

Ideas for joint research between Algarve and Andalusia
applying technology and innovation to study biodiversity

Biodiversity and Function of underwater habitats -
focus on marine vegetation
- sedaDNA for inferring long-term baselines

Ester Serrão

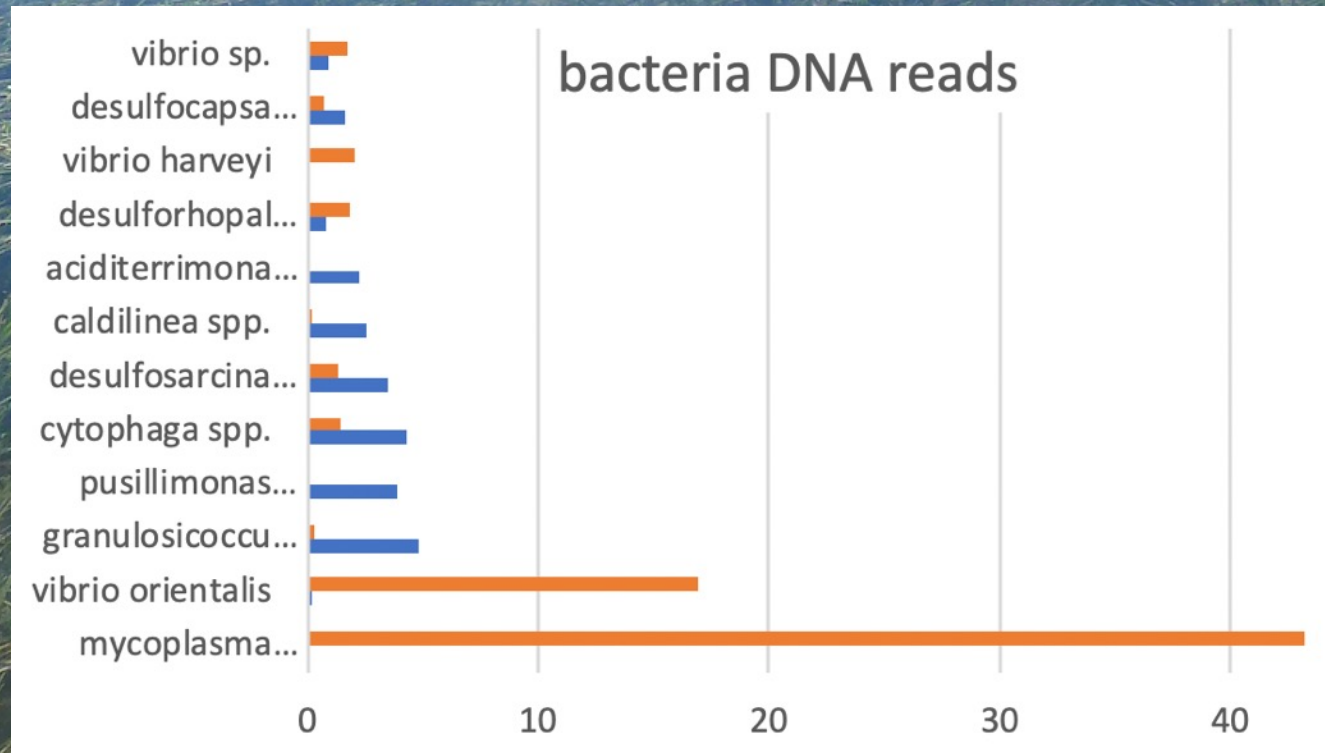
IBERGRID 2022
LifeWatch

Hypotheses to be tested with eDNA of water and surface sediments:

- underwater vegetation changes habitat biodiversity
 - the effect is different among functional groups (seagrasses/invasive or blooming species/native macroalgae)
- the effect is different among species within functional group
- the effect is different with seasonal vegetation changes

seagrass versus invasive algae (*Caulerpa*) microbiomes:

Vibrio and *Mycoplasma* (disease-causing bacteria)
were abundant in *Caulerpa* and not in seagrass



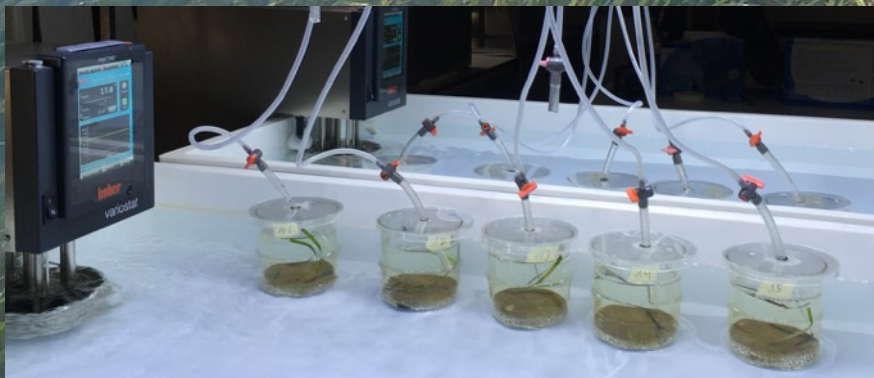
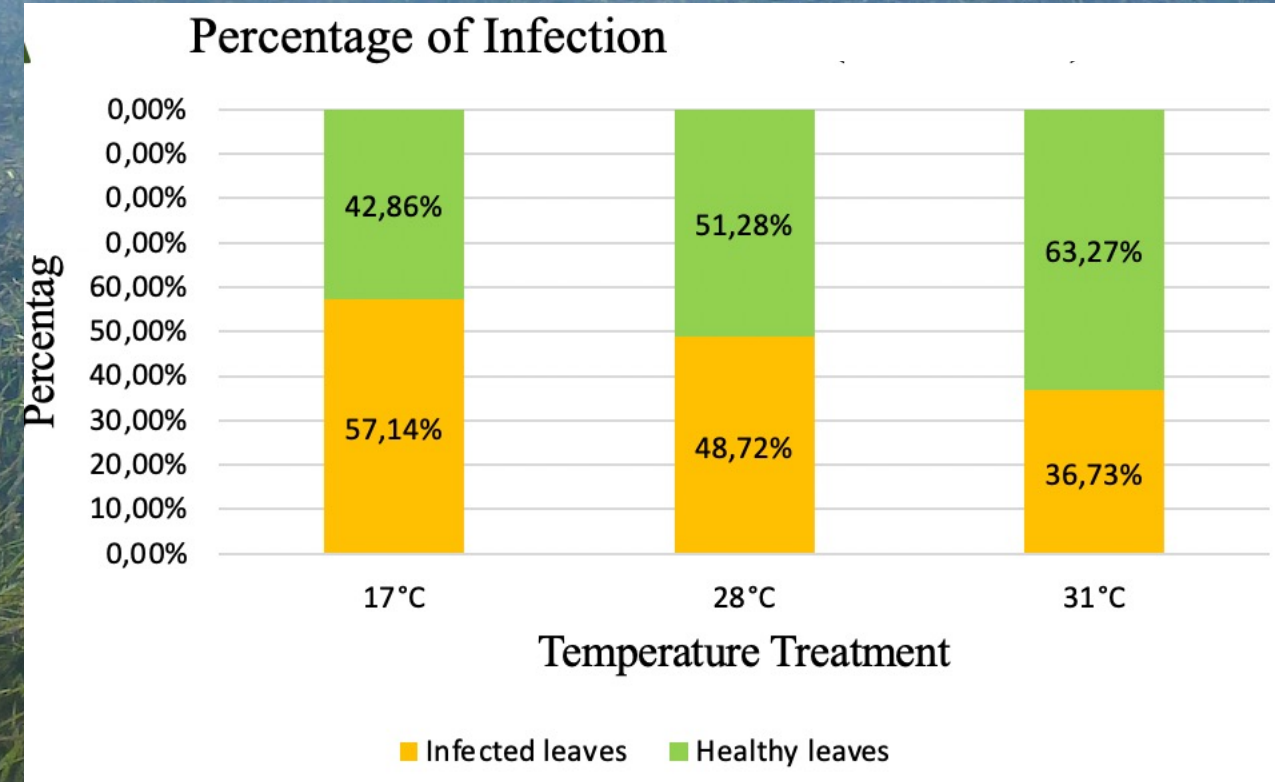
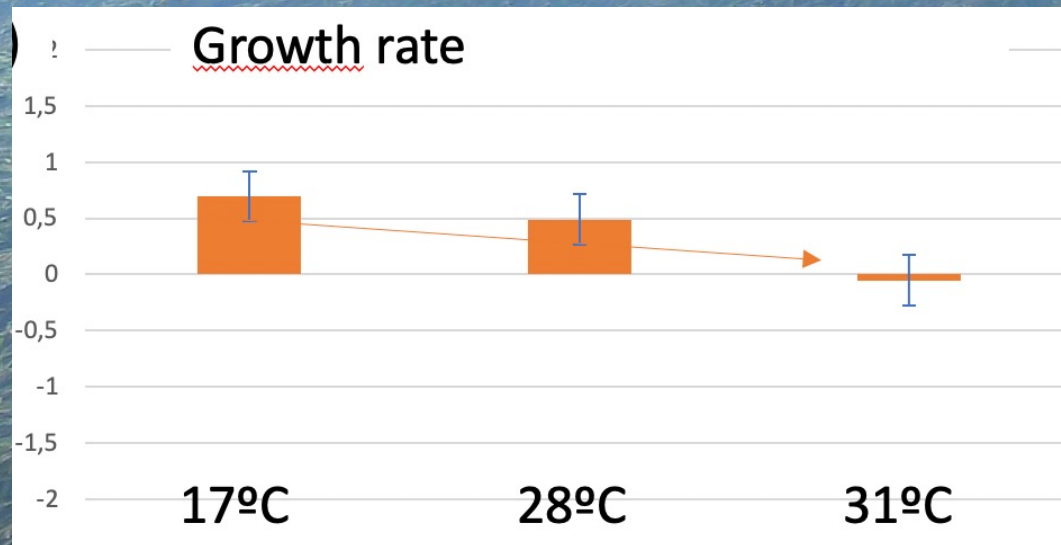
Hypotheses to be tested with RNAseq:

- underwater vegetation changes biodiversity function
 - the effect is different among functional groups (seagrasses/invasive or blooming species/native macroalgae)
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- the effect is different among species within functional group
- the effect is different with seasonal vegetation changes

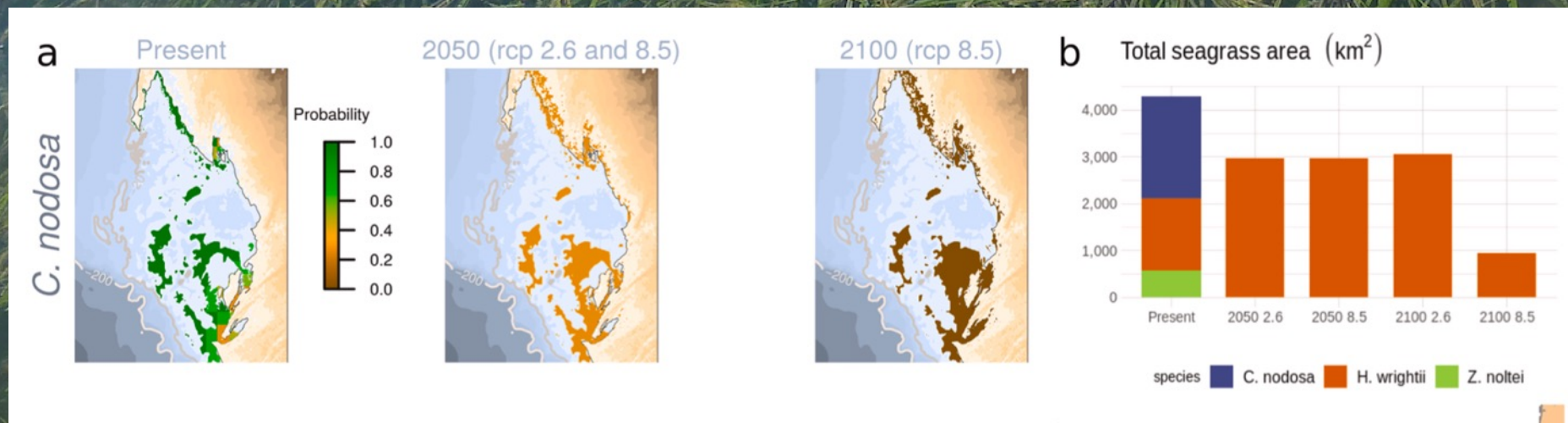
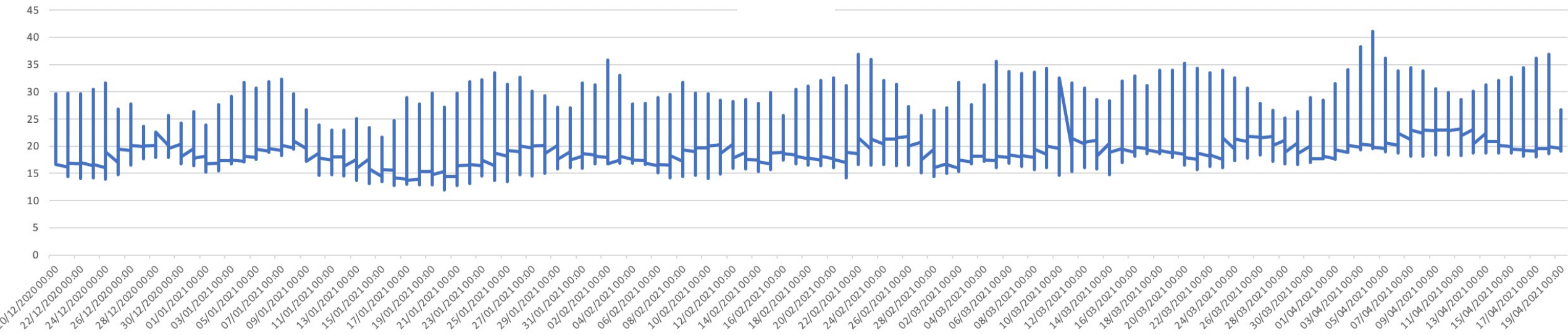
A close-up photograph of a dense, tangled mass of dead, brown, needle-like plant material, likely Cymodocea, growing in a shallow, sandy environment. The plants are dry and brittle, with many small, dark, irregular shapes scattered throughout, possibly representing dead leaves or small animals. The background is a light-colored, sandy surface.

Dead shallow *Cymodocea*

Experimental tests of climate change – transcriptomics to understand functional differences



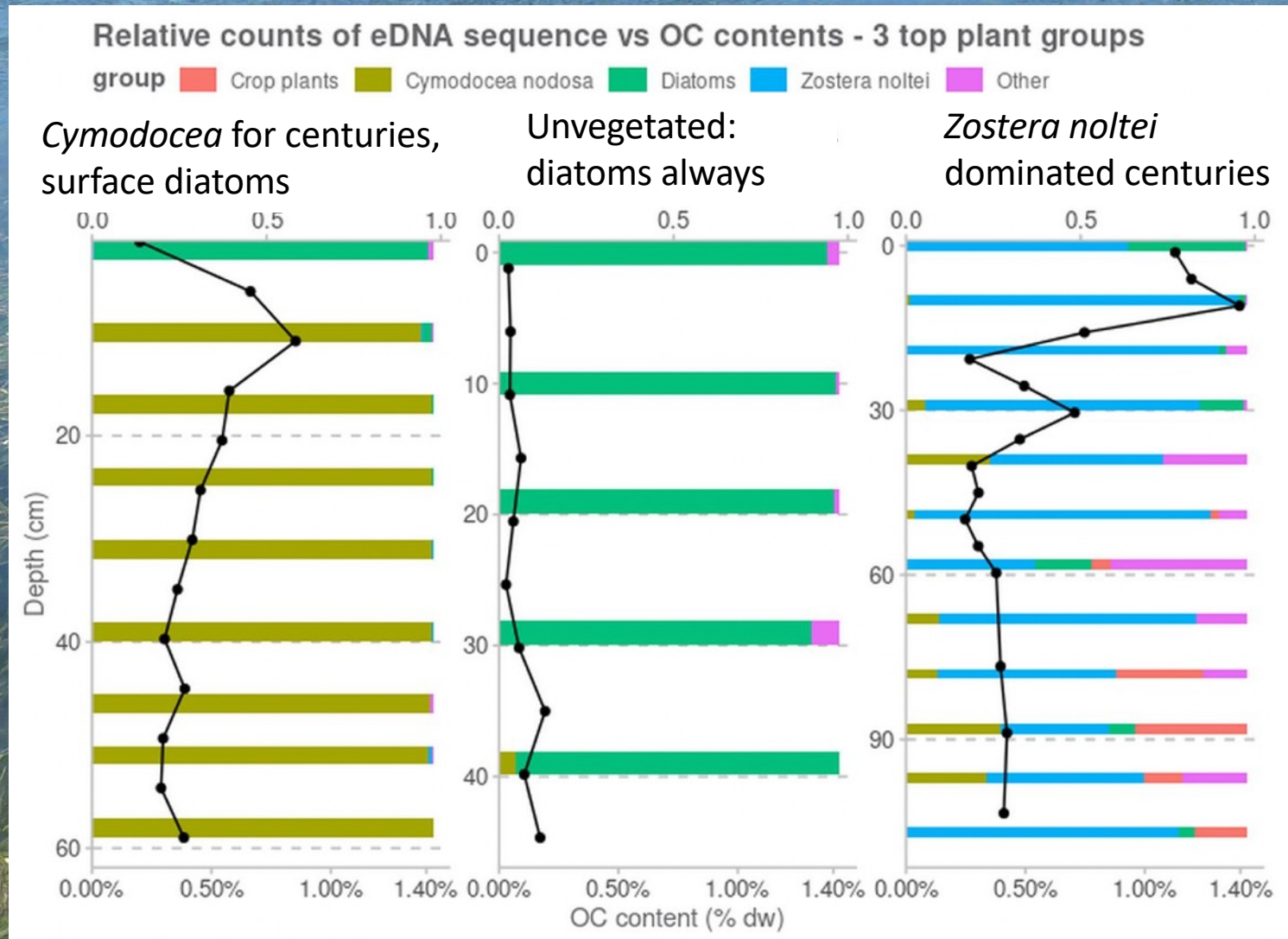
- Modeling of habitat projected for the future IPCC scenarios with sea level



Hypotheses to be tested with sedaDNA :

- seagrass habitats have been in the sites for centuries
- Where seagrass habitats existed and got lost recently, the ancient functional effects persist
- Biodiversity present in the past centuries can be detected with sedaDNA in seagrass meadows
- Threatened /locally extinct species can be detected in the past

- Centuries of **history** inferred from sediments using sedaDNA



eDNA identification of dominant primary producers contributing to the carbon stored in sediments over the past centuries

Martins et al. subm

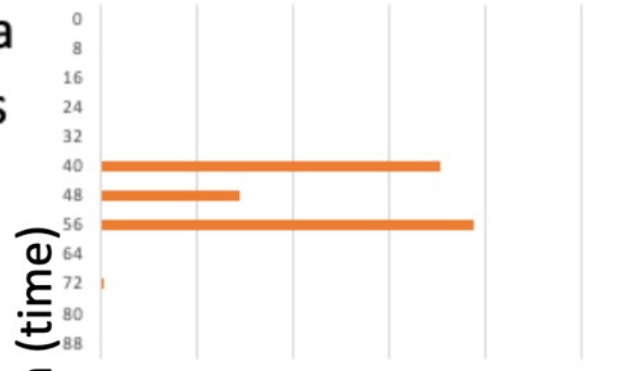
- Estimated **carbon stored** in seagrass habitats
- Centuries of **history** inferred from sediments using sedaDNA

Detecting presence of specific target species

Cores

- 18S data
- Zn cores

Reptile DNA (sea turtle)



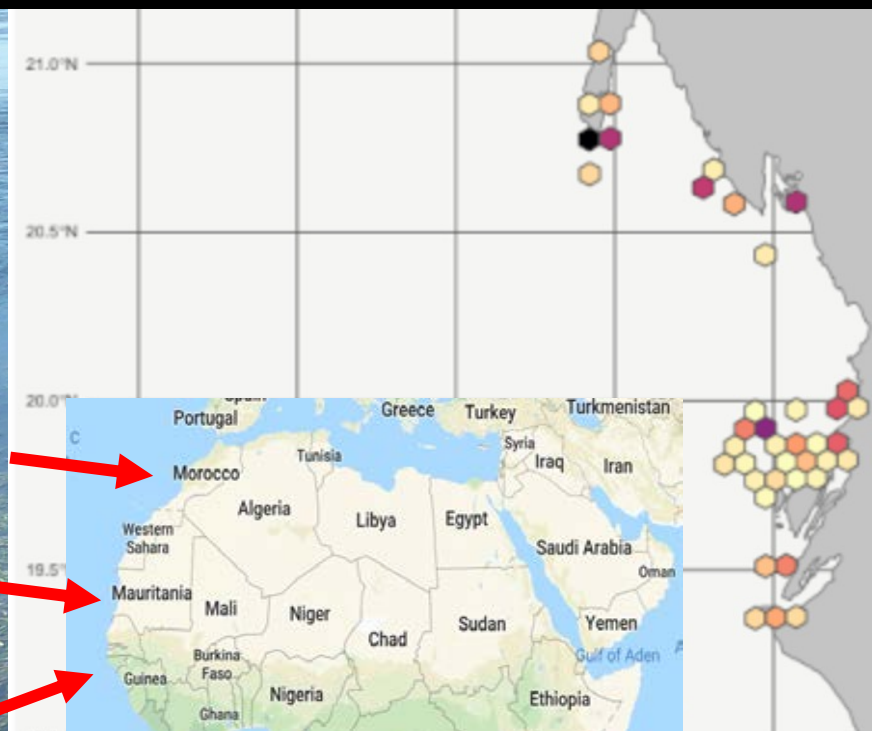
Summary of approaches suggested for marine habitats (vegetated)

- **Composition:** eDNA in seawater and surface sediments inside different types of underwater vegetation and unvegetated controls
- **Function:** RNAseq in seawater and surface sediments inside different types of underwater vegetation and unvegetated controls
- **Past Baselines:** sedaDNA to infer the past
- **Future Predictions:** Abiotic (temperature, light limitation) biotic (diseases, competitors) parameter recording and AI modeling approaches to predict future scenarios likely to change radically the biodiversity and function of underwater vegetation

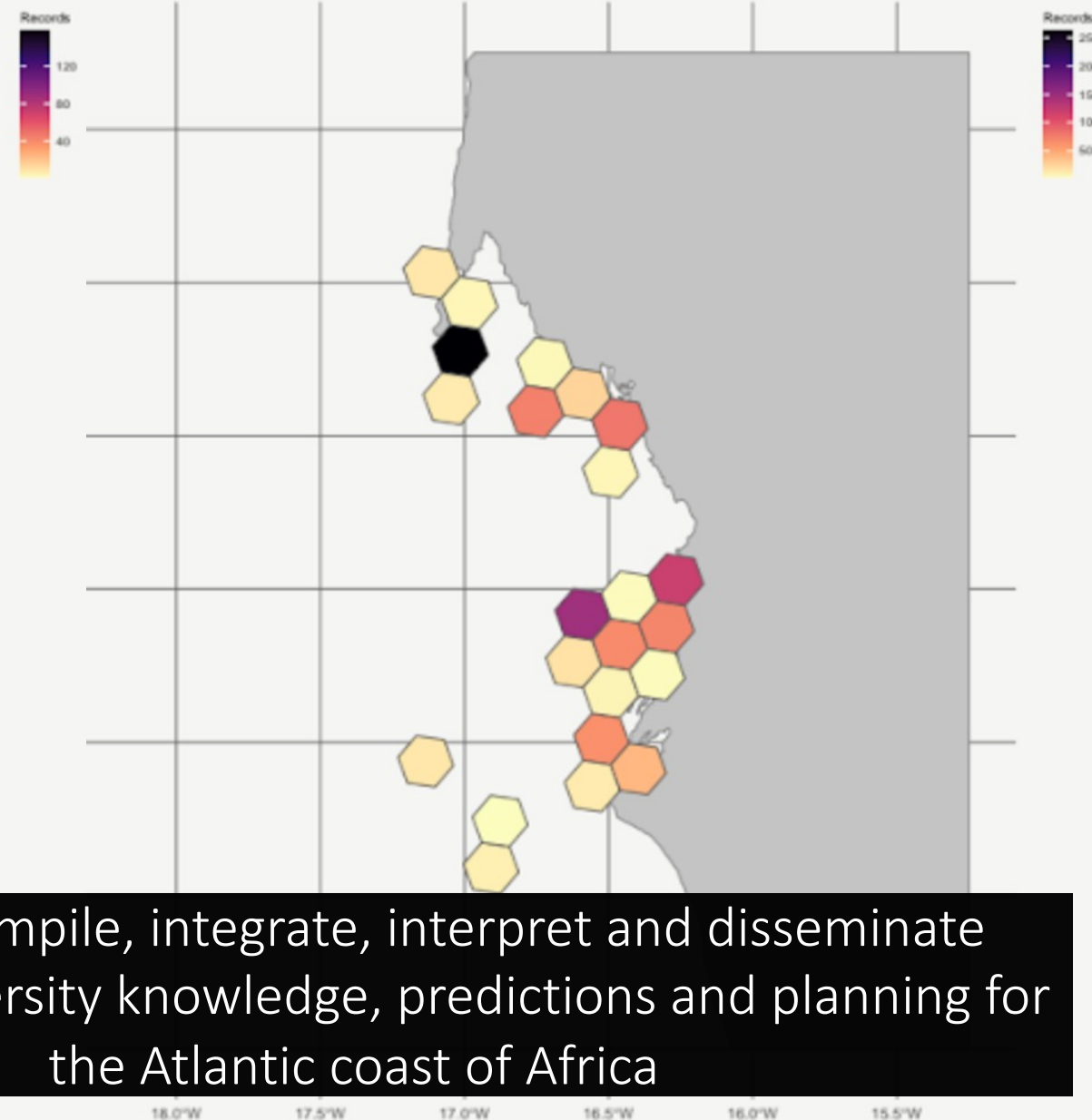
Implications for marine habitat restoration

- **Development of technologies in large scale marine habitat restoration**
- **Including best practices for :**
 - **Maintaining genetic origin and diversity**
 - **Conserving and restoring local adaptation to abiotic factors,**
 - **Accounting for biotic interactions with microbiomes (symbionts and pathogens), with eukaryotic diseases, with invasive species and other competitors**

MARAFRICA – A network monitoring, integrating and assessing marine biodiversity data along the western coast of Africa to understand, predict and mitigate changes



Goal - to compile, integrate, interpret and disseminate marine biodiversity knowledge, predictions and planning for the Atlantic coast of Africa



Project MARAFRICA 2022-2024 - A network monitoring, integrating and assessing marine biodiversity data along the western coast of Africa to understand, predict and mitigate climatic / oceanographic changes.

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MARAFRICA is a research and training network of multiple partners, including originally:

ISECMAR-UTA (**Cabo Verde**)

Universidade do Namibe (**Angola**)

Universidade de São Tomé e Príncipe (**São Tomé e Príncipe**)

CIPA-Centro de Investigação Pesqueira Aplicada (**Guiné-Bissau**)

IBAP- Instituto da Biodiversidade e Áreas Protegidas (**Guiné-Bissau**)

Universidade de Cabo Verde (**Cabo Verde**)

University of Ghana (**Ghana**)

University of Cape Town (**South Africa**)

Université Chouab Doukkali (**Morocco**)

University of Namibia (**Namibia**)

PNBA – Parc Nationale du Banc d'Arguin (**Mauritania**)

IMROP-Institut Mauritanien de Recherches Océanographiques et des Pêches (**Mauritania**)

Universidade Eduardo Mondlane (**Moçambique**)

CCMAR–Centro de Ciências do Mar do Algarve (Portugal)

IPMA-Instituto Português do Mar e da Atmosfera (Portugal)

CIBIO-Centro de Investigação em Biodiversidade e Recursos Genéticos (Portugal)

CESAM-Centro de Estudos do Ambiente e do Mar (Portugal)

Universidade do Porto (Portugal)

Universidade de Aveiro (Portugal)

