Biology and Fisheries applications: Requirements, synergies, and gaps

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Outline

- What do we mean with Biology and Fisheries?
- Relevance of the Tropical Atlantic for Fisheries
- What data do we need to collect? And what is currently done?
- What needs to be done more and how does that link to other observations?

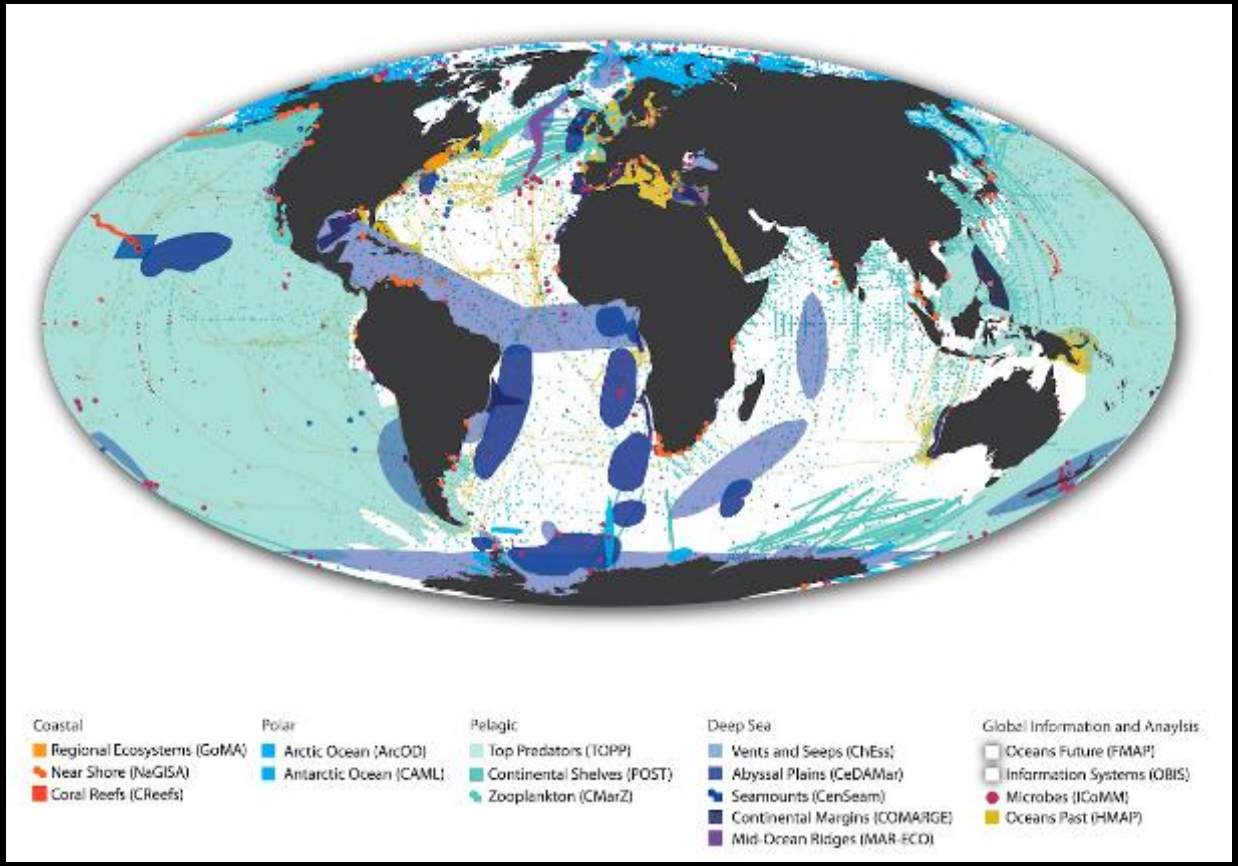
Biology and fisheries - what do we mean?

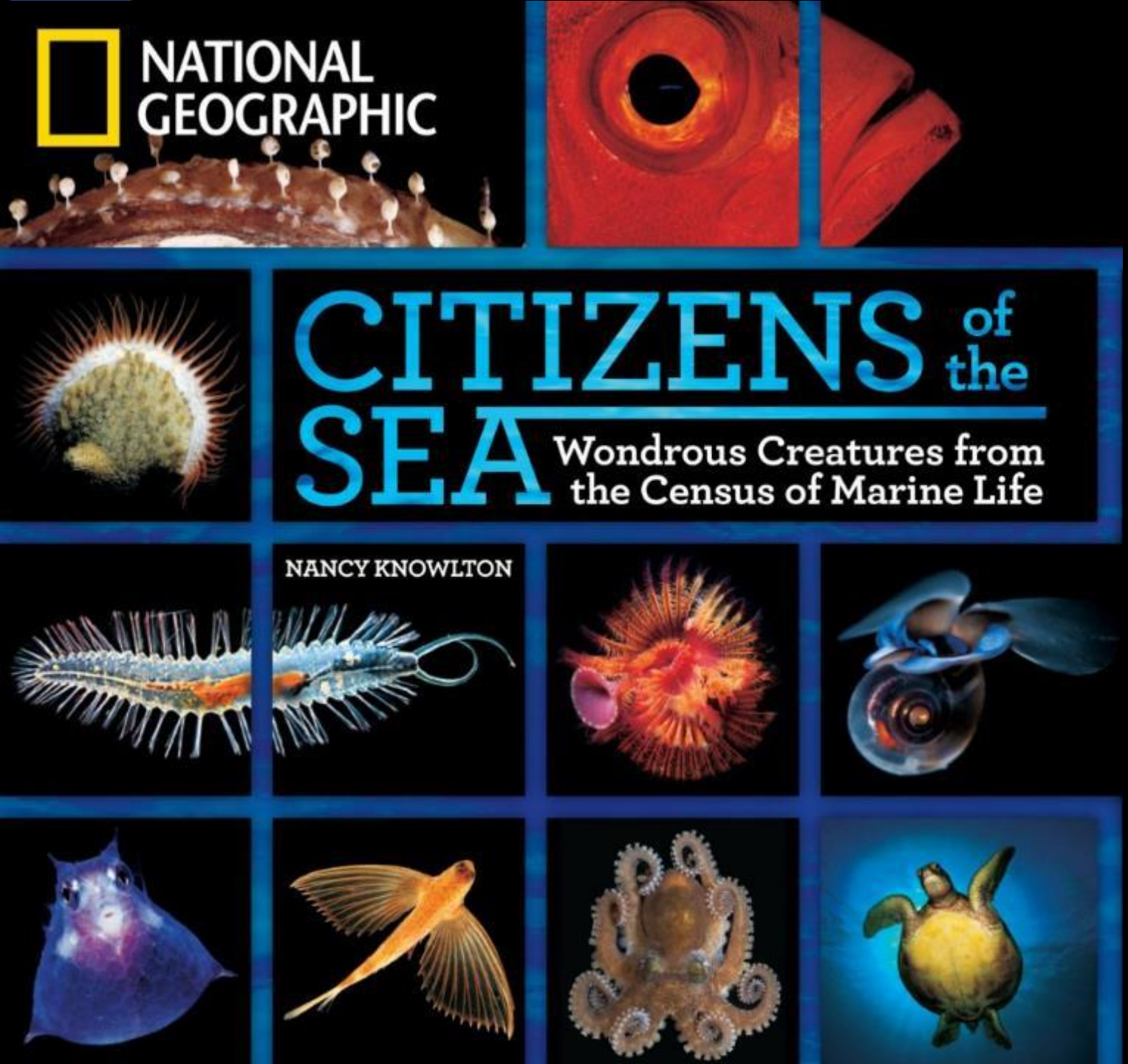
- Phytoplankton
- Zooplankton – from nano to makro
- Ichthyoplankton – fish eggs and larvae
- Fish – juvenile and adult
- Shellfish – Squid, mussels, etc.
- Benthic organisms – corals, sponges, etc.
- Megafauna – birds and marine mammals

Sampling on biodiversity

CENSUS OF MARINE LIFE

2000-2010
2700 Scientists
80+ Nations
540 Expeditions
Costs: > 650 mill US Dollars (2010)




NATIONAL GEOGRAPHIC
CITIZENS of the SEA
Wondrous Creatures from the Census of Marine Life
NANCY KNOWLTON

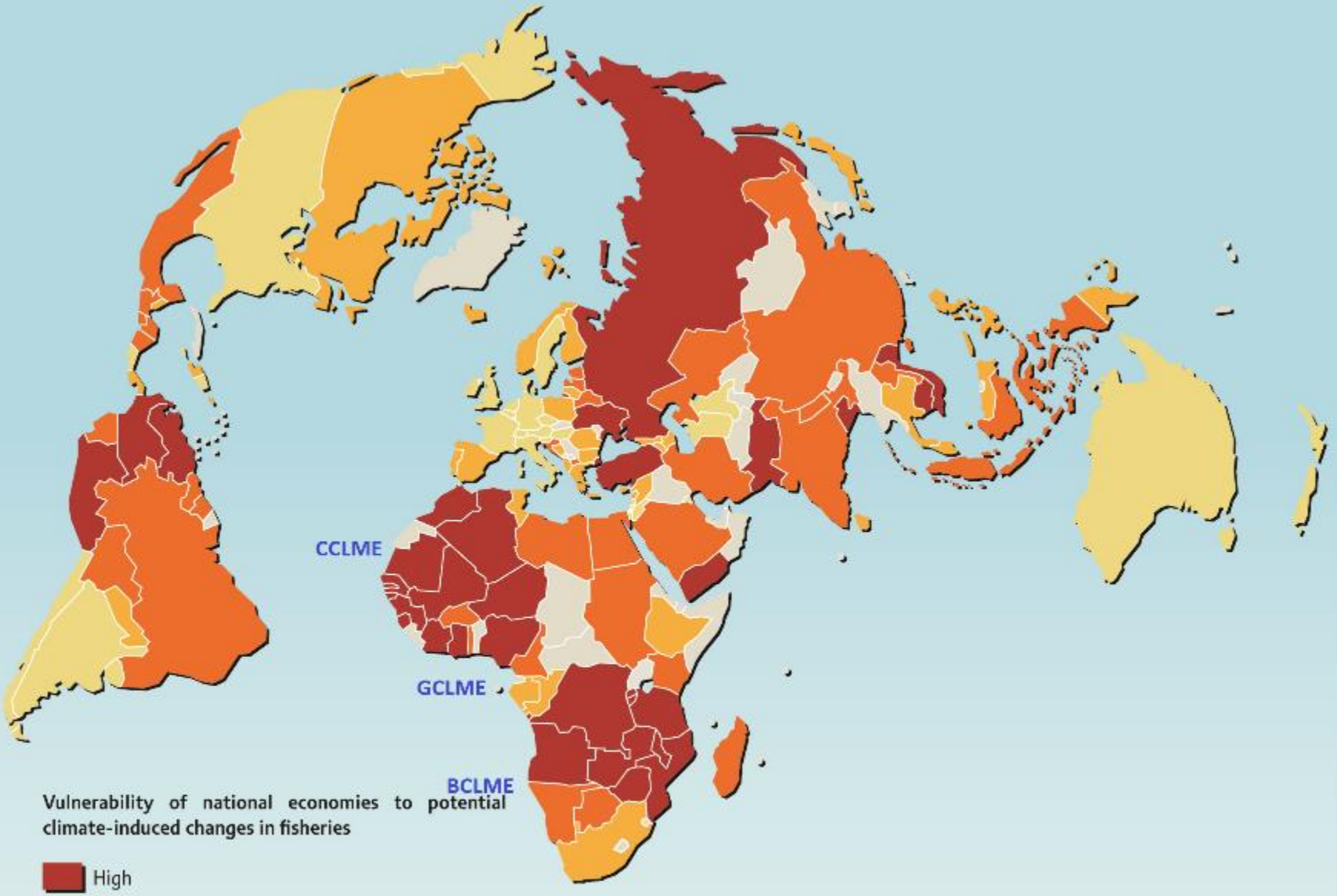
Biodiversity

Ecologically or Biologically Significant Marine Areas (EBSAS)

Fish Catches

FISHING AREA CODE	FISHING AREA NAME	AVERAGE 2003–2012	2013	2014	AVERAGE (2003–2012) –2014	2013–2014	2013–2014
			(Tonnes)		*(Percentage)*		*(Tonnes)*
21	Atlantic, Northwest	2 136 378	1 853 747	1 842 254	–13.8	–0.6	–11 493
27	Atlantic, Northeast	8 969 599	8 454 196	8 654 722	–3.5	2.4	200 526
31	Atlantic, Western Central	1 450 734					
34	Atlantic, Eastern Central	3 929 634					
37	Mediterranean and Black Sea	1 484 499					
41	Atlantic, Southwest	2 021 094					
47	Atlantic, Southeast	1 479 746					
51	Indian Ocean, Western	4 313 756	4 579 366	4 699 560	8.9	2.6	120 194
57	Indian Ocean, Eastern	6 274 406	7 617 838	8 052 256	28.3	5.7	434 418
61	Pacific, Northwest	20 256 795	21 374 002	21 967 669	8.4	2.8	593 667
67	Pacific, Northeast	2 831 978	3 205 426	3 148 703	11.2	–1.8	–56 723
71	Pacific, Western Central	11 298 748	12 398 778	12 822 230	13.5	3.4	423 452
77	Pacific, Eastern Central	1 825 231	2 024 994	1 907 785	4.5	–5.8	–117 209
81	Pacific, Southwest	642 355	581 852	543 030	–15.5	–6.7	–38 822
87	Pacific, Southeast	11 716 946	8 518 117	6 890 058	–41.2	–19.1	–1 628 059
18, 48, 58, 88	Arctic and Antarctic areas	161 608	236 617	311 896	93.0	31.8	75 279
WORLD TOTAL		80 793 507	80 963 120	81 549 353	0.9	0.7	586 233

about 9 mill. tonnes of catch



19 of the 33 countries included in the High Vulnerability class are Least Developed Countries.
For some of the most strongly fishery dependent countries (Benin, Chad, Comoros, Maldives, the Republic of Korea, São Tomé and Principe) vulnerability data are not available.

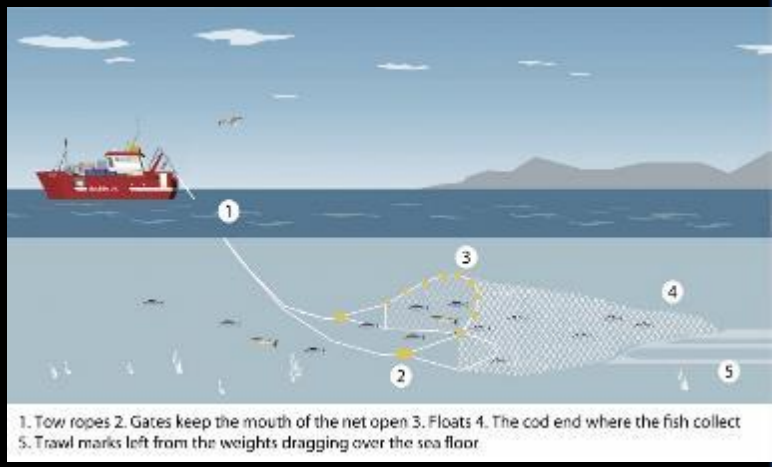
Source: E. H. Allison et al, Vulnerability of national economies to the impacts of climate changes on fisheries, Fish and Fisheries, 2009, 10, pp. 173-196.

What data do we need to collect to assess fish stocks?

- Fishery-dependent data
  - Target species
  - Catch
  - Bycatch
  - Discards
  - Effort
- Fishery-independent data
  - Egg surveys
  - Larval surveys
  - Juvenile and adult surveys

Fishery independent surveys

Net surveys

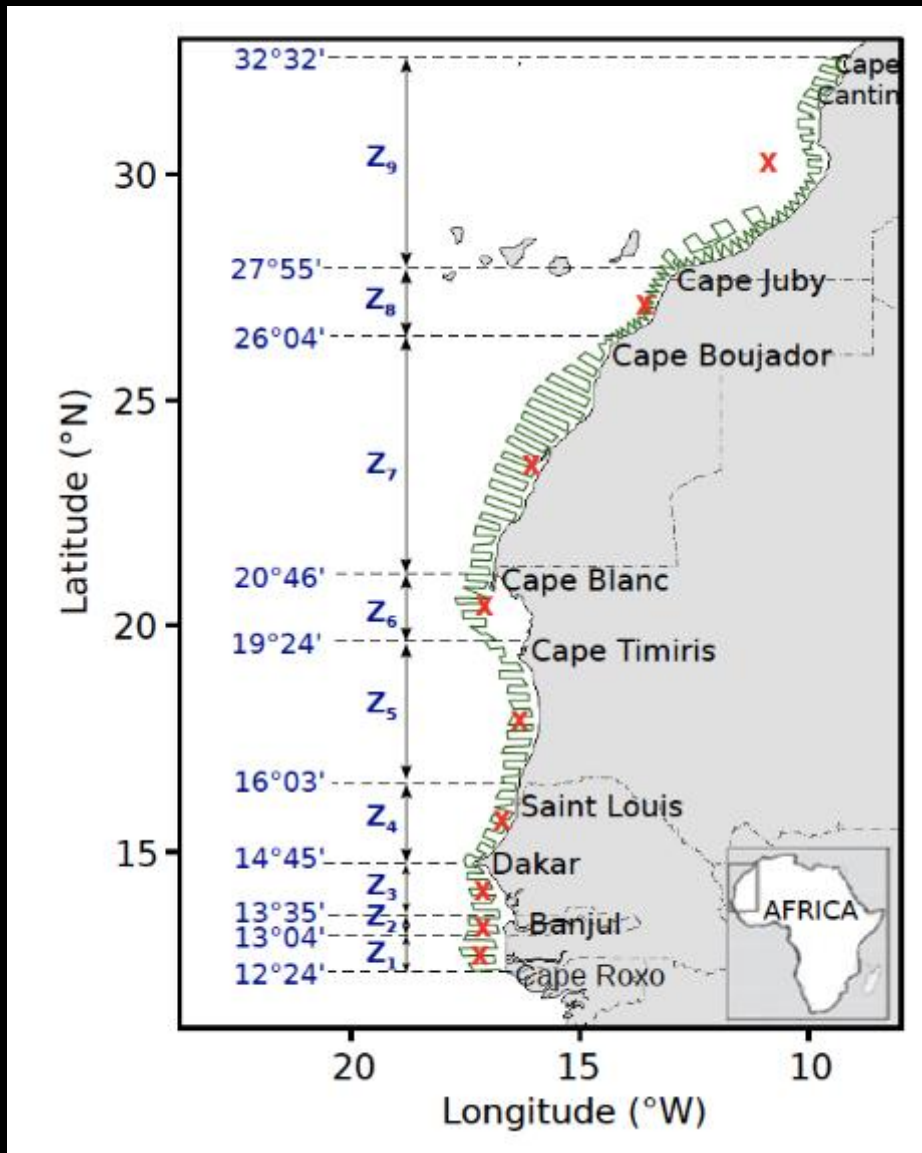


1. Tow ropes 2. Gates keep the mouth of the net open 3. Floats 4. The cod end where the fish collect 5. Trawl marks left from the weights dragging over the sea floor

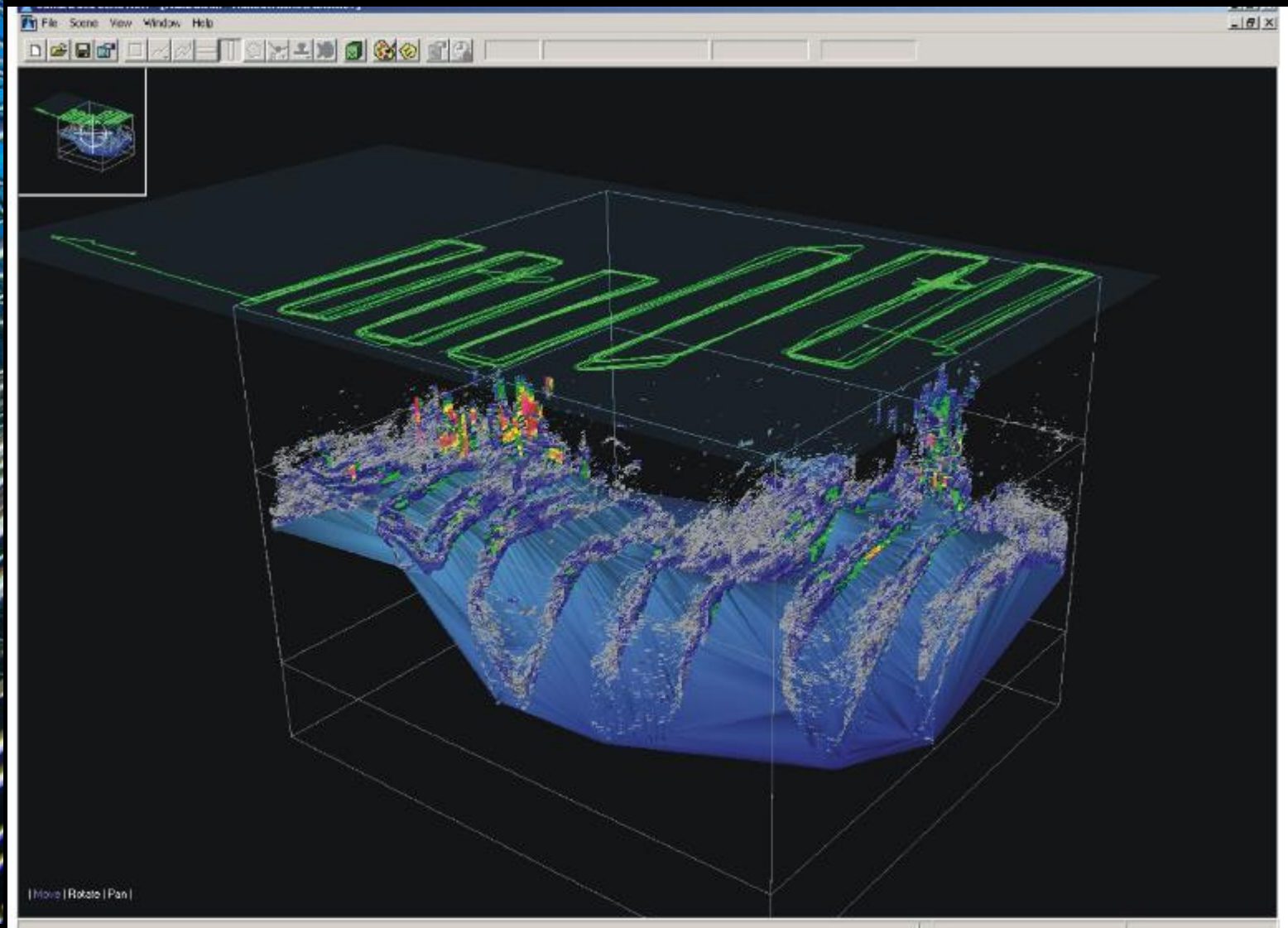
There are more types, of course
Many of those are also used in the tropical Atlantic

Small pelagics

Exemplatory cruise track along the West-African coast



Hydroacoustics



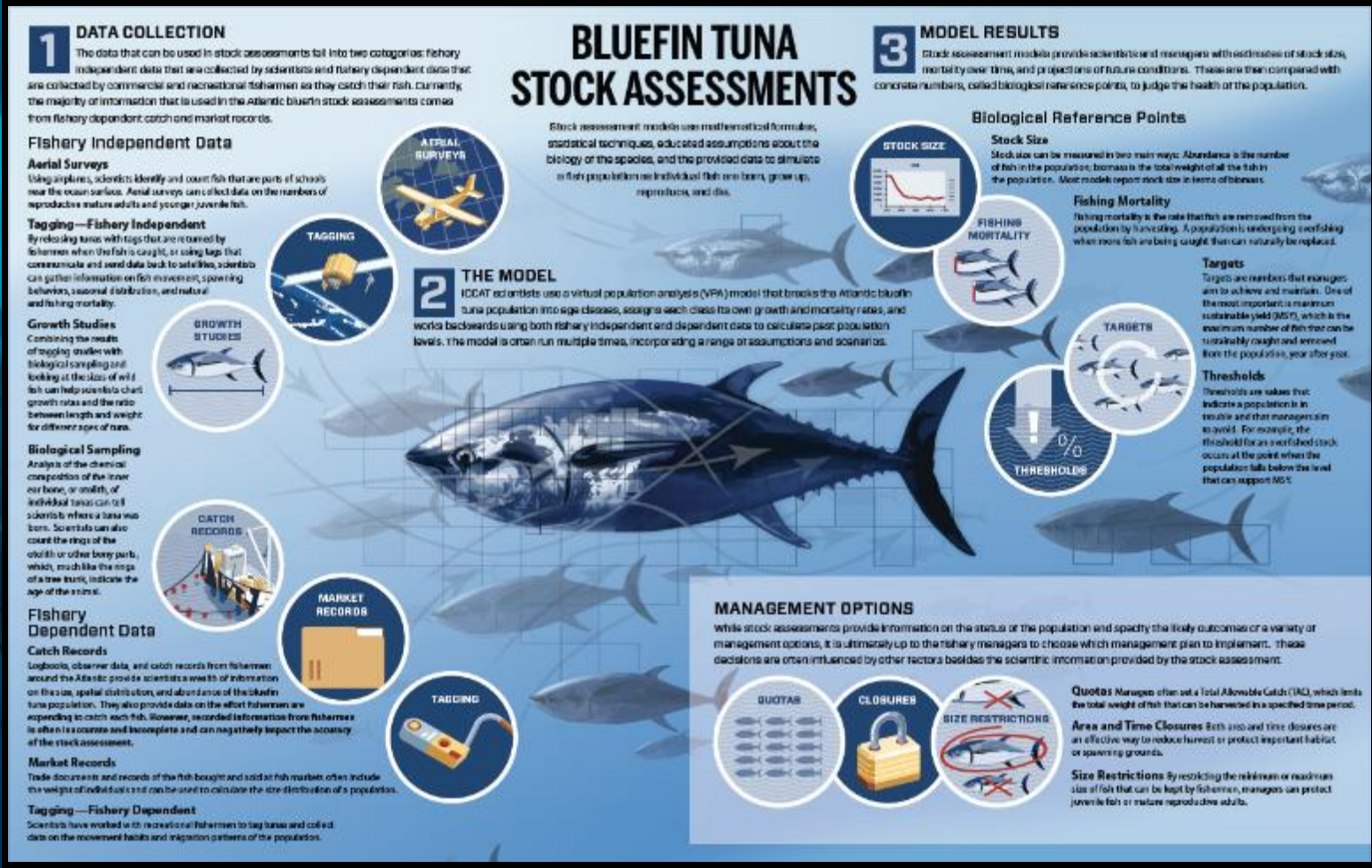
The EAF Nansen Programme

- Since 1975 a joint initiative of Norway and the Food and Agriculture Organization of the United Nations (FAO)
- The research vessel, *Dr Fridtjof Nansen* was built for the programme

EAF Nansen Programme

Fisheries and ecosystems	Pollution	Climate variability and change
> Abundance, distribution and dynamics of transboundary stocks > Biological parameters and life cycle of main species > Identification of vulnerable marine habitats > Mapping biodiversity, particularly on the sea-floor > Characterization of ecosystems	> Environmental assessment of the impact of oil/gas extraction and other mining activities > Measuring levels of hazardous substances in bottom habitats and in fish, and identifying pollutant pathways > Mapping distribution and density of marine debris, including microplastics	> Examining trends in climate-change related indicators > Assessing how climate variability and change affects marine ecosystems, including food-web dynamics, recruitment, distribution, migration and growth of fish species > Understanding how climate change affects ocean biochemistry processes

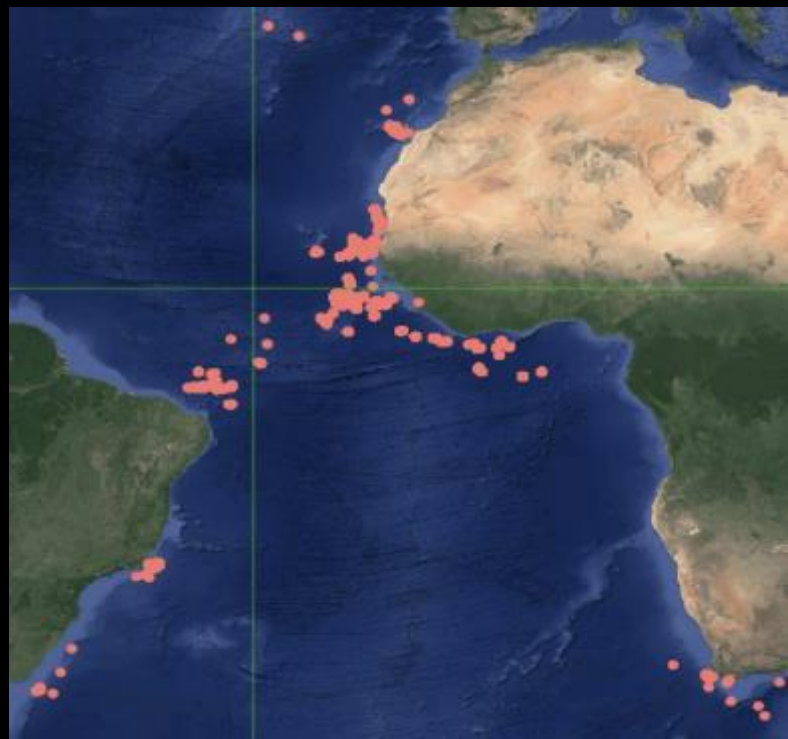
Large Pelagics



ICCAT Atlantic – Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP)

The AOTTP Programme (http://www.iccat.int/AOTTP/en/) is collecting tag-recapture data from Atlantic Ocean tropical tuna fisheries.
AOTTP will tag 120,000 fish using conventional and electronic tags.

Location of yellowfin tuna tagged between June 2016 and Sept 2017



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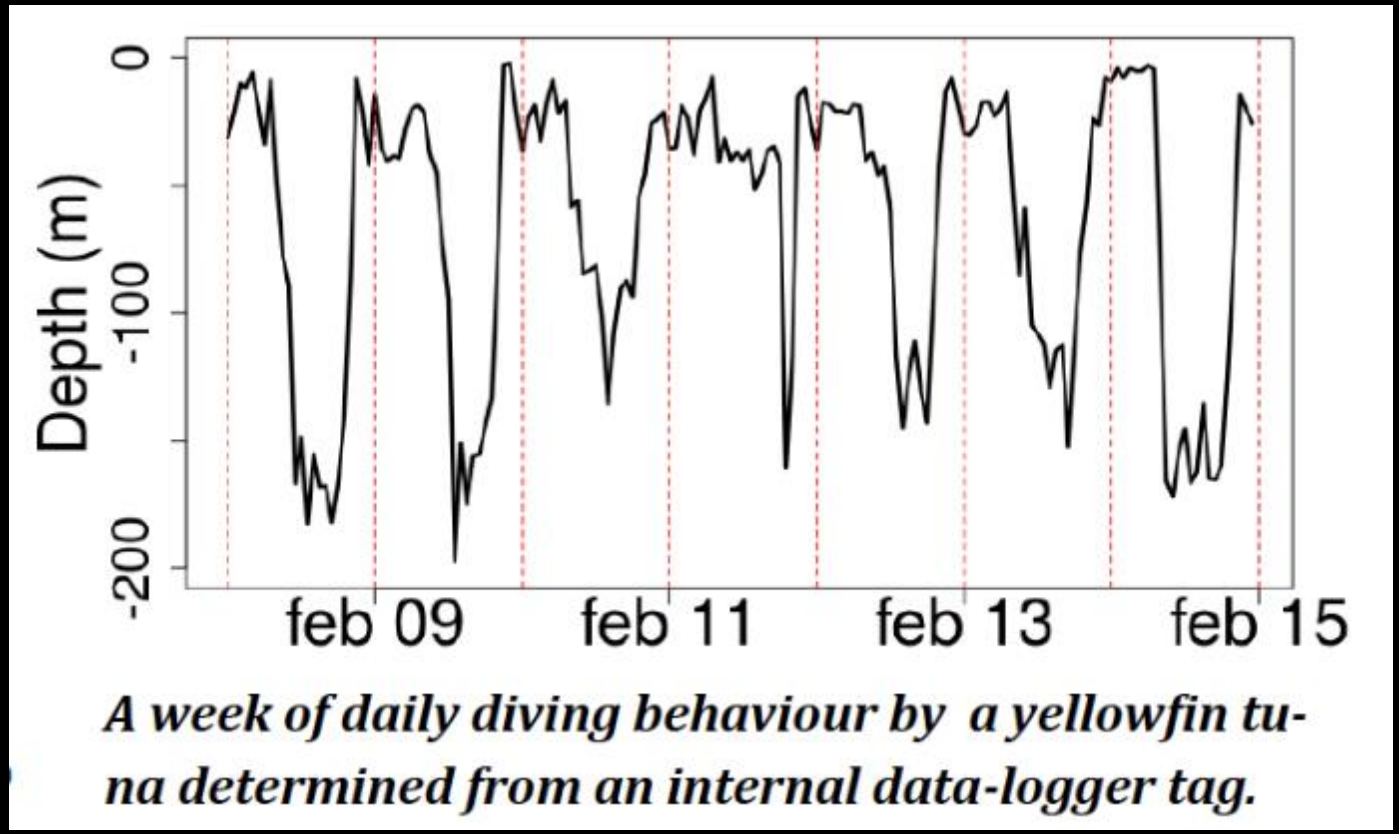
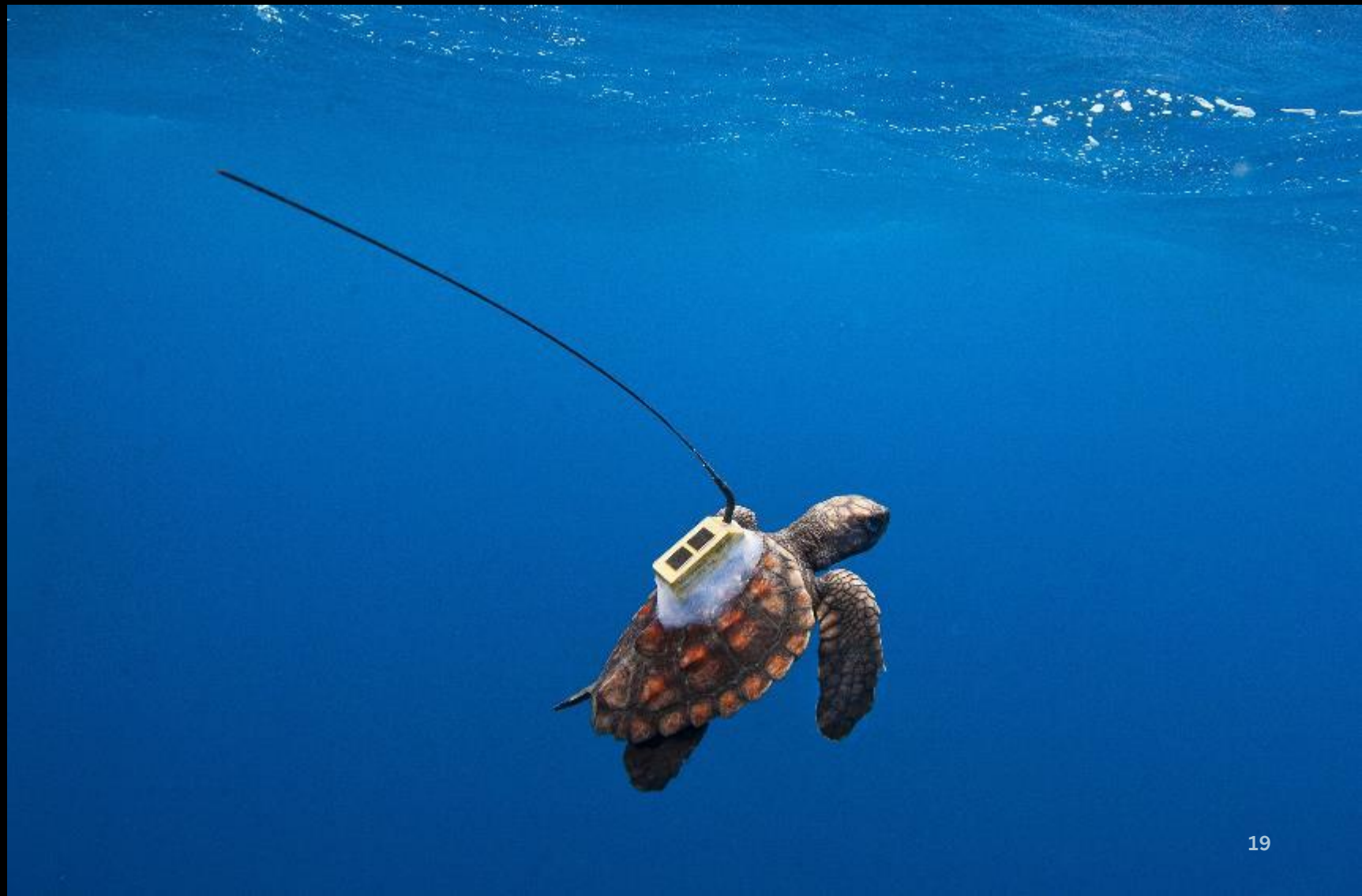


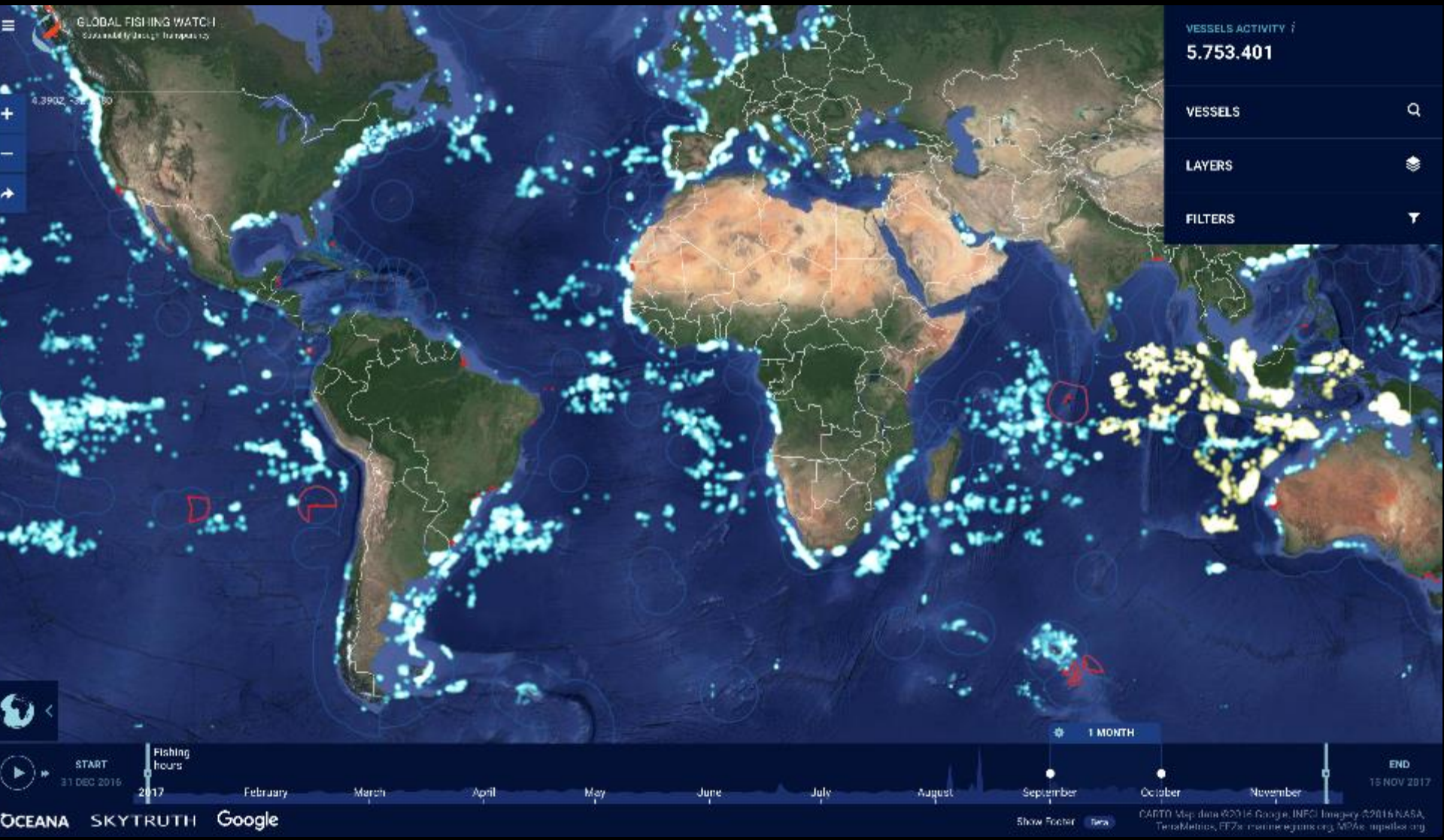
A week of daily diving behaviour by a yellowfin tuna determined from an internal data-logger tag.

Speaking about tagging...



Fishery dependent surveys

Global Fishing Watch



Global Fishing Watch

- Better use of existing data
- Surveys for commercial species
- Surveys for endangered species
- Relevance for society

Gaps

- Missing or not enough communication between communities
- Missing data exchange protocols
- Missing survey protocols

Synergies

- a lot ☺
- Adding value to observations by bringing data together

So long, and thanks for all the fish!