



atlas

UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS



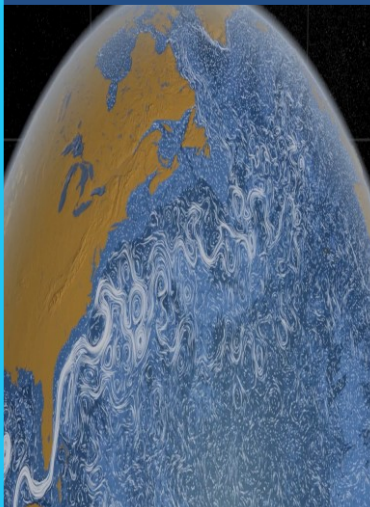
INFLUENCE OF WATER MASSES ON DEEP-SEA BIODIVERSITY AND BIOGEOGRAPHY OF THE NORTH ATLANTIC

ATLAS 4th General Assambly

Patricia Puerta, Instituto Español de Oceanografía
and contributors of deliverable 3.2

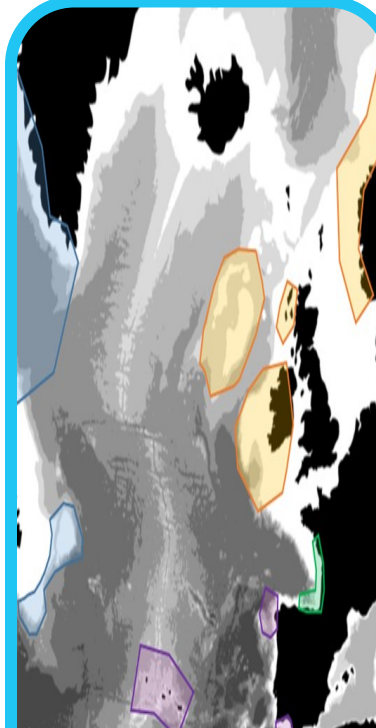


OCEANOGRAPHY



WATER MASSES

EFFECTS ON BIODIVERSITY



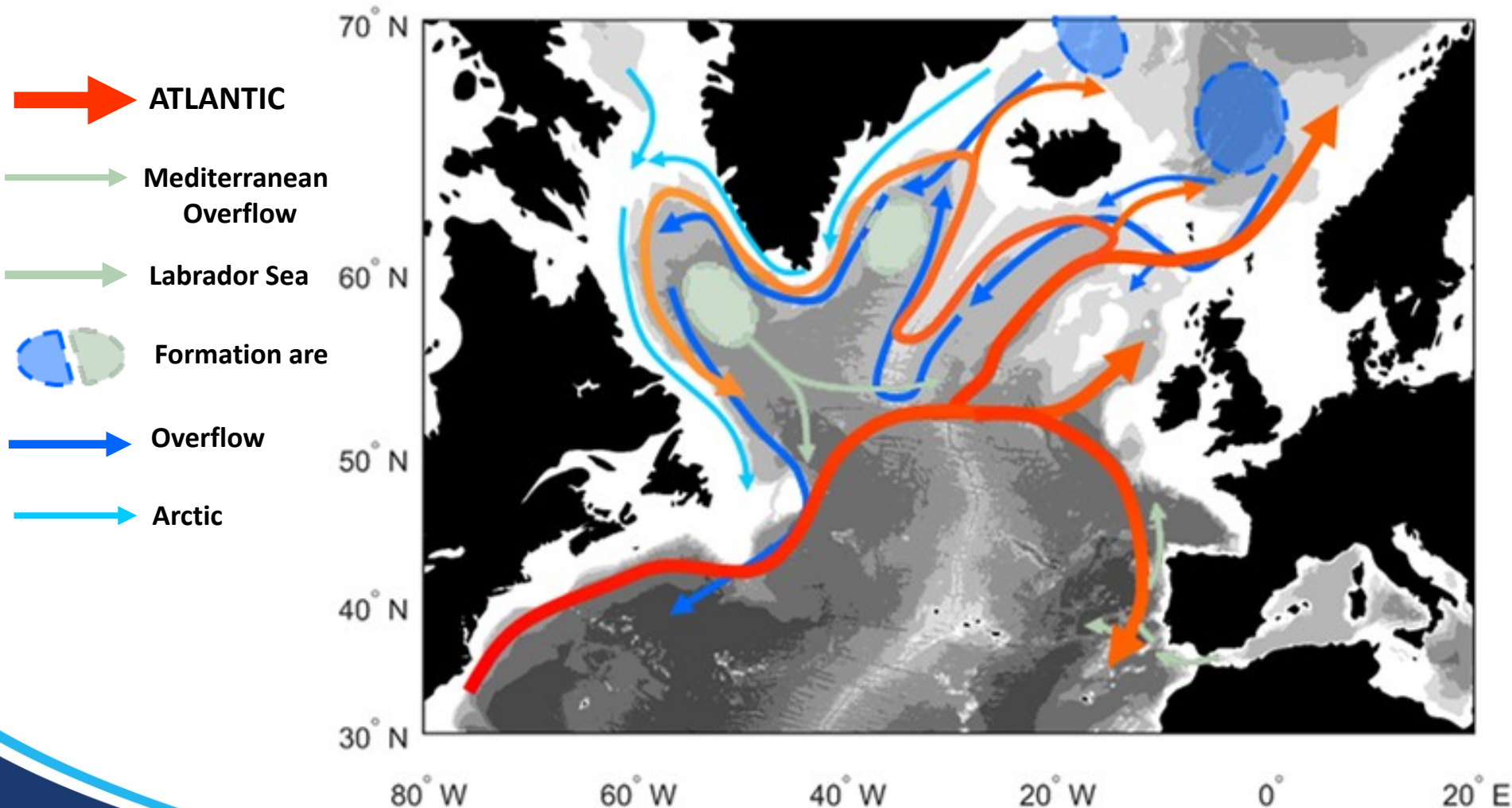
CASE STUDIES

FUTURE SCENARIOS

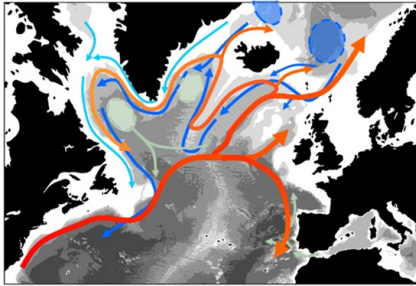


IMPACTS

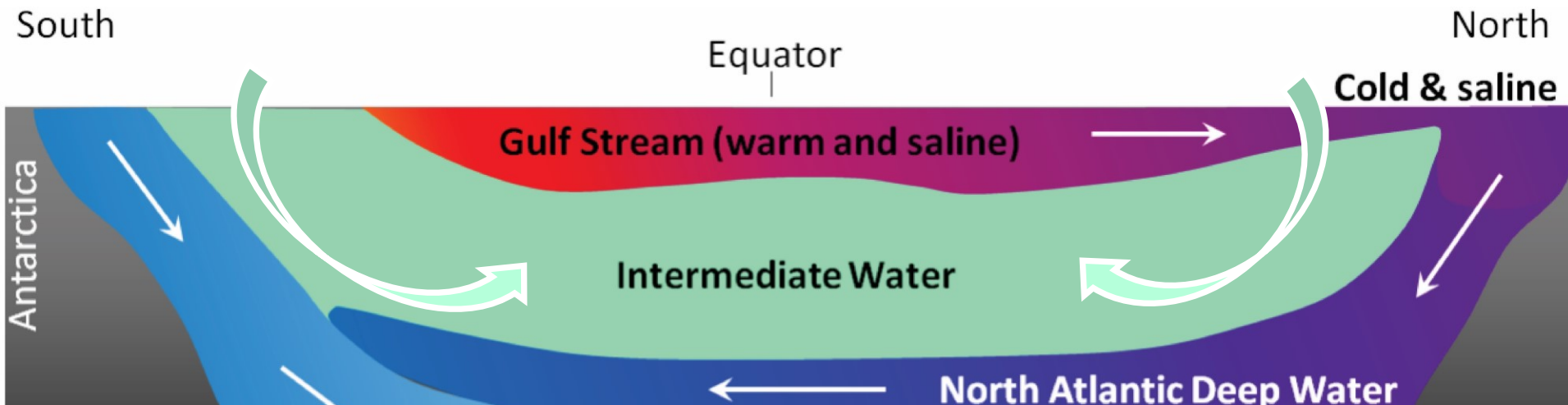
NORTH ATLANTIC CIRCULATION



... AND WATER MASSES



Mediterranean Outflow Water
Subarctic Intermediate Water
Antarctic Intermediate Water
Labrador Sea Water





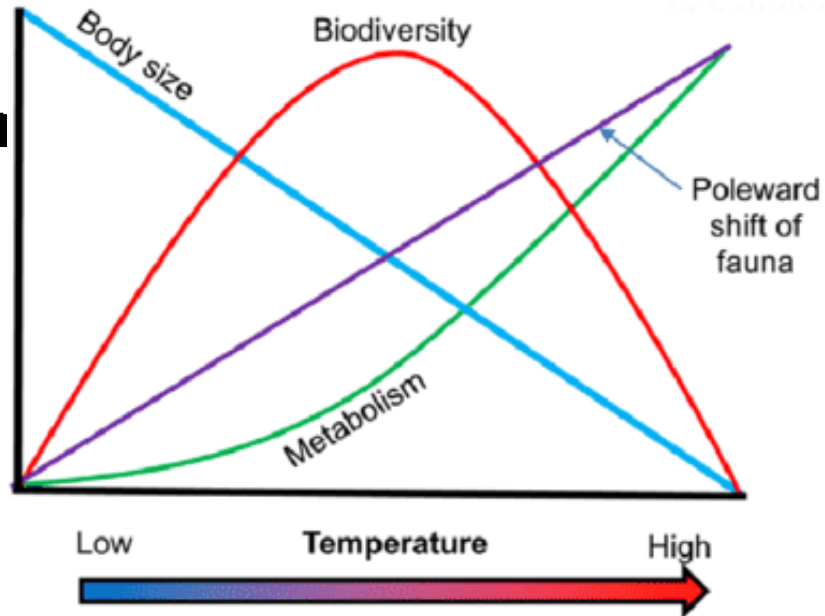
Temperature

Metabolic rates

Reproduction – connectivity

Mortality

**MAGNITUDE
EXPOSURE**



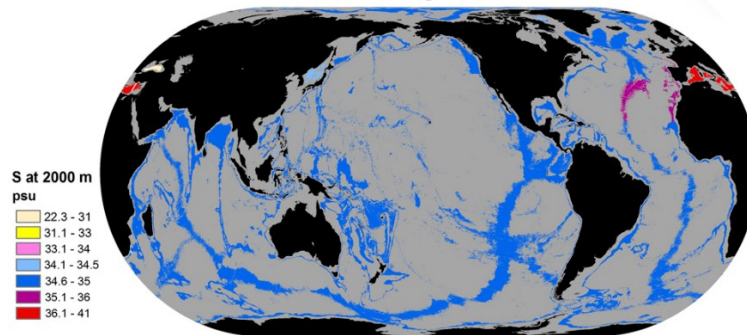
Sweetman et al 2017

CHARACTERISTICS OF WATER MASSES

INFLUENCING BIODIVERSITY AND GEOGRAPHY



Watling et al 2013

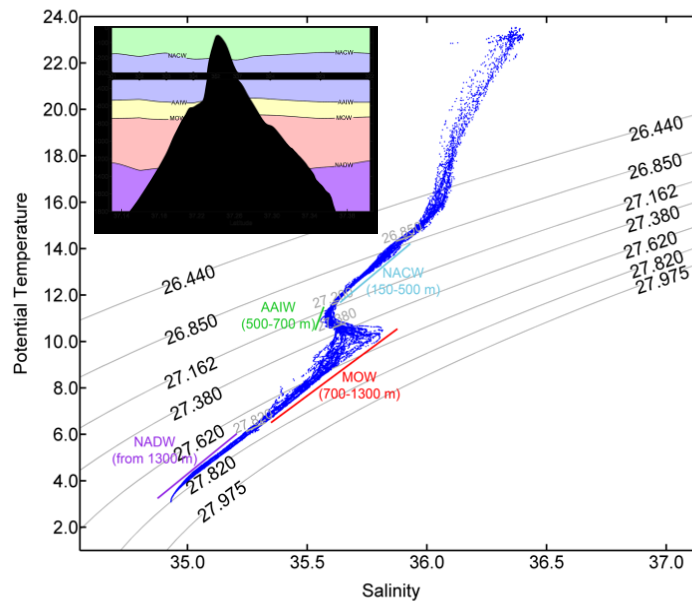


NaCl

Salinity

Distribution
Biodiversity (MOW)
Wide tolerance

**SCARCELY
EXPLORED**



CHARACTERISTICS OF WATER MASSES

INFLUENCING BIODIVERSITY AND GEOGRAPHY



Hydrodynamics



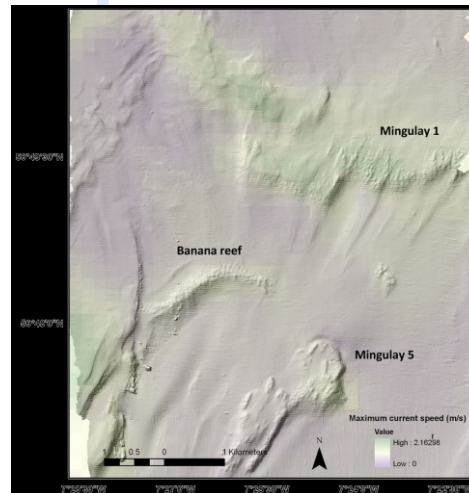
Distribution
Morphology / structure
Abundance / feeding

Organic matter

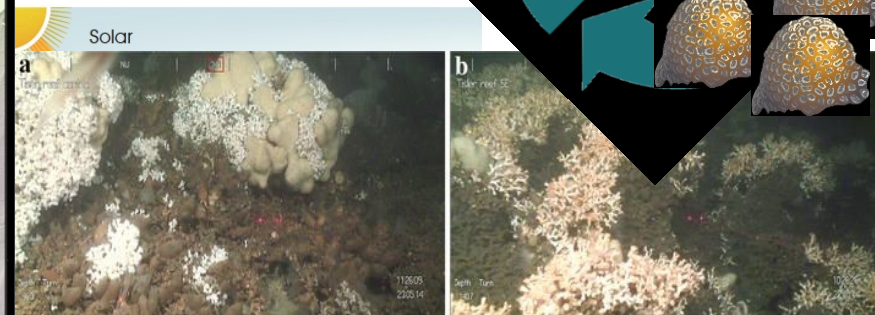


Distribution
Biodiversity
Abundance

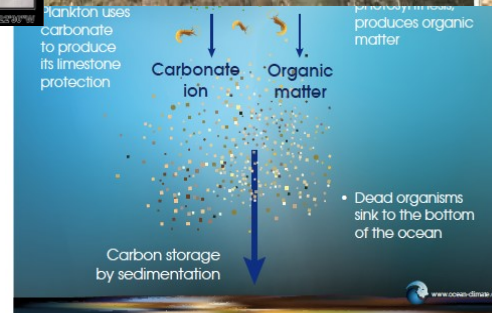
FOOD SUPPLY



Moreno-Navas et al 2014

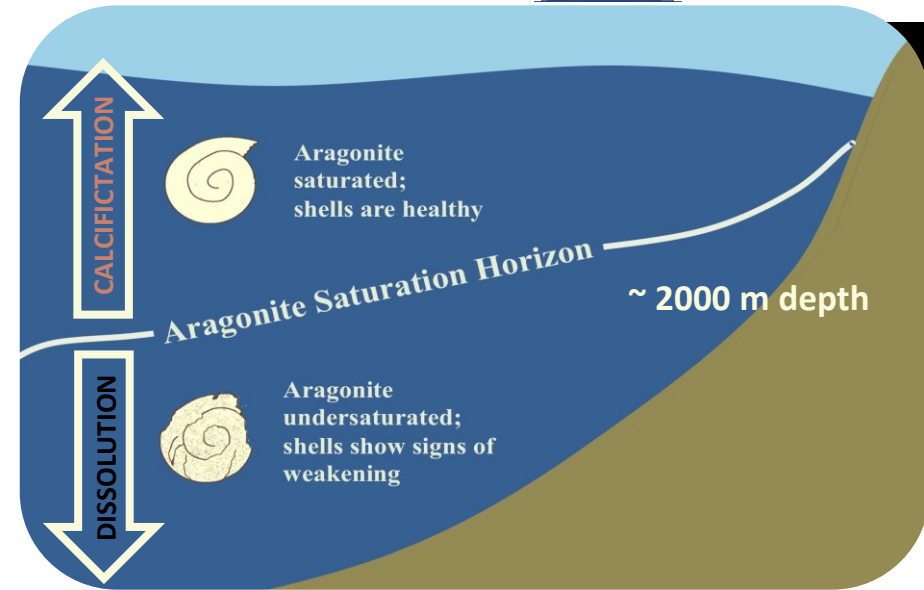


De Clippele et al 2018



CHARACTERISTICS OF WATER MASSES

INFLUENCING BIODIVERSITY AND GEOGRAPHY



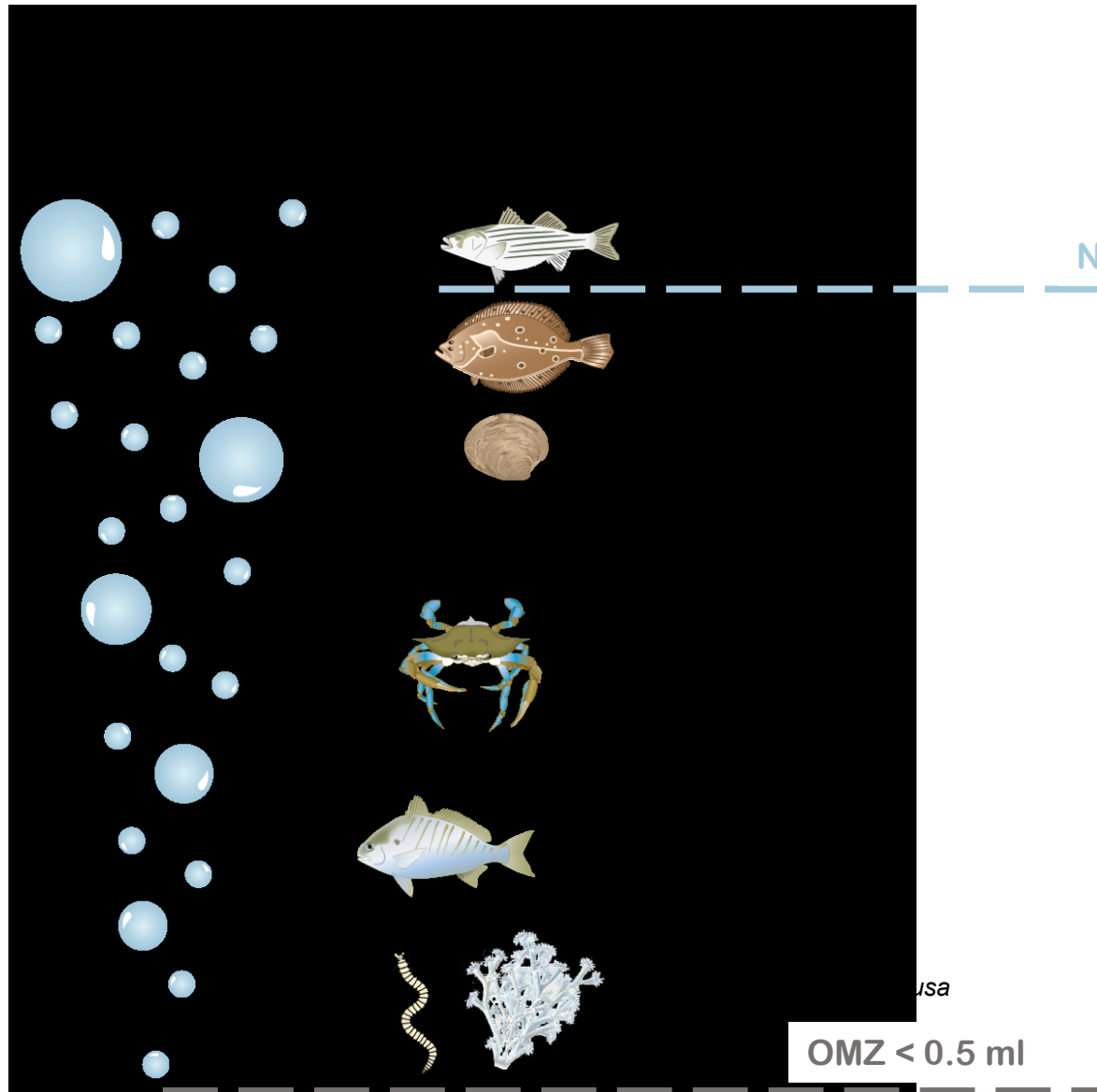
Carbonate chemistry



- Depth distribution (ASH)
- Dissolution shells/skeletons
- Energy cost
- Long-term acclimation

CHARACTERISTICS OF WATER MASSES

INFLUENCING BIODIVERSITY AND GEOGRAPHY



NORTH ATLANTIC

Oxygen



- Limiting below threshold
- Oxygen Minimum Zones
- Species richness
- Disrupted distribution
- Disrupted connectivity

CHARACTERISTICS OF WATER MASSES

INFLUENCING BIODIVERSITY AND BIOGEOGRAPHY



Temperature

Metabolic rates
Reproduction – connectivity
Mortality

**MAGNITUDE
EXPOSURE**

Hydrodynamics



Distribution
Morphology / structure
Abundance / feeding

Organic matter



Distribution
Biodiversity
Abundance

FOOD SUPPLY



Salinity

Distribution
Biodiversity (MOW)
Wide tolerance

**SCARCELY
EXPLORED**

Carbonate chemistry

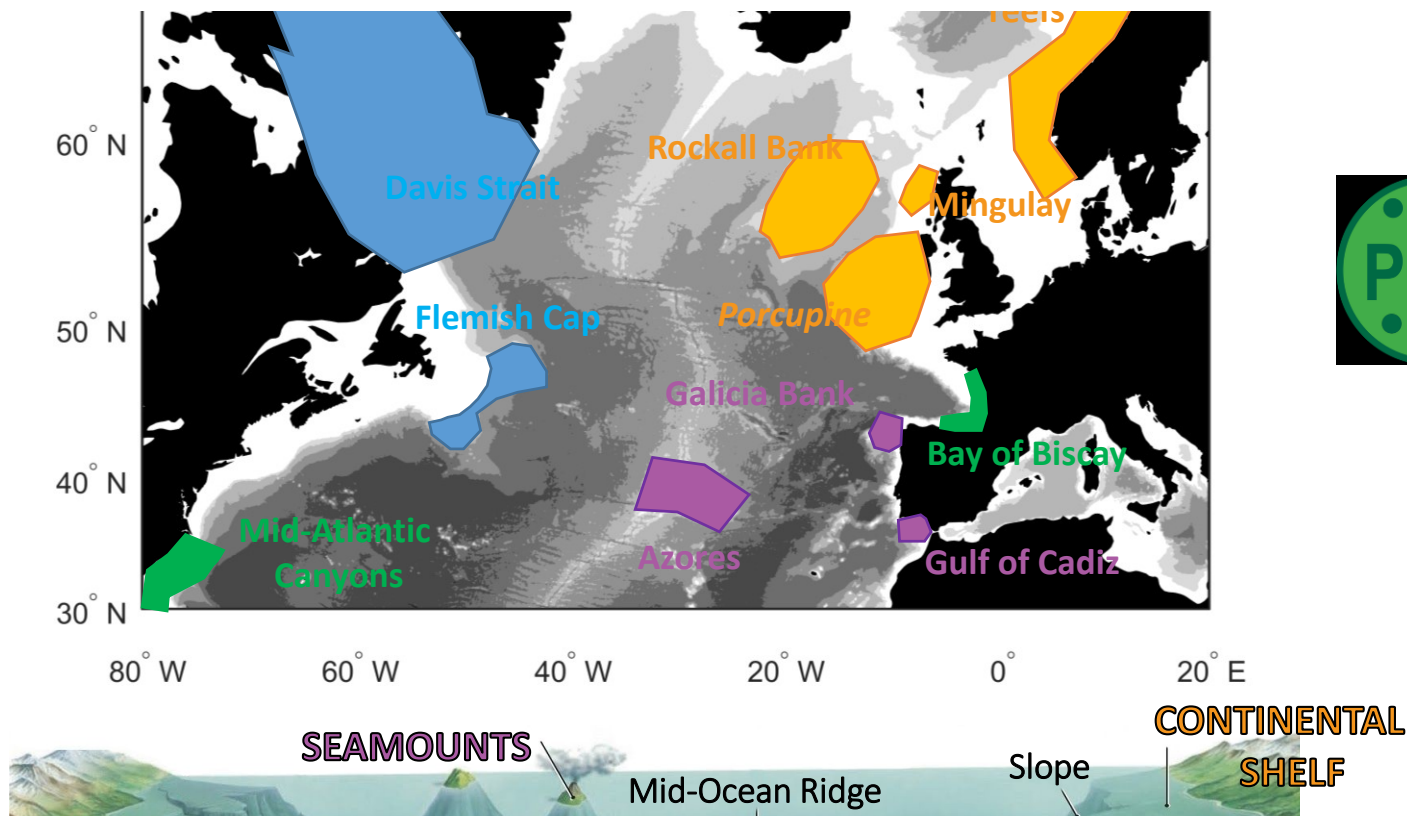


Depth distribution (ASH)
Dissolution shells/skeletons
Energy cost
Long-term acclimation

Oxygen



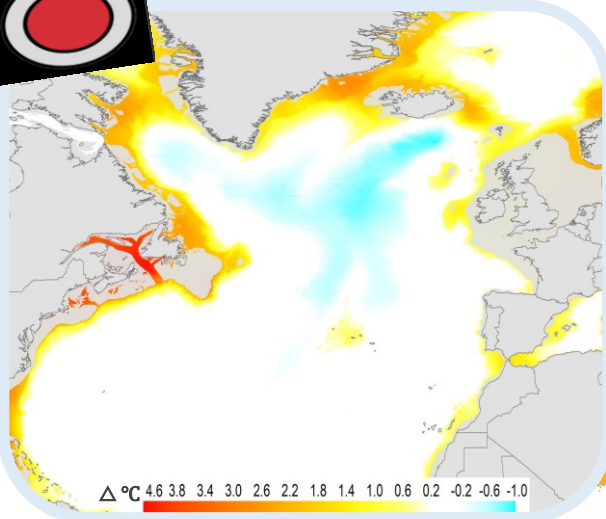
Limiting below threshold
Oxygen Minimum Zones
Species richness
Disrupted distribution
Disrupted connectivity



FUTURE CLIMATE CHANGE SCENARIOS



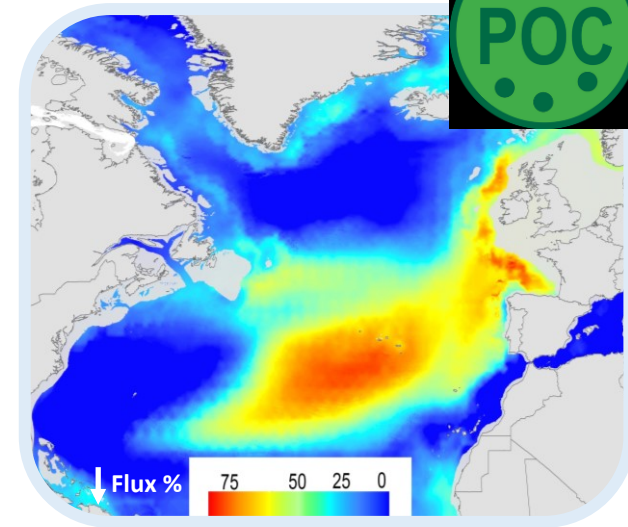
Warming



ics



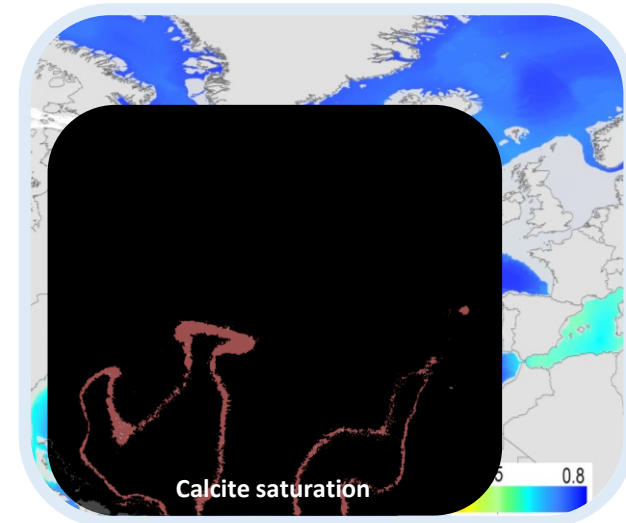
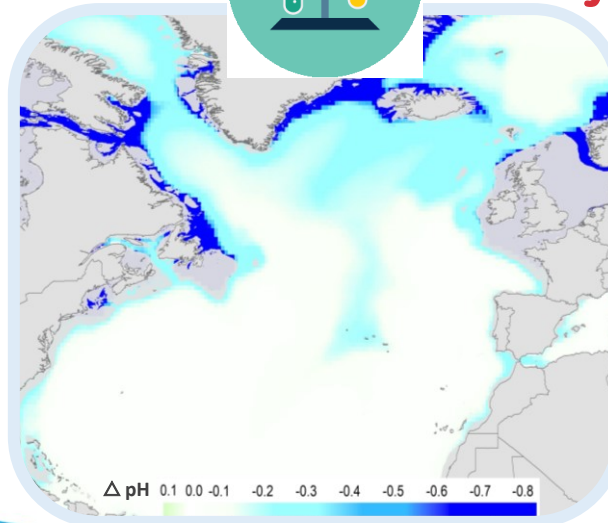
Organic matter



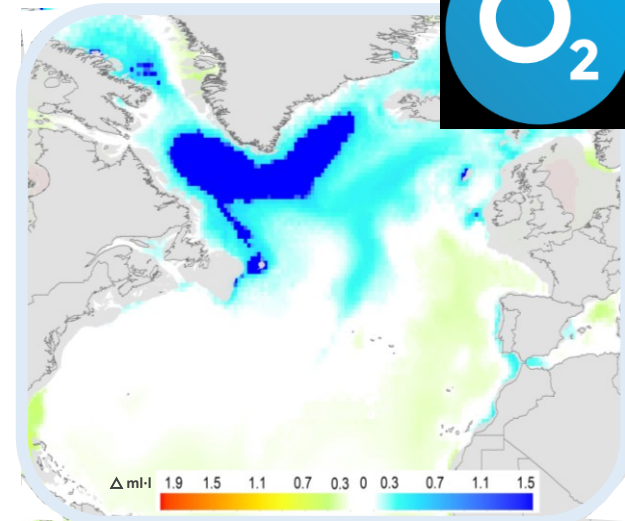
FUTURE CLIMATE CHANGE SCENARIOS



Carbonate chemistry



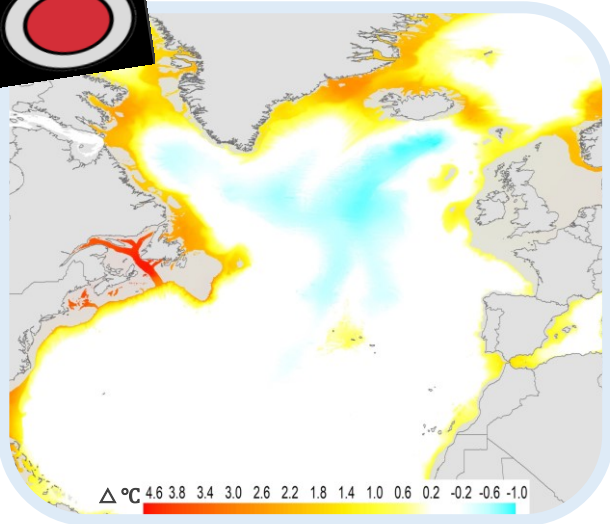
Deoxygenation



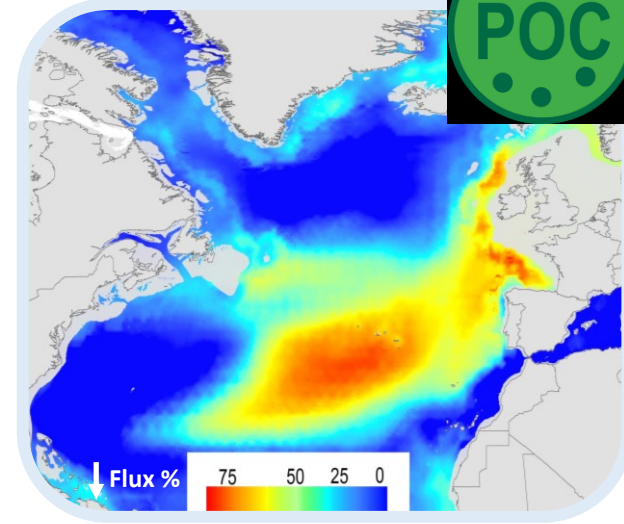
FUTURE CLIMATE CHANGE SCENARIOS



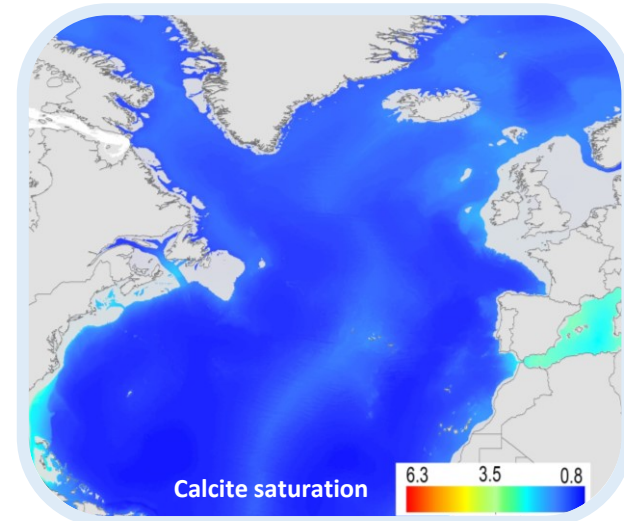
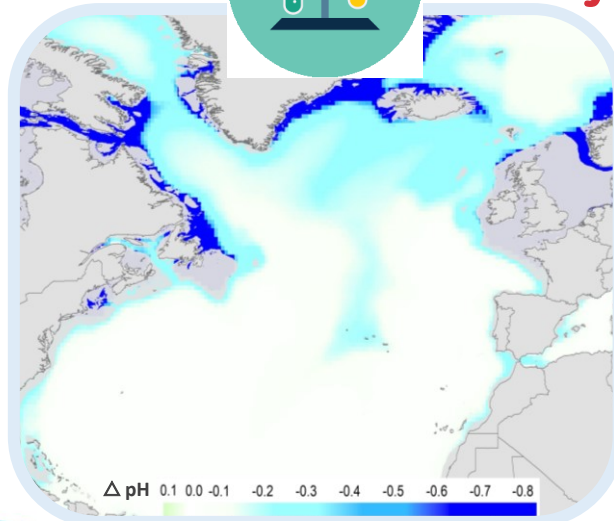
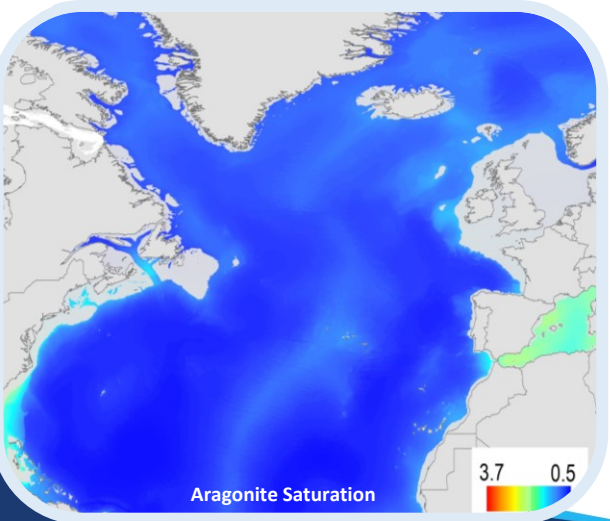
Warming



Organic matter



Carbonate chemistry



FUTURE IMPACTS ON BIODIVERSITY



**Cumulative
critical
changes**



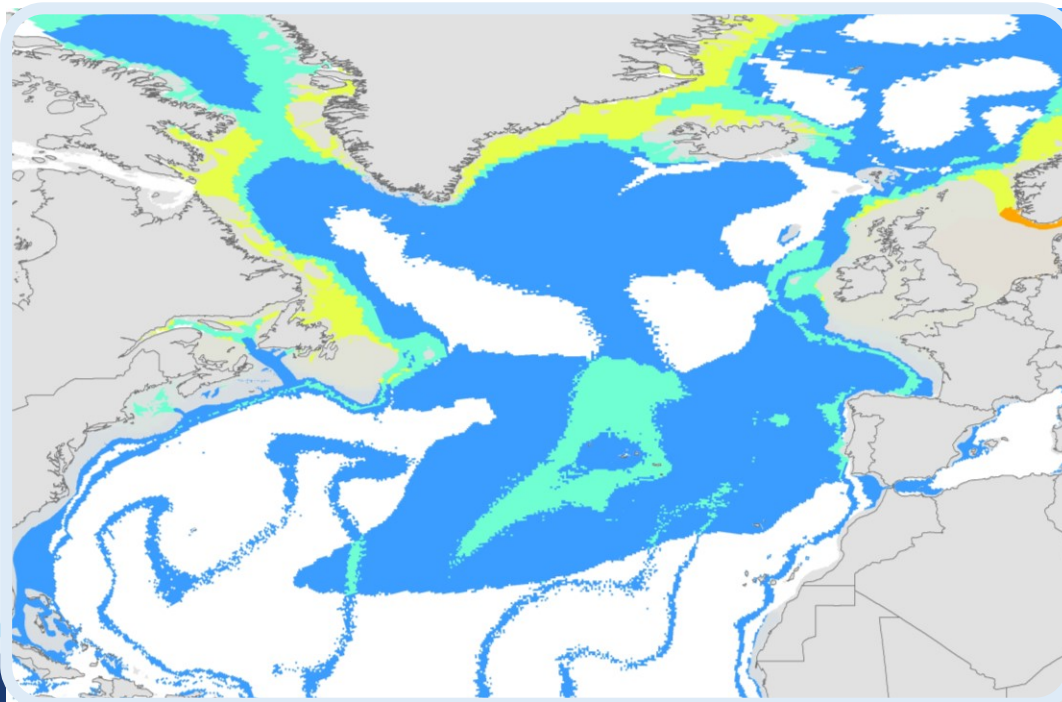
$> 1^{\circ}\text{C}$



$> 40\%$



$\text{As} < 1$ $\text{Cs} < 1$
 $\text{pH} < 0.3$



IMPACTS

HIGH ENERGETIC COST

MORTALITY

DIMINISH REPRODUCTION

LOSS OF SUITABLE HABITAT

LOSS OF BIODIVERSITY

CONECTIVITY

LOSS OF BIOMASS

ECOSYSTEM FUNCTIONING

Thank You



Presenter details

Patricia Puerta

Instituto Español de Oceanografía

patricia.puerta@ieo.es

...and contributors of deliverable 3.2

Project contact details

Coordination: Professor Murray
Roberts murray.roberts@ed.ac.uk

Project Office:
EU-Atlas@ed.ac.uk

Communication & Press:
atlas@aquatt.ie

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