

# Challenges in Inter-disciplinary Research in Portugal

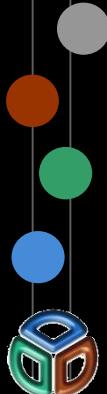
## The deep sea

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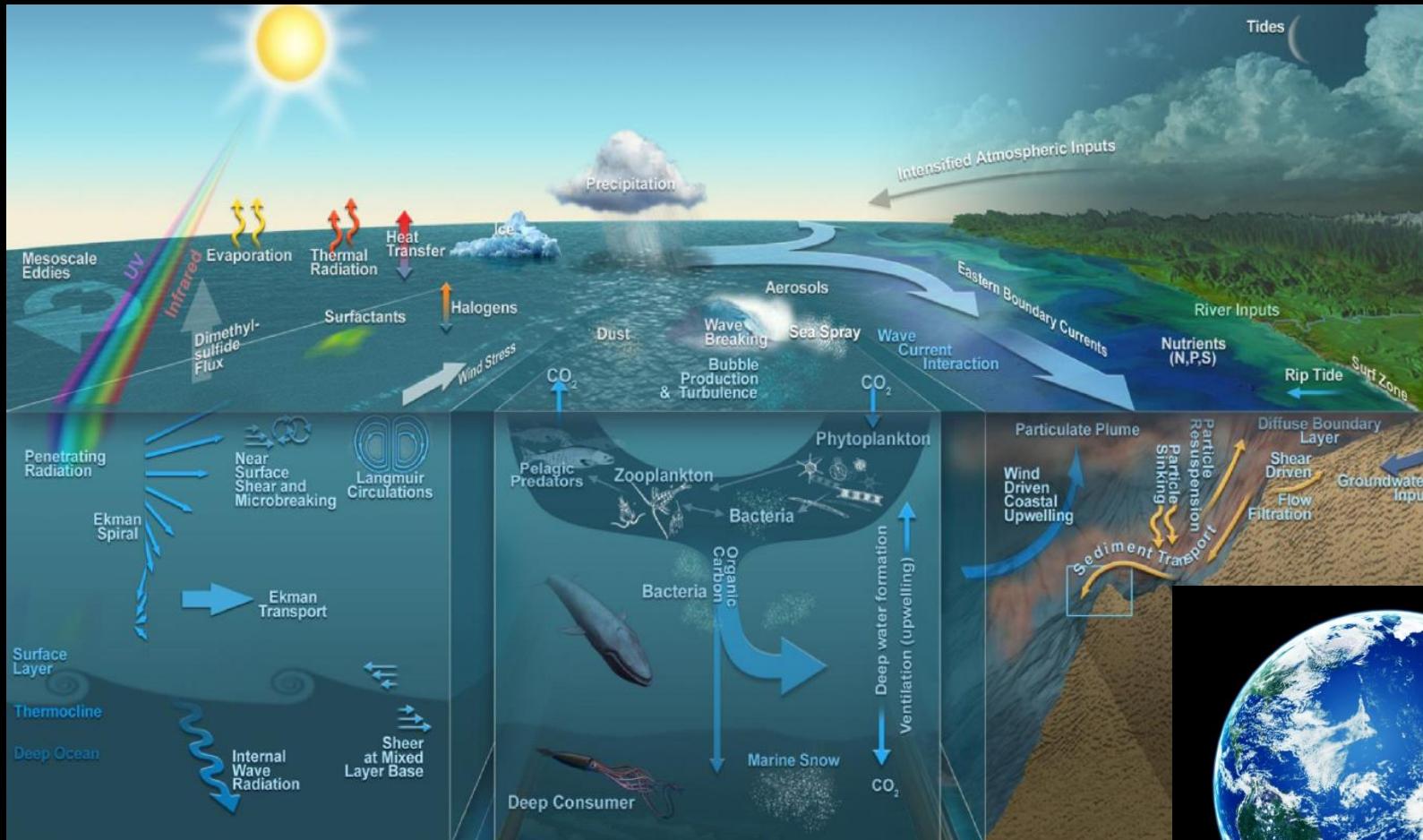
Departamento de Biologia

CESAM

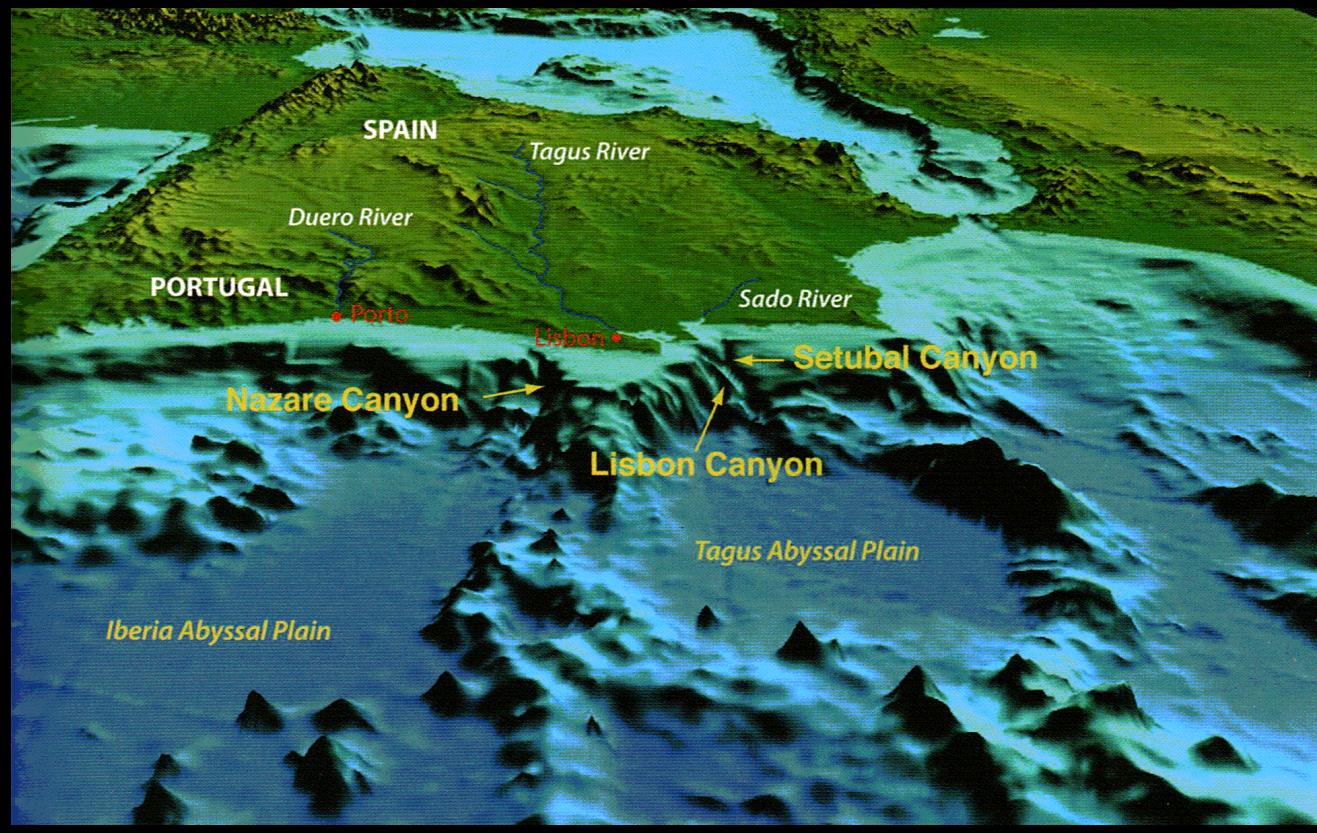


# The deep sea

*Wide range of temporal and spatial scales of structures and processes*



# Habitat diversity and complexity



# How much do we know?

58 new species

30 described

30 barcoded



Mer 15

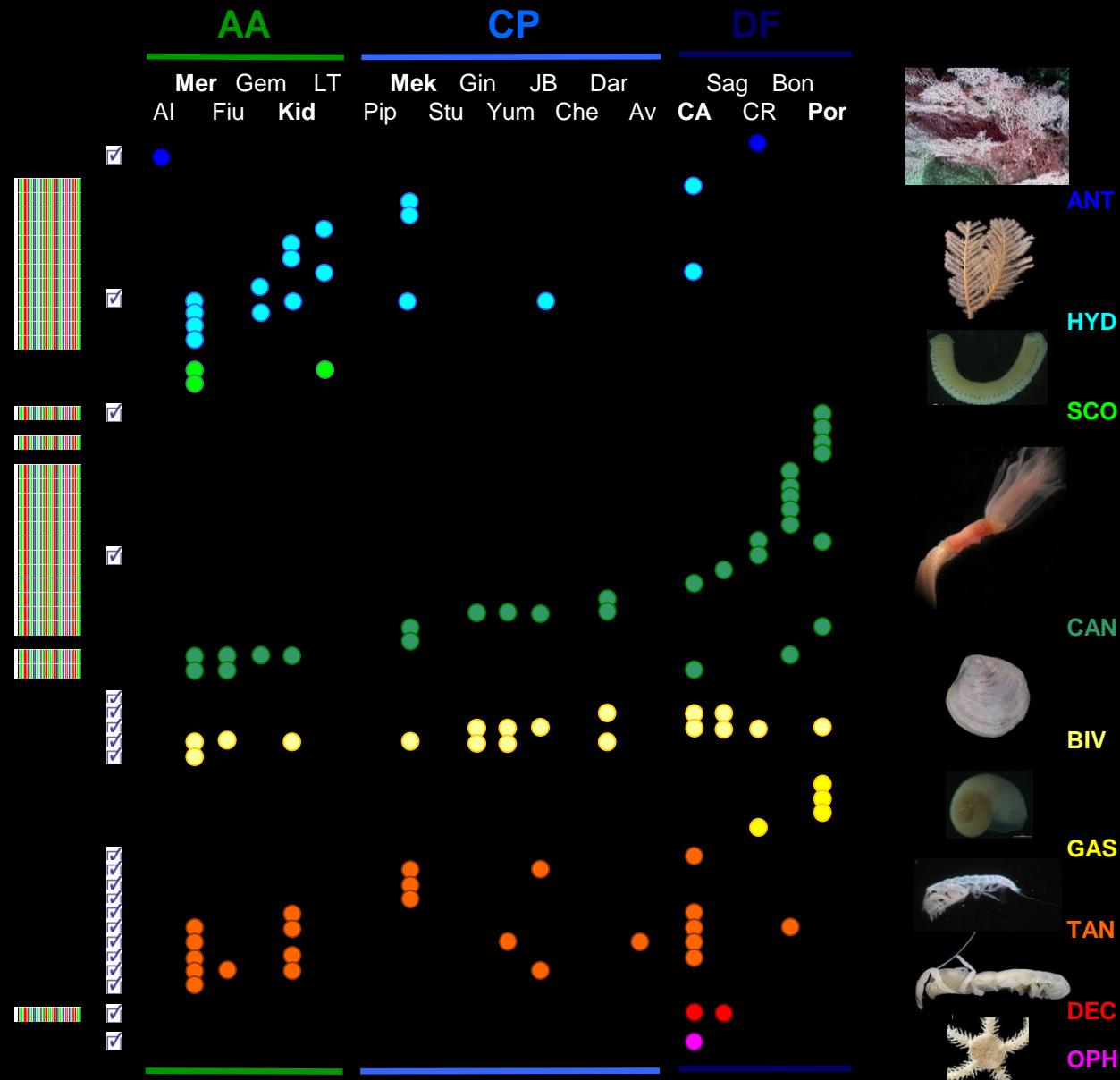
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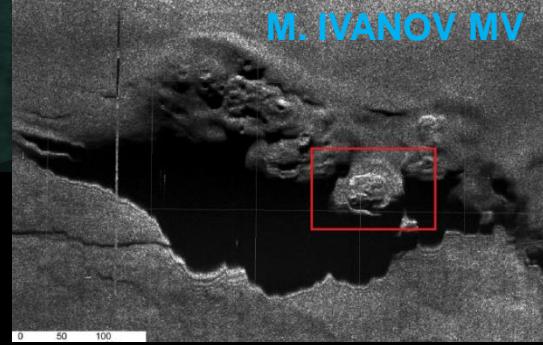
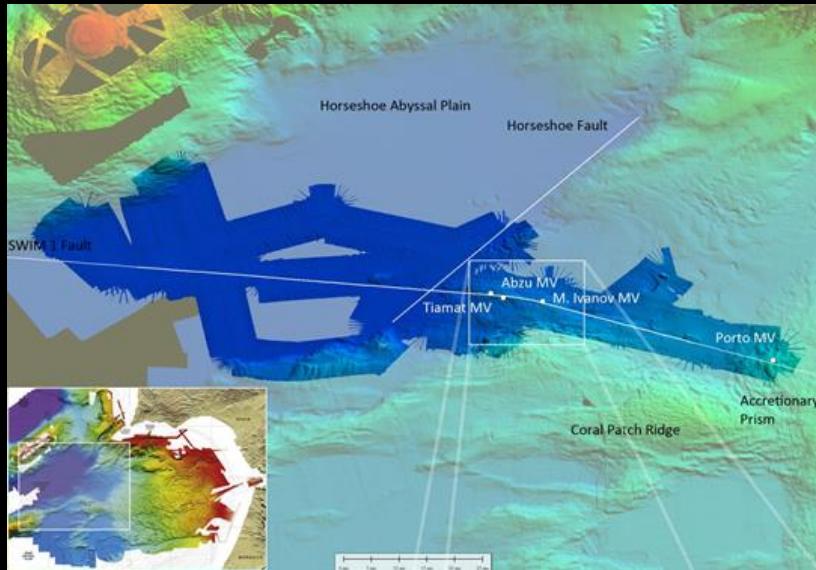
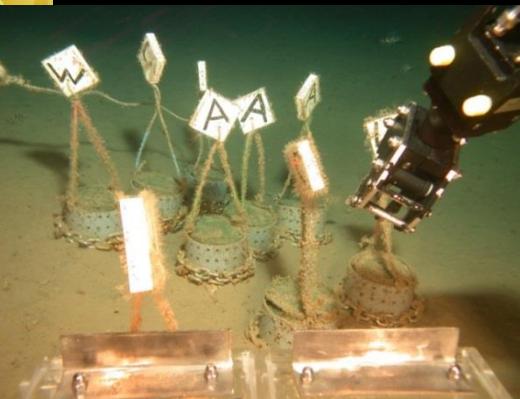
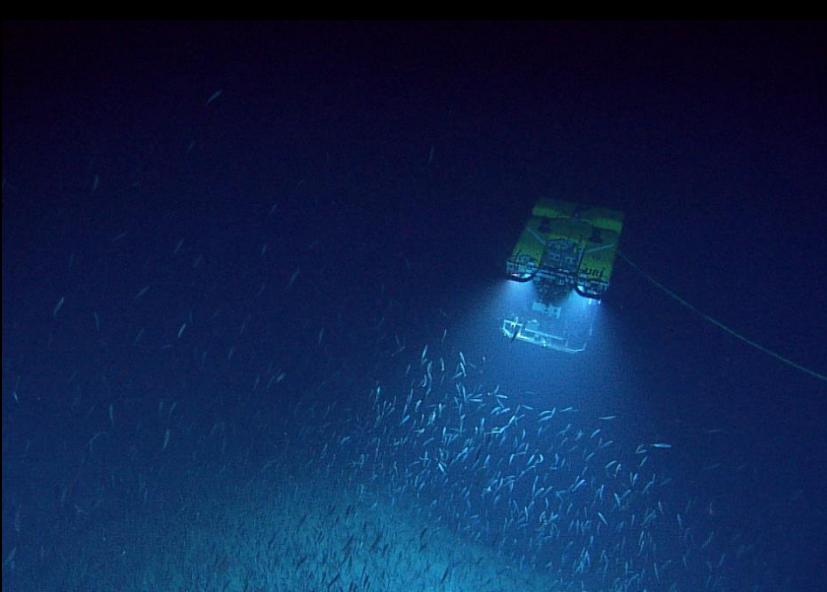
Gulf of Cadiz



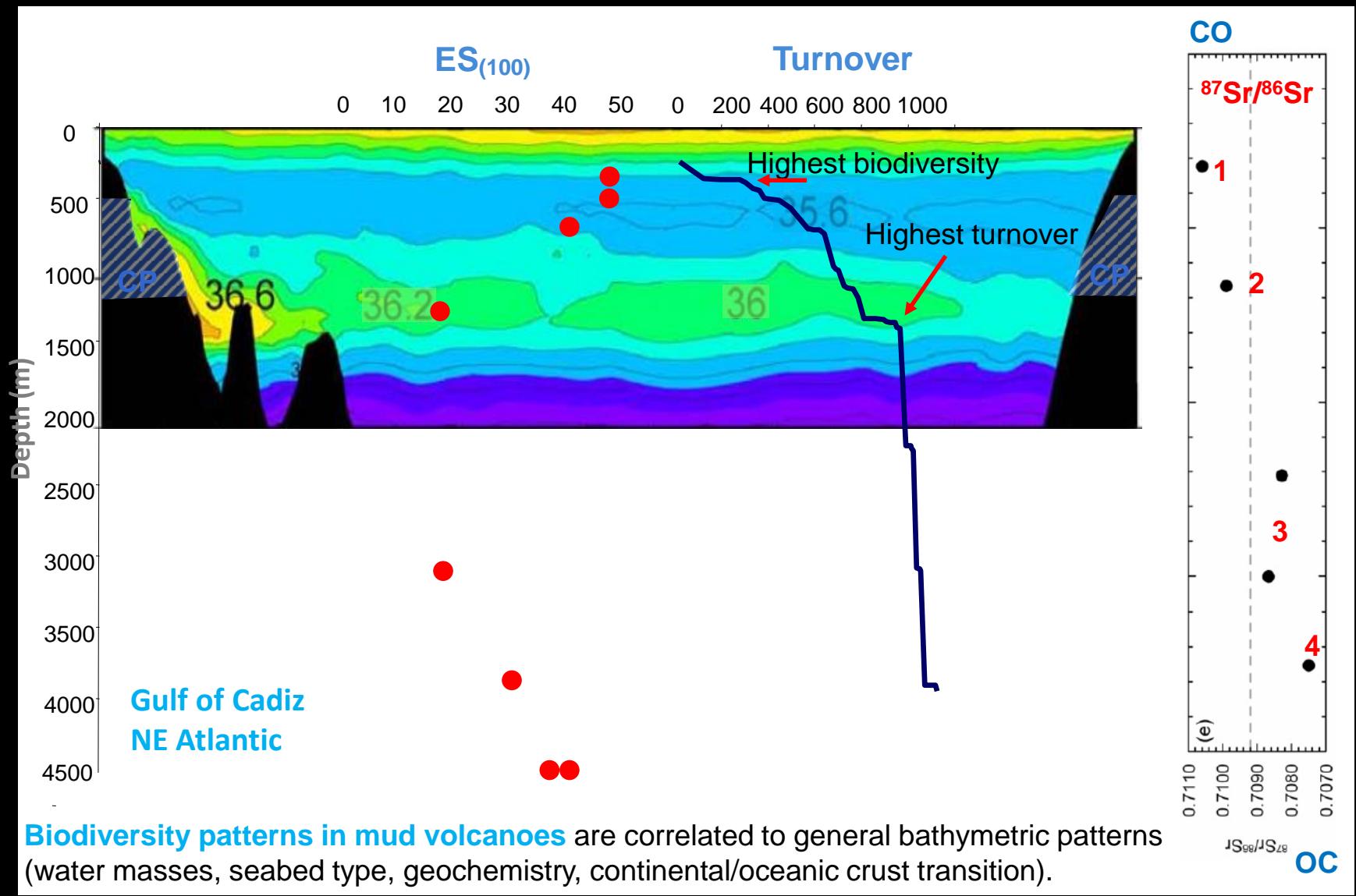
# Multidisciplinary sampling



# Remote and in situ observations and experimentation

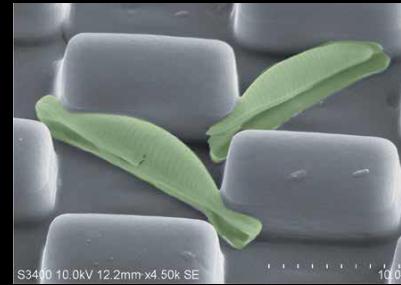
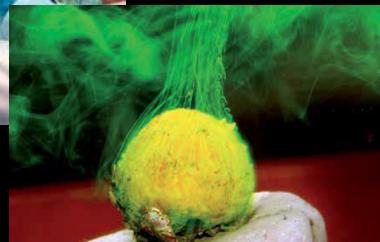
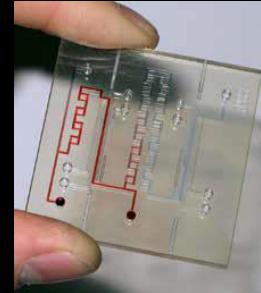


# Multidisciplinary results



# Opportunities

*Blue growth and technological advances*



*...robotics, micro-sensors, emerging technologies, biotechnology, nature inspired design*

# Ecosystems are being challenged

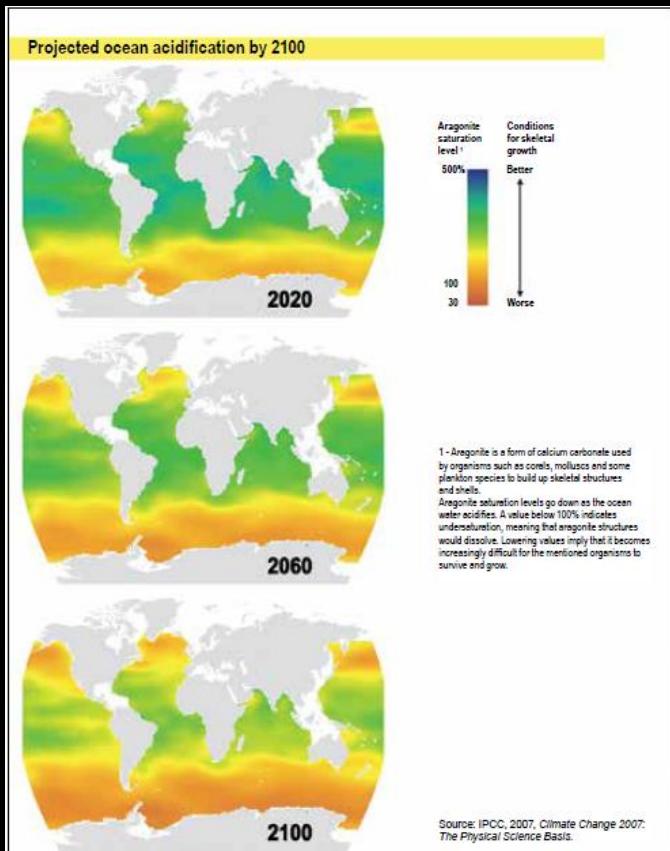
Global change

Habitat loss and degradation

*deeper...*

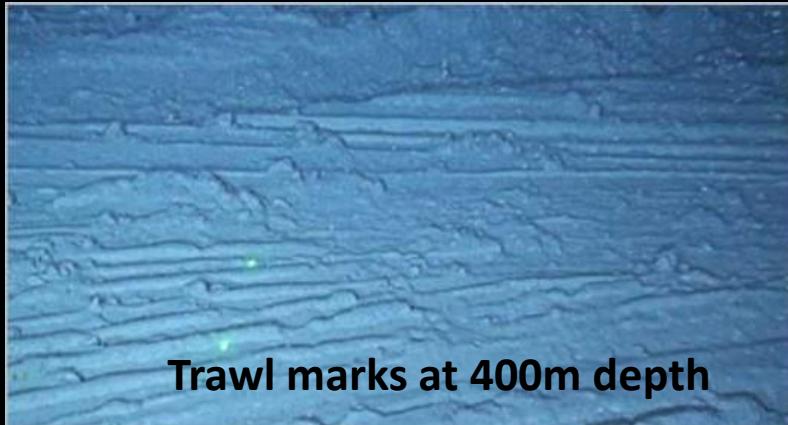
*...safer*

*...less visible*



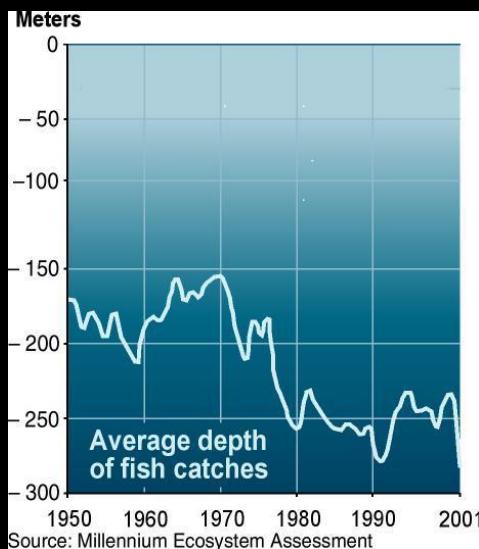
# Ecosystems are being challenged

## Biological and mineral resource extraction



Trawl marks at 400m depth

*Ploughing the seafloor!*



*...before*



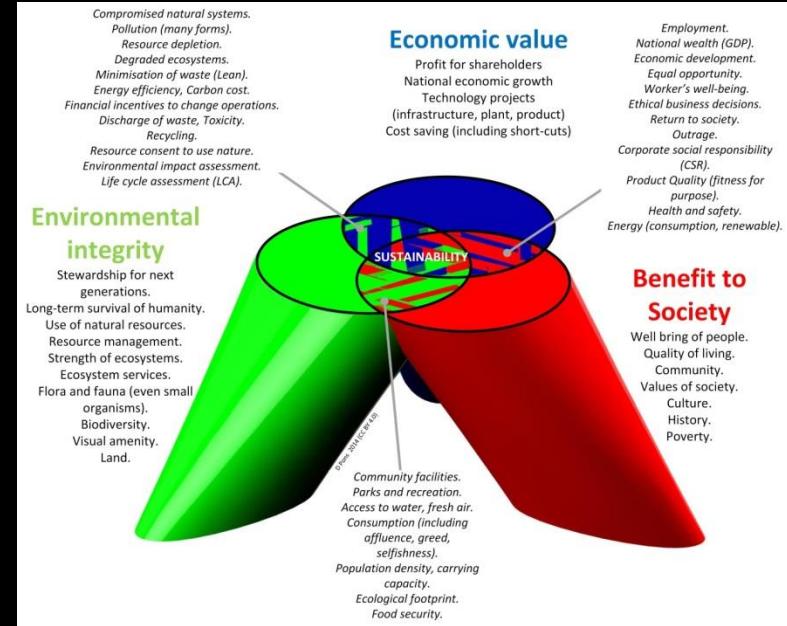
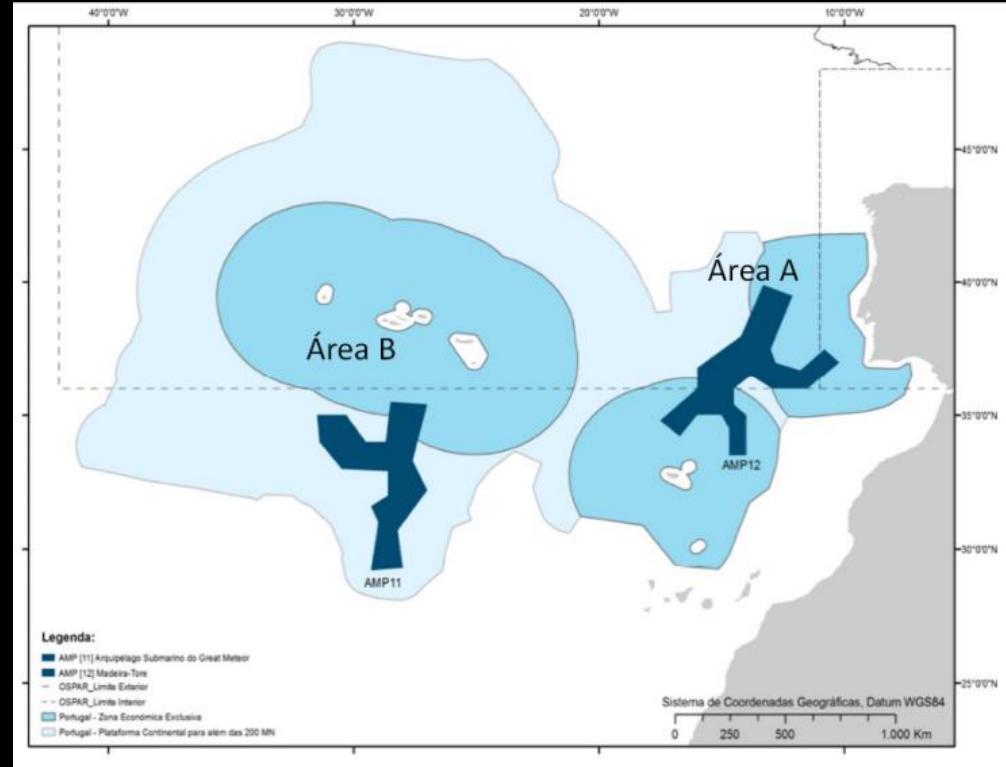
*... and after!*



*Profound, sometimes irreversible change...*



# Deep-sea conservation challenges



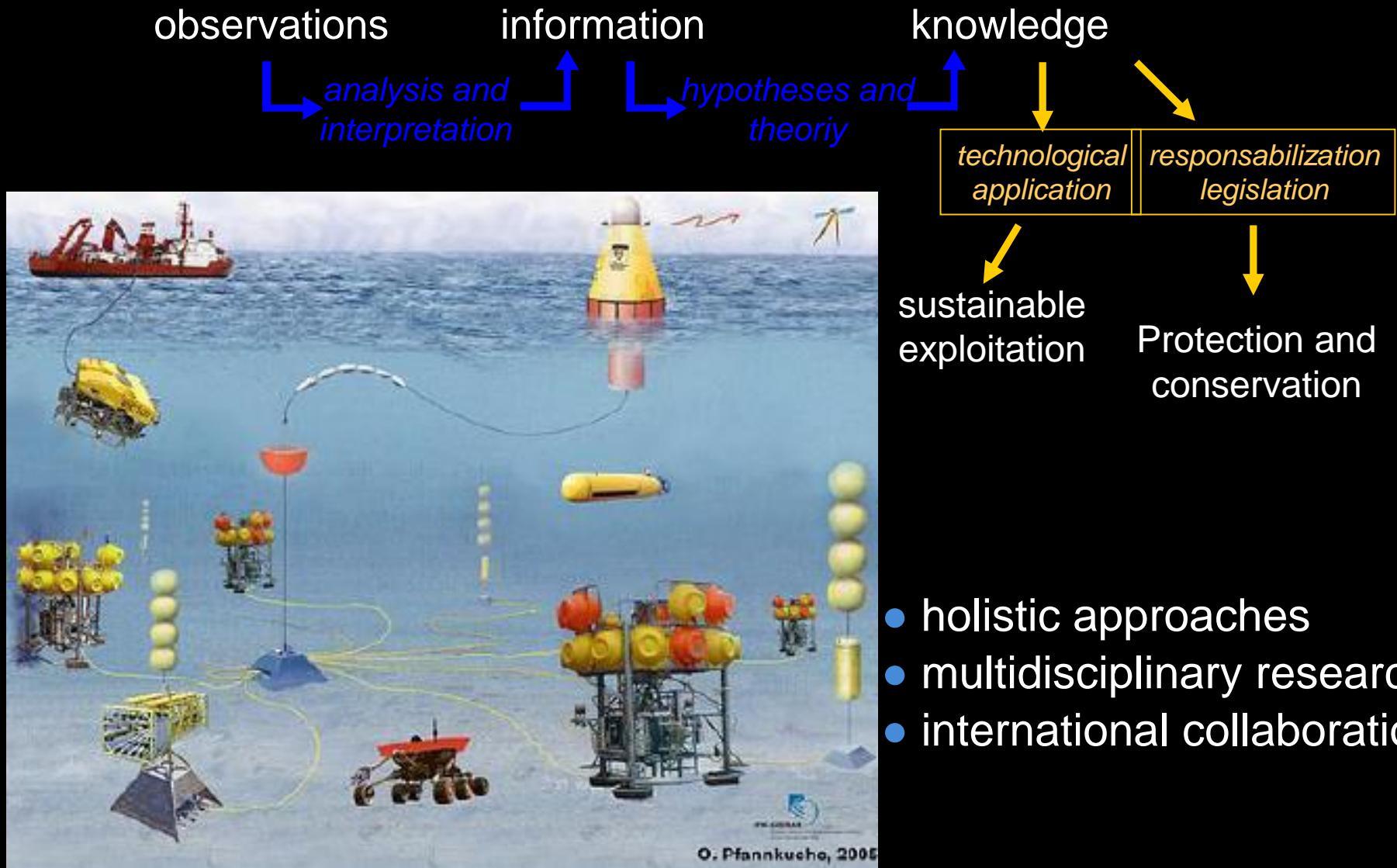
**Knowledge on ecosystems**  
**Exploitation vs (and) Protection**

**Sustainability**

## Concentric Sustainability Framework



# Deep-sea research challenges



- holistic approaches
- multidisciplinary research
- international collaboration



CESAM  
DEEP-SEA BIOLOGY TEAM



FCT Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR