ECOTOXICOLOGIA

AULA PRÁTICA 10

Planeamento das Aulas

Aula 1 (02.03) – Início dos testes de ecotoxicologia

Aula 2 (09.03) – Efeitos do bezafibrato na germinação dos organismos teste (taxas de inibição e constantes de inibição IC50)

Aula 3 (16.03) – Marcadores biofísicos de toxicidade I

Aula 4 (23.03) – Marcadores biofísicos de toxicidade II

Aula 5 (06.04) – Análise Estatística Multivariada e Índices Fotoquímicos (Teórico-Prática)

Aula 5 (13.04) - Marcadores bioquímicos de toxicidade I – Pigmentos vegetais

Aula 6 (20.04) – Marcadores bioquímicos de toxicidade II – Pigmentos Vegetais II

Aula 7 (27.04) - Marcadores bioquímicos de toxicidade III – Dano Membranar

Aula 8 (04.05) – Marcadores bioquímicos de toxicidade IV – Dano Membranar

Aula 9 (11.05) – Ocean Metagenomics

Aula 10 (18.05) - Nanotoxicologia

DELINEAMENTO EXPERIMENTAL

Control

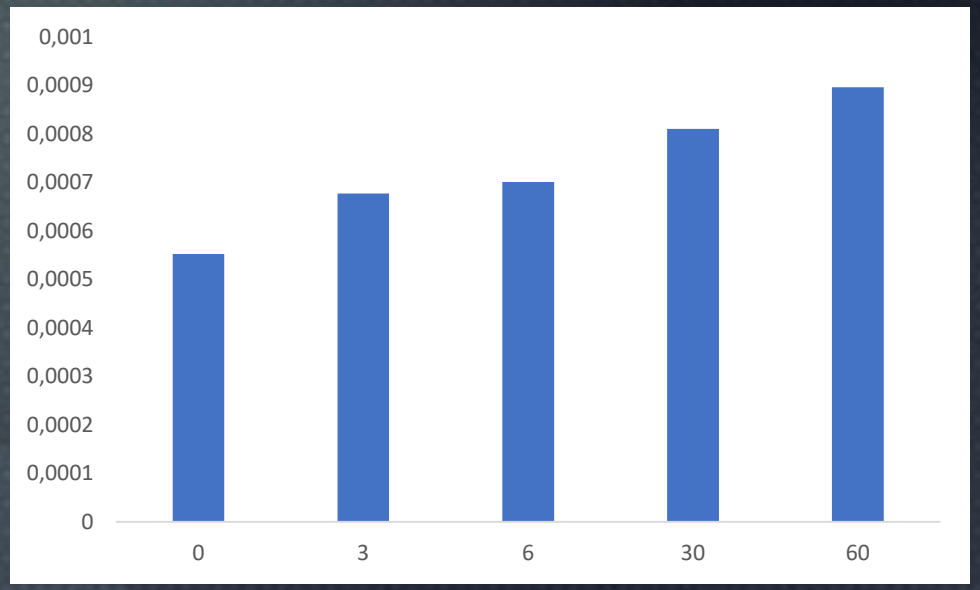
3 µg/L

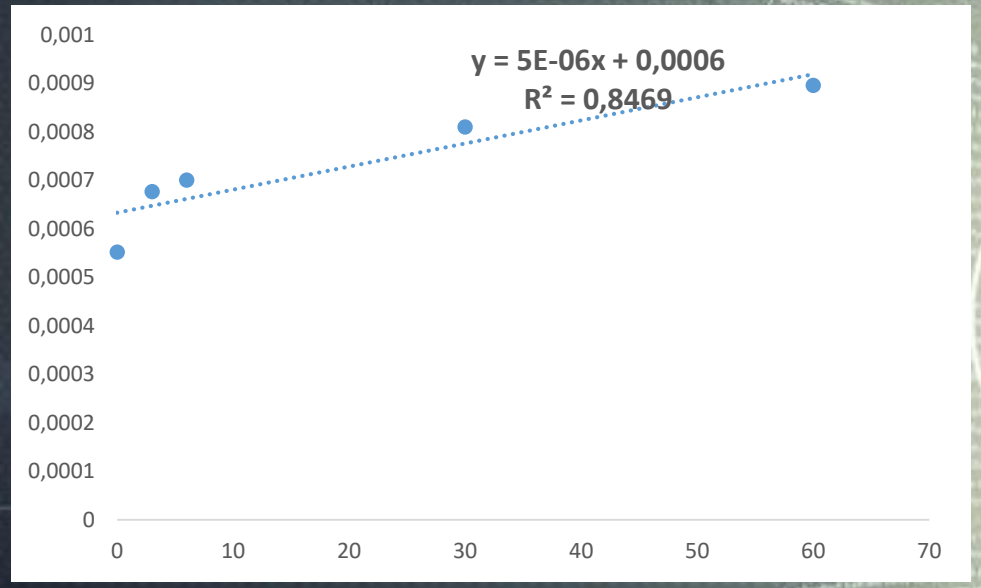
6 µg/L

30 µg/L

60 µg/L

LIPID PEROXIDATION



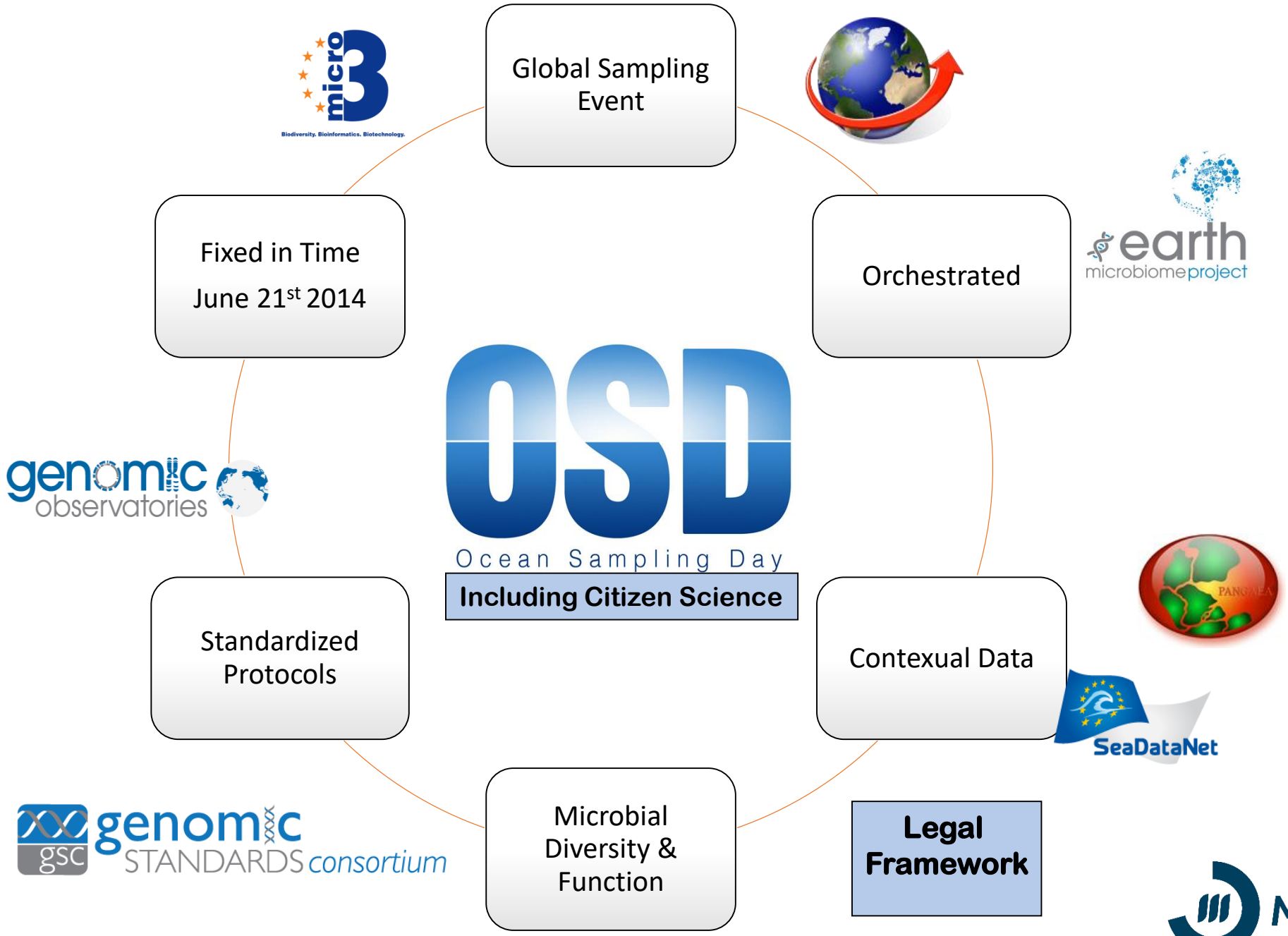


MARE centro de ciências do mar e do ambiente

Projecto MicroB3

Ocean Sampling Day

EMBL-EBI


Global Sampling Event
Orchestrated
Contexual Data
Legal Framework
Microbial Diversity & Function
Standardized Protocols
Fixed in Time
June 21st 2014
OSD
Ocean Sampling Day
Including Citizen Science
micro3
Biodiversity. Bioinformatics. Biotechnology.
earth microbiome project
genomic observatories
PANGAEA
SeaDataNet
gsc genomic STANDARDS consortium
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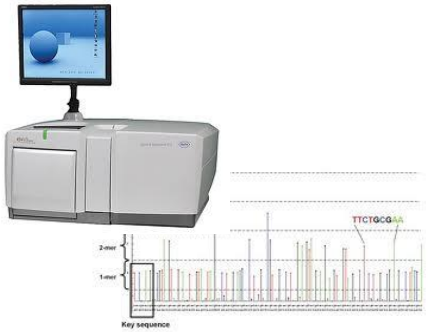
Sampling from environment

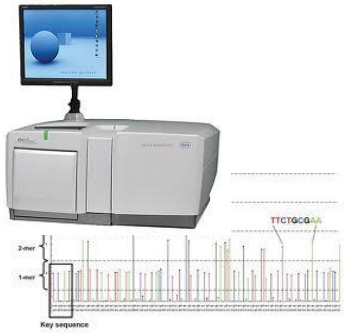
Filtering step

Extraction of DNA

Sequencing

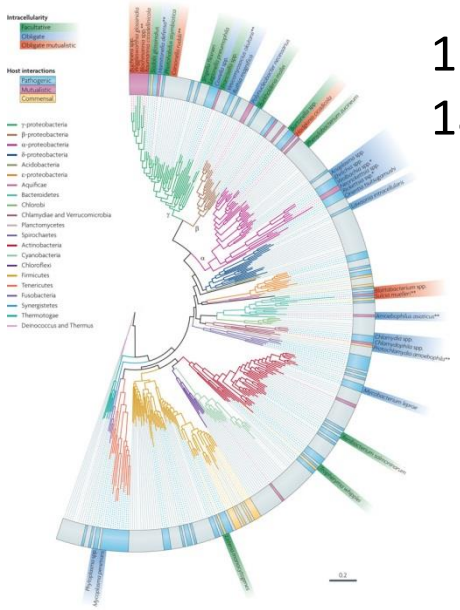


MARE centro de ciências do mar e do ambiente

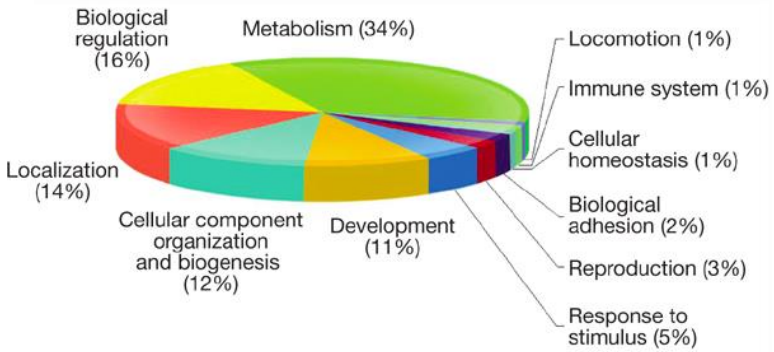


Quality control

Taxonomic analysis



16S rRNA
18S rRNA
ITS
etc



Functional analysis

Identification and characterisation of protein coding sequences

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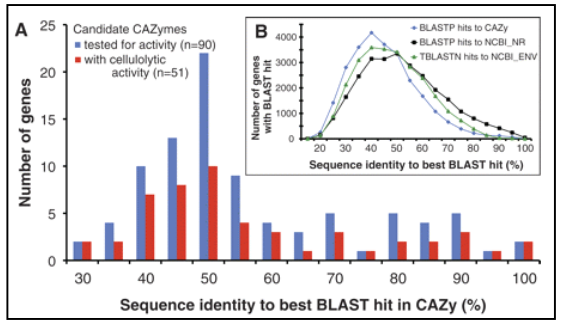
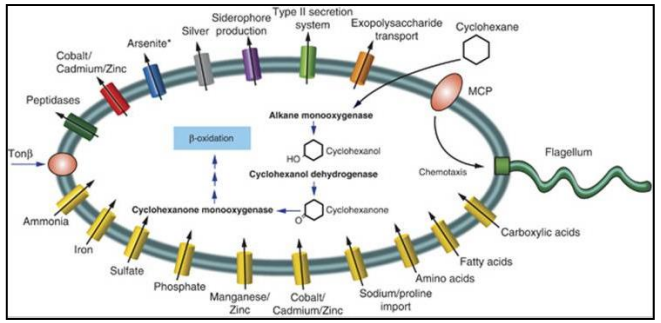
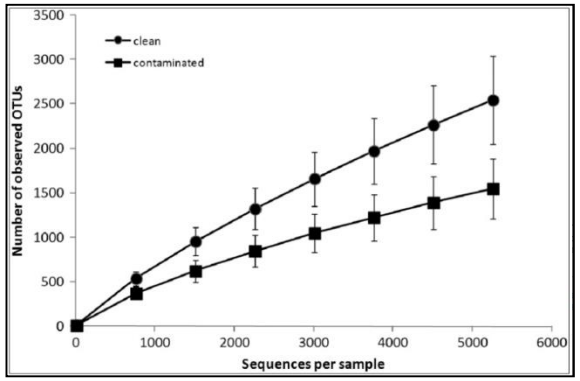
Applications of metagenomics



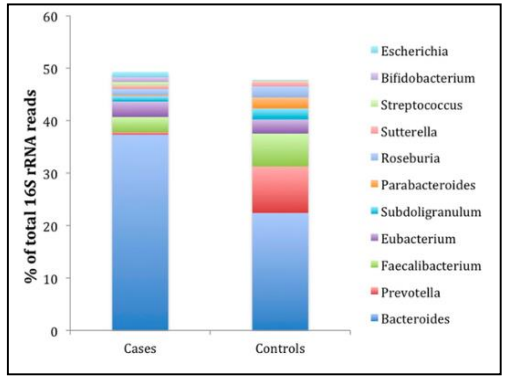
Bioprospecting for novel sequences



Reconstruction of community pathways



Diversity analysis



Comparing populations/ activities from different sites or states

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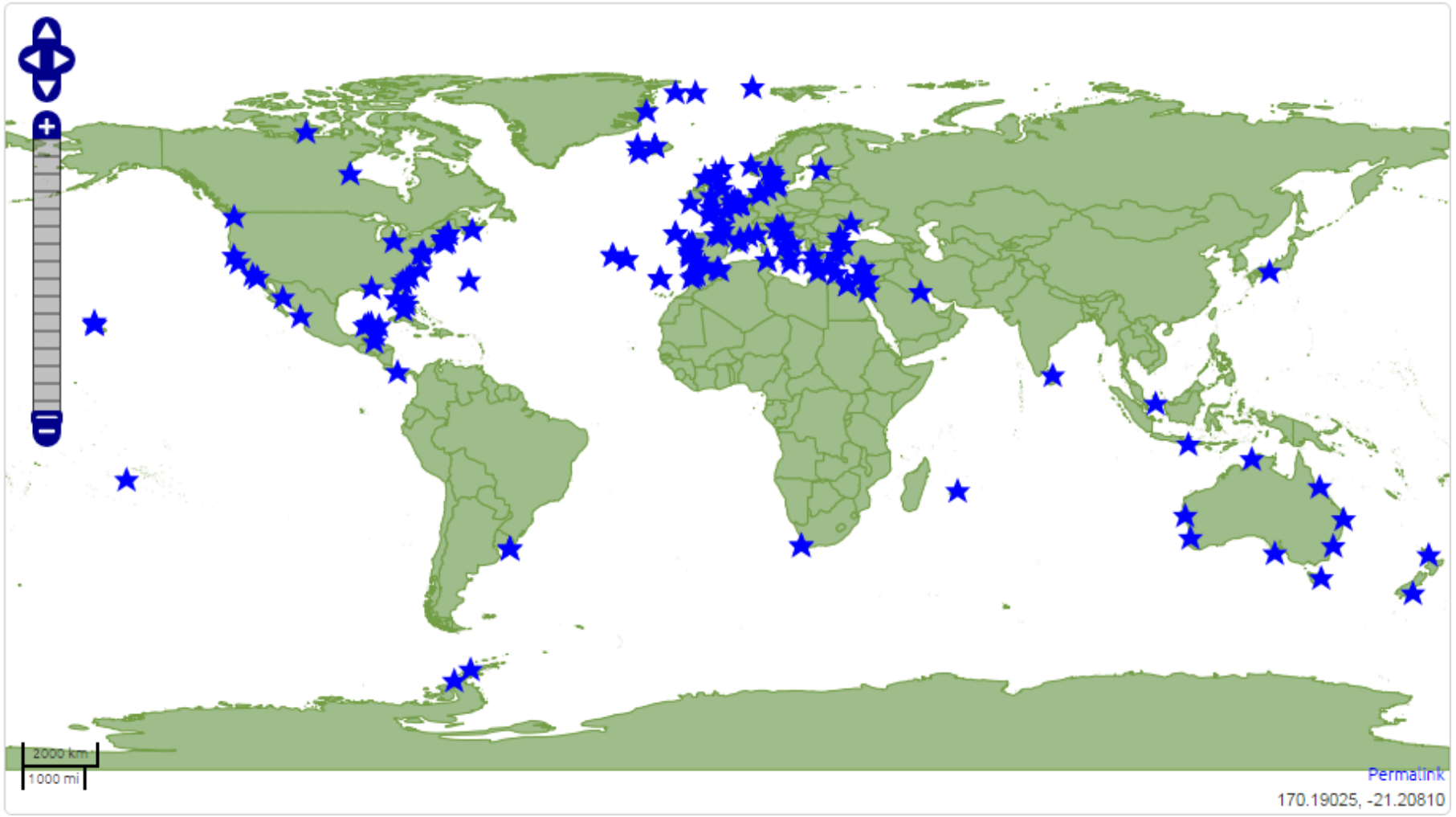

191 OSD Sites amostrados em simultâneo!

(2015) + 300 Sites MyOSD

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OSD 2014 Main Event: Geographical distribution

- **Participating OSD sites ranged from:**
  - subtropical waters in Hawaii to extreme environments such as the Fram Strait in the Arctic Ocean
- **All seven major oceanic divisions (Pacific-, Atlantic-, Indian-, Antarctic- and Arctic Ocean) and continents are covered:**
  - Majority in Europe (105) and North America (34)
  - Vast majority in Northern Hemisphere (171)
  - 37 sites in the Mediterranean and the Black Sea (OSD-Med Sub-network)
  - Best coastal coverage along the western coast of Portugal with 13 sites

> 1000 filtros Sterivex (2014)

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> 1,5 Toneladas
de gelo seco (2014)

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~150 h de trabalho

~ 325 extracções

(2014)

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22 616 729 sequências 16S

5 089 384 sequências 18S

(2014)

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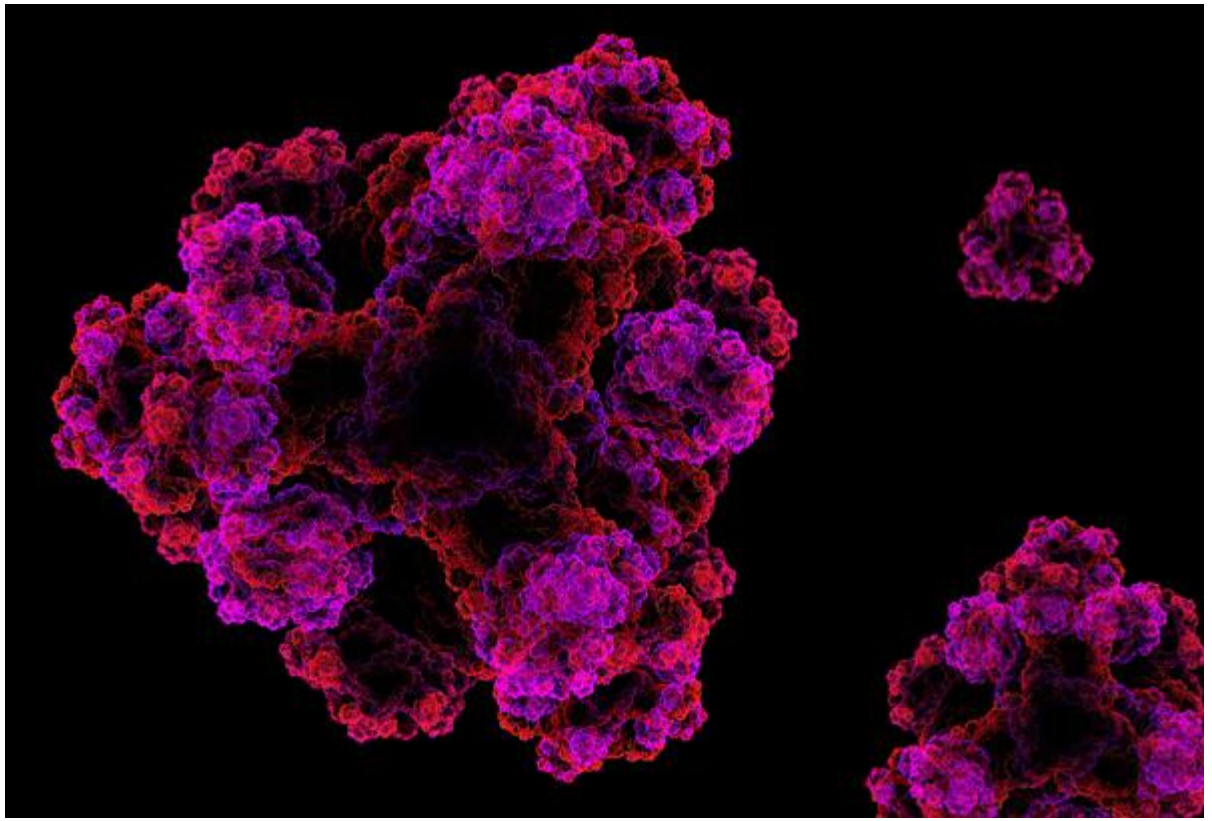
15 007 Proteínas Identificadas (2014)



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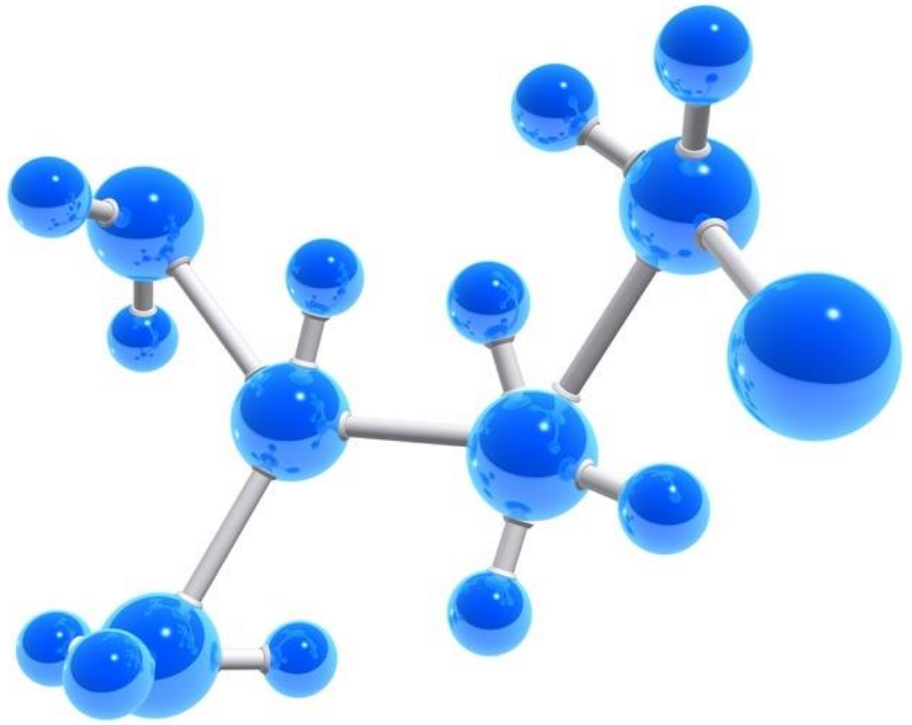
21 938 730 Péptidos Identificados (2014)



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EBI Metagenomics

http://www.ebi.ac.uk/metagenomics

A ***free*** resource for the analysis, archiving & browsing of metagenomic study data

Easy submission

Powerful analysis

Data archiving

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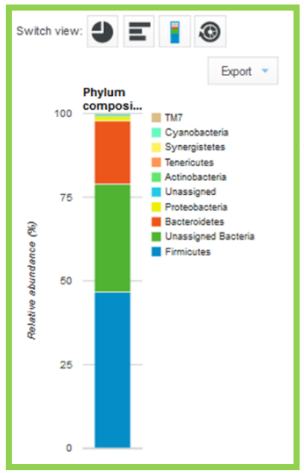
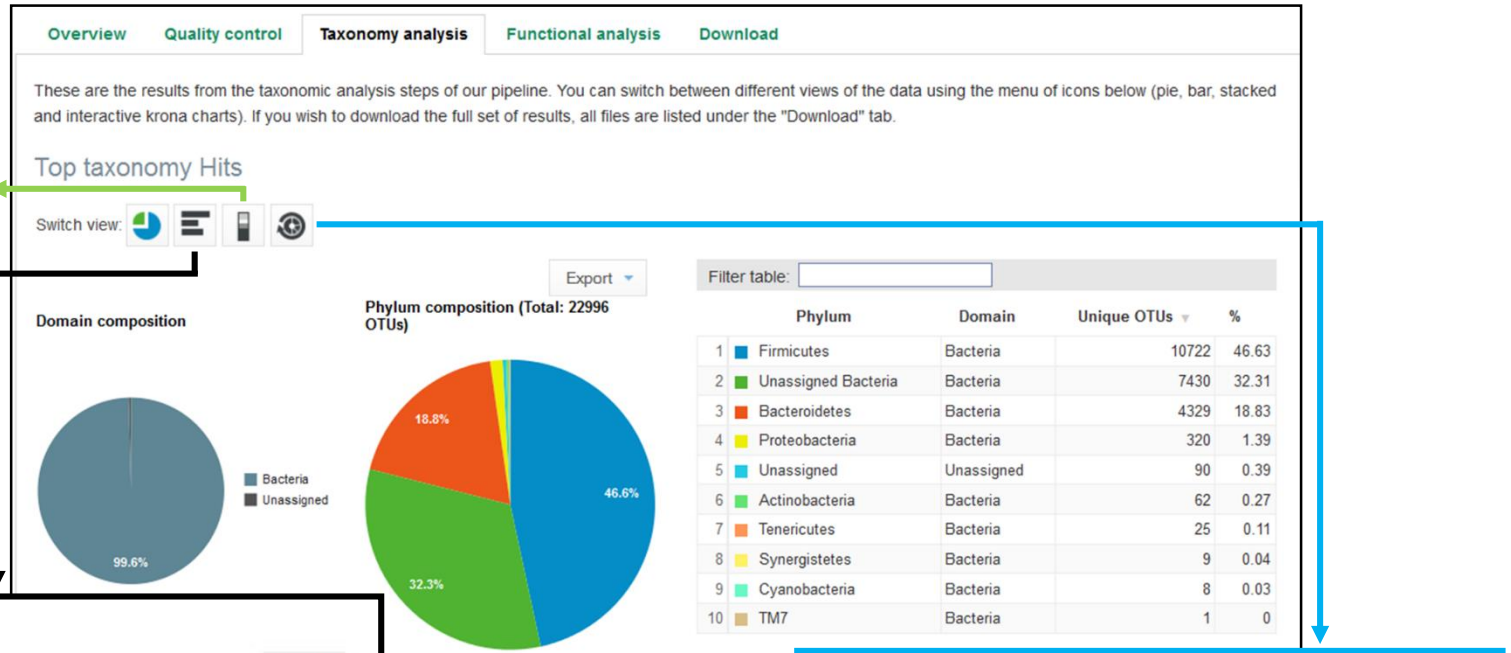
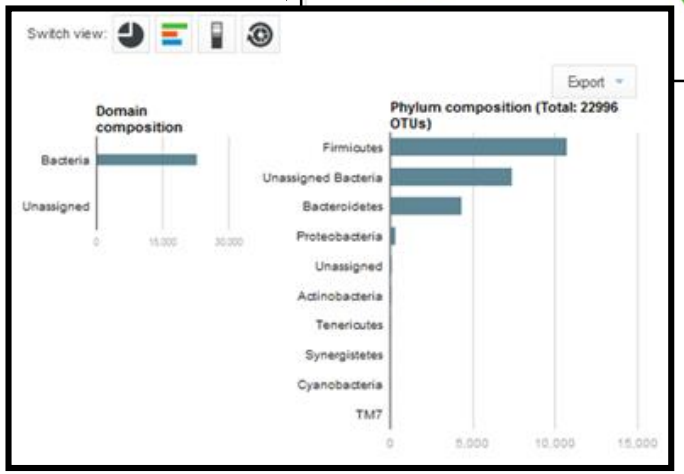
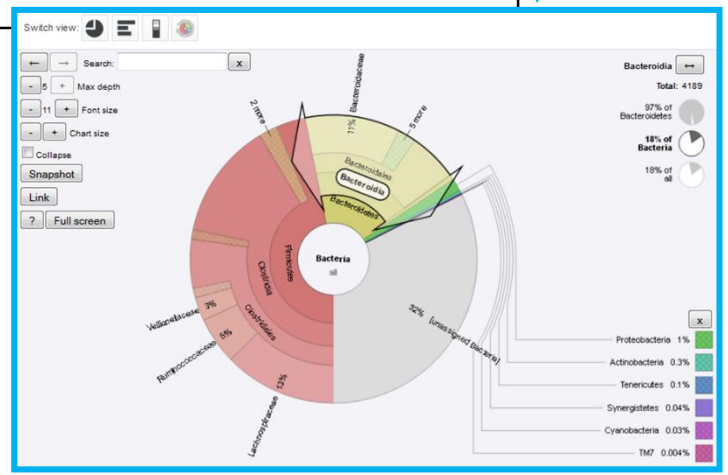
EBI Metagenomics taxonomy visualizations

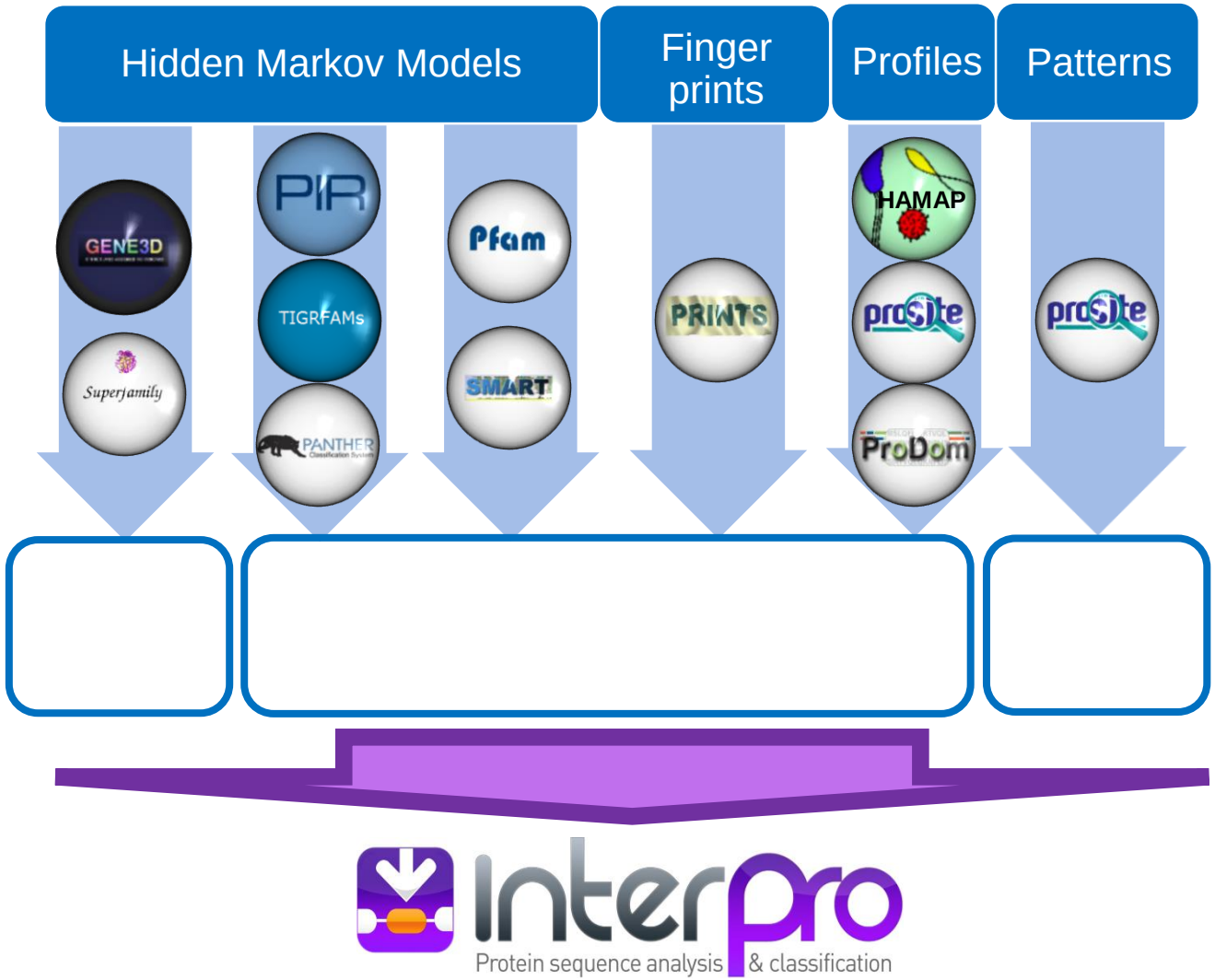








MARE centro de ciências do mar e do ambiente



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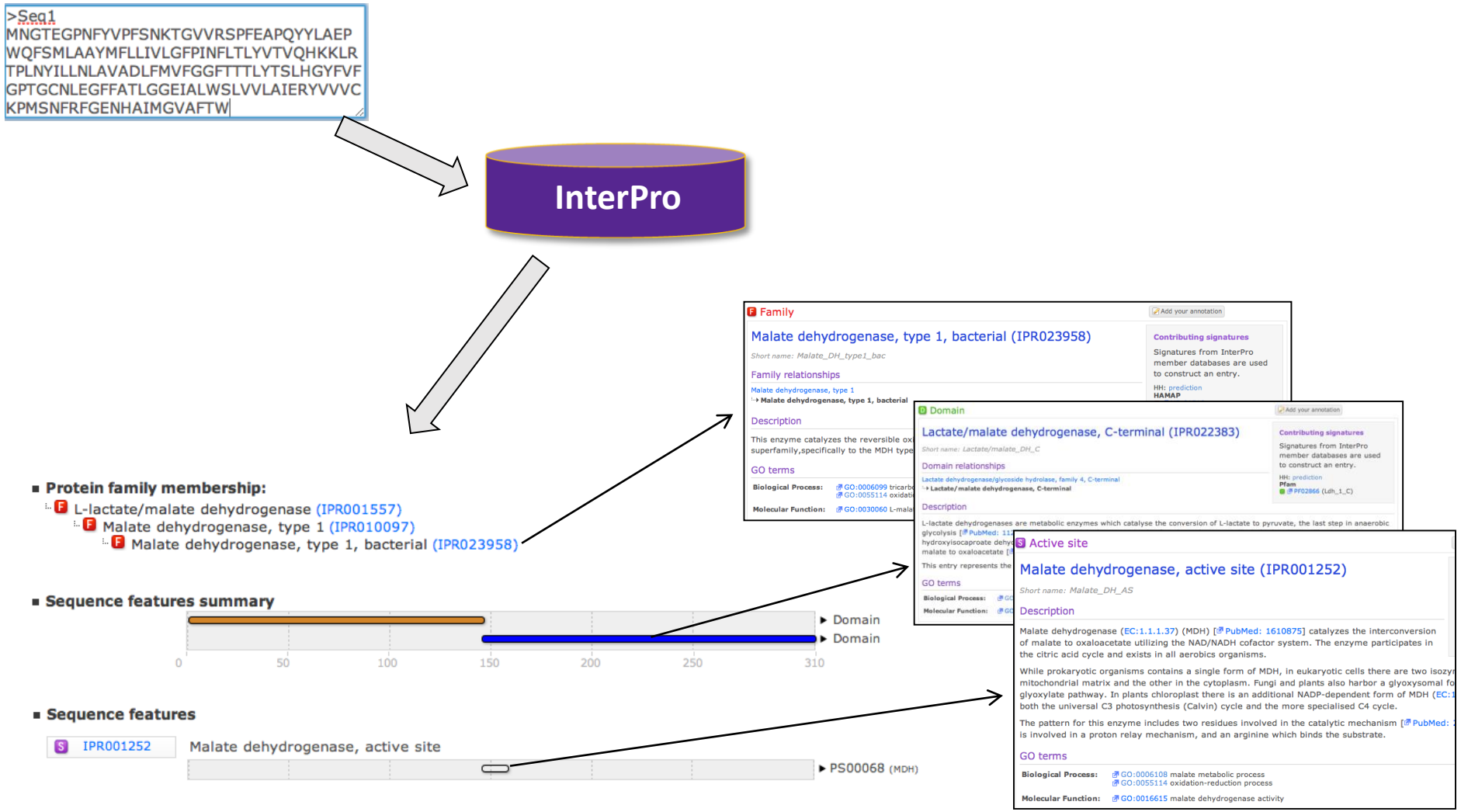
The aim of InterPro



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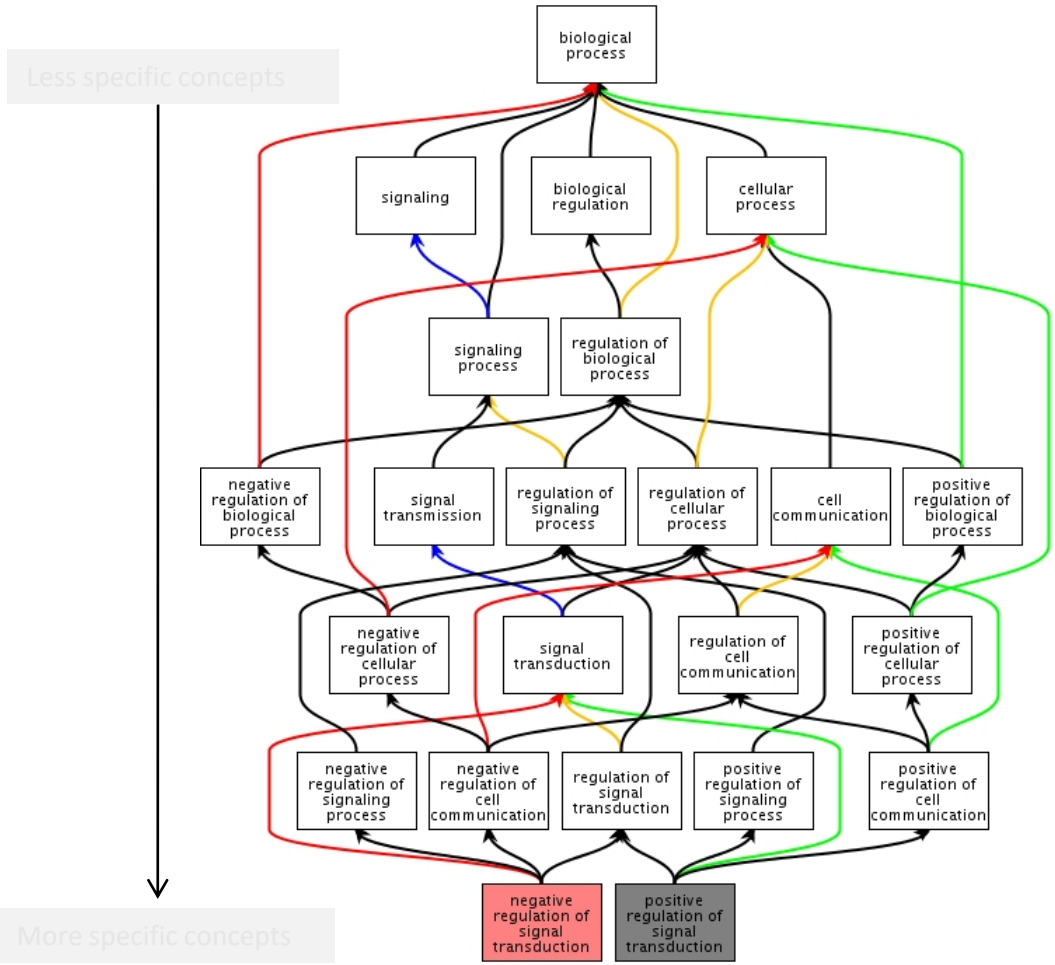
The Gene Ontology

- A way to capture biological knowledge in a written and computable form

- A set of concepts and their relationships to each other arranged as a hierarchy



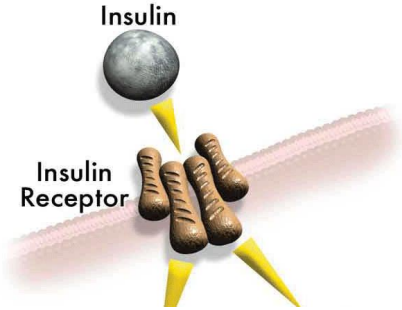
www.ebi.ac.uk/QuickGO

MARE centro de ciências do mar e do ambiente

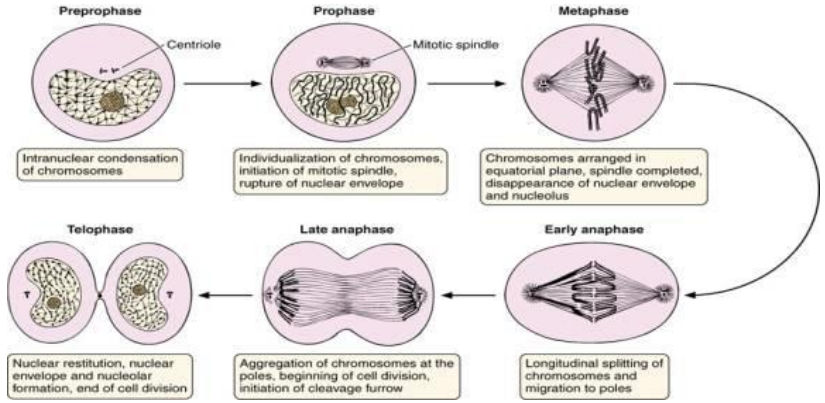
The Concepts in GO

1. Molecular Function

An elemental activity or task or job



- protein kinase activity
- insulin receptor activity



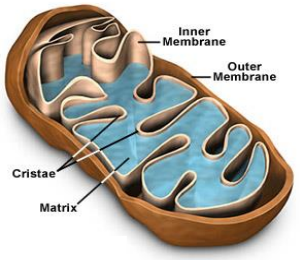
2. Biological Process

A commonly recognised series of events

- cell division

3. Cellular Component

Where a gene product is located



- mitochondrion
- mitochondrial matrix
- mitochondrial inner membrane

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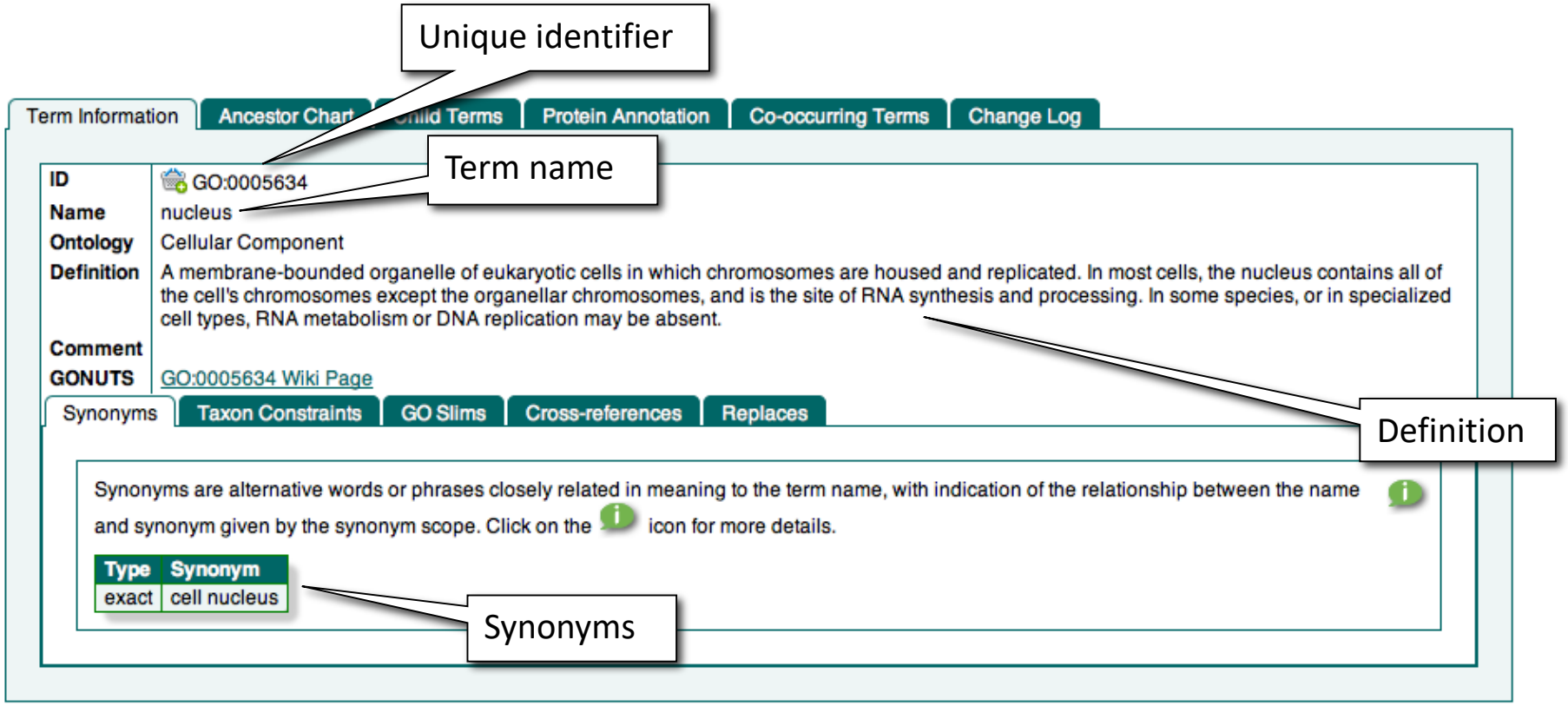
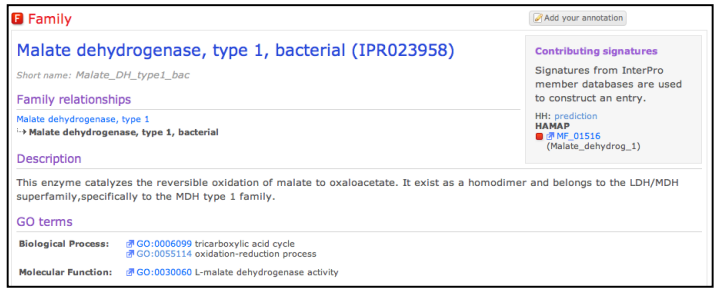
Anatomy of a GO term

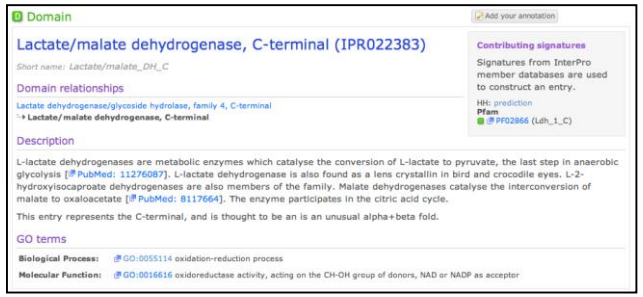


MARE centro de ciências do mar e do ambiente

InterPro2GO

```
>Seq1
MNGTEGPNFYVPFSNKTGVVRSPFEAPQYYLAEP
WQFSMLAAYMFLLIVLGFPINFLTLYVTVQHKKLR
TPLNYILLNLAVADLFMVFGGFTTTLYTSLHGYFVF
GPTGCNLEGFFATLGGEIALWSLVVLAIERYVVVC
KPMSNFRFGENHAIMGVAFTW
```





Biological Process

GO:0055114 oxidation-reduction process
GO:0006099 tricarboxylic acid cycle

Molecular Function

GO:0016616 oxidoreductase activity, acting on the CH-OH group of donors, NAD or NADP as acceptor
GO:0030060 L-malate dehydrogenase activity

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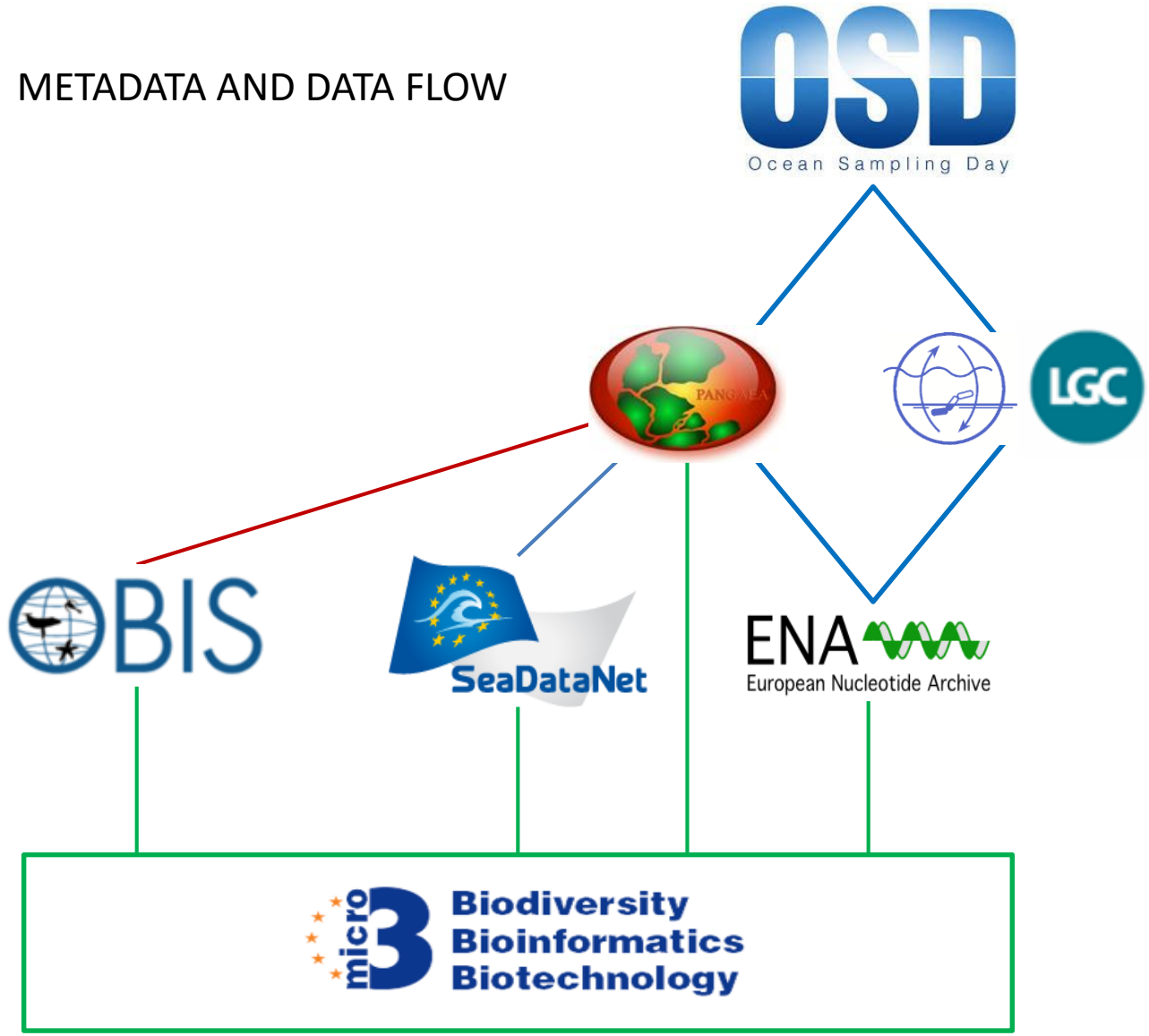
METADATA AND DATA FLOW



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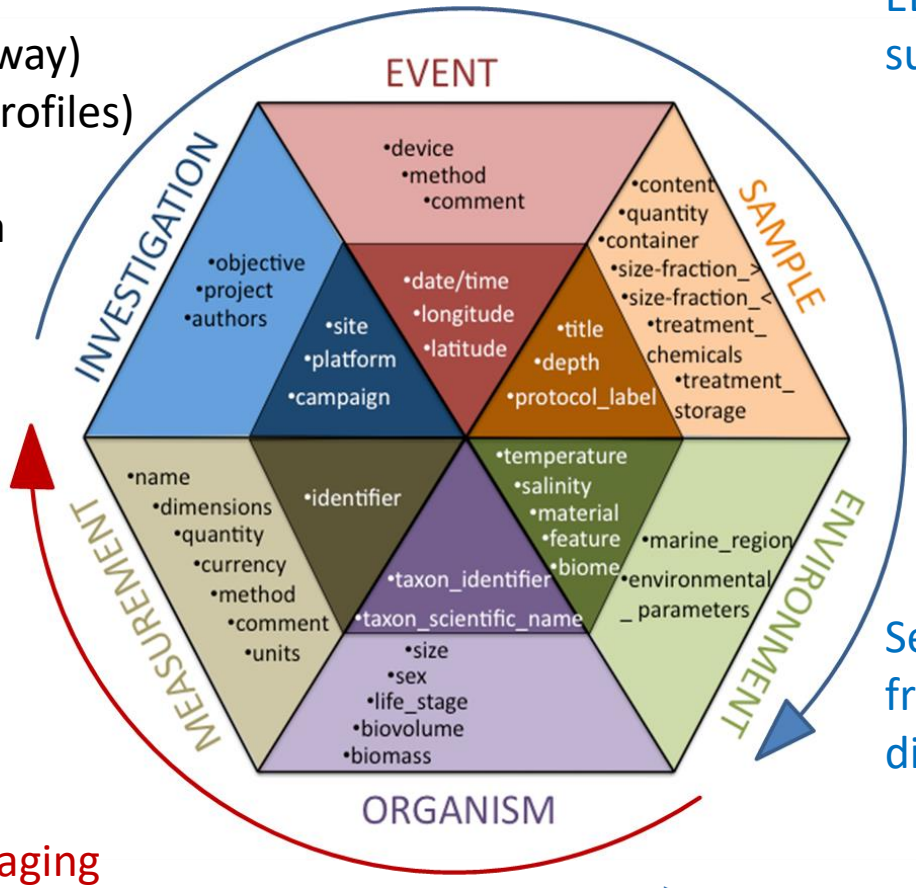
Environmental data published at PANGAEA:

- Metadata
- Sensors (underway)
- Sensors (vert. profiles)
- Water samples
- Contextual data
- more to come



Contextual environmental data disseminated to EBI/ENA for each sequence submitted by Genoscope:

- Sample metadata
- Temperature
- Salinity
- Oxygen
- Nutrients
- Chlorophyll

Selected environmental data from all sampling sites disseminated to SeaDataNet:

- Temperature
- Salinity
- Oxygen
- Nutrients
- Chlorophyll

Taxonomic and imaging data to be published at PANGAEA and disseminated to OBIS

Ten Hoopen, et al. M2B3, Standards in Genomic Science (ACCEPTED!!!)

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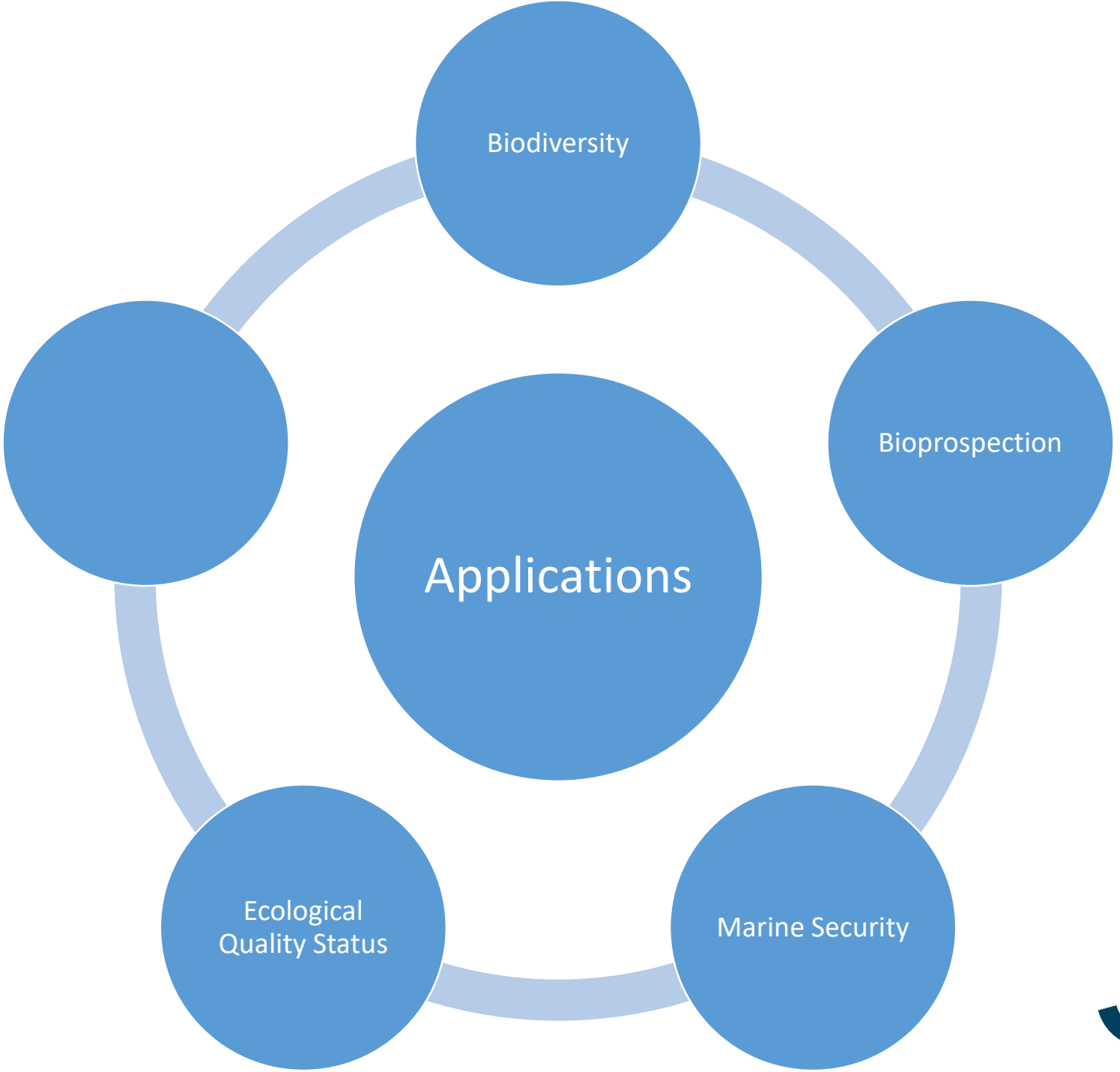

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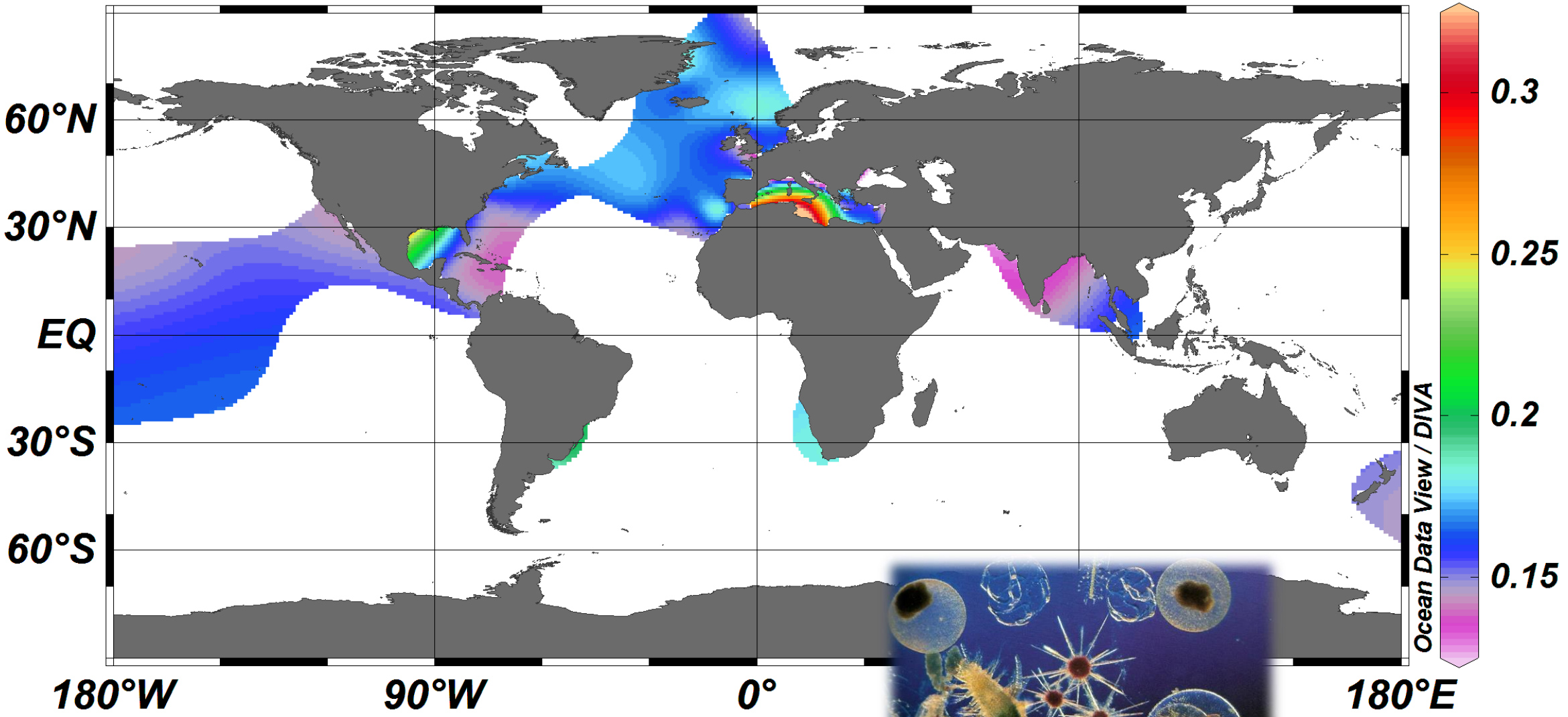
Diversity Index 18S



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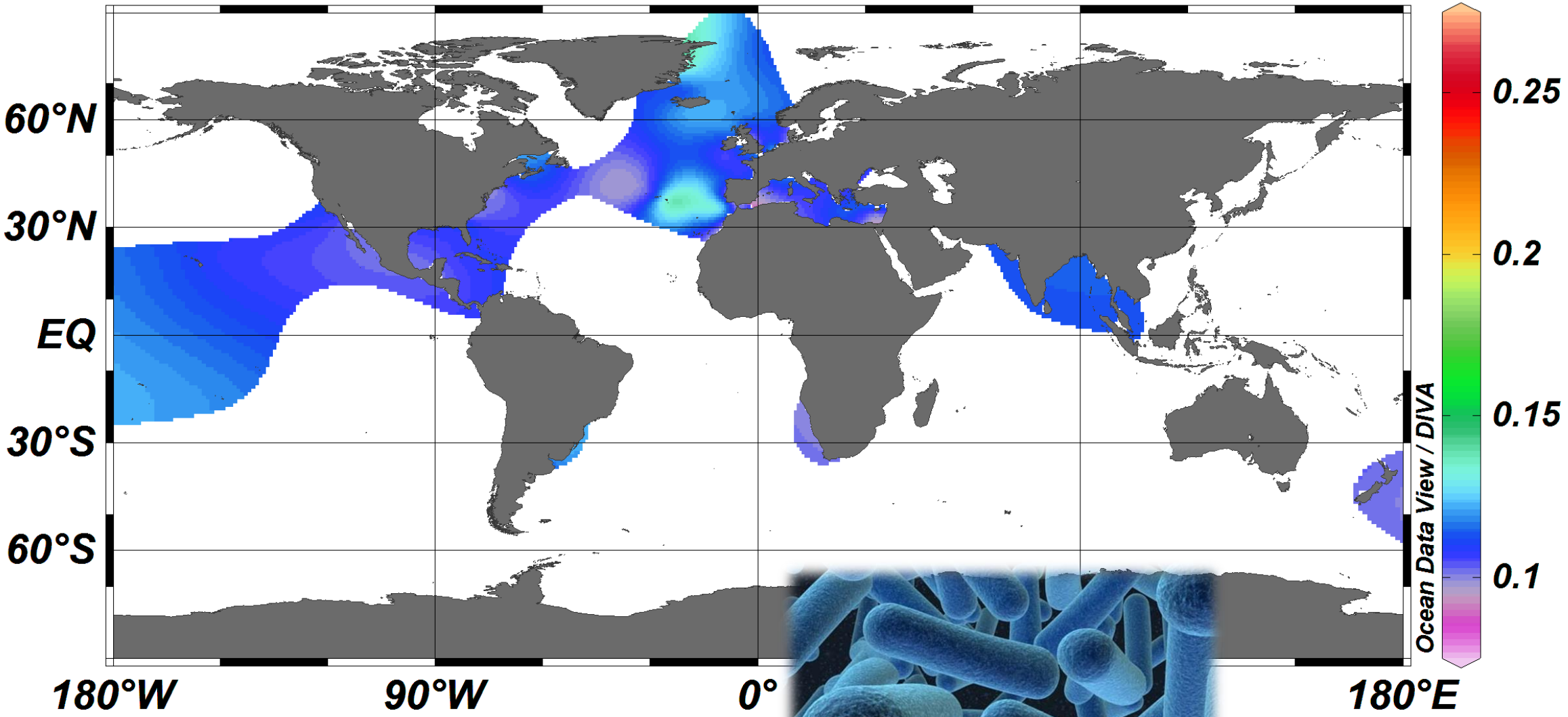
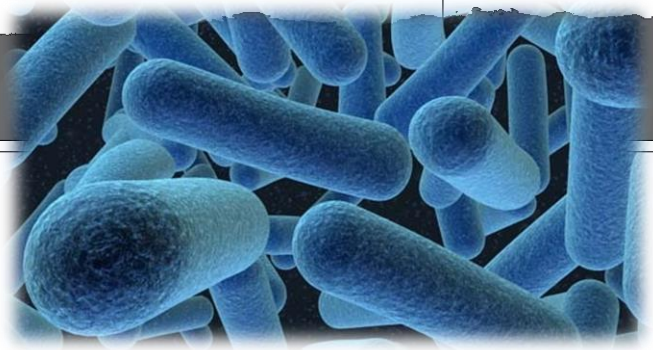
Diversity Index 16S





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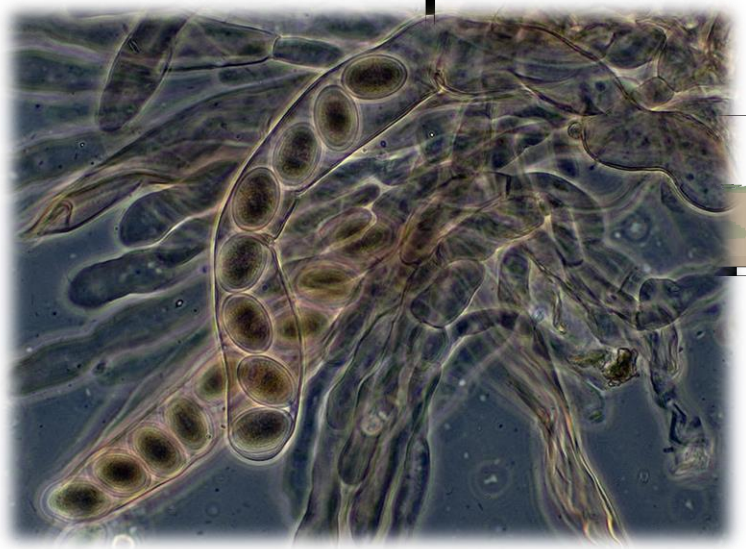
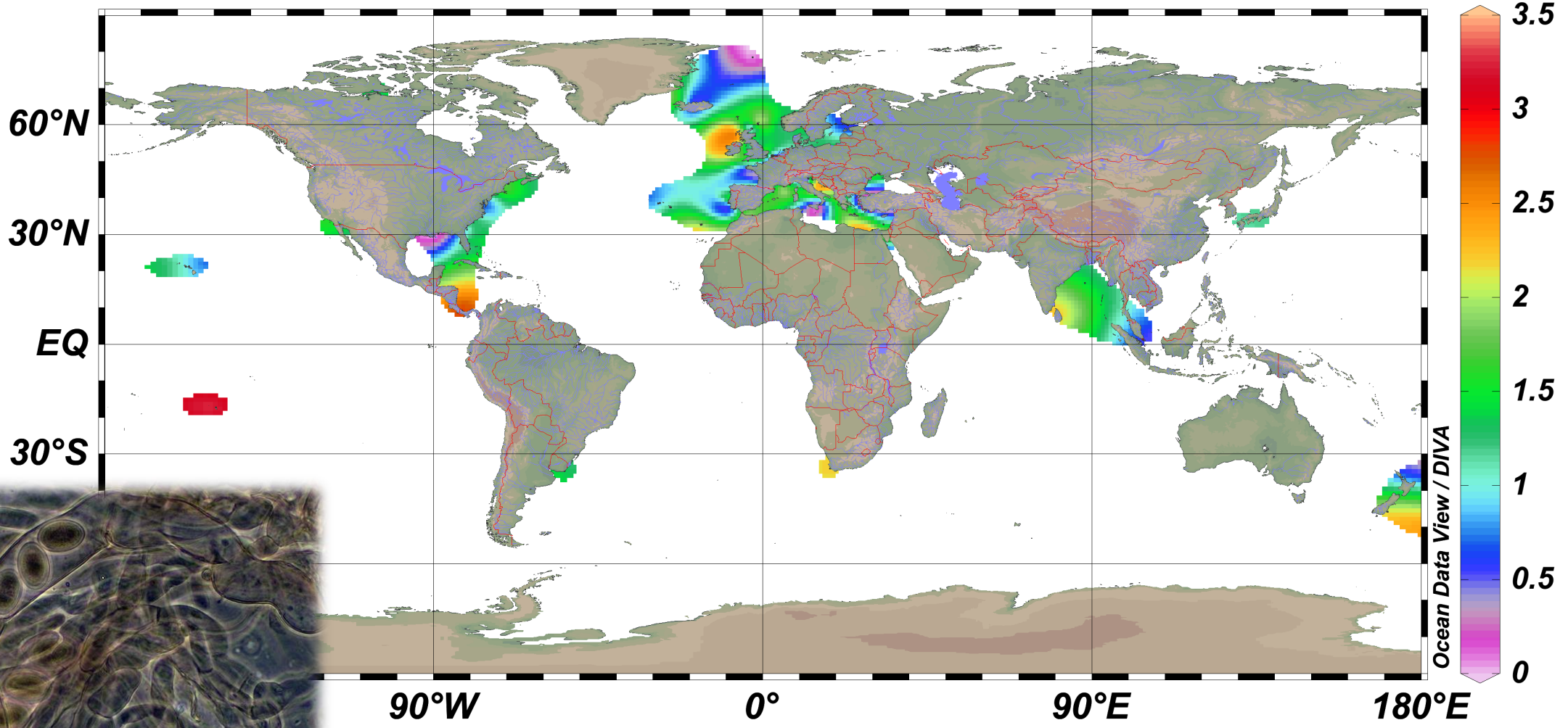
Fungi Shannon Diversity





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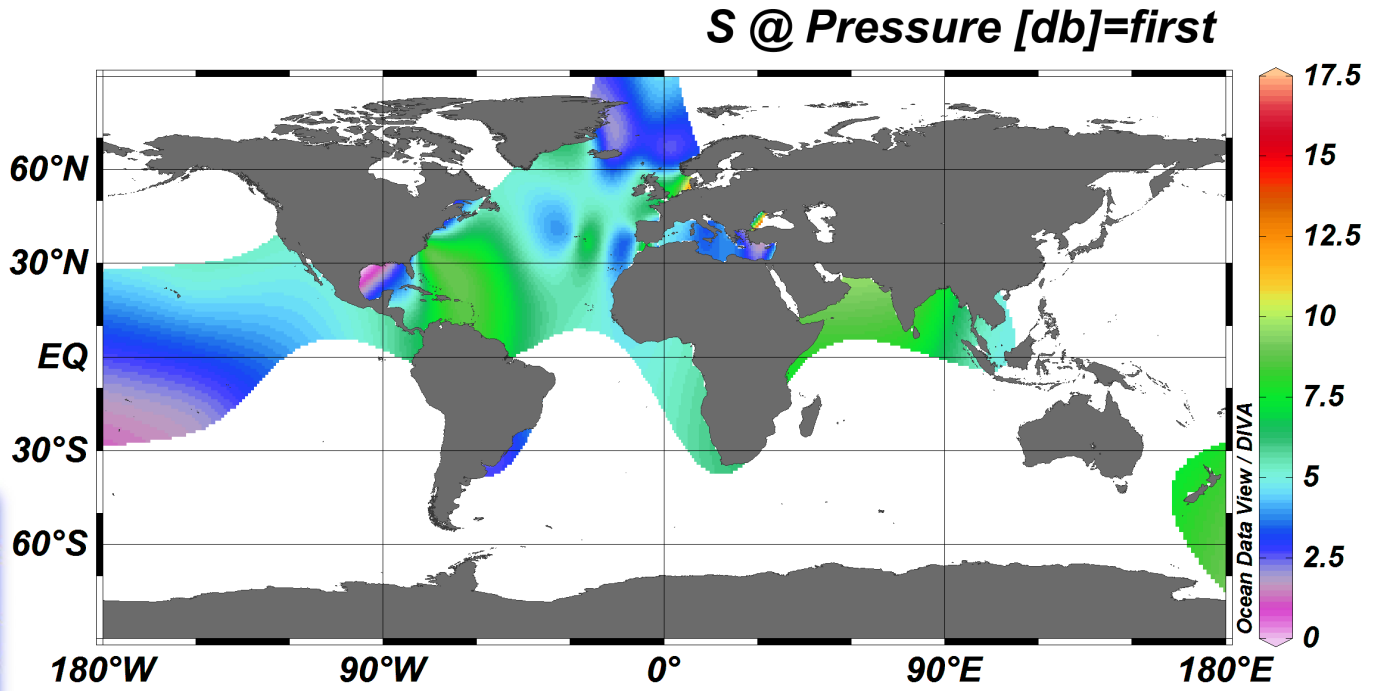
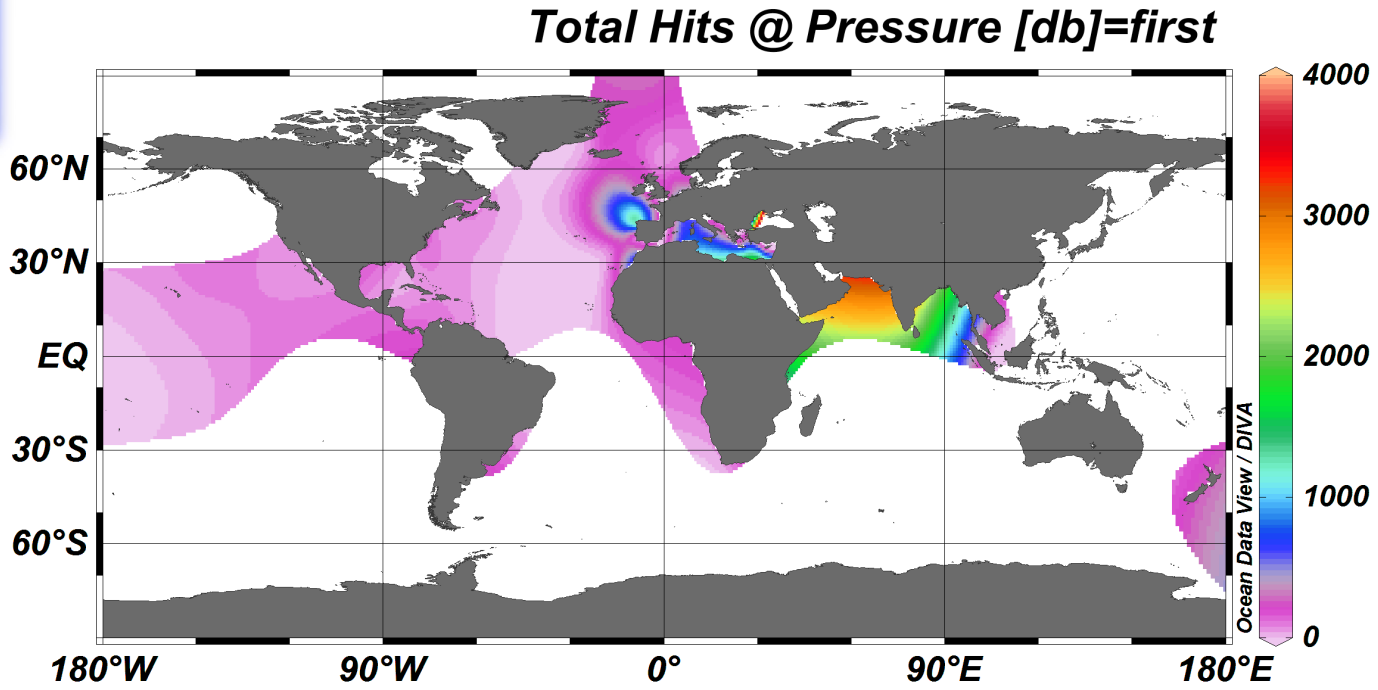
Cnidaria





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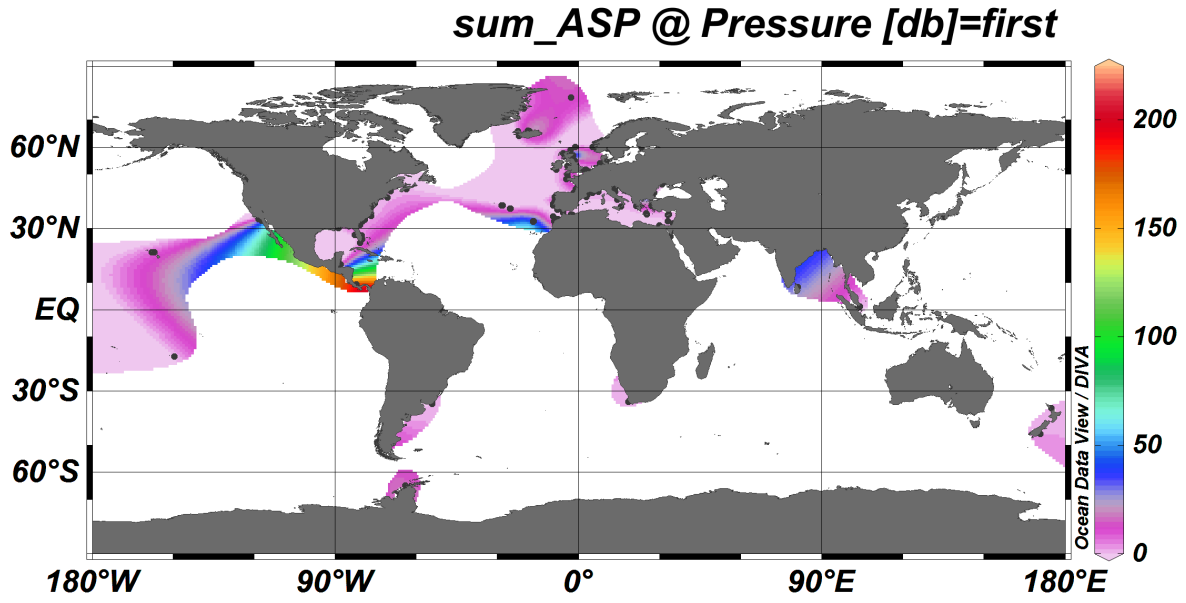

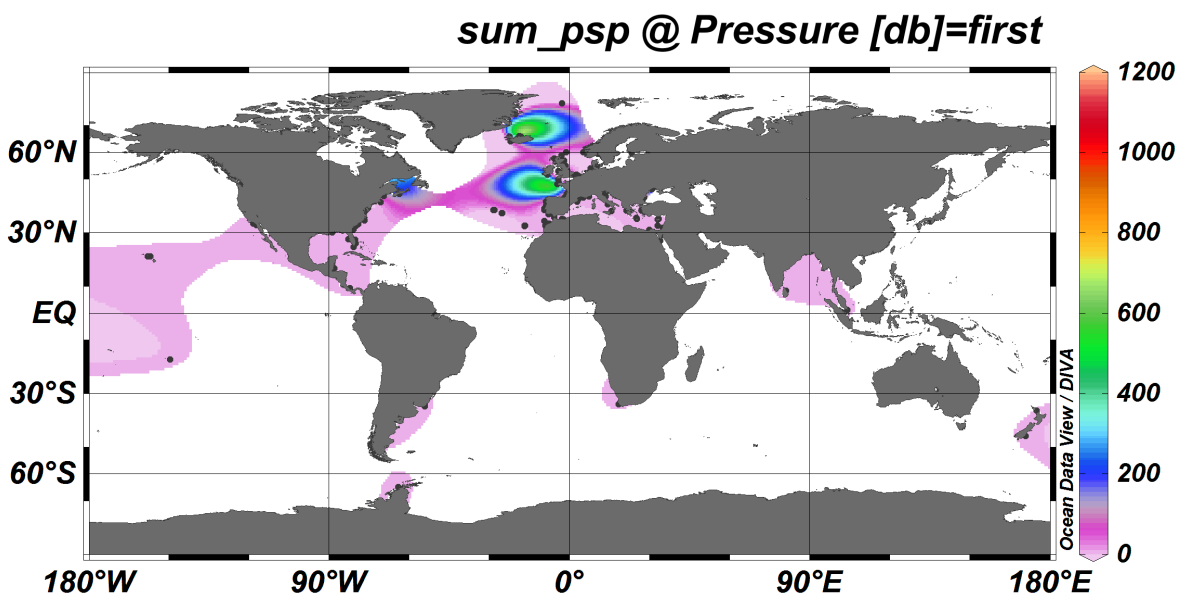

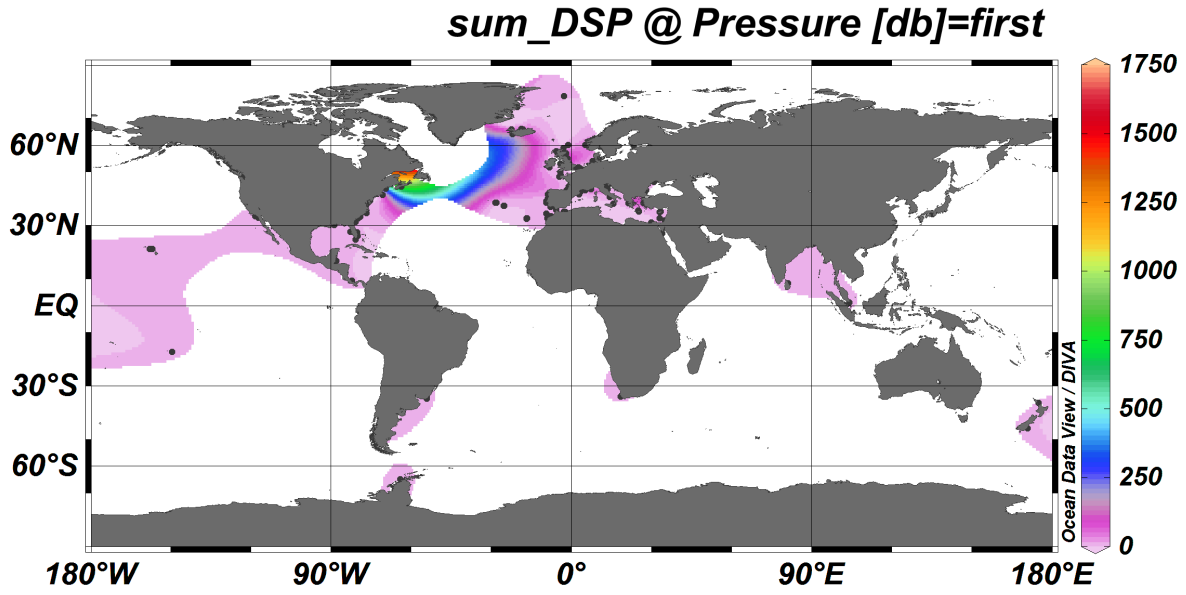

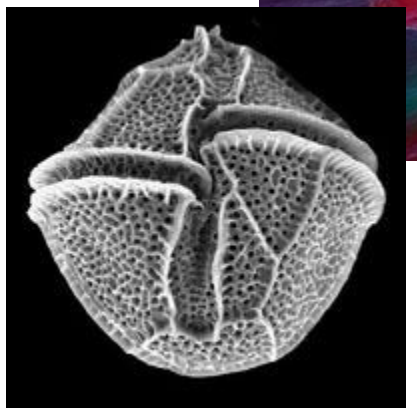

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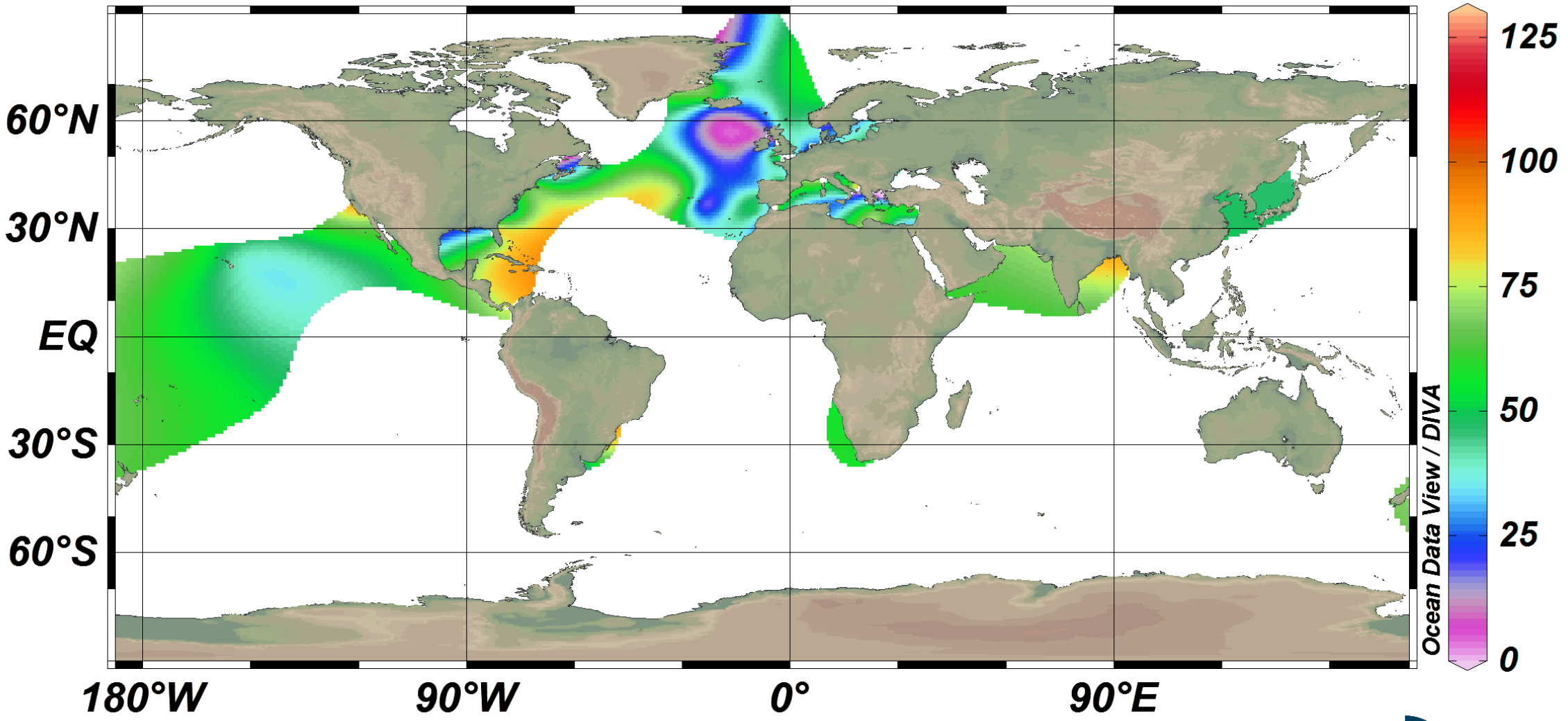
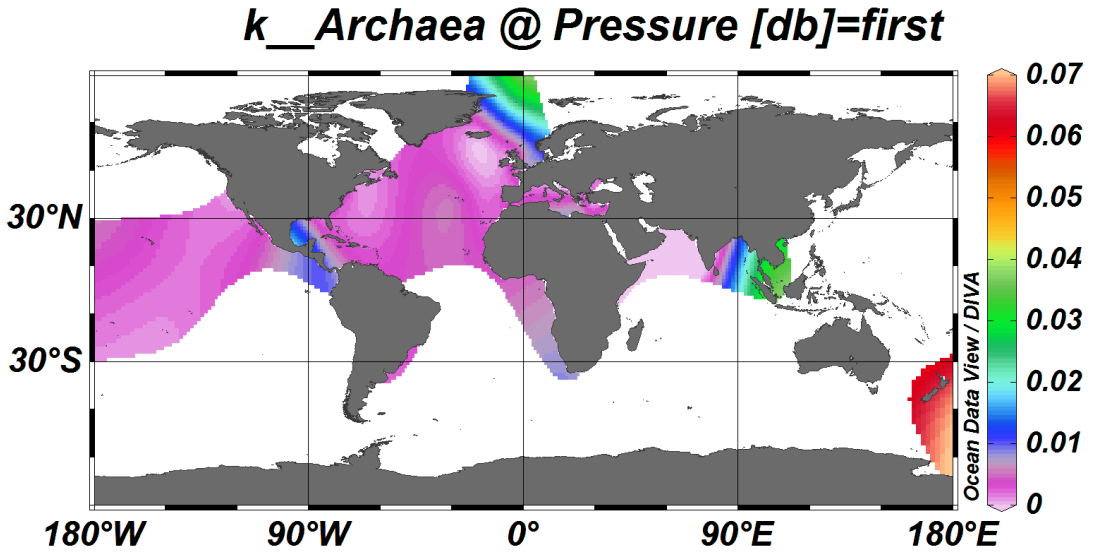
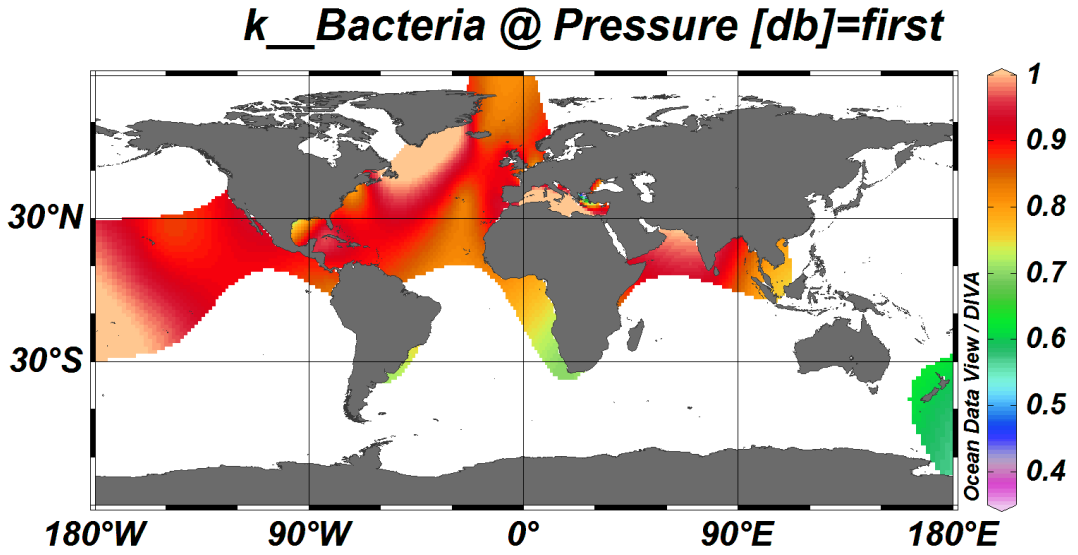
Small_multidrug_resistance @ Pressure [db]=first

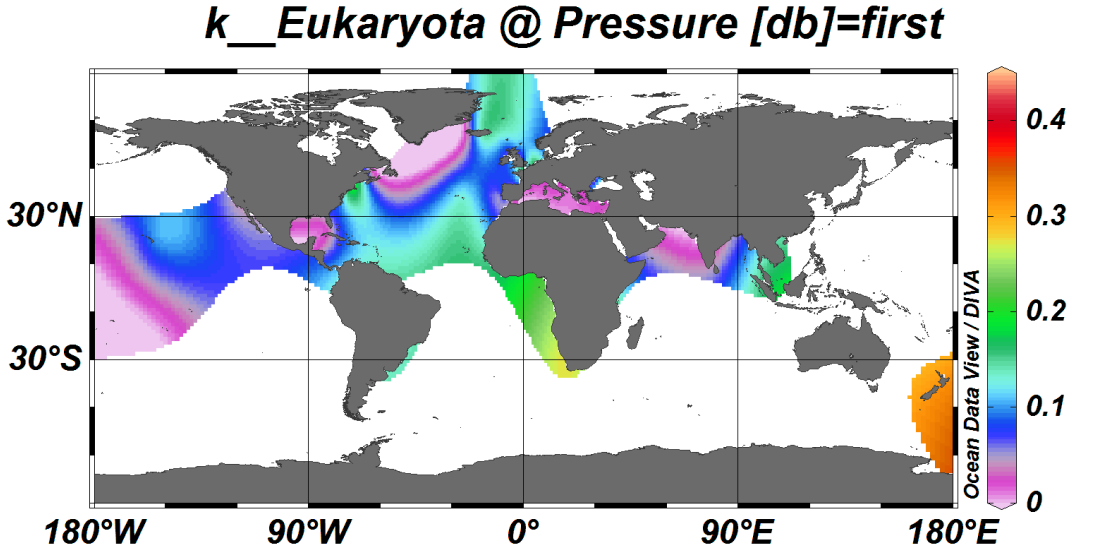


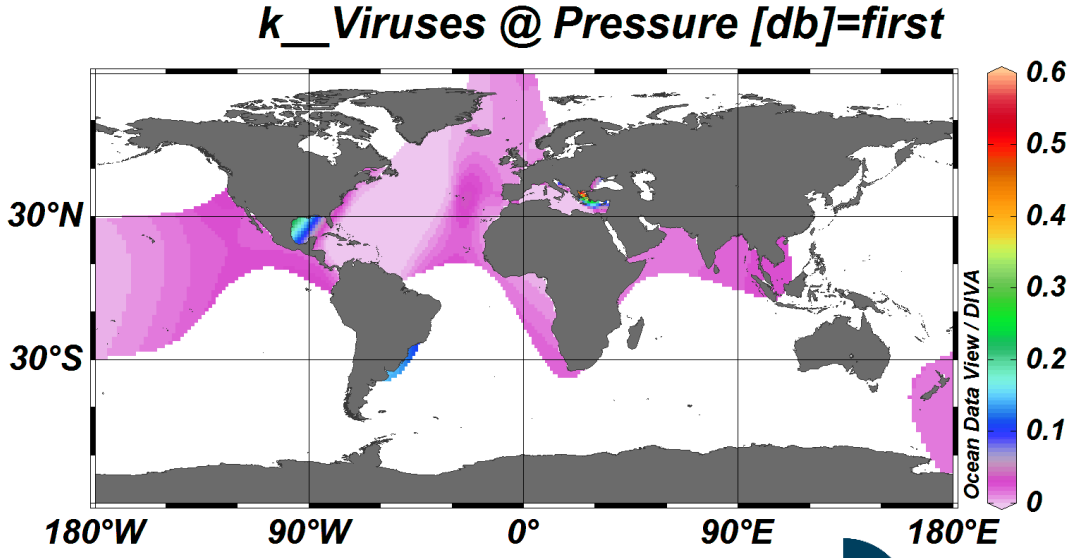
MARE centro de ciências do mar e do ambiente

UniPept





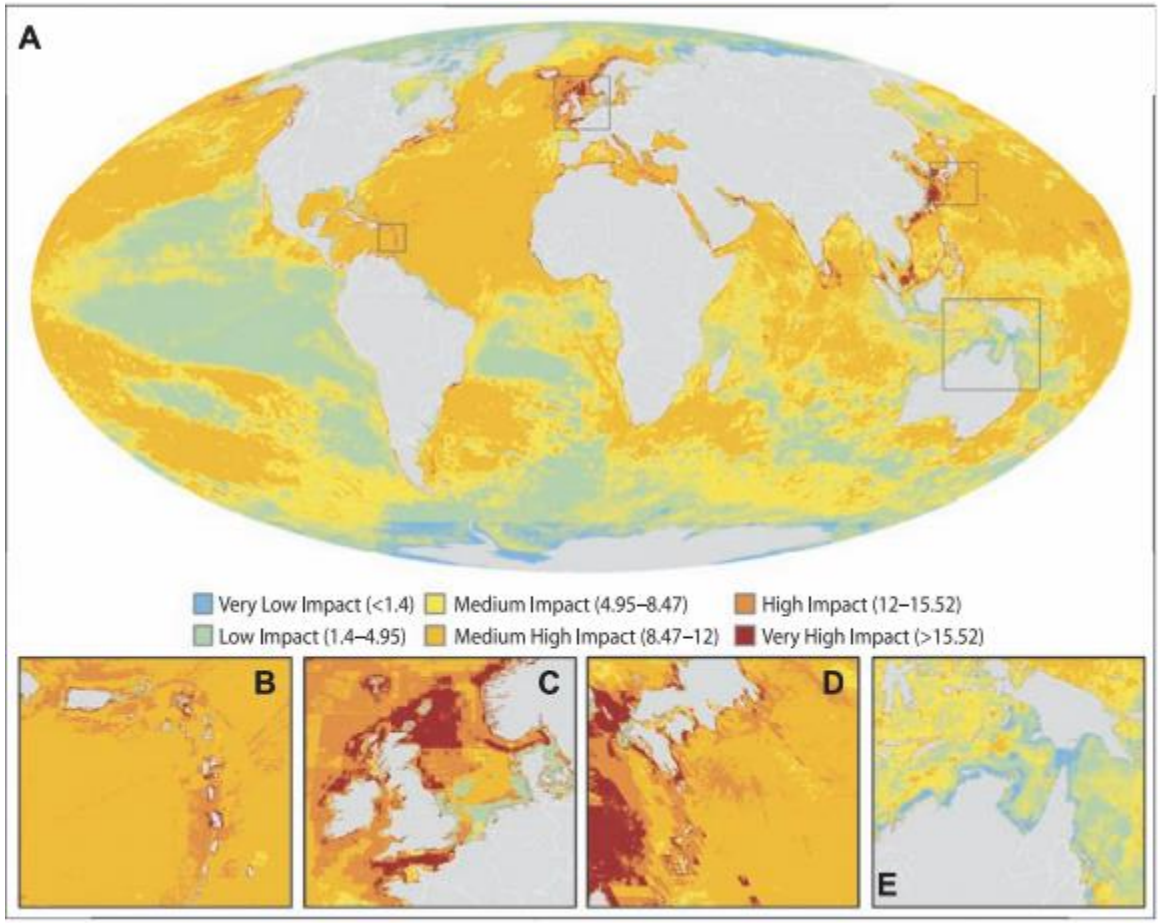




MARE centro de ciências do mar e do ambiente

A Global Map of Human Impact on Marine Ecosystems

Benjamin S. Halpern,[1]‡ Shaun Walbridge,[1]* Kimberly A. Selkoe,[1,2]*‡ Carrie V. Kappel,[1] Fiorenza Micheli,[3] Caterina D'Agrosa,[4]† John F. Bruno,[5] Kenneth S. Casey,[6] Colin Ebert,[1] Helen E. Fox,[7] Rod Fujita,[8] Dennis Heinemann,[9] Hunter S. Lenihan,[10] Elizabeth M. P. Madin,[11] Matthew T. Perry,[1] Elizabeth R. Selig,[6,12] Mark Spalding,[13] Robert Steneck,[14] Reg Watson[15]



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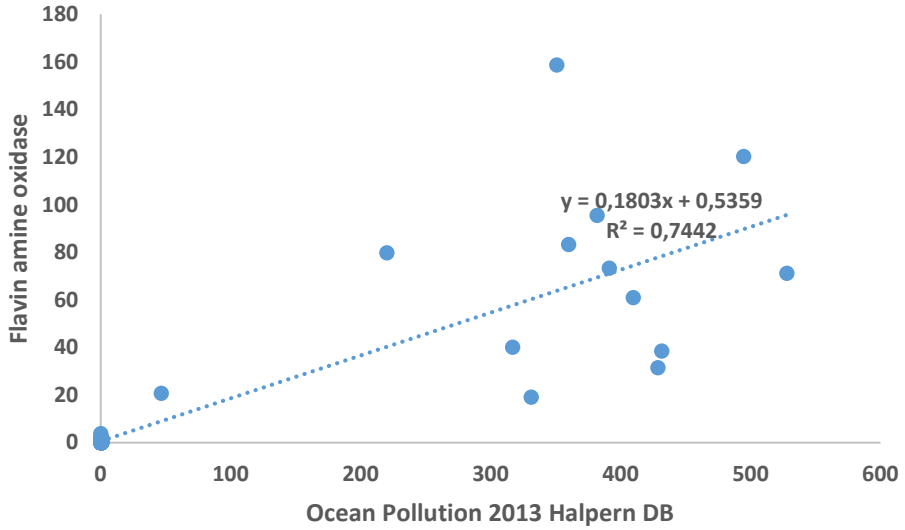

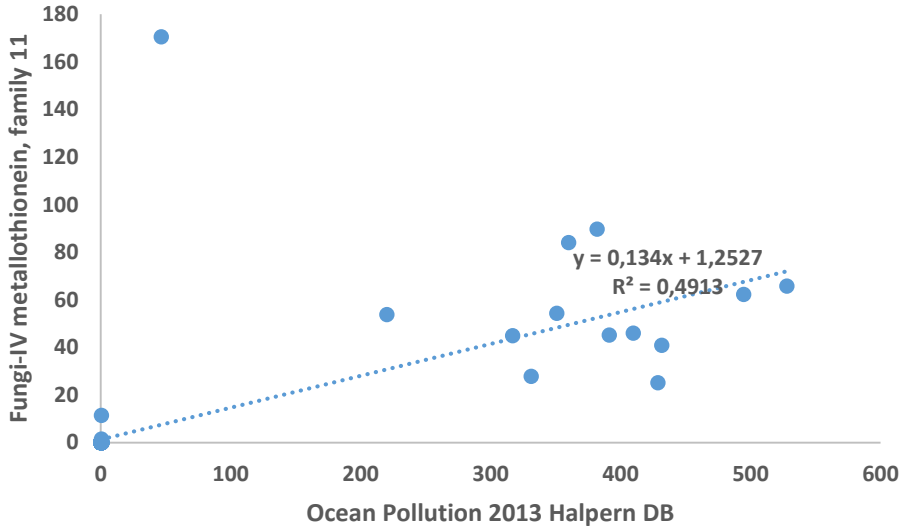

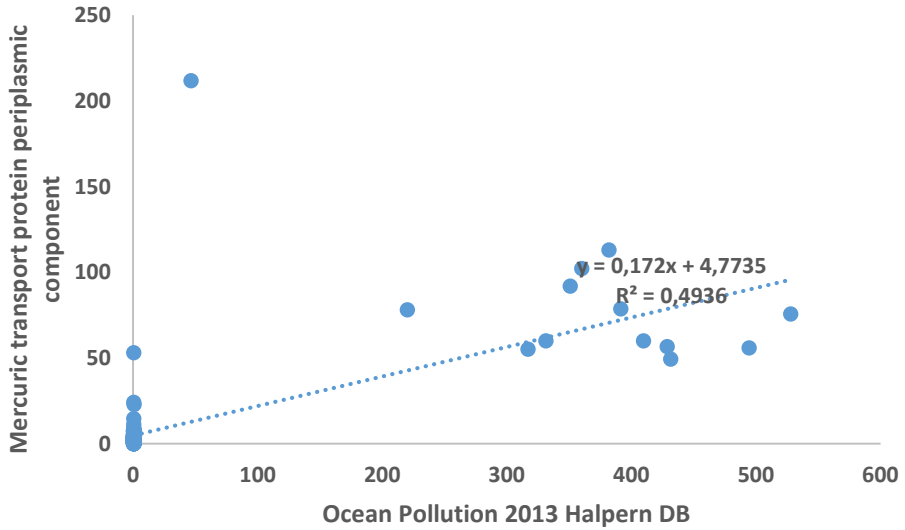

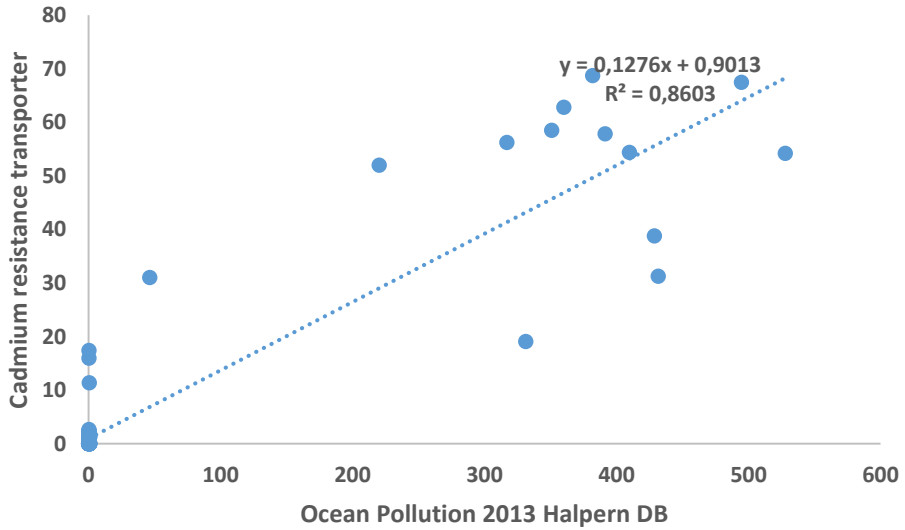

MARE centro de ciências do mar e do ambiente