



Food and Agriculture  
Organization of the  
United Nations



The Commonwealth



UNECE

## **2<sup>nd</sup> Oceans Forum on Trade-related Aspects of SDG 14**

***Enabling sustainable and integrated seafood and  
living marine resources value chains and related services***

Entrenching biodiversity conservation considerations within the marine-based value chain production lines in developing countries

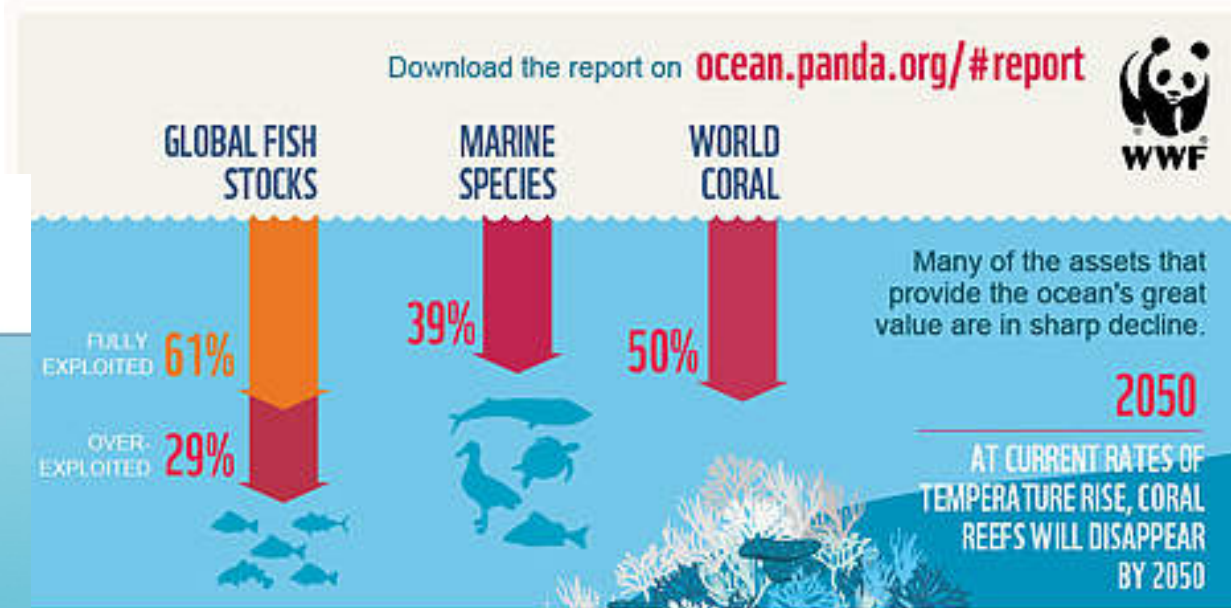
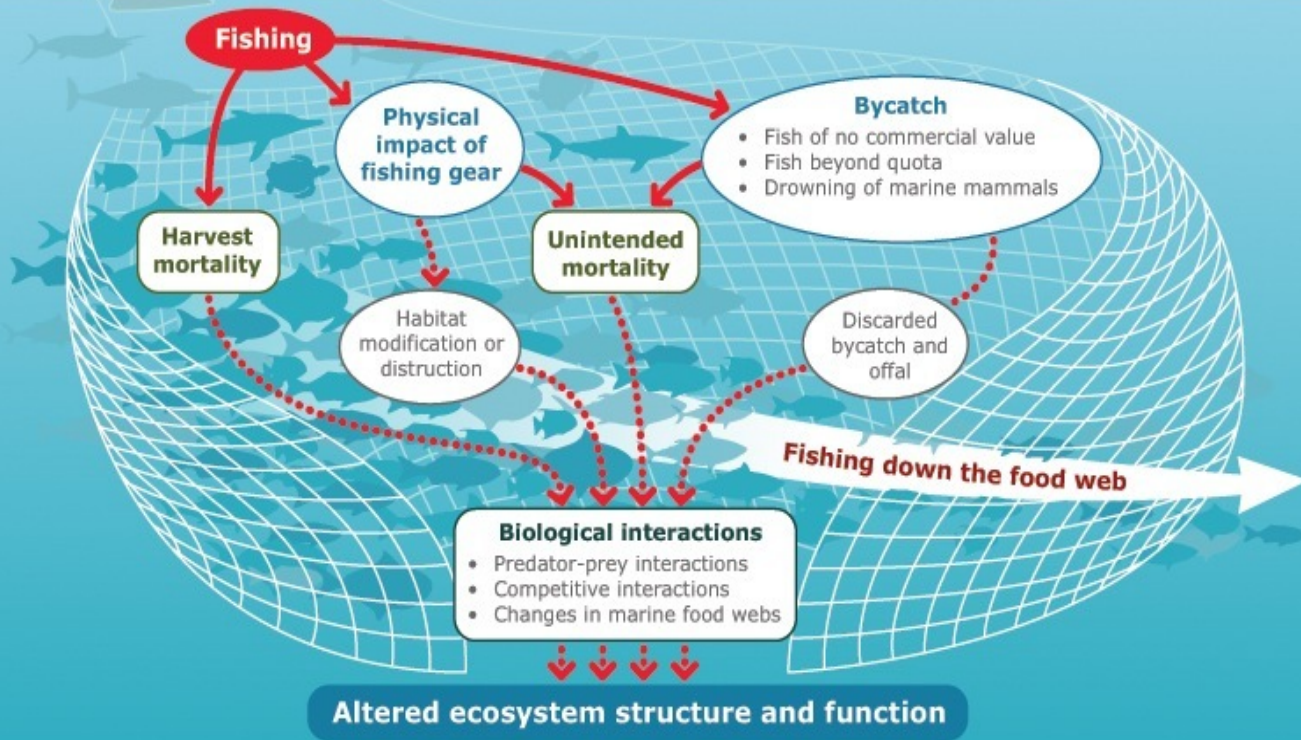
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# SETTING THE CONTEXT

# Impacts of current high-value marine-based chains



## Ecosystem Overfishing



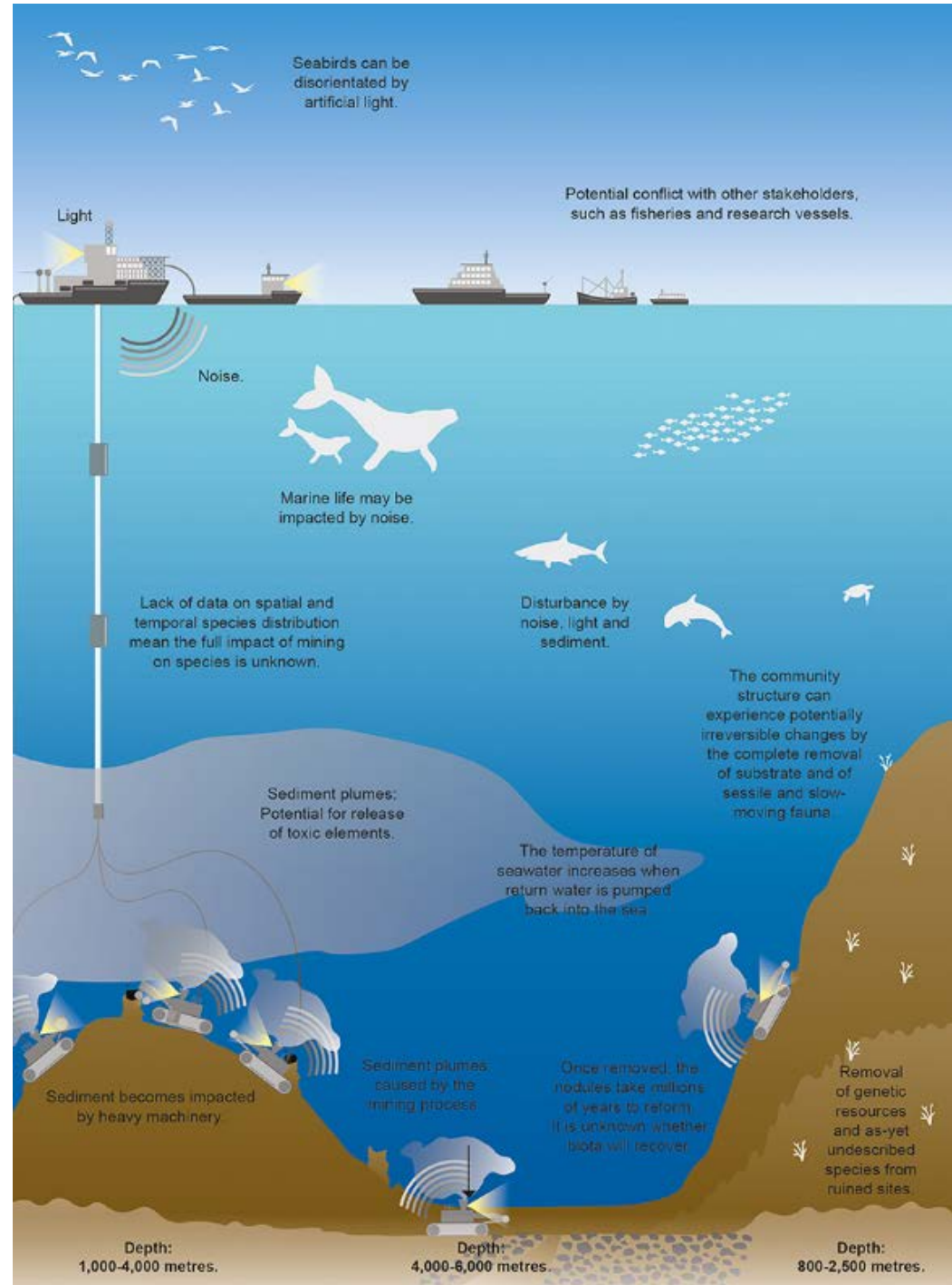
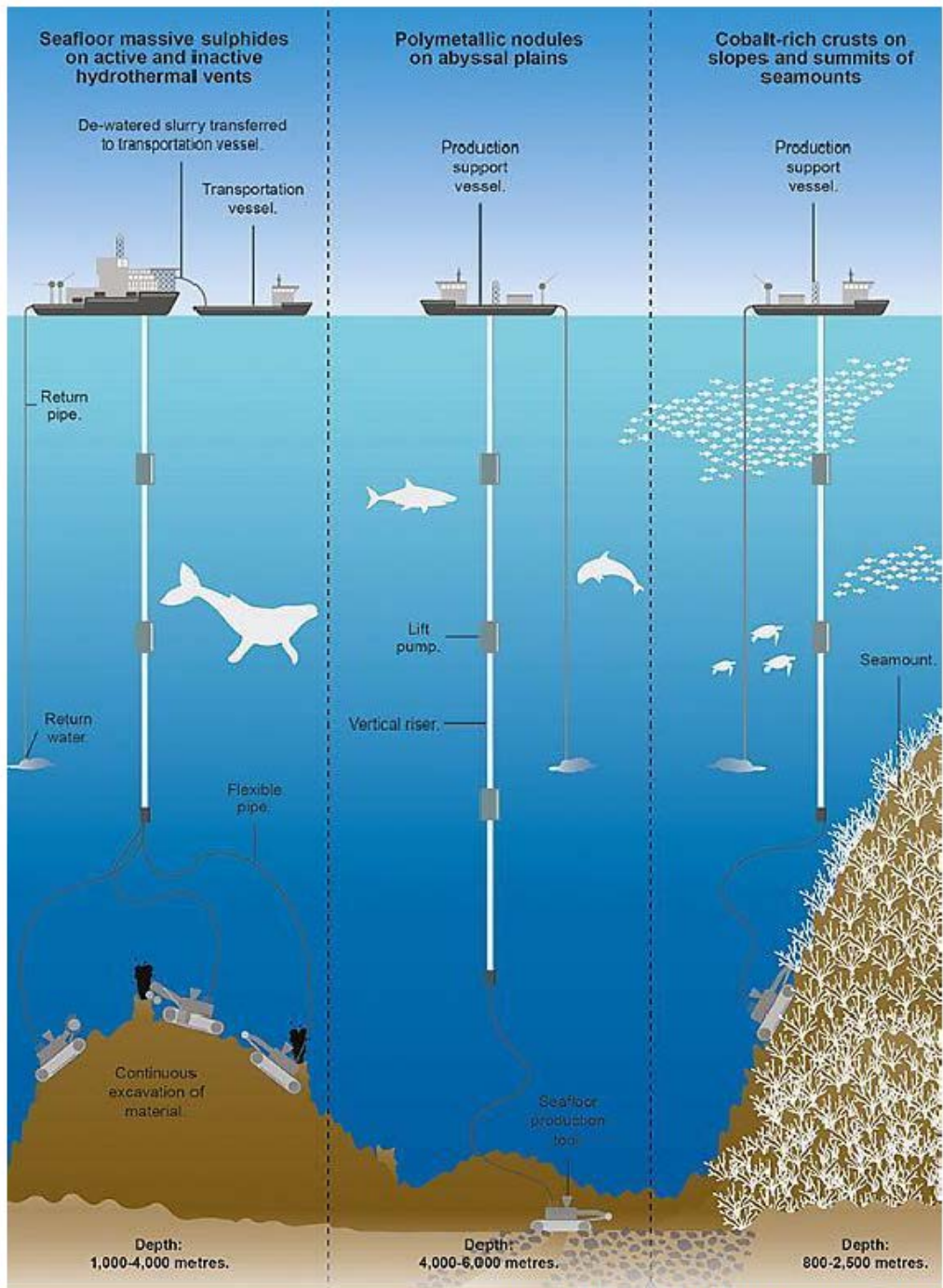


# Impacts of future high-value marine-based chains

## Marine genetic resources

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- Management of marine genetic resources has become a prominent issue. The issues are multifaceted
  - (1) concerns on the impact on the marine environment of the recovery of genetic resources
  - (2) fair access to genetic resources for less technologically advanced states
  - (3) sharing of the financial and other benefits derived from genetic resources
  - (4) lack of environmental regulations of unrestrained scientific activity

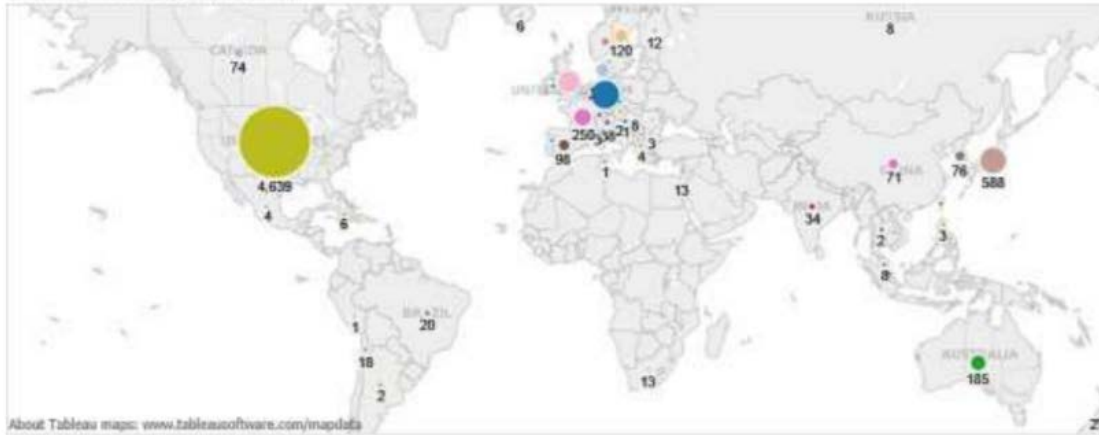


Source: <https://doi.org/10.3389/fmars.2017.00418>



# Impacts of future high-value marine-based chains

Global First Filings (INPADOC)



Regional First Filings (INPADOC)



European First Filings (INPADOC)



Category	Family Count	Family Members	Tac Occurrences
Genetic Engineering	3,081	48,728	2,518
Medicines	2,965	45,716	3,308
Peptides	2,130	36,737	2,081
Biocides, Pesticides, Herbicides	1,650	19,126	640
DNA Sequencing/Testing Enzymes or Microorganisms	1,575	30,183	1,269
Fermentation/Using Enzymes to Synthesize Compounds	1,483	30,315	1,393
Analysing Chemical/Physical Properties	1,328	25,734	1,026
Sugars, Nucleosides, Nucleic Acids	1,102	27,834	727
Heterocyclic Compounds	969	11,252	184
Plant Breeding	547	7,375	212
Cosmetics	542	4,740	527
Animal Husbandry	517	12,095	631
Foodstuffs	406	4,989	759
Acyclic/Carbocyclic Compounds	334	4,319	73
Fodder	288	3,882	543
Enzyme Genetic Engineering	266	4,727	287
Microorganisms (Index)	263	5,925	260
Greenhouse Gas Reduction	216	2,556	170
Microbiology Apparatus (e.g. Bioreactors)	197	2,767	93
Combinatorial Libraries	185	4,513	61
Wastewater Treatment	172	1,764	140
Sterilising Materials	149	1,960	140
Coating Compositions, e.g. Paints	143	1,635	96
Fertilisation	123	1,593	4
Detergents	118	2,030	72
Dyes, Paints, Polishes	115	1,675	151
Digital Data Processing (Bioinformatics)	114	2,116	40
	101	2,173	97

The existing literature on patent activity involving marine genetic resources has highlighted that “claims associated with marine genes originate from only 31 of the 194 countries in the world” with ten countries dominating 90% of patents containing marine genes and 70% from three countries led by the United States, Germany and Japan [4].

# Why should we care?

- According to marine ecosystem valuation (ecosystem services), the oceans, based on the gross marine product, the OCEANS are the 7<sup>th</sup> largest economy in the world
- The overall value of key ocean assets is more than 24 trillion US dollars

Most of the time, the true value of ecosystem services is not known or appreciated. In fact, studies show they provide significant value:



# Ecosystem-based management

- ▶ Ecosystem-based management is an environmental management approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation (Christensen et al. 1996, McLeod et al. 2005).
- ▶ **Terrestrial** ecosystem-based management (often referred to as ecosystem management) came into its own during the conflicts over endangered species protection (particularly the northern spotted owl), land conservation, and water, grazing and timber rights in the western United States in the 1980s and 1990s (Yaffee 1999).
- ▶ Interest in ecosystem-based management in the **marine** realm has developed more recently, in response to increasing recognition of the declining state of fisheries and ocean ecosystems (POC 2003, USCOP 2004, Millennium Ecosystem Assessment 2005).



### **BOX 3 Ecosystem-based management as a paradigm shift**

#### **From**

Individual species

Small spatial scale

Short-term perspective

Humans independent of ecosystems

Management divorced from research

Managing commodities

#### **To**

Ecosystems

Multiple scales

Long-term perspective

Humans as integral parts of ecosystems

Adaptive management

Sustained production potential for ecosystem goods and services

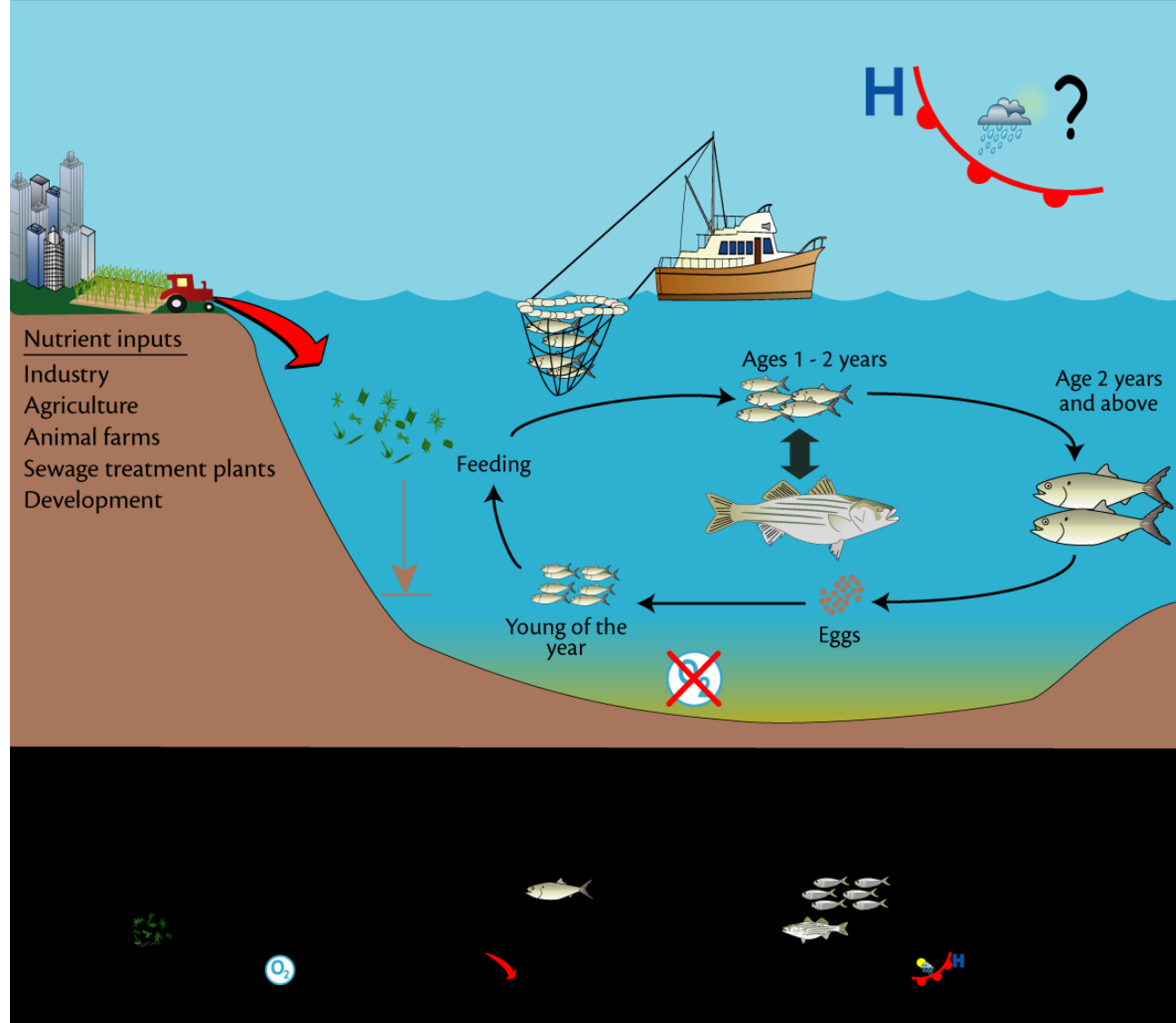
Source: Lubchenco 1994, Sherman and Duda 1999










### **BOX 1 Switzerland joins efforts to protect the North Sea**

'At the roof of Europe', Switzerland is a mountainous country far away from any coastline or sea. Switzerland is nonetheless an important participant in ministerial meetings on the protection of the North Sea. Discharge limits for waste waters produced by Swiss industries bordering the River Rhine are set to meet standards designed to restore and maintain the environmental qualities of the North Sea.





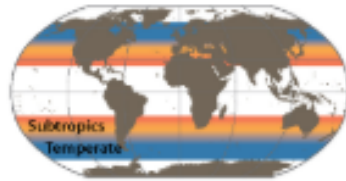
Ecosystem based fisheries management aims to manage fisheries in a manner that considers a variety of interactions with the fishery of interest. Ecosystem based fisheries management is now strongly advocated and in some cases even mandated. Some of the main ecological interactions affecting menhaden biomass  and recruitment  are availability of food (plankton ) , level of predation from fish such as striped bass  , and habitat quality such as dissolved oxygen  , nutrient input  , and weather pattern variability  .

# The goalposts are moving.....

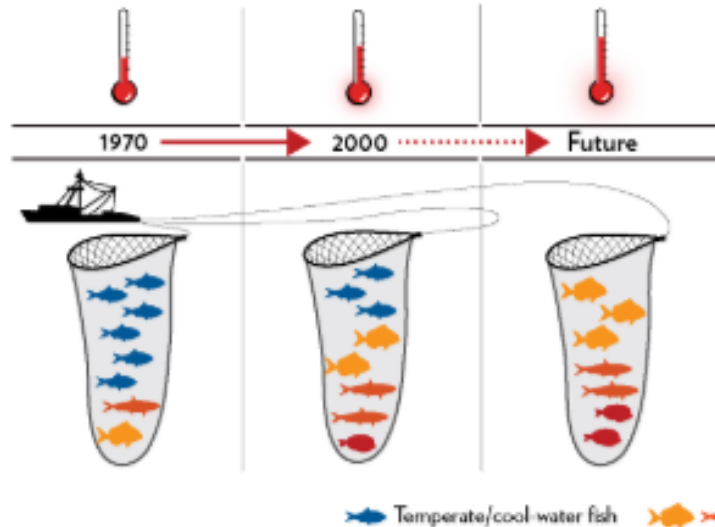
## Warming Oceans Are Reshaping Fisheries

Marine species are gradually moving away from the equator into cooler waters, and, as a result, species from warmer waters are replacing those traditionally caught in many fisheries worldwide. Scientific studies show that this change is related to increasing ocean temperatures.

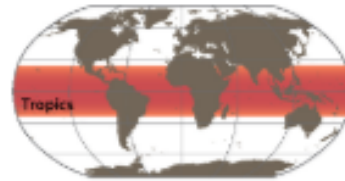
### Subtropic and temperate ocean



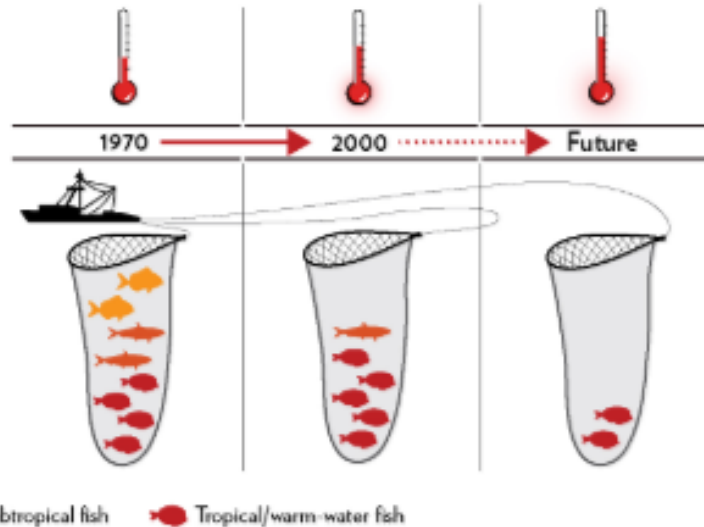
From 1970 to 2006, as open temperatures were rising, catch composition in the subtropic and temperate areas slowly changed to include more warm-water species and fewer cool-water species.



### Tropics



In the tropics, the catch composition changed from 1970 to 1980 and then stabilized, likely because there are no species with high enough temperature preferences to replace those that declined.




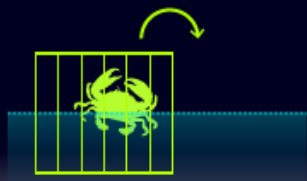

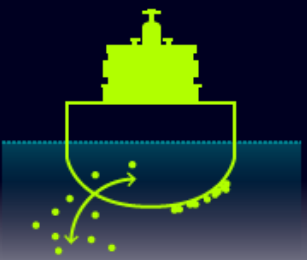

**Fisheries managers should be speaking to oceanographers.....**

*These shifts could have negative effects including loss of traditional fisheries, decreases in profits and jobs, conflicts over new fisheries that emerge because of distribution shifts, food security concerns, and a large decrease in catch in the tropics.*



# Other 'less obvious' impacts

## Invasive Marine Species - Dispersal Methods

Aquarium Trade	Aquaculture	Canal Construction	Shipping	Live Seafood Trade
<p>Invasive species can escape or be released accidentally or intentionally from commercial and private aquariums.</p>	<p>Aquaculture species raised in or near coastal waters can escape and harm native species, biodiversity and ecosystem structure or function. Pests imported with aquaculture stock can also escape and cause similar types of damage.</p>	<p>Alien species have spread through manmade canals, such as the Panama Canal, Suez Canal and others.</p>	<p>Oceangoing ships transport alien marine species in ballast water and attached to hulls or other underwater structures that are not thoroughly cleaned.</p>	<p>Global live seafood trade can enable the spread of non-native species that are capable of spawning if released back into marine environments.</p>
				

Logos at the bottom of the slide include: UNITED NATIONS UNCTAD, FAO Food and Agriculture Organization of the United Nations, UN environment, The Commonwealth, IOI International Oceans Institute, and UNECE.

**SOLUTIONS**

# Solutions

- Apply precautionary approach in fisheries management plans
- Apply EBM approach in fisheries through regional approach
- Invest in operational monitoring and surveillance to enforce FRAs and other designated areas (e.g. AIS and VMS signal monitoring)
- Identification of spawning, nursery areas through modelling
- Tangibly support small-scale fishermen
- Explore alternative sources of protein (e.g. jellyfish)
- Implement the Access-to-Benefit Sharing (ABS) provisions vis-à-vis MGR
- Legislate against aquaculture-mediated transport of aliens (e.g. as contaminants, fouling organisms, escape into the wild)
- Invest in capacity-building and training programmes within SIDs



# Putting the EBM approach into practice

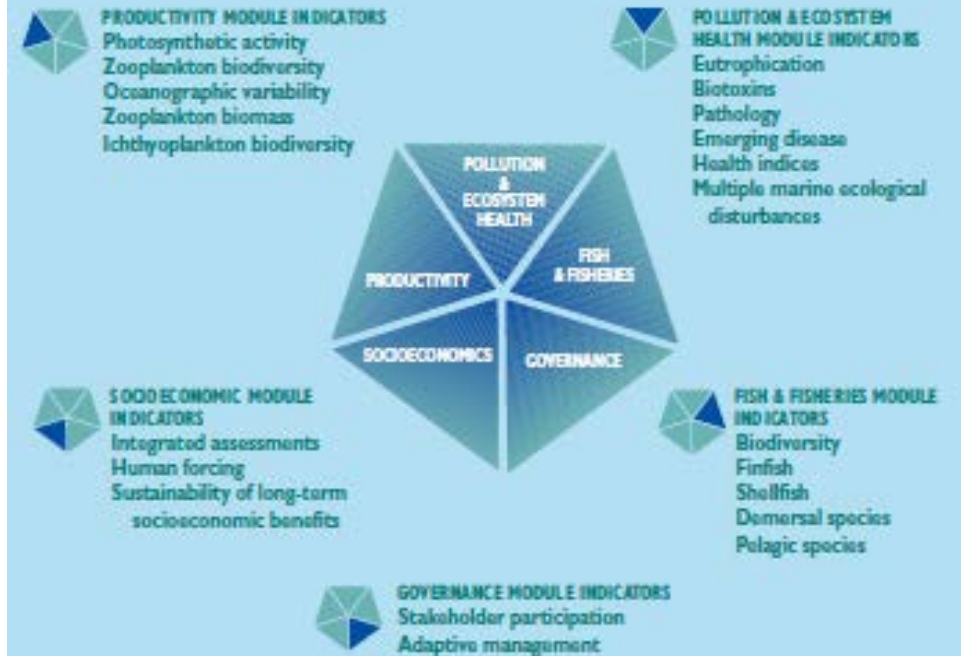
## Characteristics of an LME

- Size: c. 200 000 sqkm (many are much larger!)
- Topographical/morphological boundaries
- Unique hydrography
- Current driven systems (Benguela, Canary, etc.)
- Semi-enclosed seas (Baltic, Mediterranean, Yellow Seas, etc.)
- Boundaries seen as transition zones
- Boundaries where fish biomasses drop to a minimum



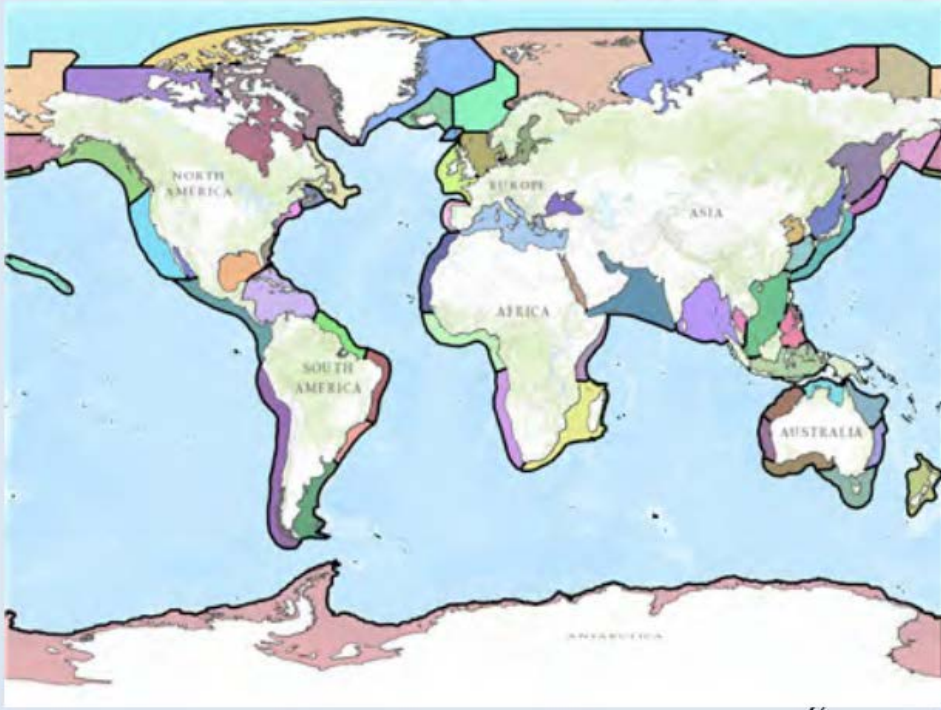
Alexander, 1993

## Modular Assessments for Sustainable Development



# THE LME APPROACH

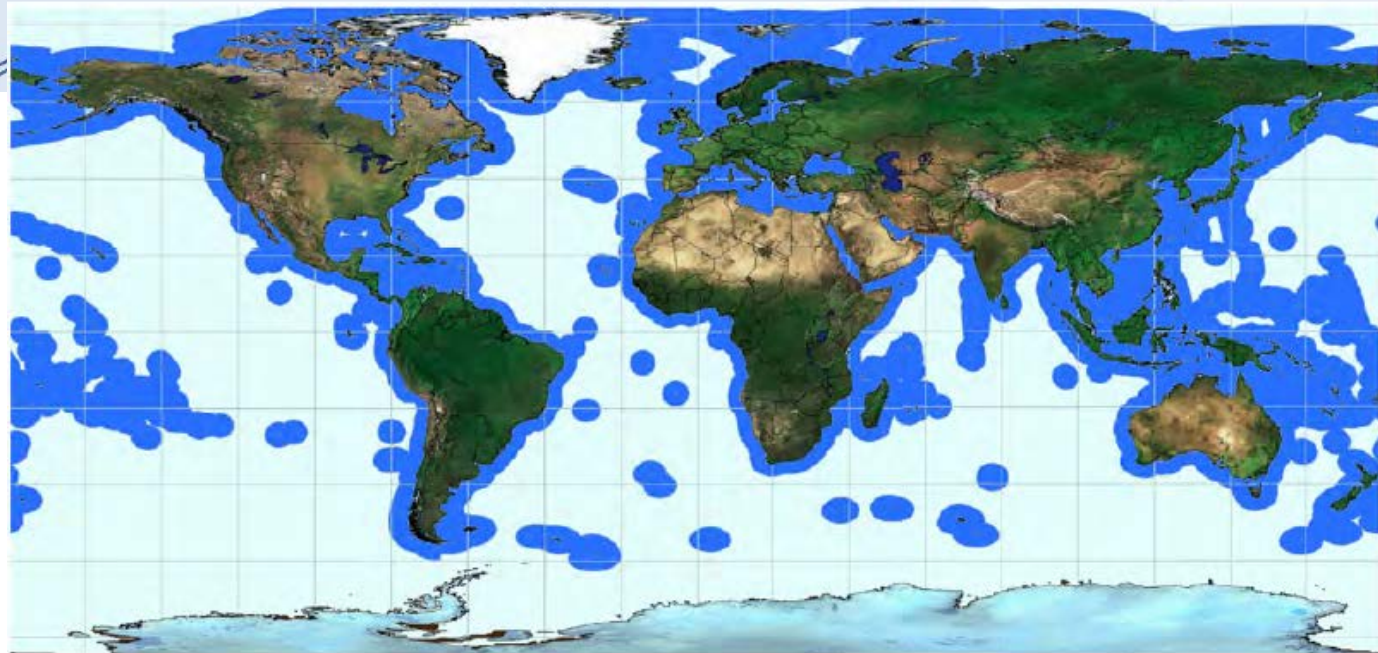
LMEs today: 66 defined



## The Exclusive Economic Zone



- 40% of the world ocean area are under national jurisdiction
- More than 90% of the fish catches are taken within these zones.



# The precautionary approach – applied to fisheries

- determination of limit **reference points** materialising biological constraints and minimum requirements for sustainability;
- determination of **thresholds** (or "buffers") to ensure that the limits are not accidentally violated;
- improved methodology to evaluate **uncertainty** and the risk attached to it;
- the elaboration of **rebuilding strategies and plans** (and special control rules) for overfished stocks;
- **improved communication** between scientists and managers as to explicit uncertainty consideration and their impact;
- development, adoption and implementation of **precautionary fisheries management plans**;
- implementation of **recovery plans** for depleted resources; and,
- more recently, **participative risk assessment** methods and processes have started to be systematically used (e.g. in Australia).



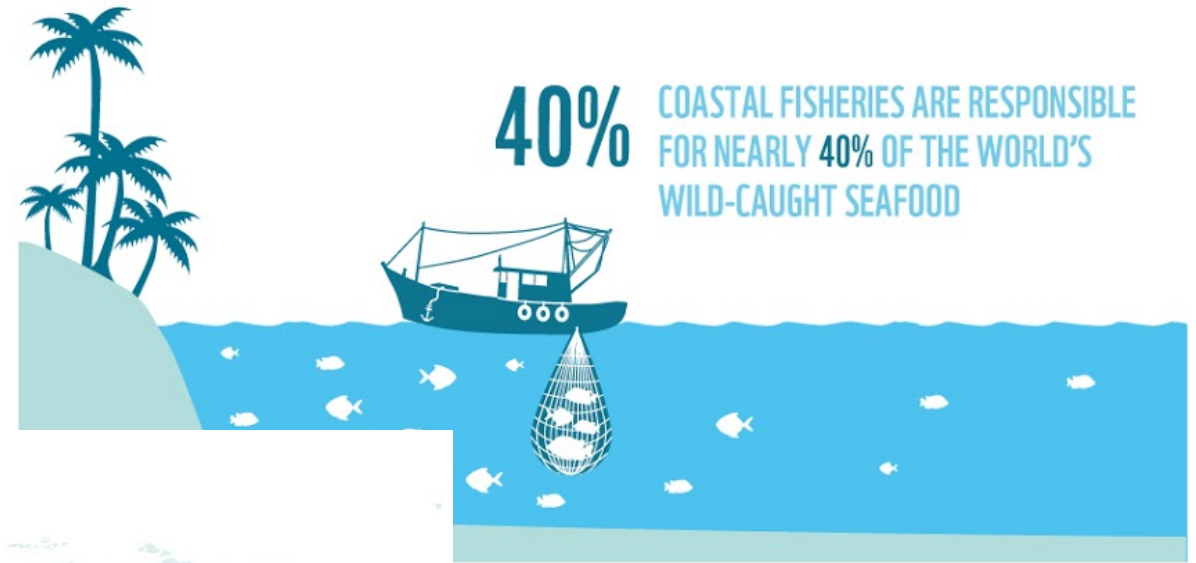
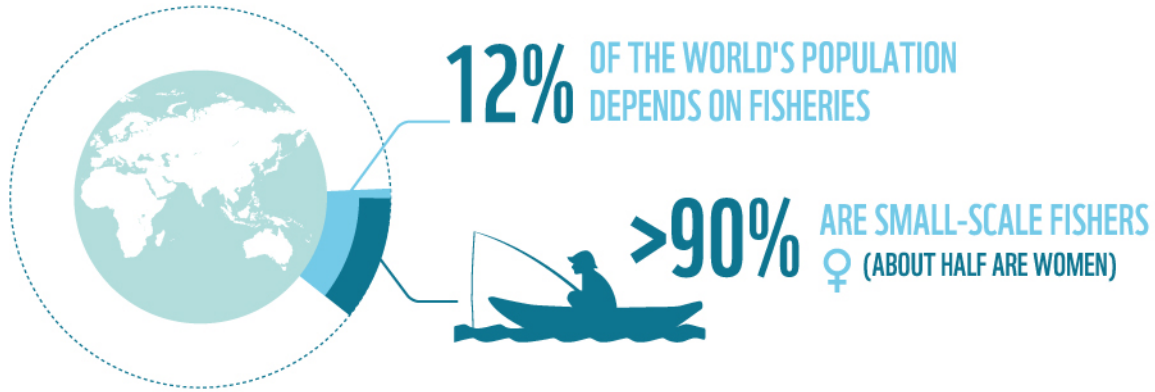
# Importance of artisanal, small-scale fisheries

## SMALL-SCALE FISHERIES (SSF) ARE IMPORTANT

- Provide livelihoods, welfare & social protection-safety nets
  - ~97% SSF located in developing countries
  - Nearly all countries with marine fisheries have SSF
- Food security and nutrition
  - 90-95% of SSF catch for direct local consumption
- Commercial capture fisheries value chain
  - ~90% of all full-time and part-time fishworkers employed in the small-scale sector
  - ~50% are women
- SSF may have smaller environmental footprint than industrial fisheries
  - Large-scale marine fisheries use 10 times more fuel per tonne of catch than SSF
  - SSF produces less by-catch and discards



# Importance of artisanal, small-scale fisheries



# Importance of artisanal, small-scale fisheries

**Table 4: Full time vessels by size.**

	0-8m	8.01-12.00m	12.01-15.00m	15.01-20.00m	20.01 - over	Total
<b>Malta</b>	121	33	30	14	16	214
<b>Gozo</b>	53	12	9	10	4	88
<b>Total</b>	174	45	39	24	20	302

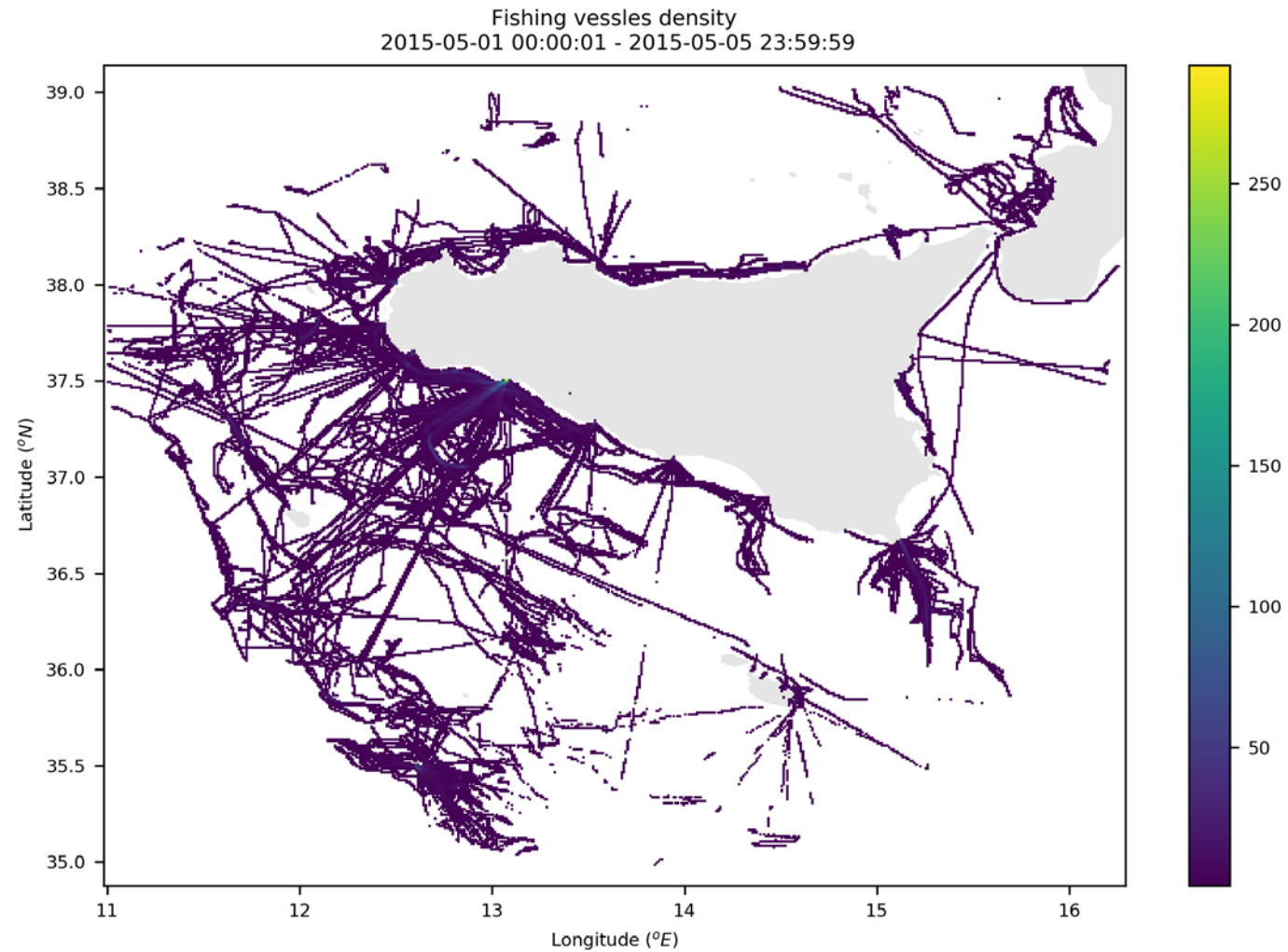
**Table 6: Part time vessels by size.**

	0-8m	8.01-12.00m	12.01-15.00m	15.01-20.00m	20.01 - over	Total
<b>Malta</b>	1131	96	9	1	2	1239
<b>Gozo</b>	217	11	1	-	-	229
<b>Total</b>	1348	107	10	1	2	1468

## The case of the Maltese Islands



# Use of vessel AIS data





# Use of probabilistic models to identify important areas for fisheries

13

MEDSUDMED - TECHNICAL DOCUMENTS

Pilot Study: spatial distribution of demersal fishery resources, environmental factors and fishing activities in GSA 15 (Malta Island)

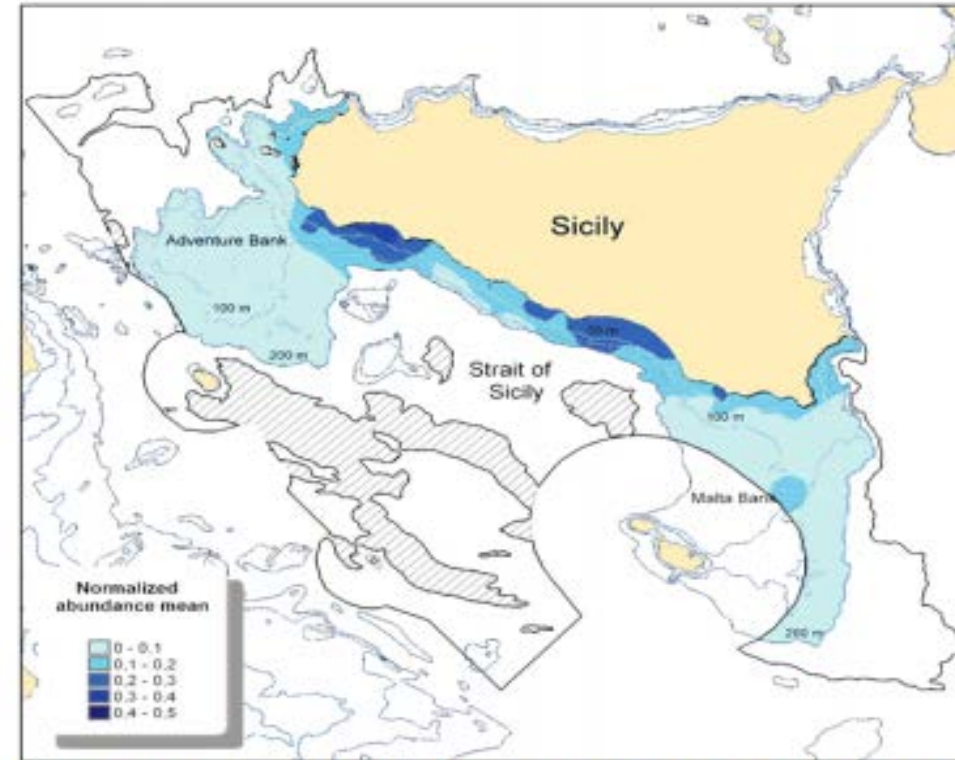
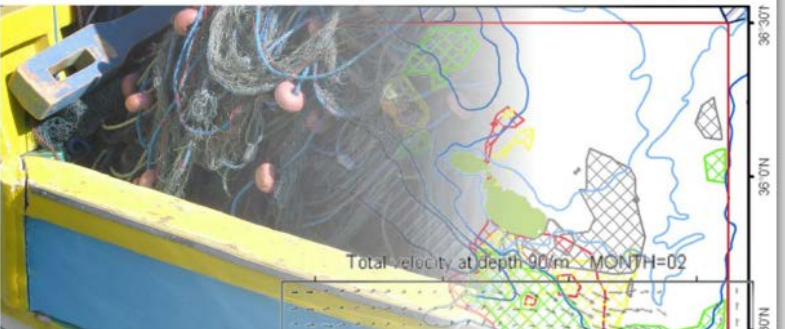


Figure 13. Map of the normalized mean abundance of *Mullus barbatus* recruits, based on data from the Italian GRUND surveys in GSAs 15 and 16. The contour of the overall area (GSAs 15 and 16) and the depth exceeding 800m (hatched areas) are also shown (from Garofalo *et al.*, 2004).

**Nursery areas, spawning areas = submitted to the RFMO (e.g. GFCM) for designation as an FRA (Fisheries Restricted Area)**

# Once identified, FRAs need to be protected!

**TIMES OF MALTA**



Day Trips  
Viator

Home News Sport Business Comment Life Entertainment Classifieds

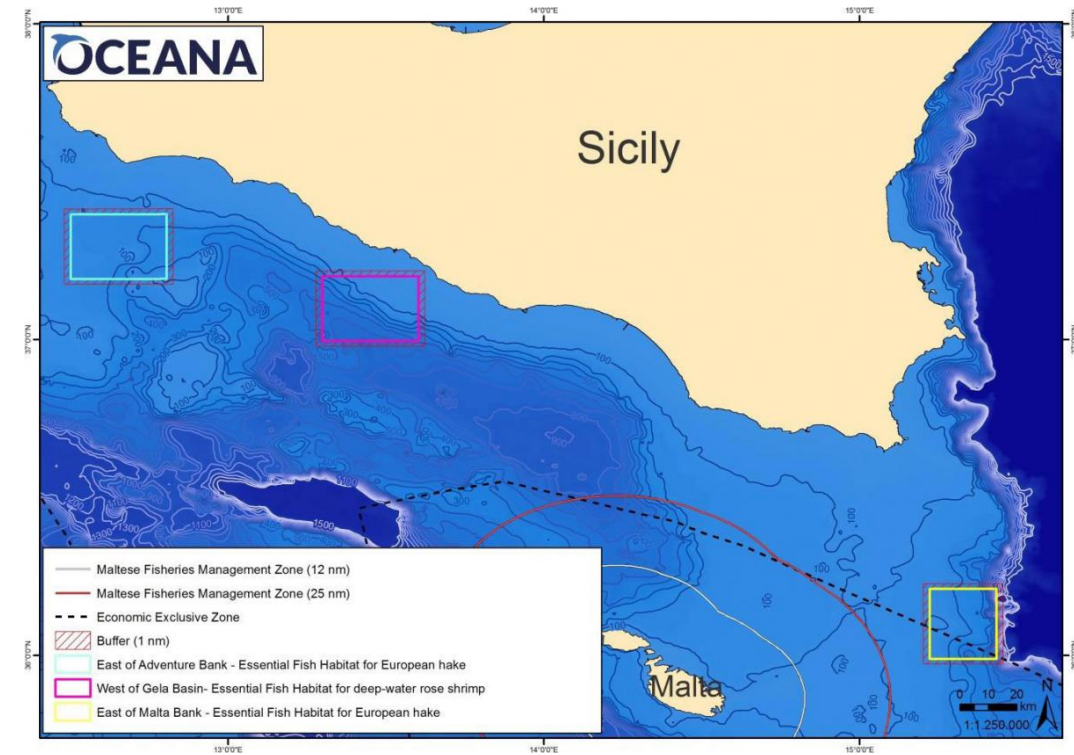
National World Social & Personal Education Interview Environment Gozo Pictures Reli



Saturday, July 14, 2018, 19:35 by Keith Micallef

## Research nets illegal fishing off Maltese coast

Mediterranean governments are turning a blind eye to pirate fishing, says Oceana



2<sup>nd</sup> Oceans Forum on  
Trade-related Aspects of SDG 14



# Identifying alternative sources of marine protein

**Jellyfish: If you can't beat them, eat them**



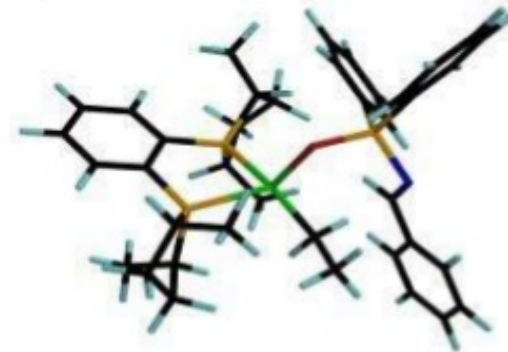
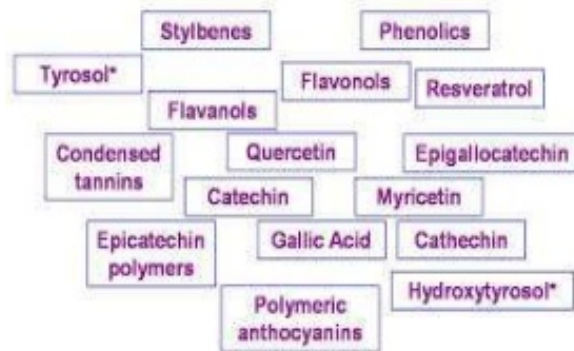
- + bycatch
- + fish discards
- + waste fish biomass from catering industry
- + bluefin tuna offal



# Bioactive compounds

## Bioactive compounds

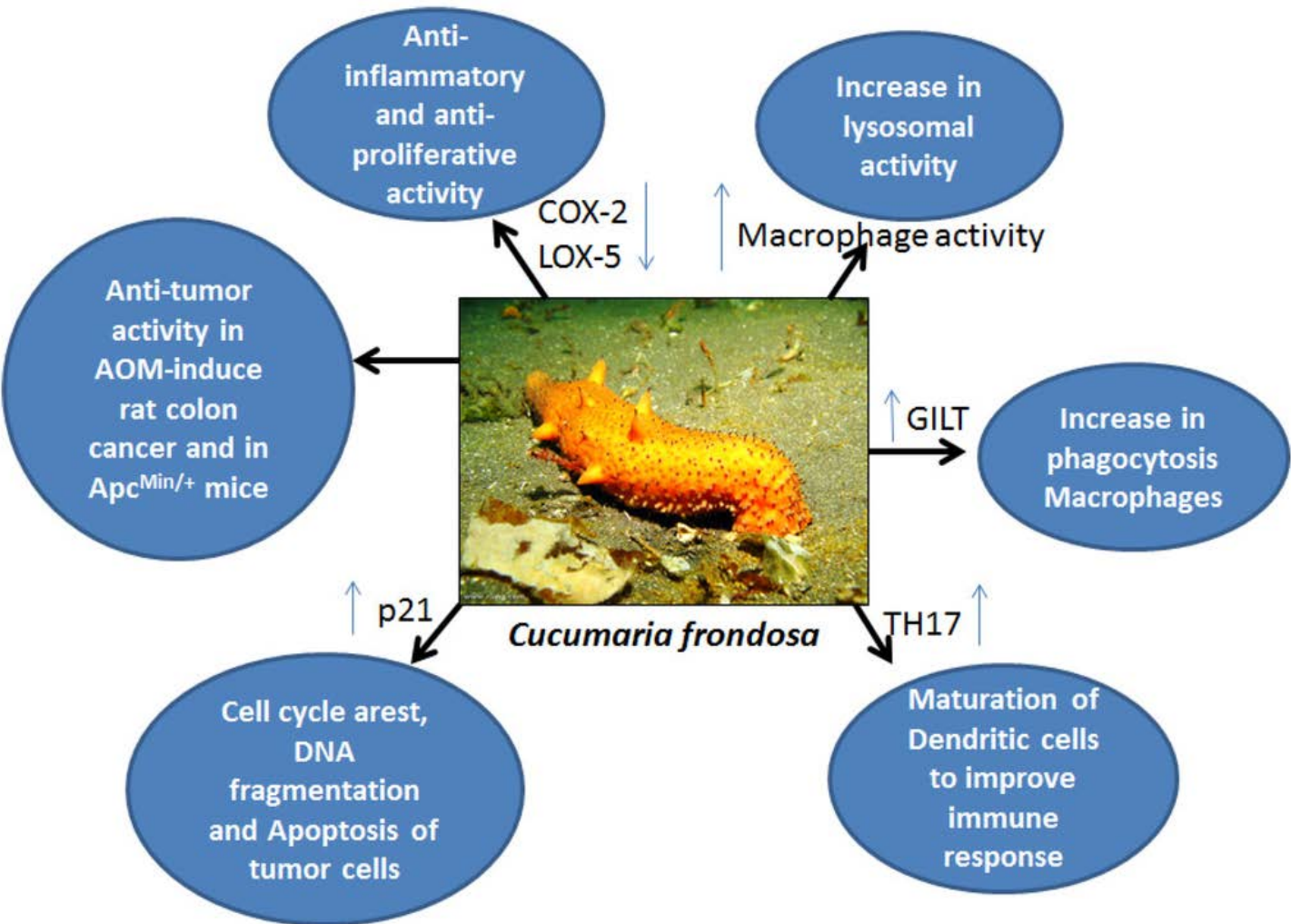
- Biologically active compounds
- Extra nutritional constituents
- Occur in small quantity in foods
- Health stimulating – therapeutic benefits



(Kris-Etherton *et al*)



# Drugs from the sea



# Jellyfish as sources of collagen and bioactive compounds



Examples of compounds extracted from jellyfish so far:

- (i) Venom from *Pelagia noctiluca* displayed anti-tumoral properties;
- (ii) Collagen extracted from *Rhopilema* sp. has antioxidant properties;
- (iii) Tentacle extract from *Aurelia* is useful to treat thrombosis;
- (iv) Extracts from giant jellyfish *Nemopilema* has immunostimulatory effect
- (v) + cytotoxic, anti-microbial and insecticidal action

# Immuno-modulators

**Immunomodulators** = substances that affect the functioning of different components of the immune system

Examples include: immunosuppressants, specific immunostimulants (immunoadjuvants) and non-specific immunostimulants

Sea cucumbers (holothurians) are also been used for the extraction of immuno-modulators (e.g. against leukaemia cells) and for their antimicrobial properties

# Access to Benefit Sharing (ABS)

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## The Nagoya Protocol on Access and Benefit-sharing

The *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity* is an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding, thereby contributing to the conservation of biological diversity and the sustainable use of its components. It was adopted by the Conference of the Parties to the Convention on Biological Diversity at its tenth meeting on 29 October 2010 in Nagoya, Japan. The Nagoya Protocol will enter into

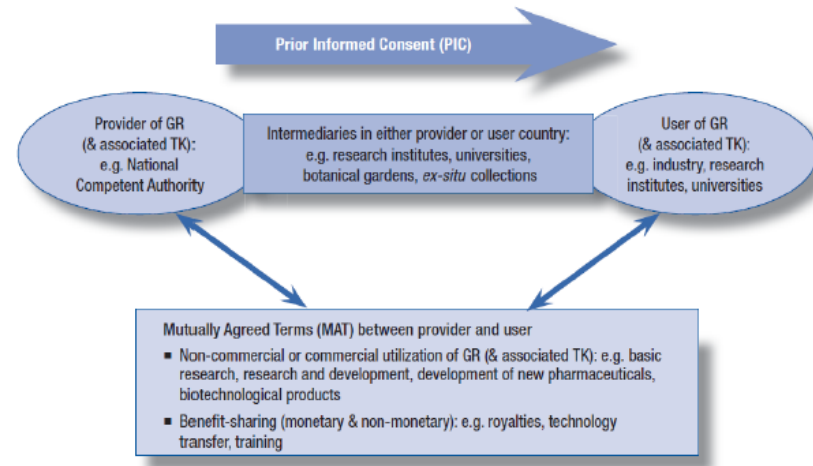
**COP-MOP/1 Website**





# Access to Benefit Sharing (ABS)

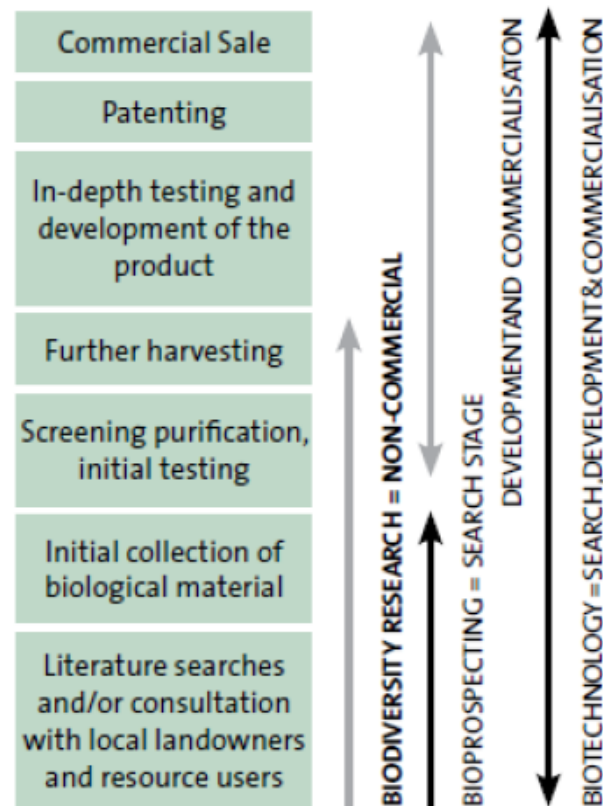
## Access and Benefit Sharing (ABS)



- Requires a Prior Informed Consent (PIC) process, and the enactment of Contracts with Mutual Agreed Terms (MATs) on how the profit is shared between the Sovereign State(s) and the Product Developer

# Access to Benefit Sharing (ABS)

## Access and Benefit Sharing (ABS)



The process has to factor in the initial access/collection leading to research and development, testing, patenting and placing on the market of GRs

