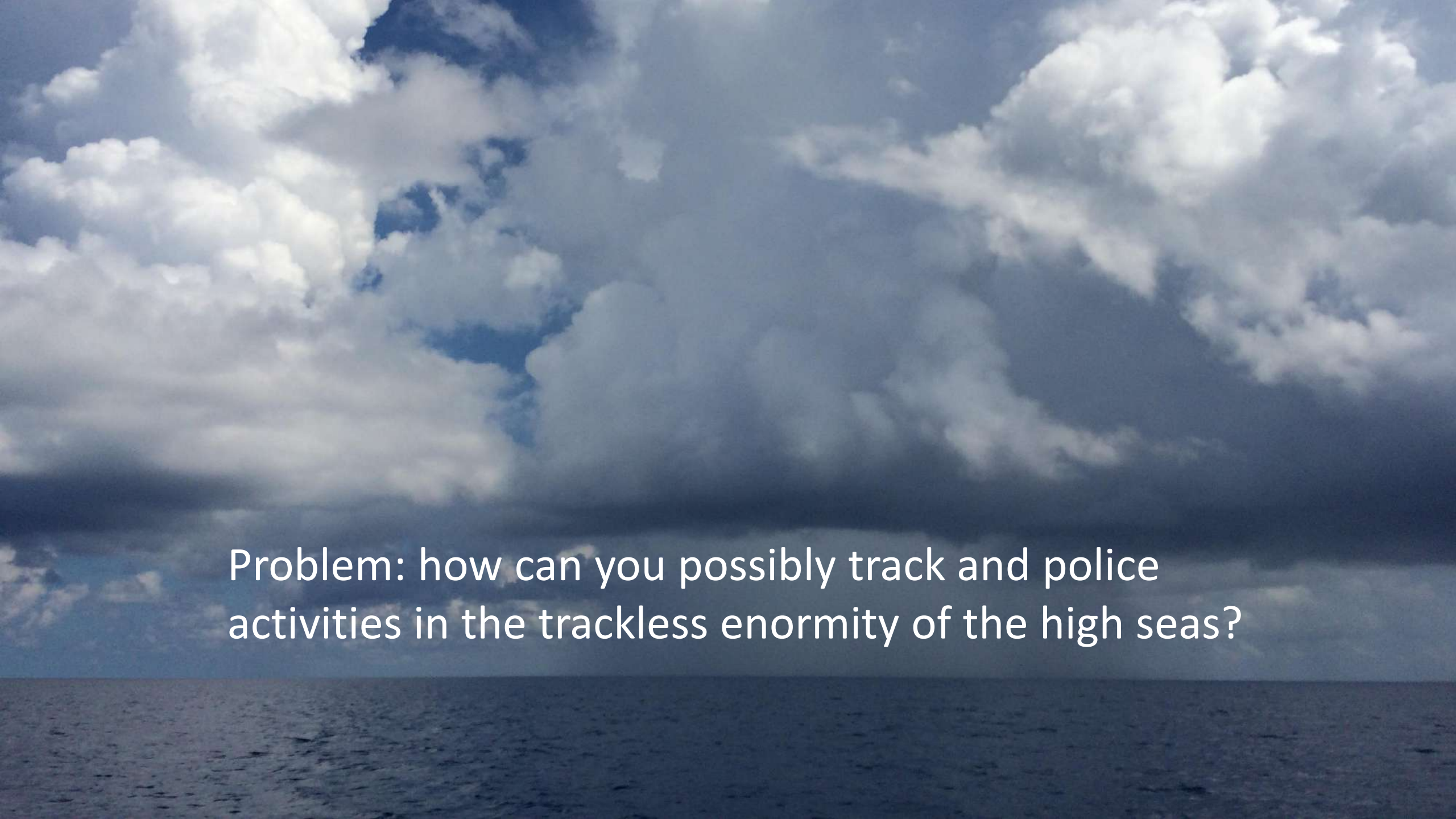
UN General Assembly resolution in 2006 directed RFMOs to identify and protect vulnerable marine ecosystems on the seabed by 2008



UN Intergovernmental Conference on Biodiversity Beyond National Jurisdiction: 2018-2020

Aim: to produce an International Legally Binding Instrument for the Protection of Biodiversity Beyond National Jurisdiction

To include:
Area-based management tools, including MPAs
Benefit sharing from marine genetic resources
Environmental impact assessments

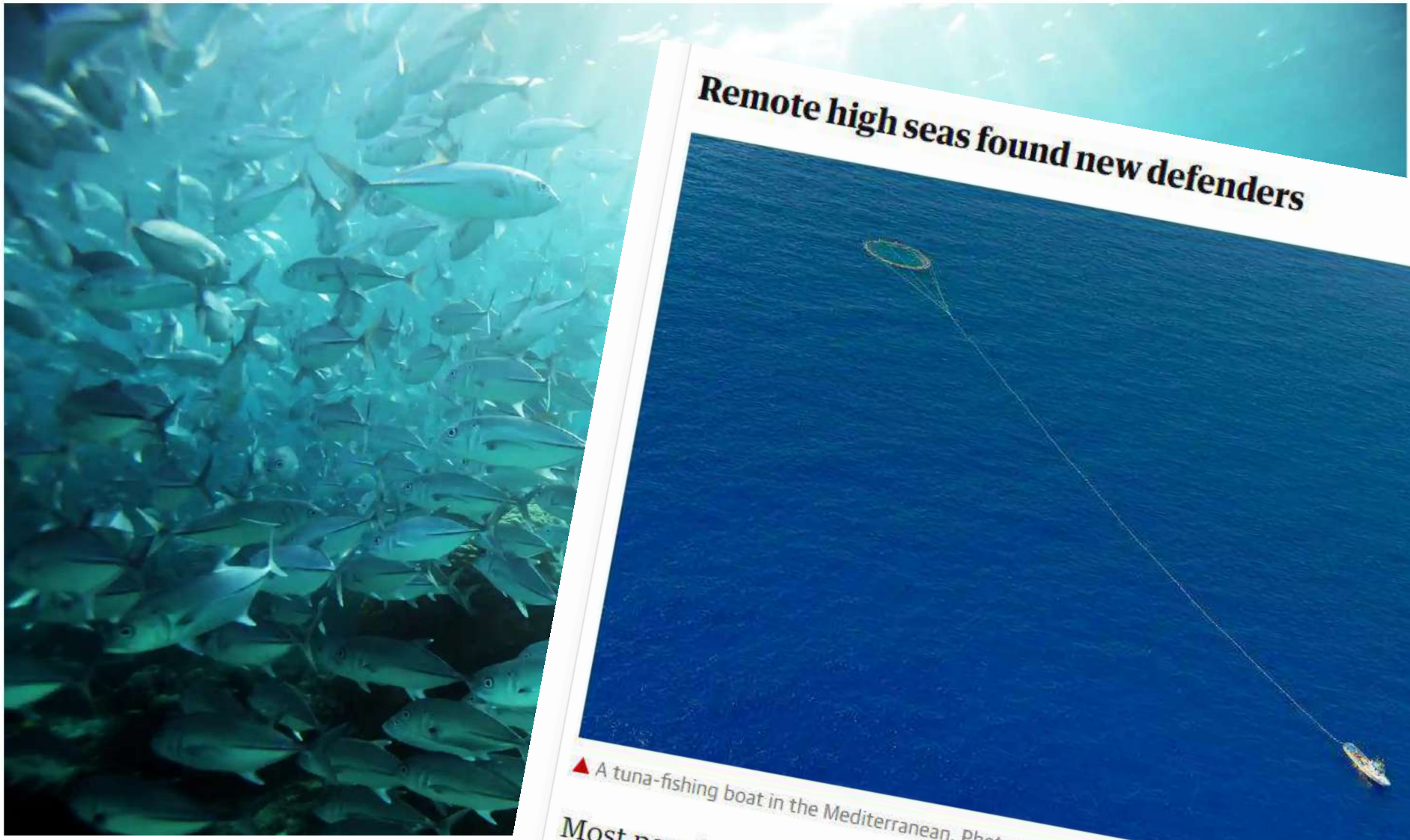

Problem: how can you possibly track and police activities in the trackless enormity of the high seas?

The Observer
Science

The science stories that shook 2018

Adam Rutherford, **Jim Al-Khalili**, **Pete Etchells**, *Sheena Cruickshank*, **Callum Roberts**, *Julia Jones*, **Mark Miodownik**, **Athene Donald**, *Mark Jobling*, **Anil Seth**, **Jon Butterworth**

Sun 23 Dec 2018 07.00 GMT

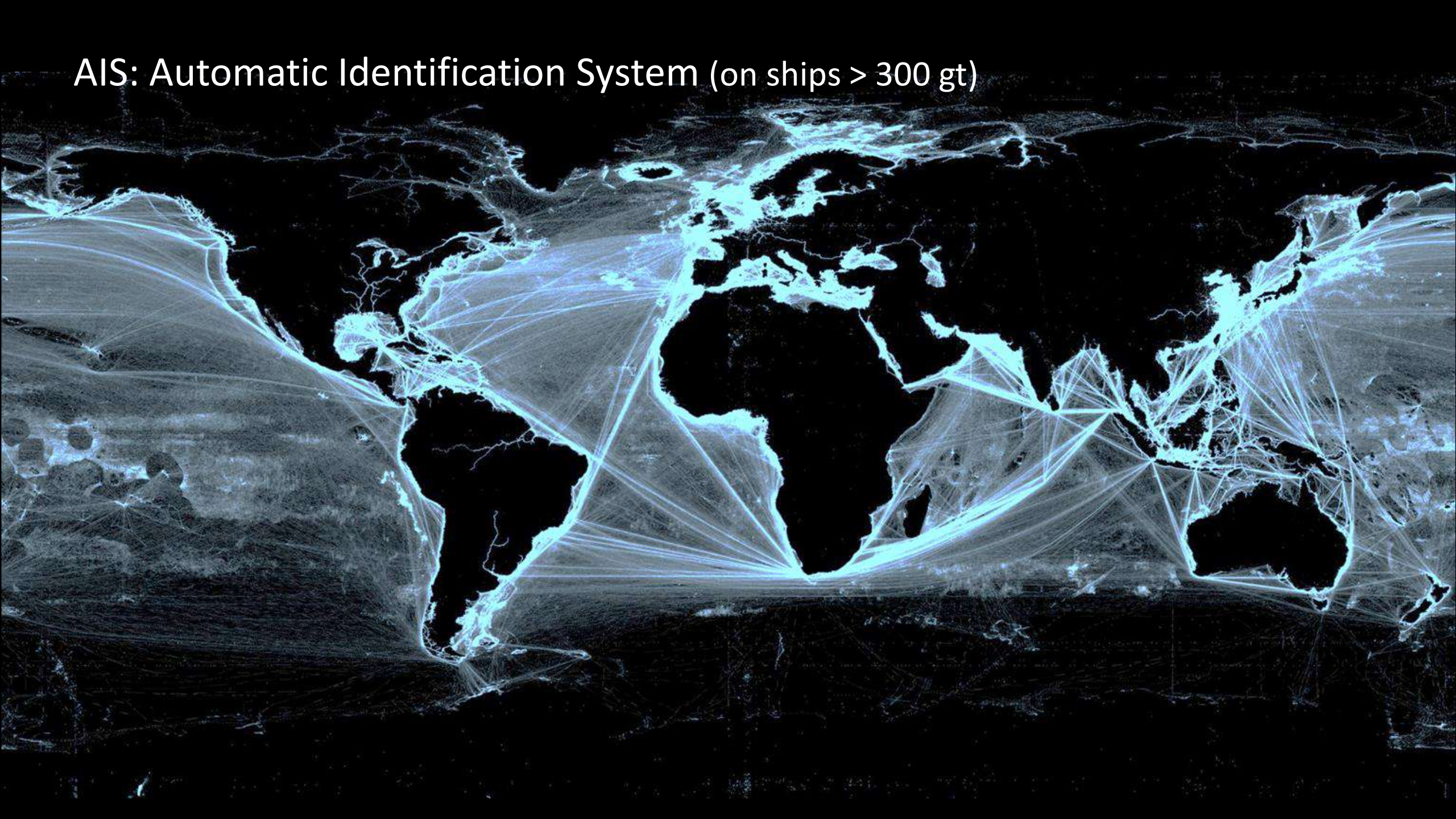


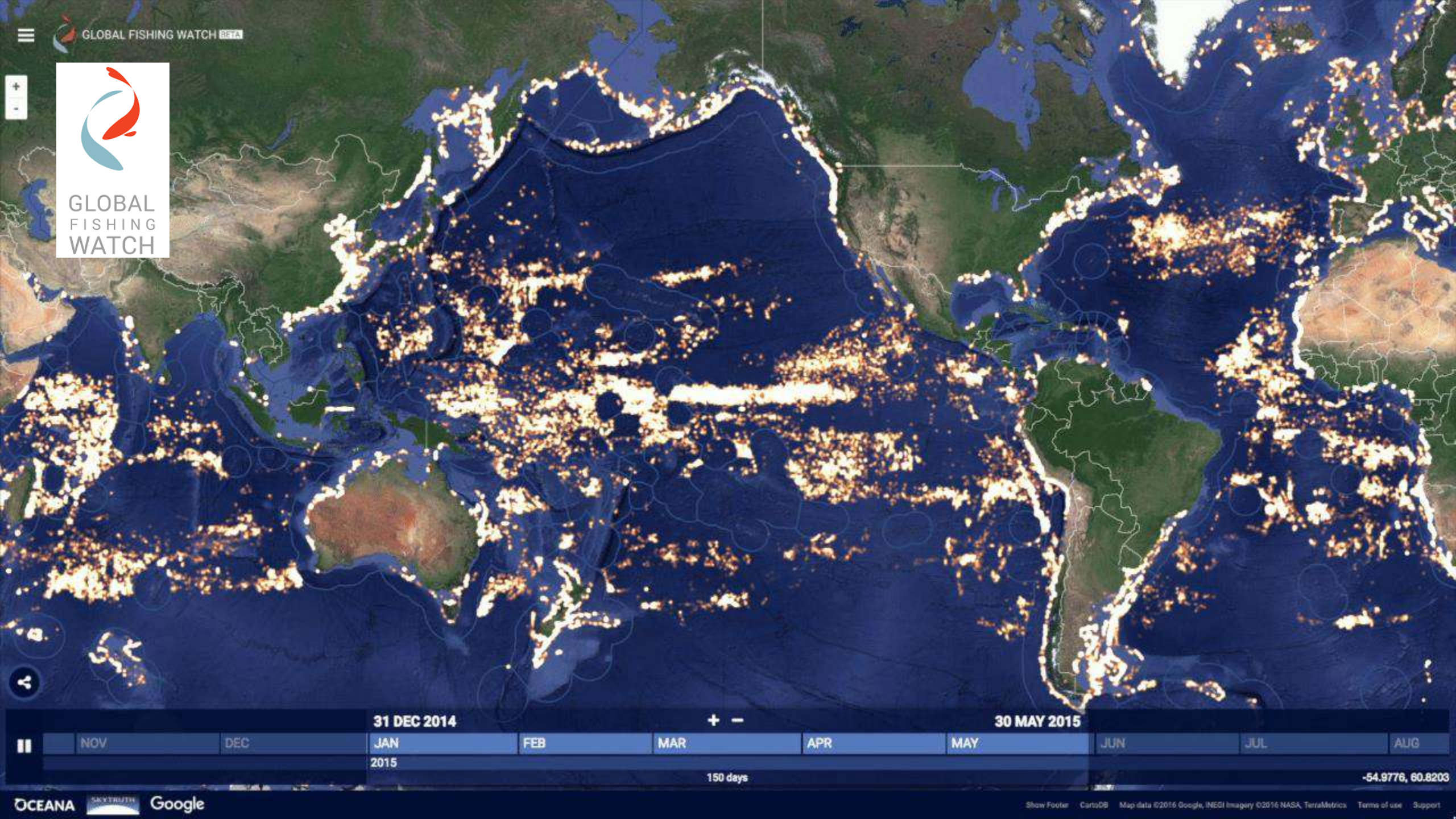
Remote high seas found new defenders

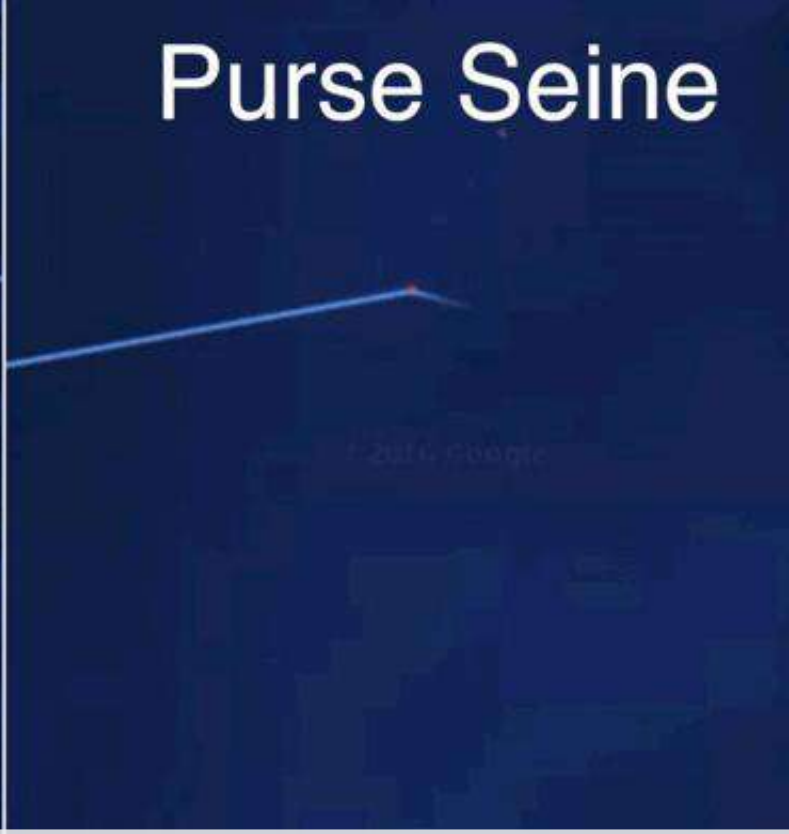
▲ A tuna-fishing boat in the Mediterranean. Photograph: Andreas Solaro/AFP/Getty Images

Most people don't think much about the high seas. [illegible] they begin where national control end[illegible] and cover 61% of the [illegible]

AIS: Automatic Identification System (on ships > 300 gt)




GLOBAL FISHING WATCH BETA
GLOBAL
FISHING
WATCH
31 DEC 2014
30 MAY 2015
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
2015
150 days
-54.9776, 60.8203
OCEANA
SKYTRUTH
Google
Show Footer
CartoDB
Map data ©2016 Google, INEGI Imagery ©2016 NASA, TerraMetrics
Terms of use
Support

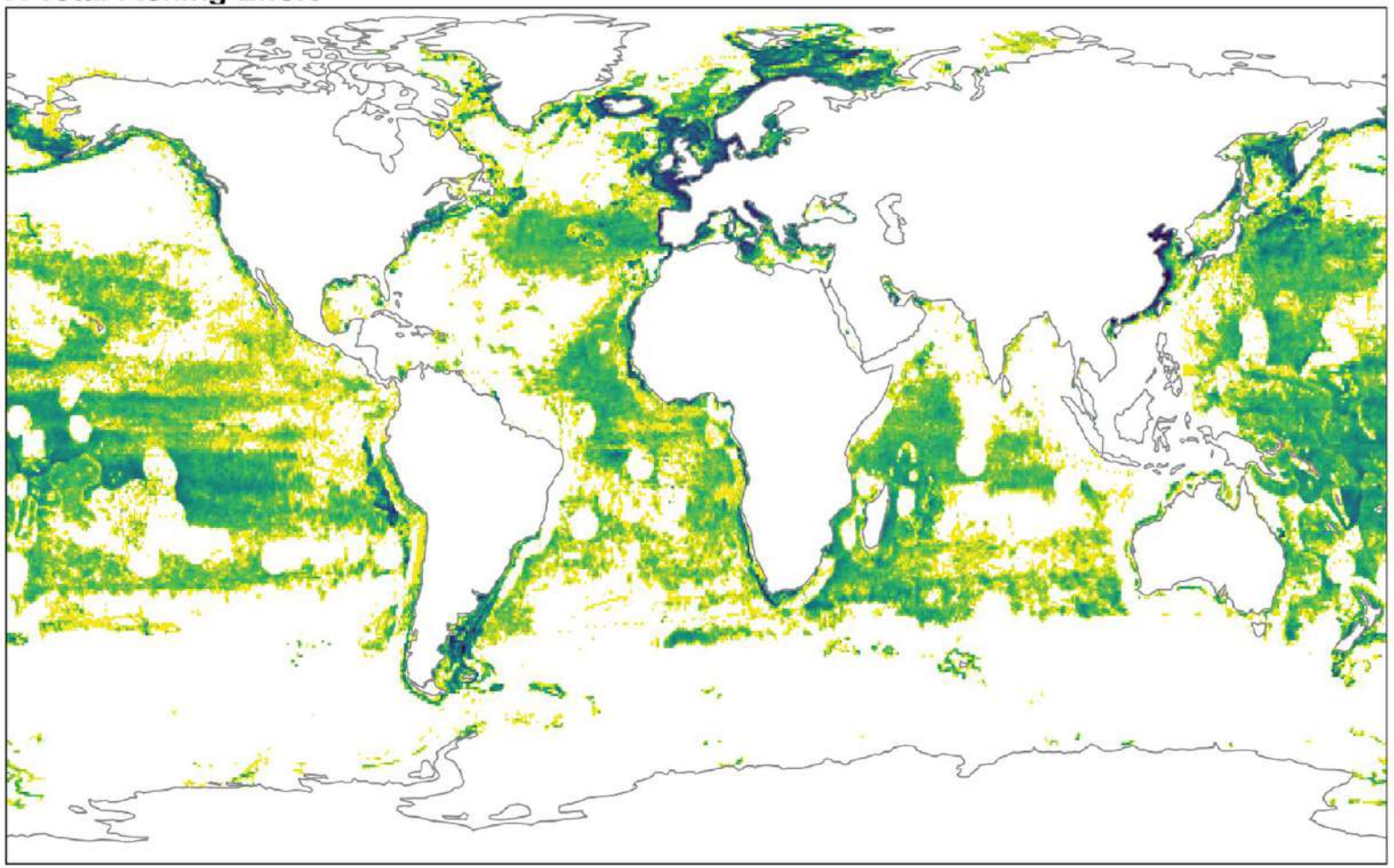


Fishing gear and pattern detection from vessel tracks

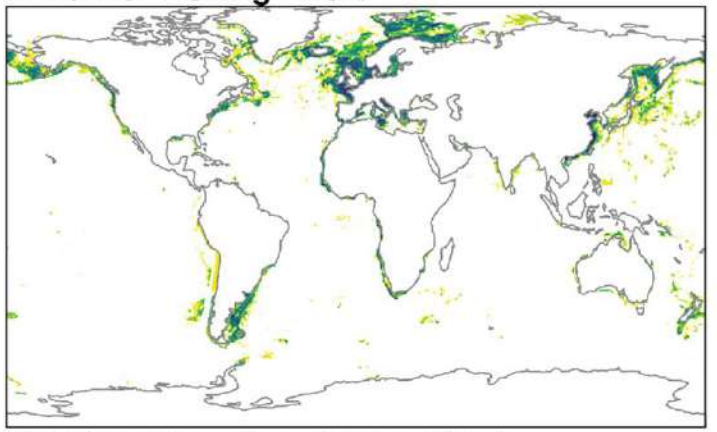
Global patterns of fishing

About 60% of fishing effort > 100nm from coasts included

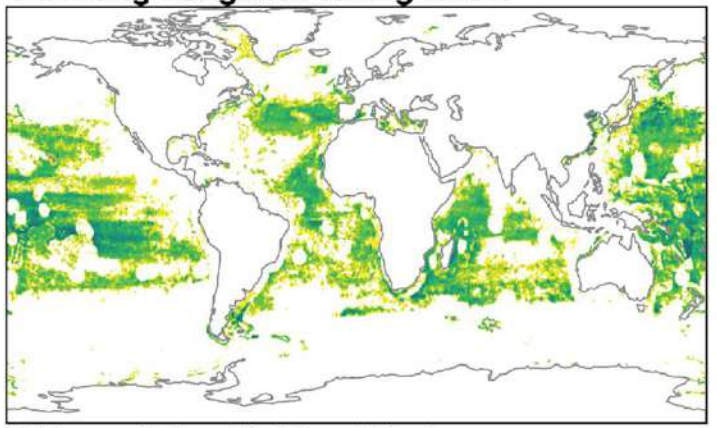
A Total Fishing Effort



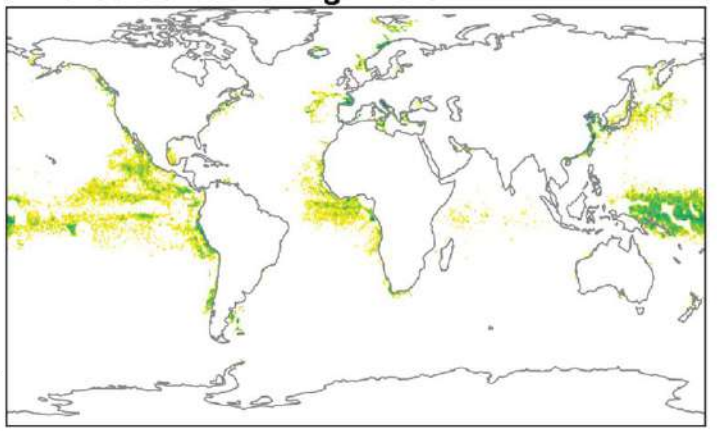
B Trawler Fishing Effort



C Drifting Longline Fishing Effort

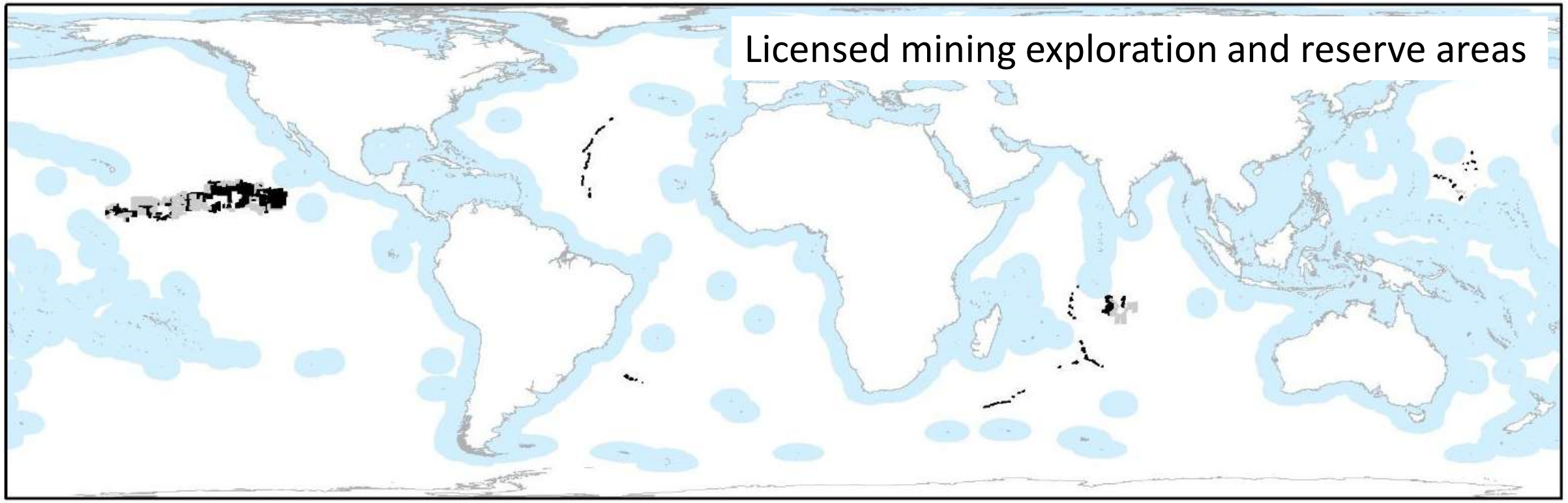


D Purse Seine Fishing Effort

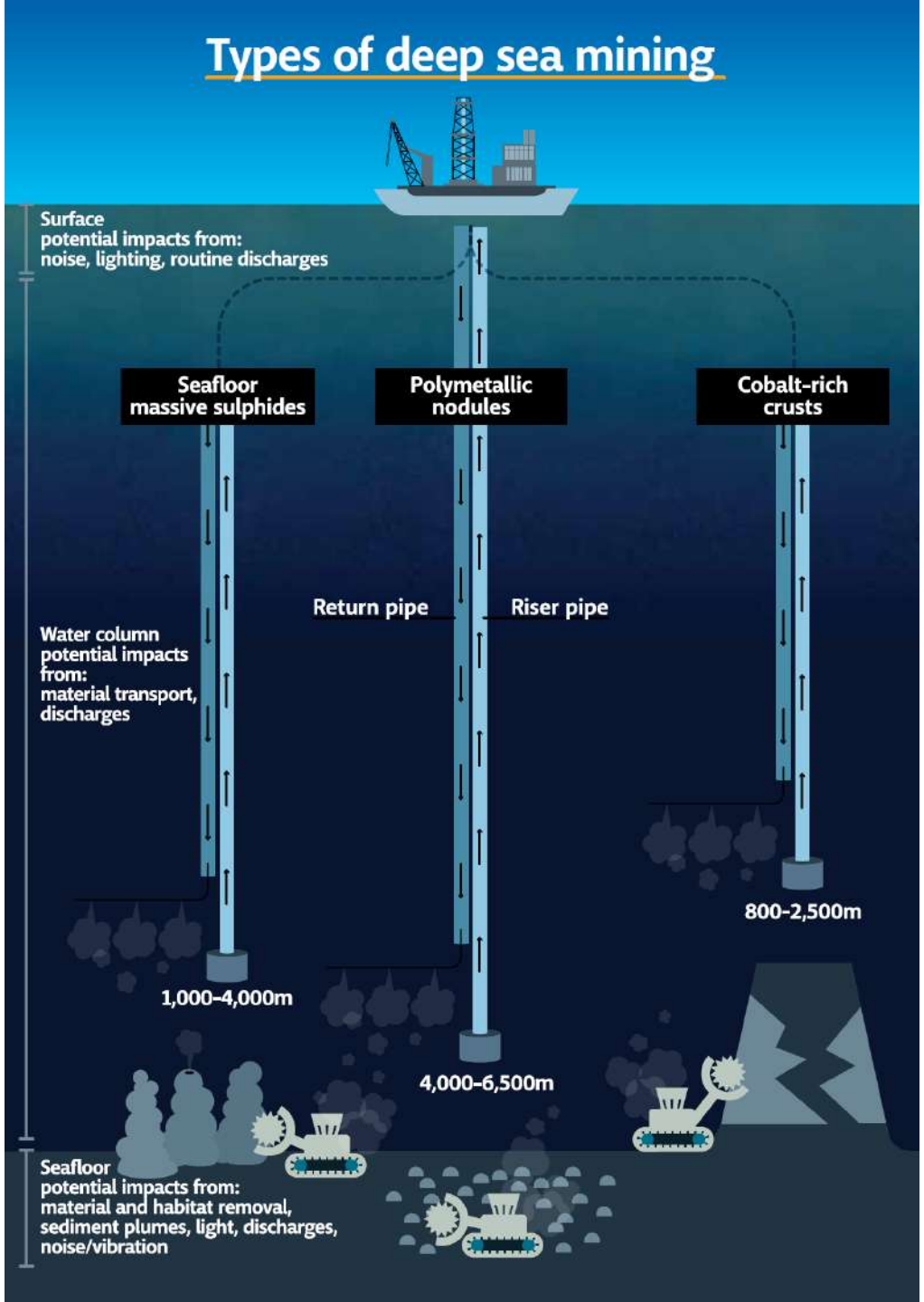


Fishing Effort ($h\ km^{-2}$) 0.001 0.01 0.1 1.0 10

Kroodsma et al (2018) Science, 10.1126/science.aao5646



Dual role: promoter and regulator of mining

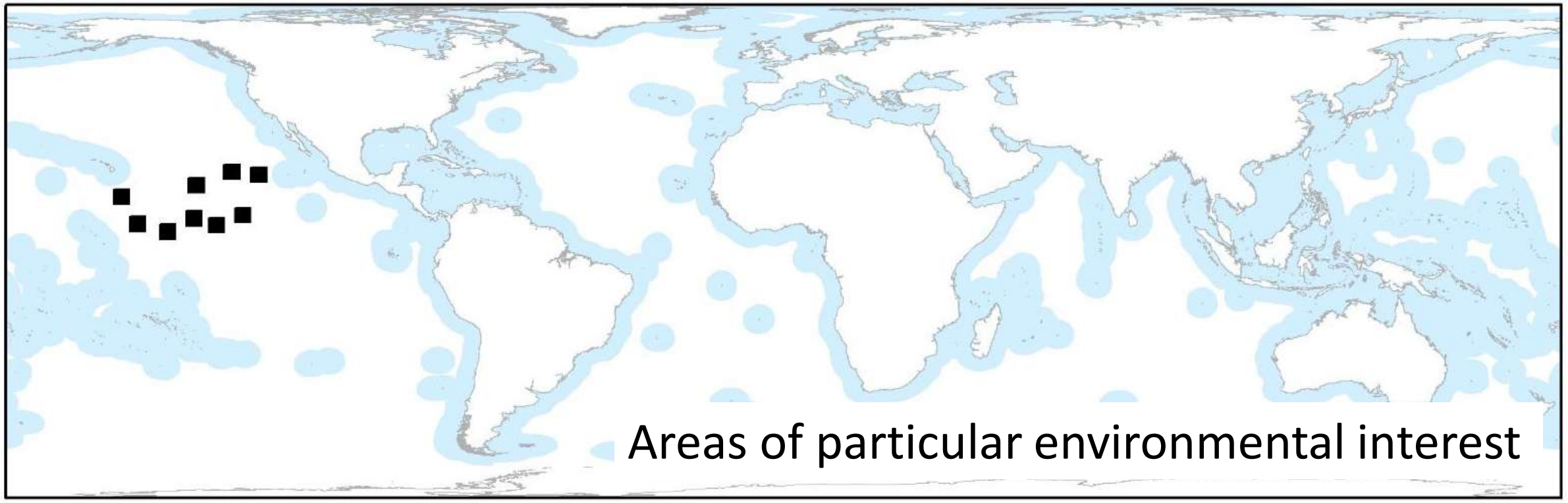


Target deposits are on seamounts, around hydrothermal vents and manganese nodules on the deep abyssal plain – just where biodiversity is richest!

SEAS AT RISK

Deep sea mining? Stop and think!

Deep sea mining has no place in a future shaped by the 2030 Agenda for sustainable development.


Areas of particular environmental interest

Alfred Wegener Institute OFOS team 2015

Mesopelagic Initiative:
Unleashing new marine resources for a growing human population

INSTITUTE OF MARINE RESEARCH

NIFES
NASJONALT INSTITUTT FOR ERNÆRINGS- OG SJØMATFORSKNING

Nofima

UNIVERSITY OF BERGEN

200m

1000m

4000m

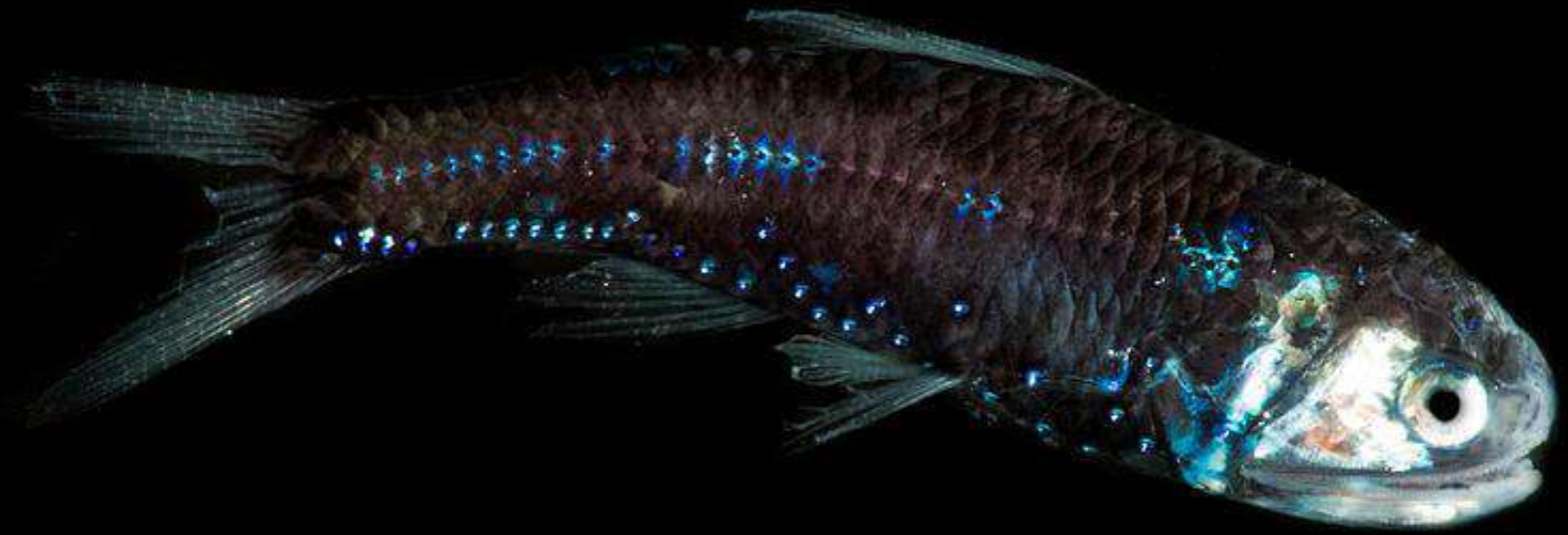
Sunlit zone

Twilight zone

Midnight zone

Ocean depth zones

Mesopelagic fish: The greatest migration on Earth



10 billion tonnes (28x all the people on Earth)
Perhaps 90% of all the fish in the ocean
Feed at the surface, poop in the deep sea
Promote carbon storage, helping reduce climate change

Photo: Dante Fenolio

Without these little fish, there could be 50% more carbon dioxide in the atmosphere, and the world would be much hotter

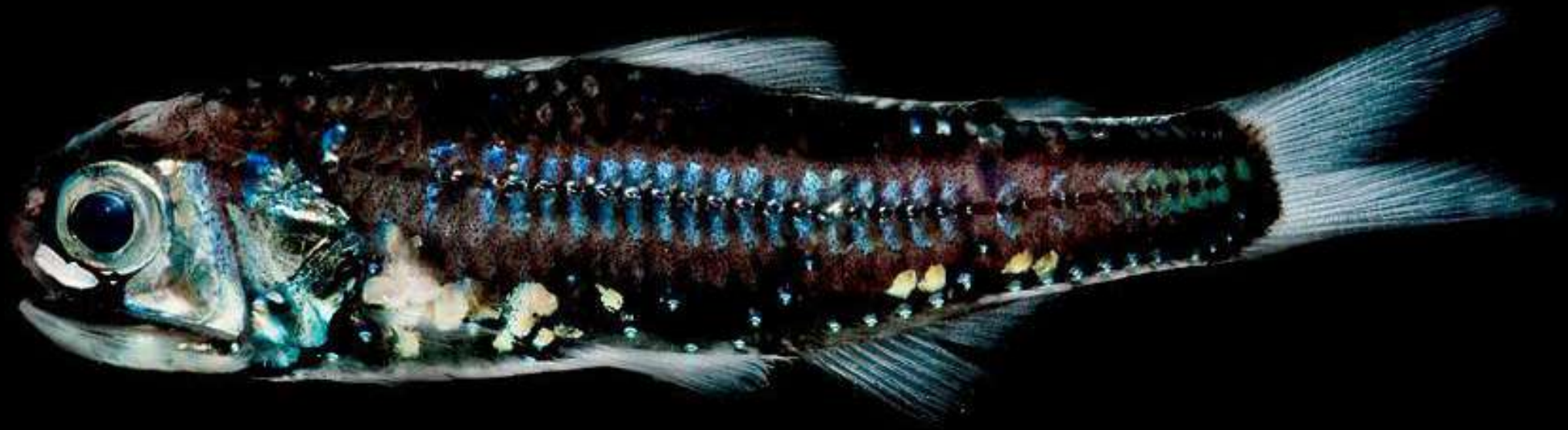
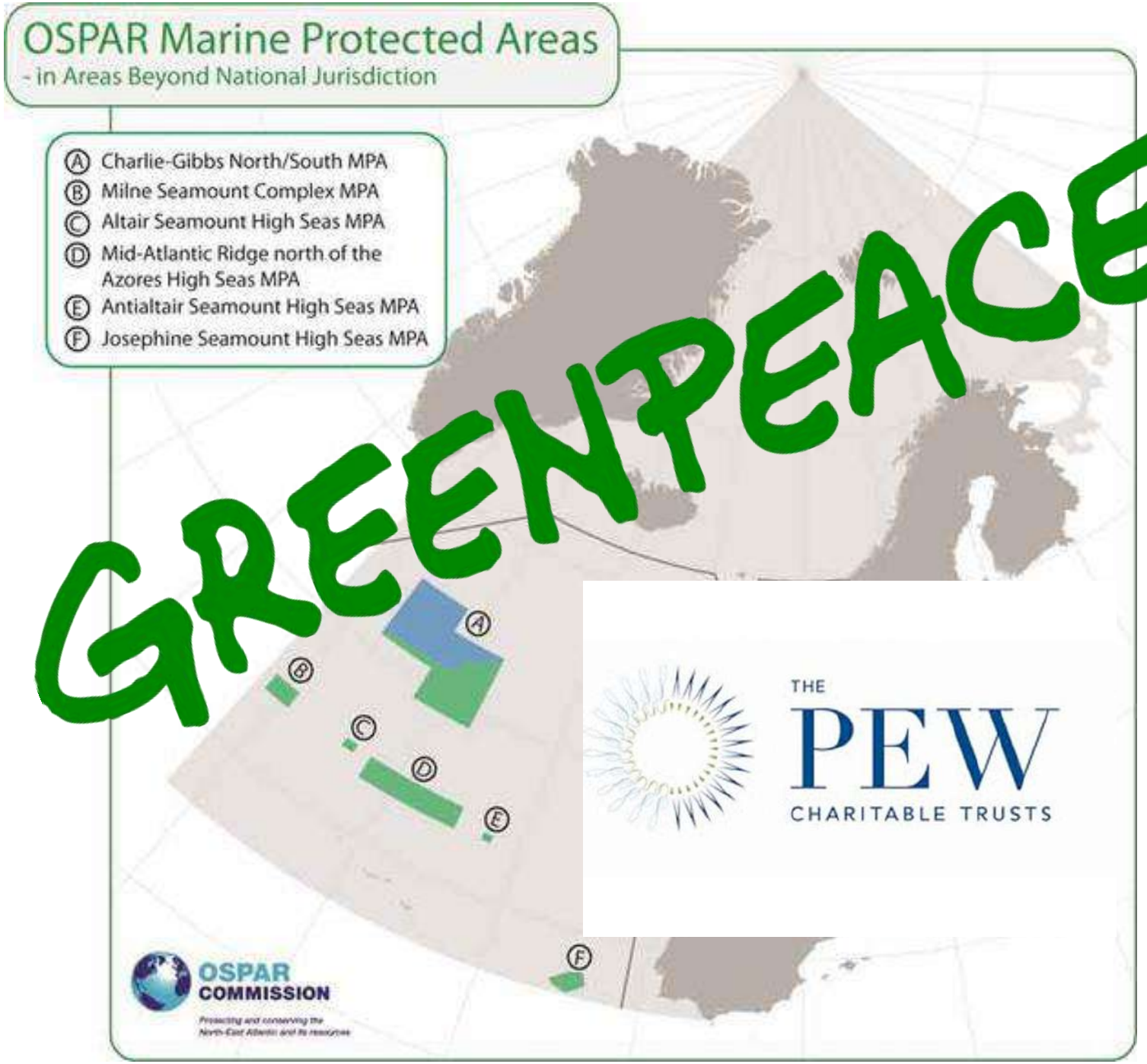


Photo: Dante Fenolio

In the search for new biological resources, a large unexploited biomass has been identified in the mesopelagic zone (water column between 200 and 1000 m)…If exploited at sustainable levels, without impacting upon biodiversity and compromising the oceans' role in climate regulation, this biomass could be used to produce more high quality ingredients…



Questions for the UN Intergovernmental Conference:

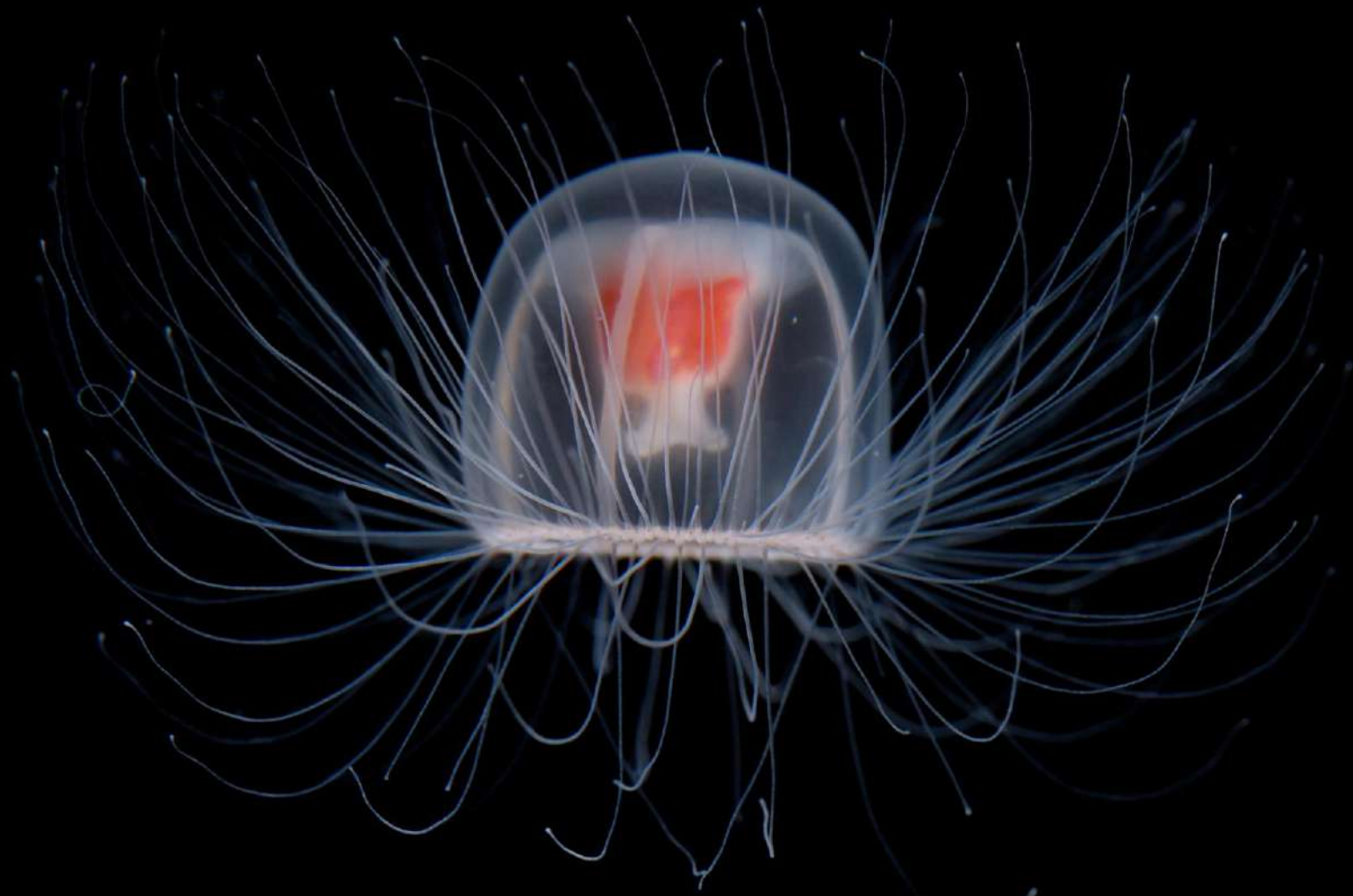
- How will MPAs be established? (representative, replicated network? coverage?)
- Who by?
- Who will manage and enforce them?
- What will they be protected from?
- Will protection include the whole water column and seabed?

Habitat protection in the open ocean is meaningless if it does not include the creatures that live there – they constitute the ‘habitat’

O’Leary, B.C. and C.M. Roberts (2017) The structuring role of marine life in open ocean habitat: Importance to international policy. Front. Mar. Sci. 4:268

THE PEW CHARITABLE TRUSTS

Photo: Alex Mustard



Many thanks to Beth O’Leary, Harriet Allen, Kristina Boerder, Boris Worm, Kristina Gjerde and Richard Page for help and use of images, and the Pew Charitable Trusts and Greenpeace for funding.