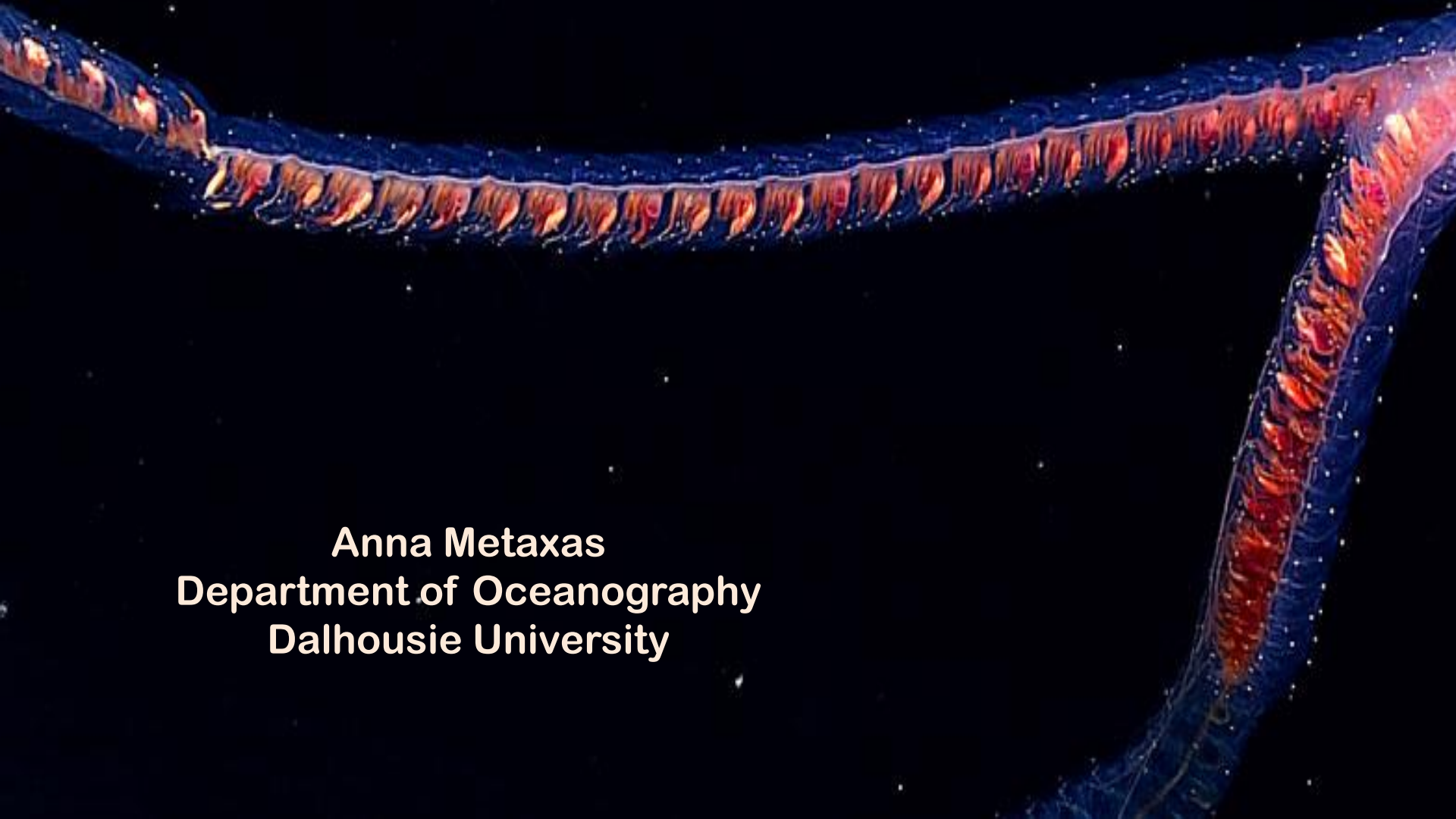
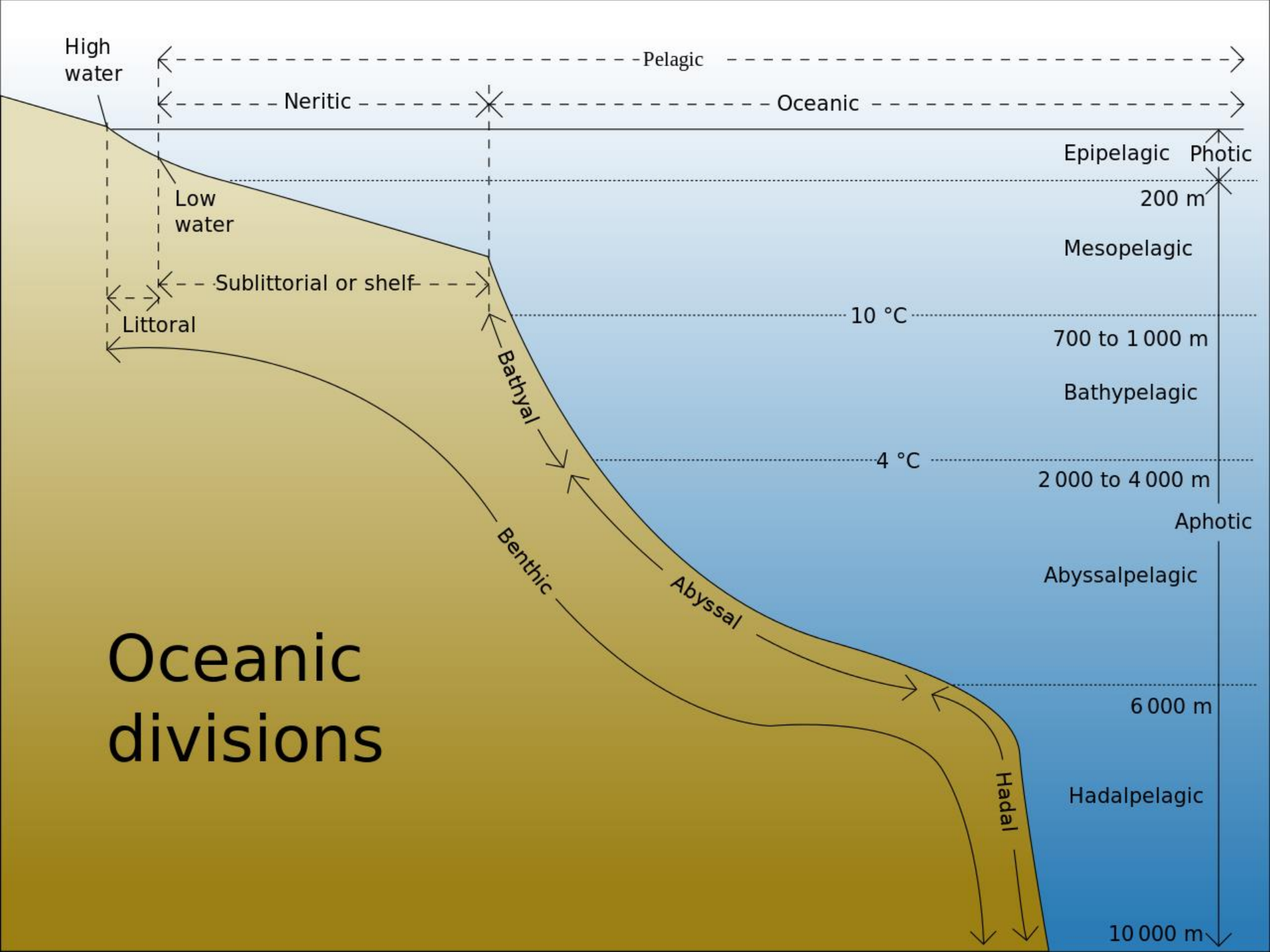
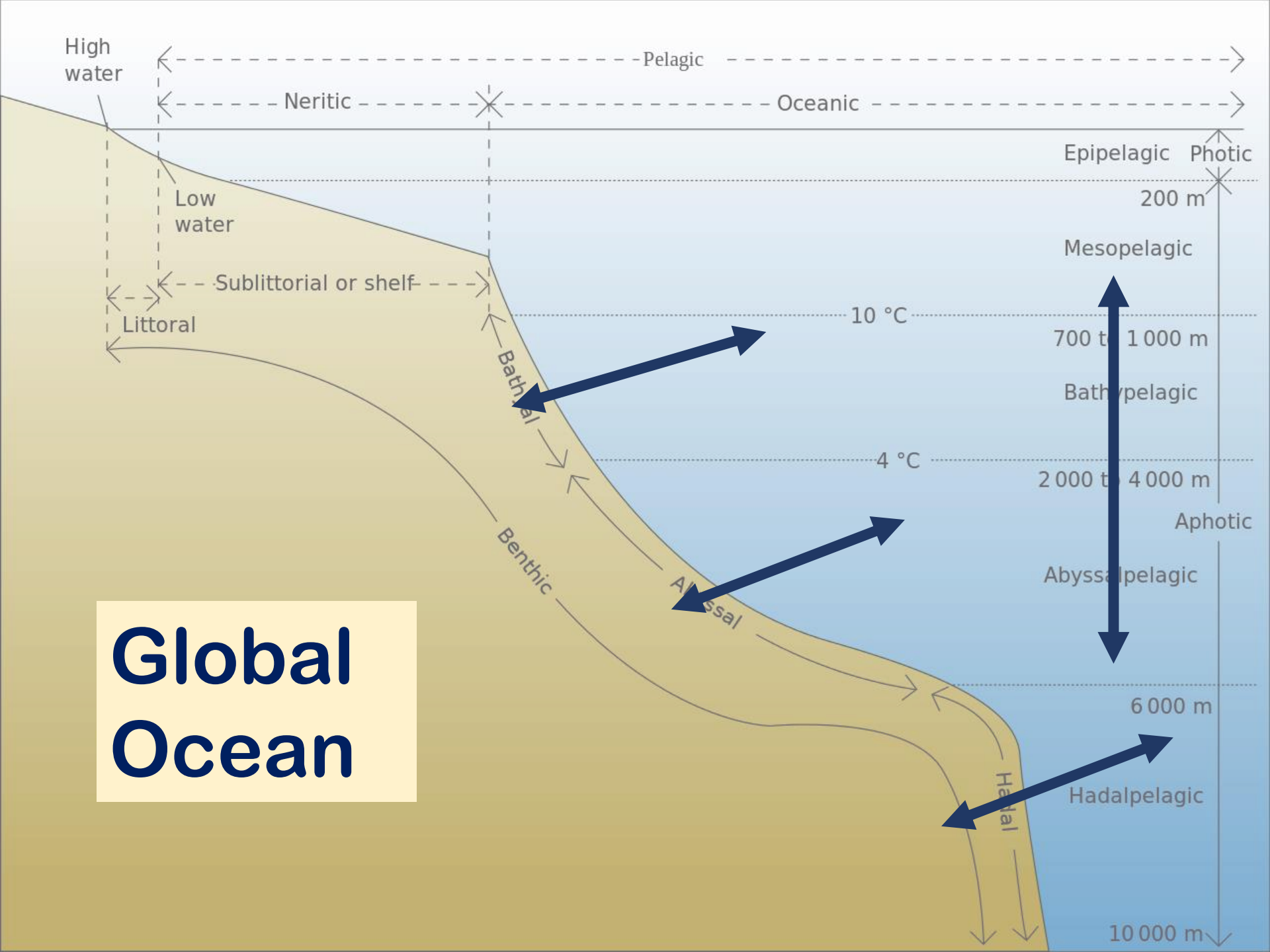


# Ecological connections between the Area and the High Seas: considerations for management

**Anna Metaxas**  
**Department of Oceanography**  
**Dalhousie University**

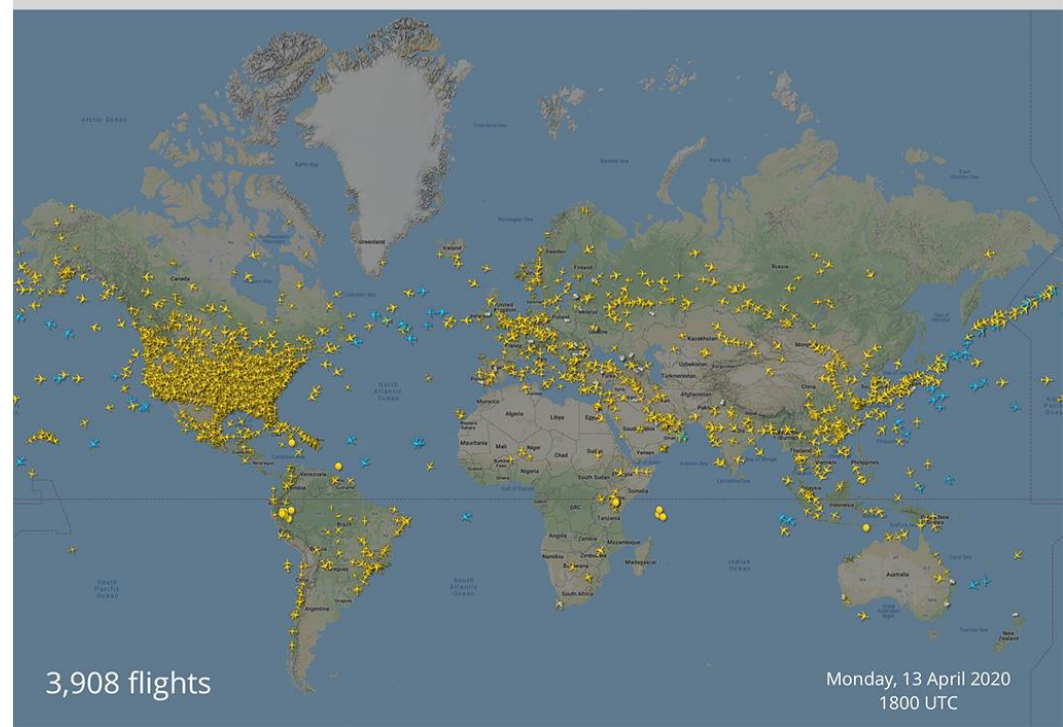


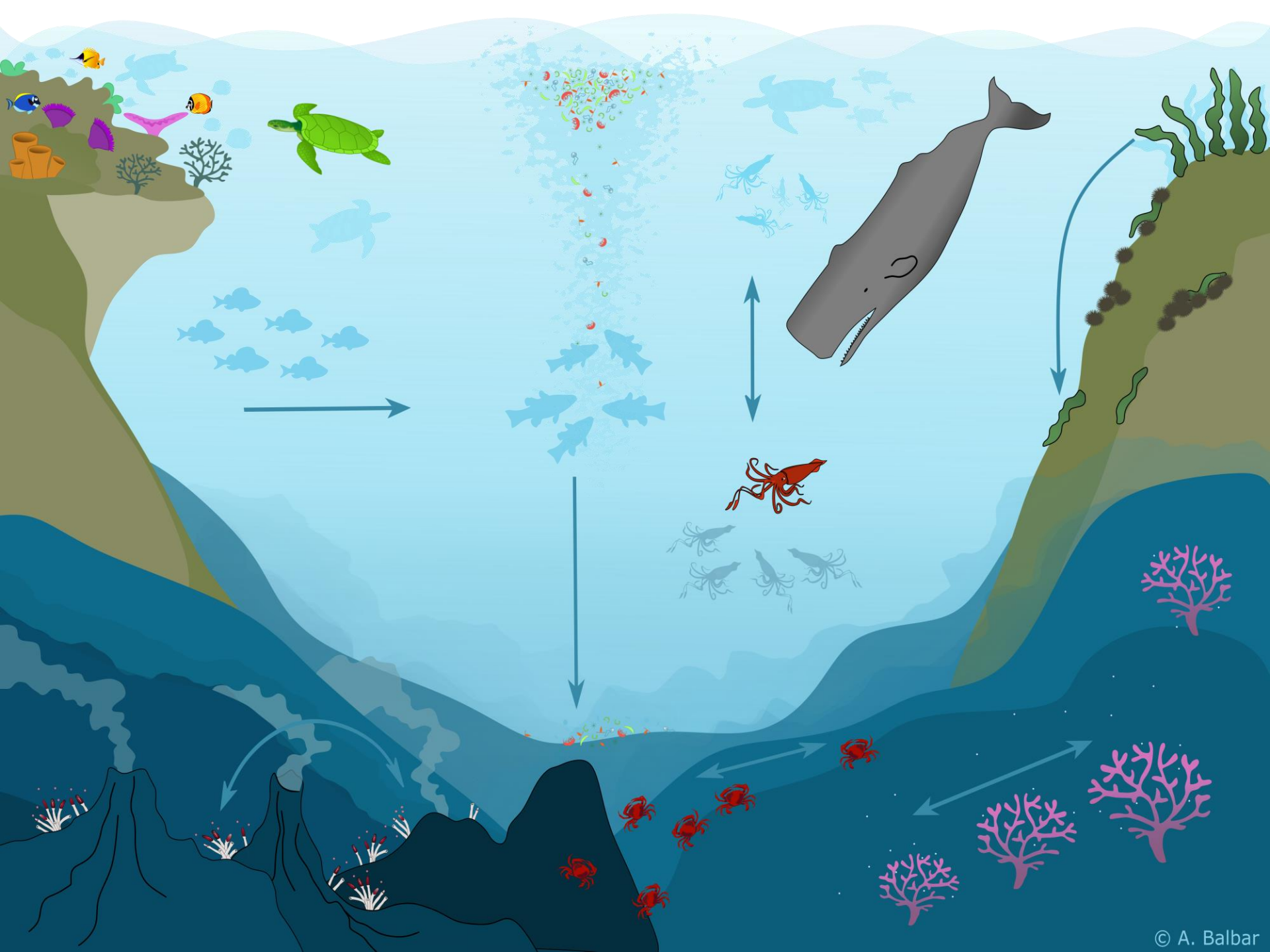




# Broken connections

020	LONDON	CANCELLED
021	PARIS	CANCELLED
022	ROM	CANCELLED
023	BERLIN	CANCELLED
024	BARCELONA	CANCELLED
025	MADRID	CANCELLED
026	PRAGUE	CANCELLED
027	MUNICH	CANCELLED
028	VIENNA	CANCELLED
029	DUBLIN	DELAYED
030	AMSTERDAM	CANCELLED
031	BRUSSELS	DELAYED
AIRPORT CLOSED		EPIDEMIC WARNING





# What is ecological connectivity?

Connectivity describes the ecological linkages between locations and habitats, including individual organisms and the resources they require

# IUCN Guidelines for Conserving Connectivity through Ecological Networks and Corridors

Online Virtual Launch presented by:



Stephen Woodley, IUCN WCPA Thematic Vice Chair for Science and Biodiversity

Jodi Hilty, CCSG Deputy Chair

Gary Tabor, CCSG Chair

Annika Keeley, Delta Stewardship Council



## Guidelines for conserving connectivity through ecological networks and corridors

Jodi Hilty, Graeme L. Worboys, Annika Keeley, Stephen Woodley, Barbara Lausche, Harvey Locke, Mark Carr, Ian Pulsford, James Pittock, J. Wilson White, David M. Theobald, Jessica Levine, Mely Reuling, James E.M. Watson, Rob Ament and Gary M. Tabor

Craig Groves, Series Editor



Best Practice Protected Area Guidelines Series No. 30





Drazen et al. 2020





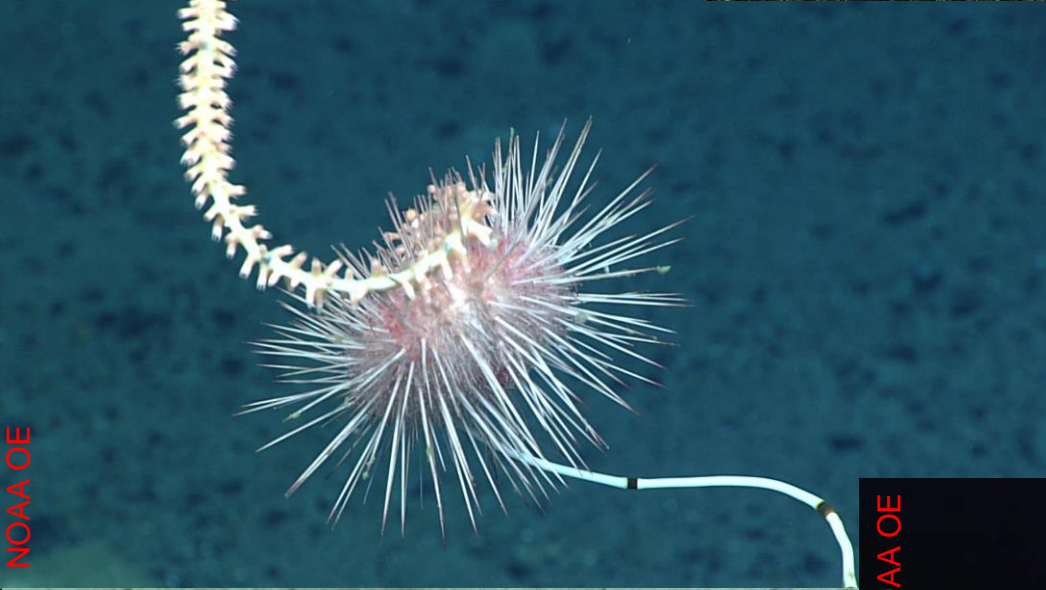
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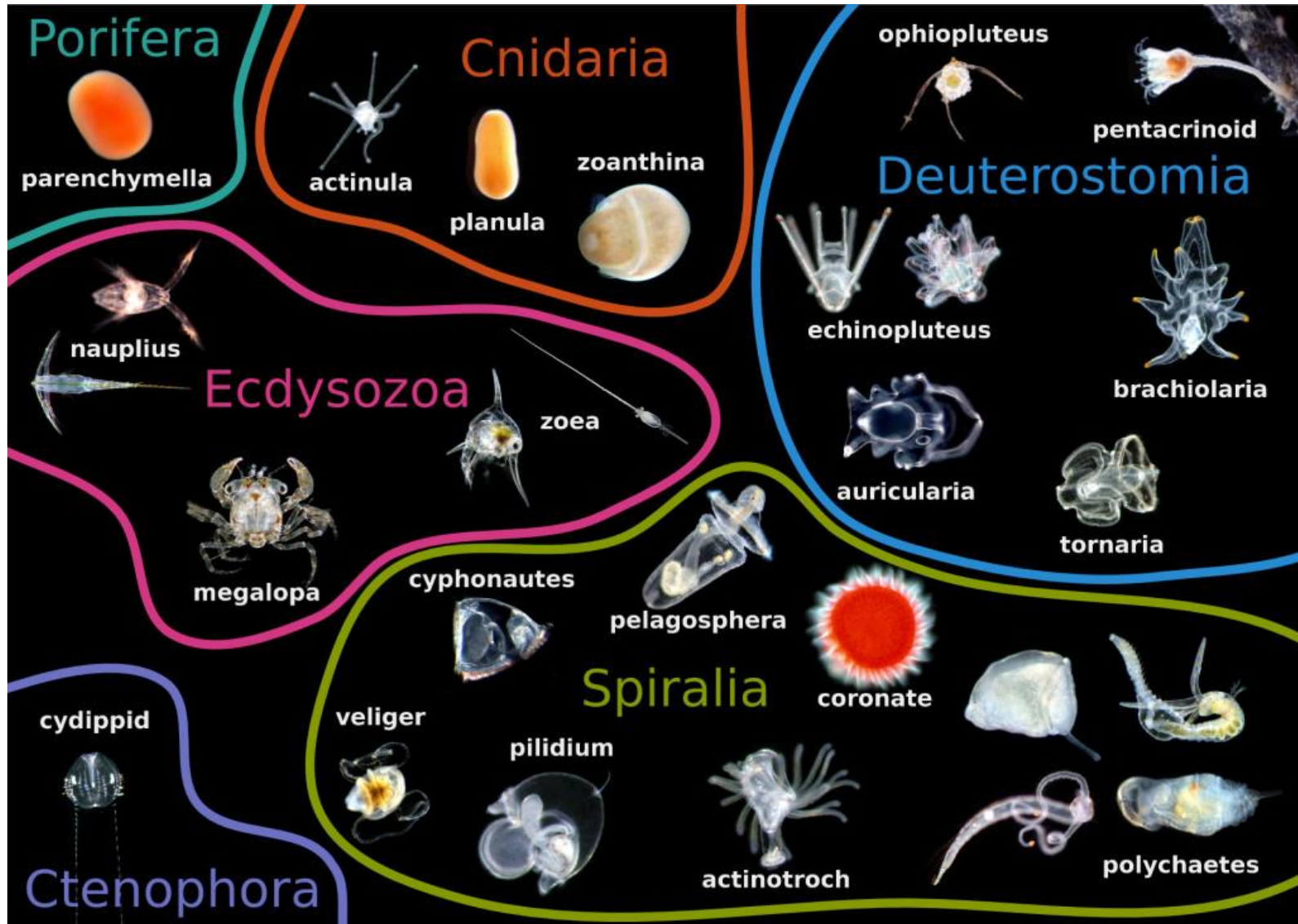


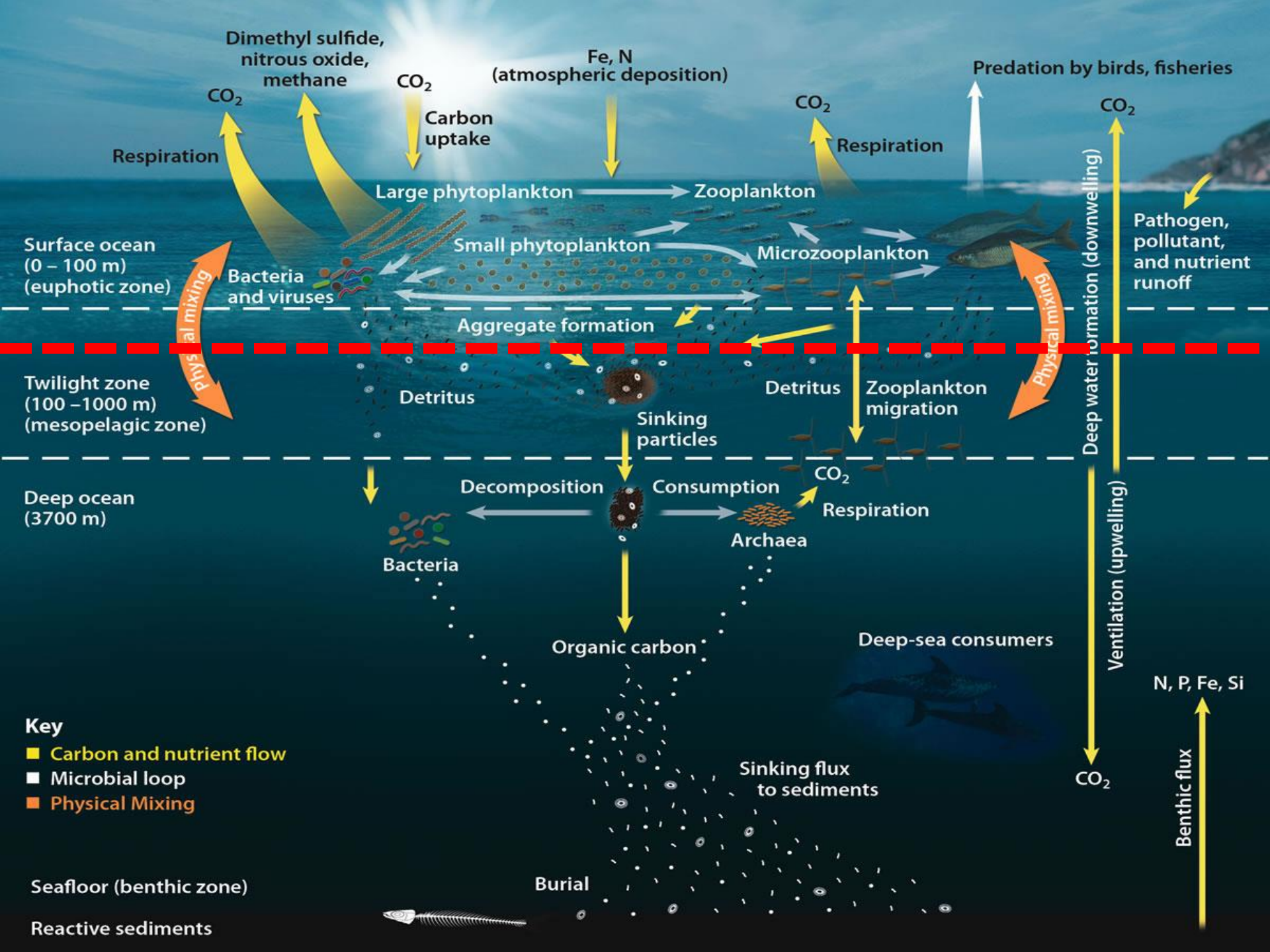
NOAA OE



NOAA OE

# Larvae provide connections because they move the largest distances





# The great migration(s)



## EUPHOTIC ZONE



Sharks



Swordfish

## Apex Predators



Sperm Whale

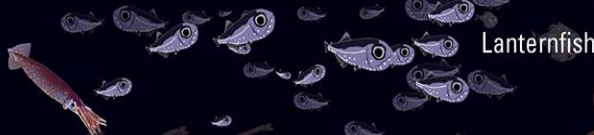
Copepods

## Crustaceans

Krill

Shrimp

## TWILIGHT ZONE



Lanternfish

## Fish

Hatchetfish

Arrow Worms



Pteropods

## Other Invertebrates

Salps

## Squid

Larvaceans

## Jellies

Jellyfish

Ctenophores

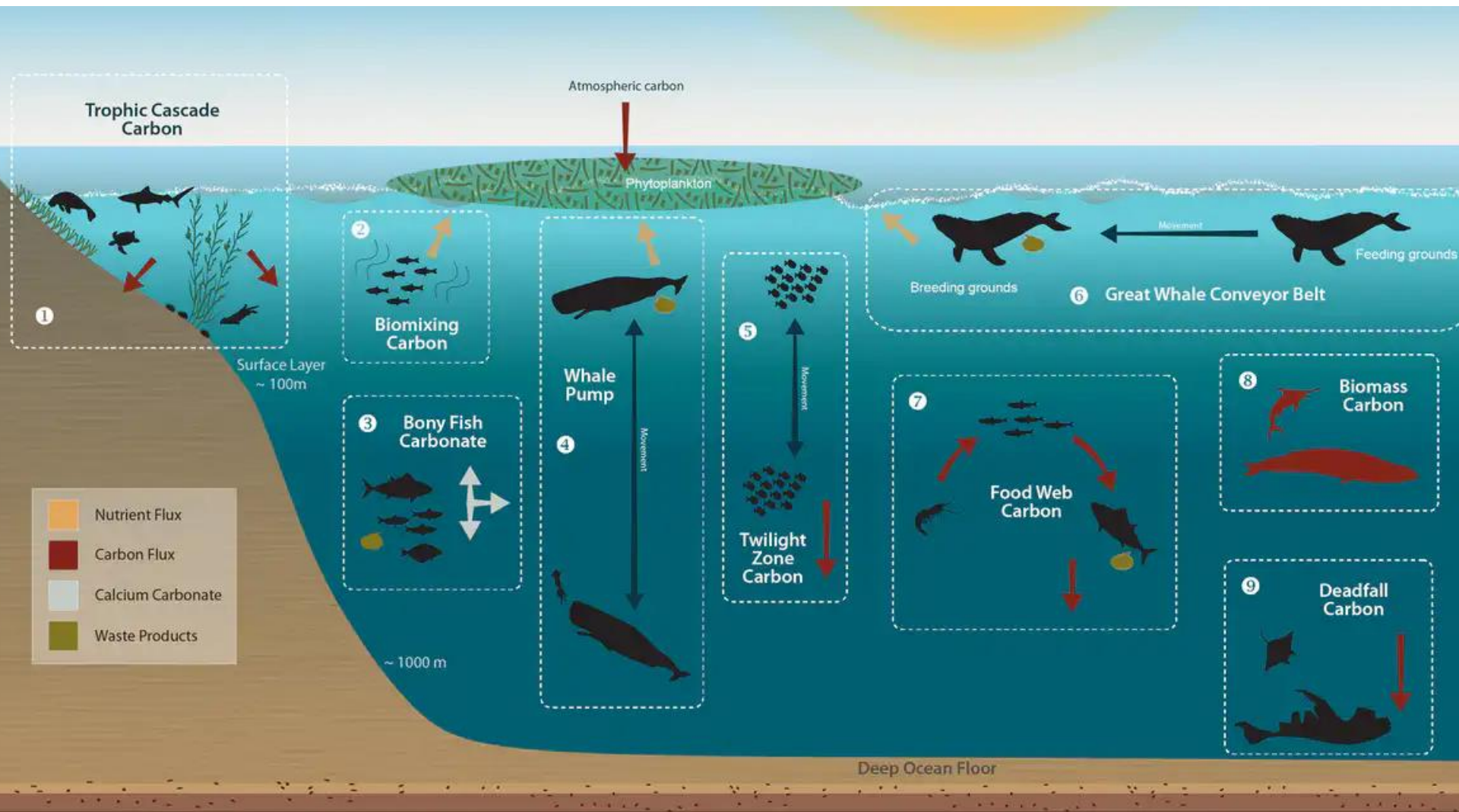
Siphonophores

Bristlemouths

Anglerfish

## ABYSSAL ZONE

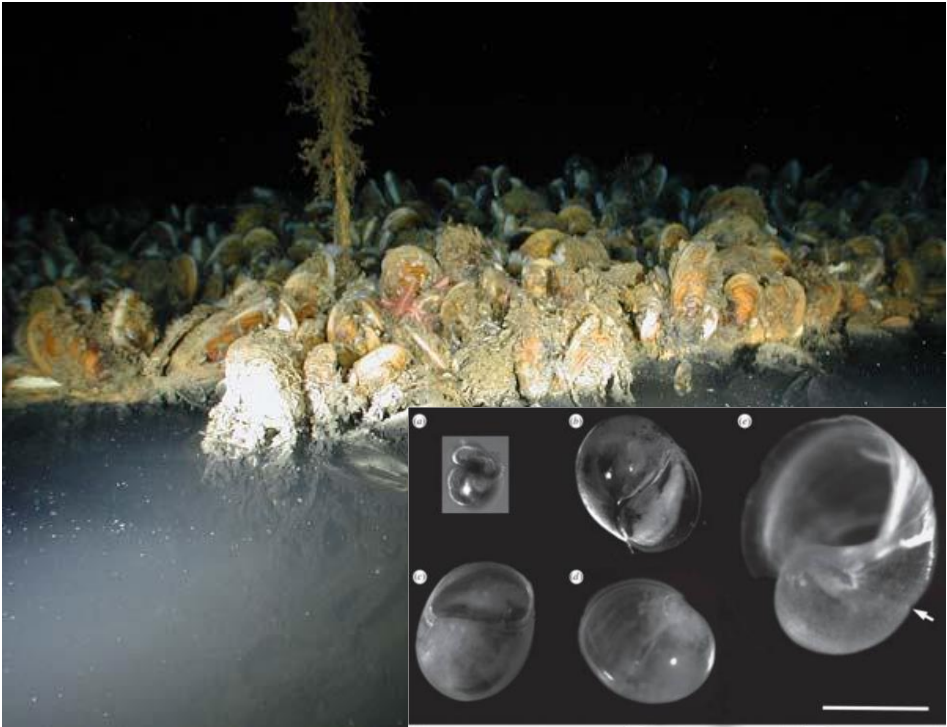
# Carbon transfer – bony animals



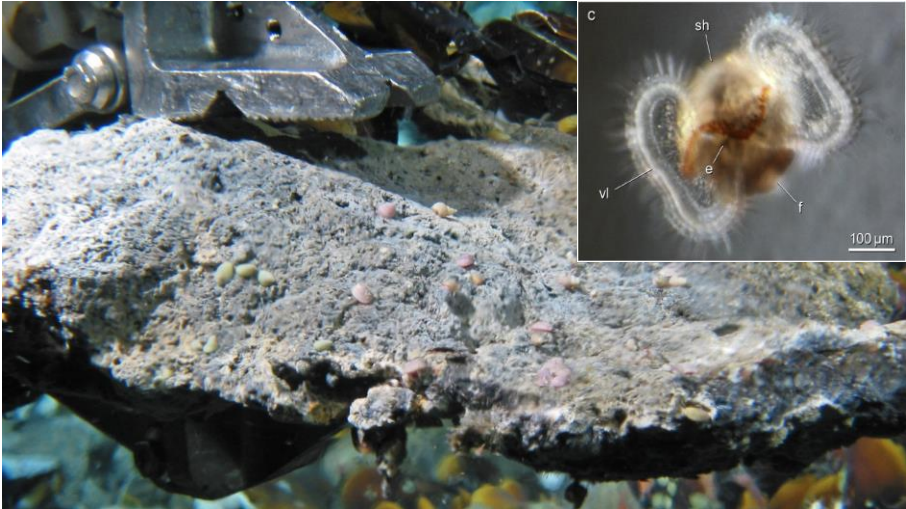
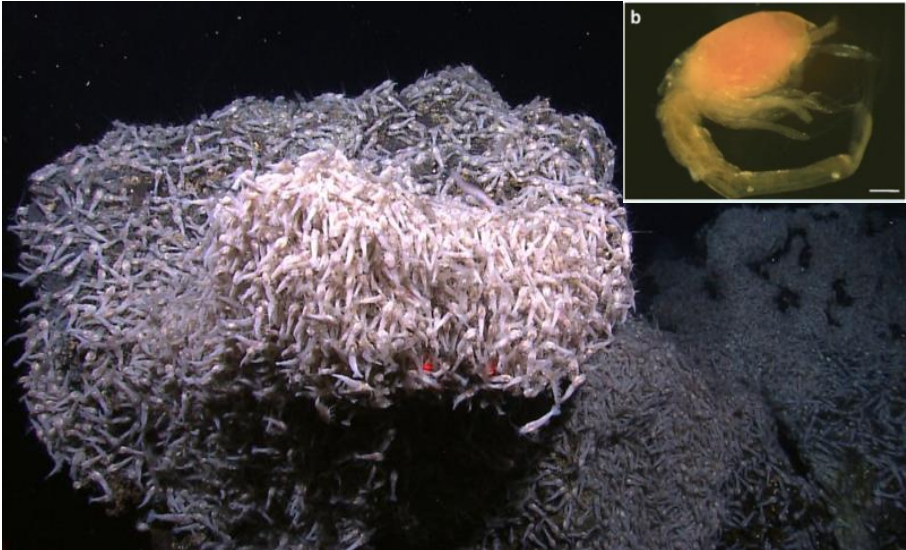
Reference: Lutz, S.J., Pearson, H., Vatter J., Bhakta D. (2018): Oceanic Blue Carbon. Arendal: GRID-Arendal

# Deep-sea larvae migrate to the ocean surface

## Cold seeps



## Hydrothermal vents

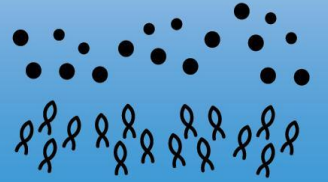




Seabird aggregations



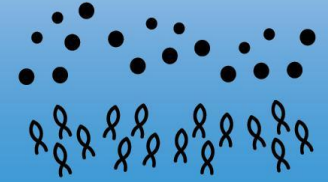
Increased nutrients



Increased phytoplankton



Increased nutrients



Increased phytoplankton

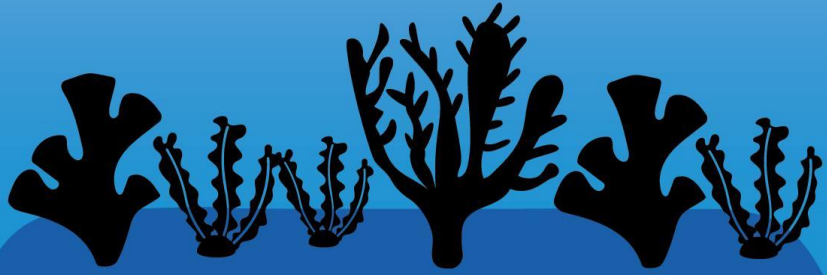
Upwelling



Pelagic predators



Light-dependent coral reefs



**HIGH SEAS SEAMOUNT**

Pelagic predators



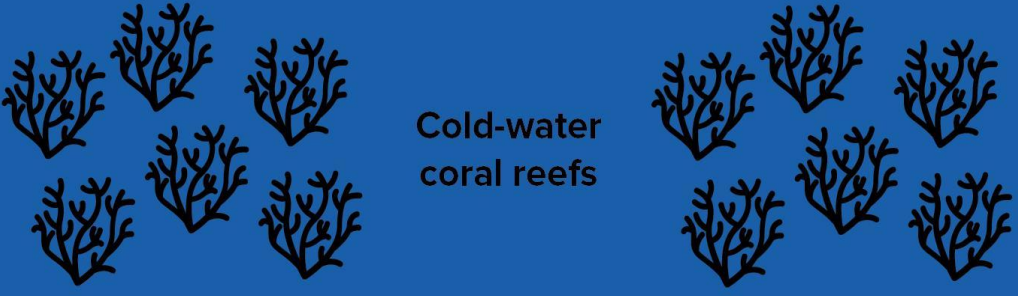
Mixing



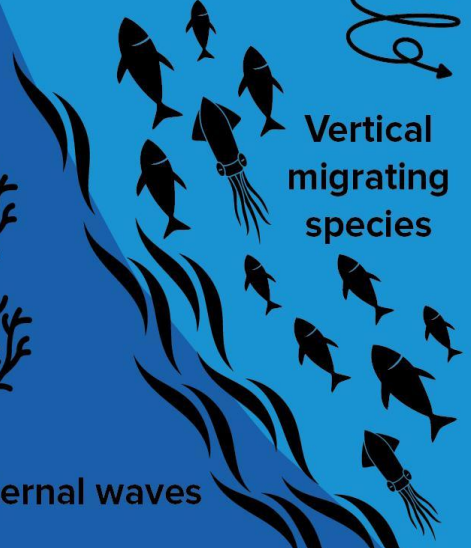
Vertical migrating species



Cold-water coral reefs



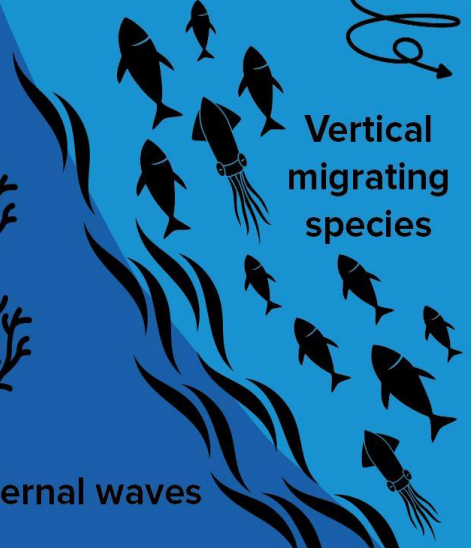
Vertical migrating species



Internal waves



Internal waves



# Deep water ecosystem services

- **Provisioning services**

Finfish, shellfish, mammals; oil, gas, minerals; chemical compounds; waste disposal sites; carbon capture

- **Regulating services**

Climate regulation; waste absorption and detoxification; biological regulation

- **Supporting services**

Nutrient cycling; habitat; resilience; biodiversity; primary productivity; water circulation

- **Cultural services**

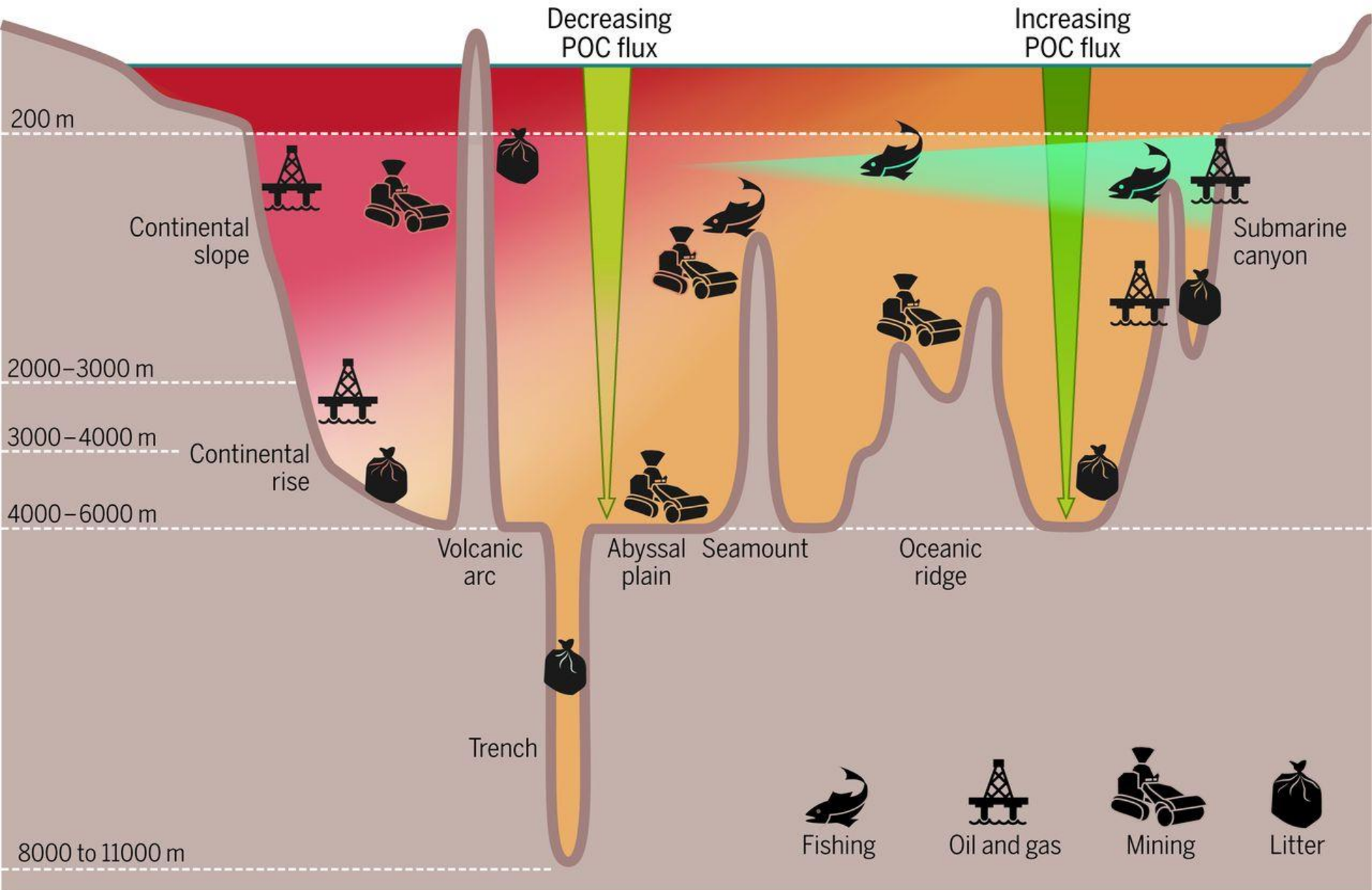
Educational, scientific, aesthetic, existence

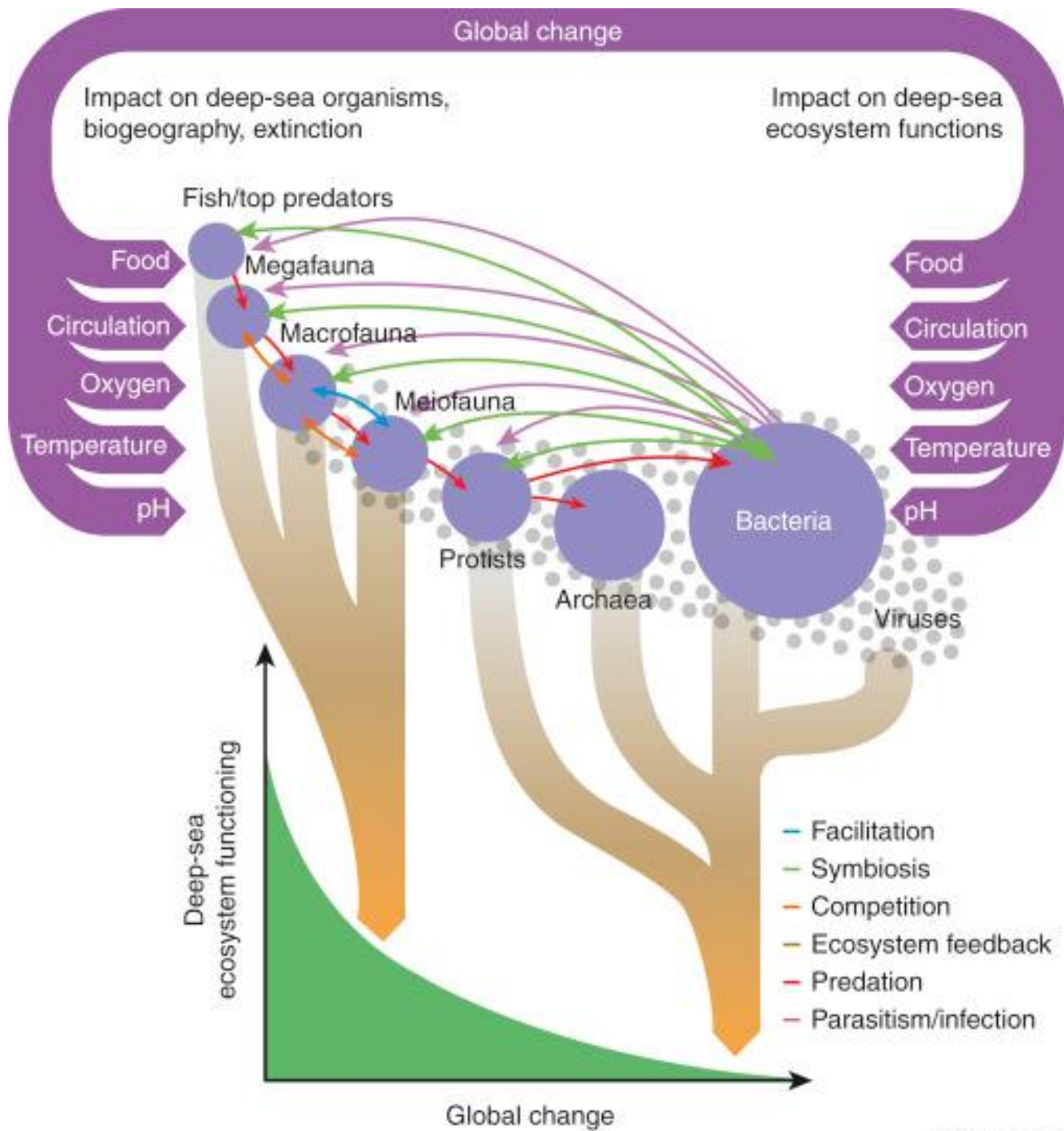


**Warming**

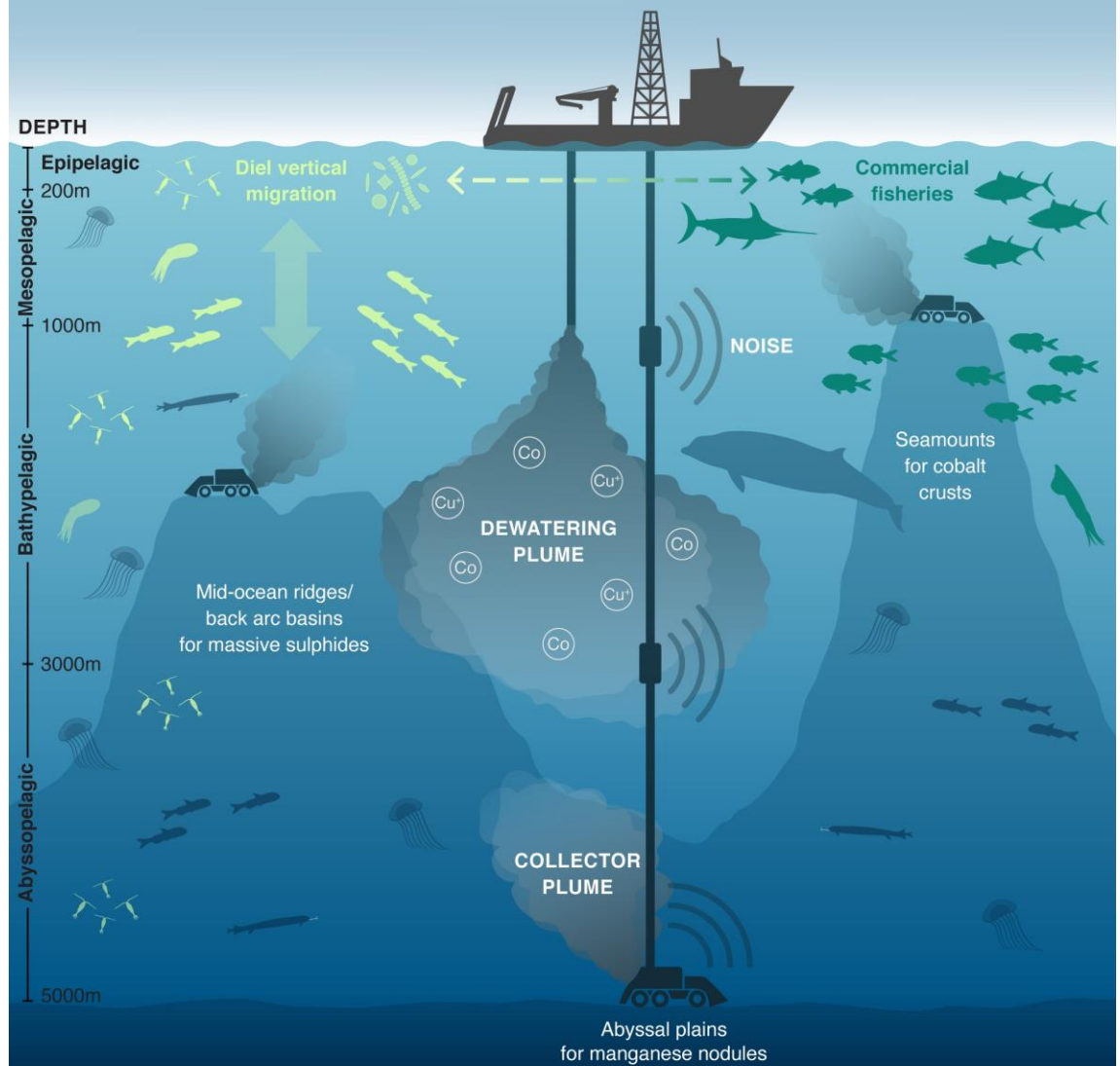
**Acidification**

**Deoxygenation**





# Potential effects of deep-sea mining on midwater ecosystems



## POTENTIAL EFFECTS

### Individuals

- Respiratory distress
- Auditory distress
- Reduced feeding
- Reduced visual communication
- Buoyancy issues
- Toxicity

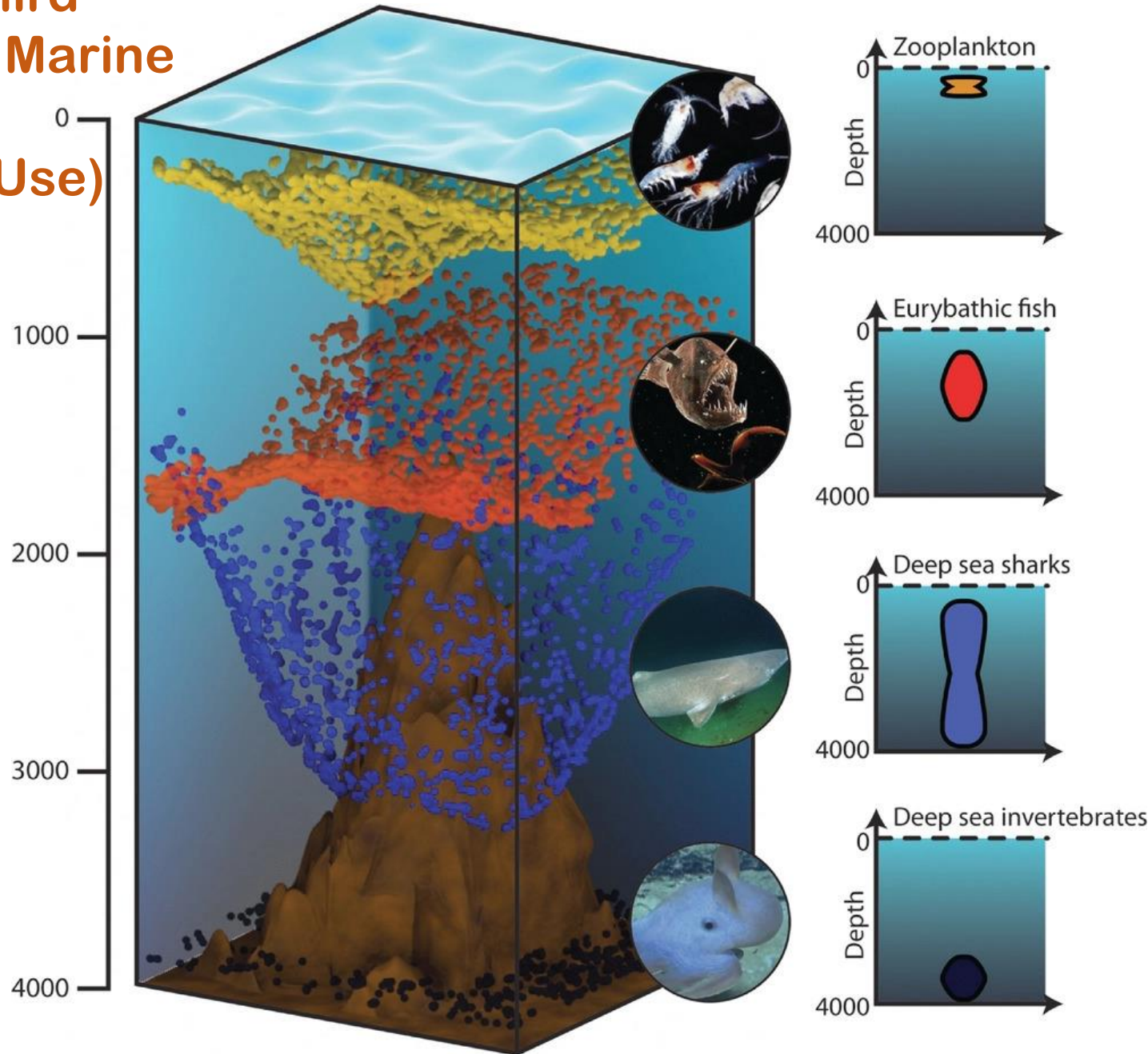
### Populations

- Changes in community composition
- Emigration
- Mortality
- Decreased fitness/reproduction

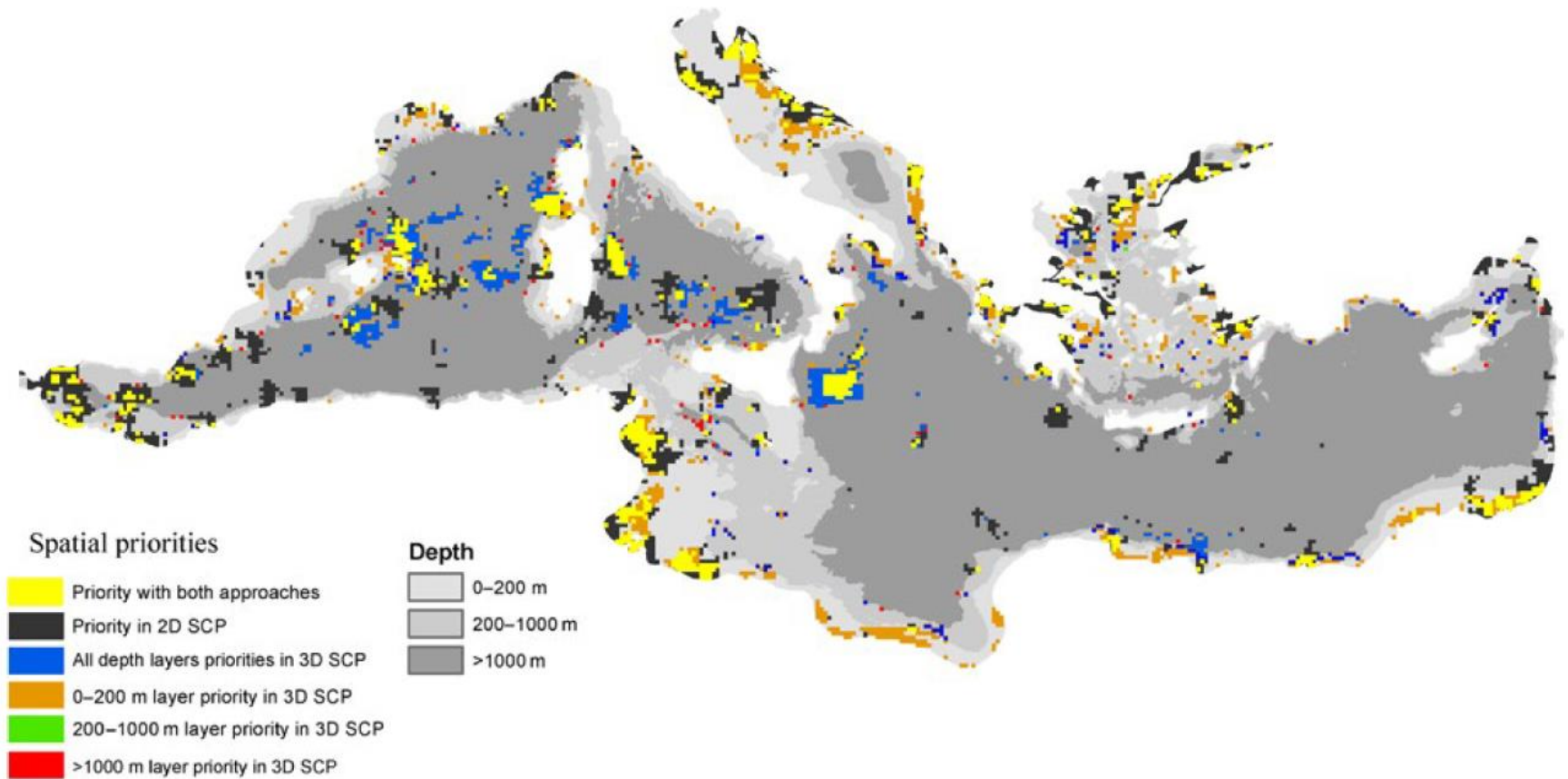
### Ecosystem Services

- Fisheries
- Seafood contamination
- Carbon transport
- Biodiversity

# Adding the Third Dimension to Marine Conservation (Sustainable Use)



# Spatial prioritization for planning and conservation in 3D



# Conclusions – All about connections

- ❖ The global ocean is **connected** from the surface to the abyss
- ❖ Ecological **connections**: food, nutrient cycling, carbon sequestration, larval dispersal
- ❖ **Connections** support the health of our planet
- ❖ Broken **connections**: climate change, resource extraction
- ❖ Spatial protection and management of **connections**

## BBNJ and ISA: 3-dimensional planning

