Present status of Mediterranean marine biodiversity and potential anthropogenic threat

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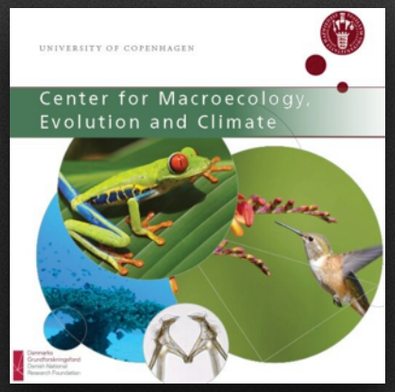
GLOBAL CHALLENGES:
ACHIEVING SUSTAINABILITY

Copenhagen, october 2014



OBSERVATOIRE OCEANOLOGIQUE DE VILLEFRANCHE/MER

MERMeX

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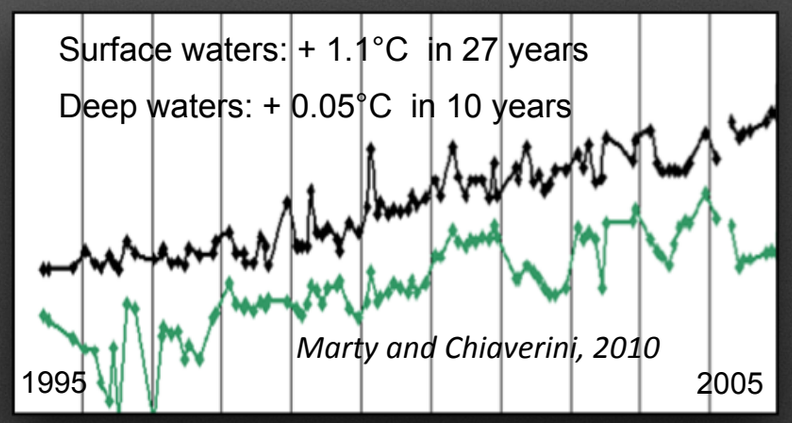
Context of the study

- A complex coupled system (Mermex group, 2011)

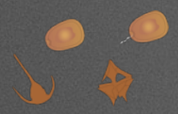
- A biotope in mutation:
. Climate change
. Increasing anthropogenic pressures



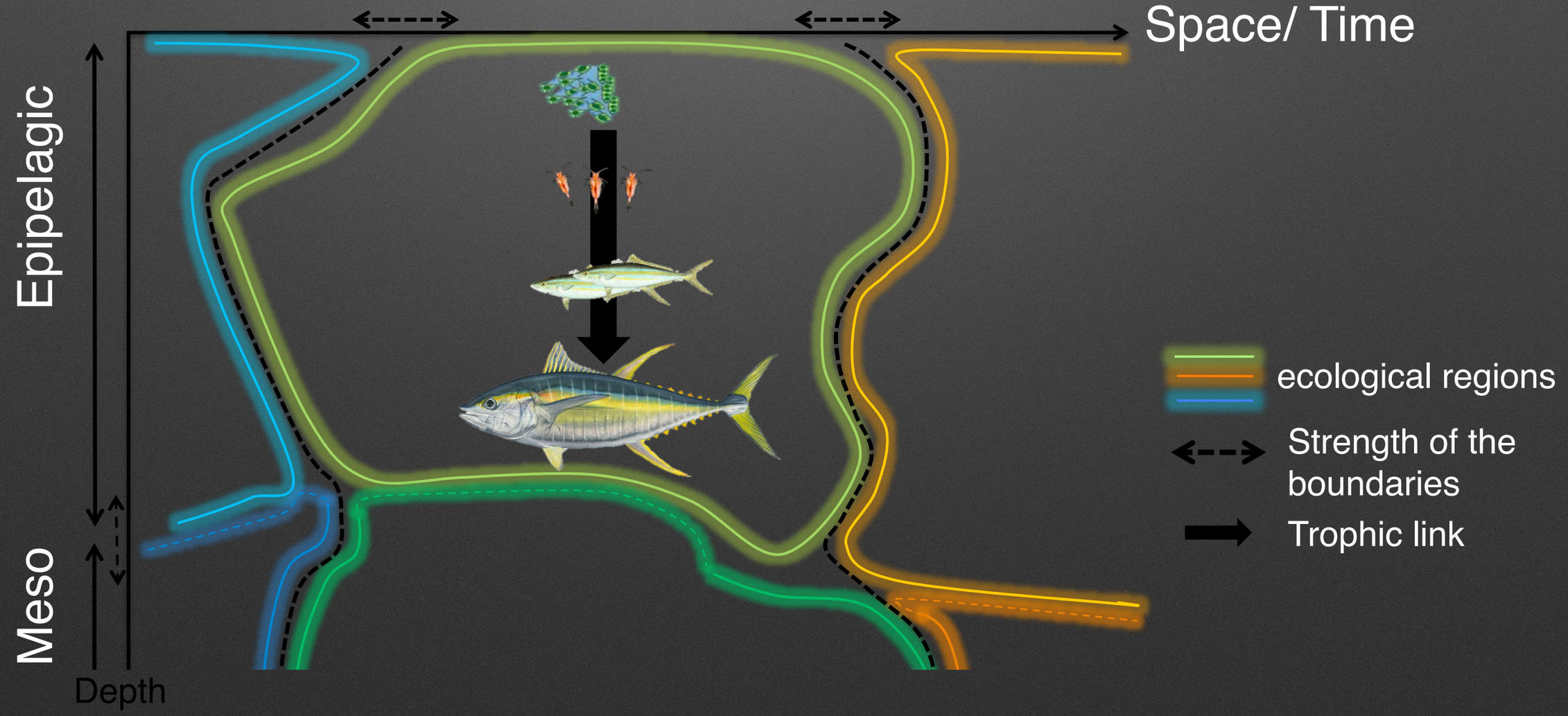
- An important endemism of marine species and emblematic species already **endangered**

Objectives

1) **Evaluate the ecosystems characteristics of the Mediterranean sea**

+ from  **to** 

+ Quantify the biodiversity gradient and special features

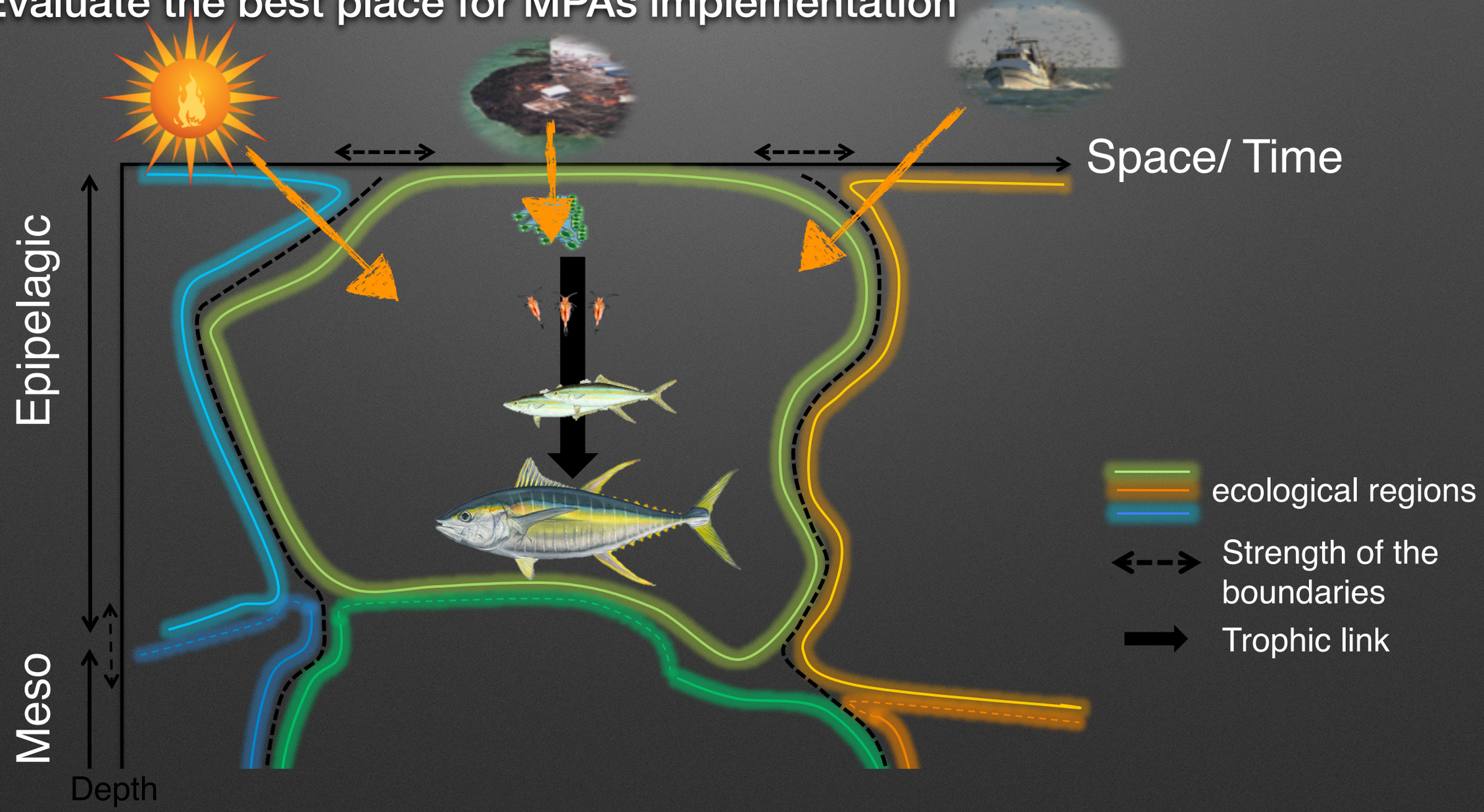


Objectives

2) Link anthropogenic pressure with biodiversity for an optimal management

+ Quantify the mean anthropogenic pressures and look at the relation with biodiversity

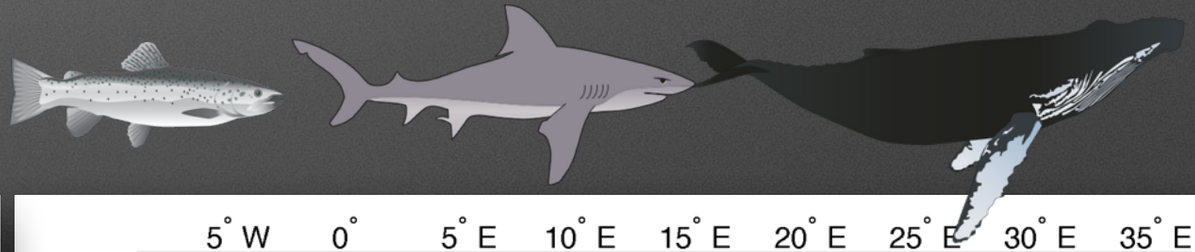
+ Evaluate the best place for MPAs implementation

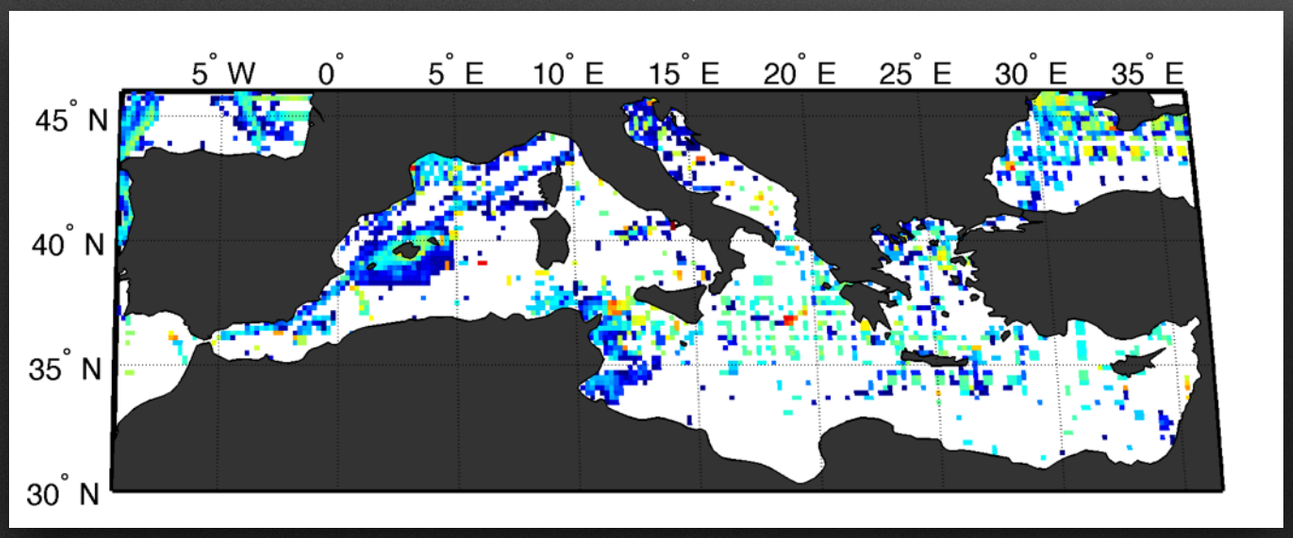


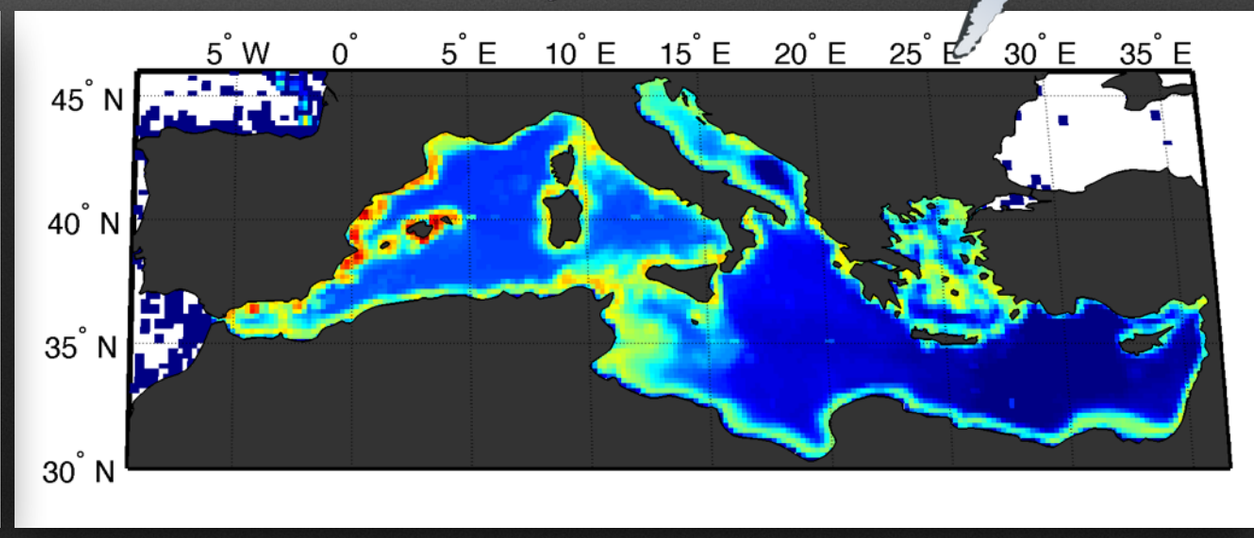
Materials : Biological observations

<u>Gather all biological informations from:</u>

+ International database (Obis, Gbif, Pangea …)
+ Atlas (fisheries and mammals distributions)
+ Online campaign (Sesame)
+ pers. com (Publications)







Materials : Biological observations

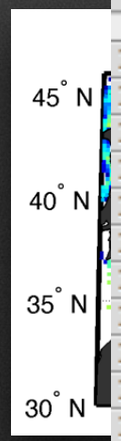
Gath
+ Int
+ Atl
+ Or
+ pe

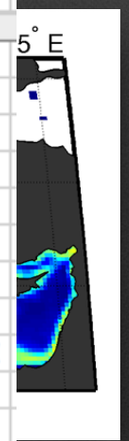
Number of observations:
> 20.000.000 presence

Number of species (sp. and spp.)
>2000

Mean trophic level, mean size, depth range and ecology are retrieved for each species

	A	B	C	D	E	F	G	H
1	name (genus_species) if not informed	size min (mm)	size max (mm)	Trophic Level (see Fishbase)	depth range min	depth range max	Habitat	zone PELAGIQUE
1066	Lepadogaster_purpurea	NaN	75	3.3	1	20	BENTHIC	SEAFLOOR
1067	Lepidion_guentheri	NaN	810	3.6	750	800	DEMERSAL	SEAFLOOR
1068	Lepidion_lepidion	150	300	3.6	150	2000	DEMERSAL	SEAFLOOR
1069	Lepidopus_caudatus	1800	2100	3.8	30	400	PELAGIQUE	MESOPELAGIQUE
1070	Lepidorhombus_boscii	300	400	3.7	150	400	BENTHIC	SEAFLOOR
1071	Lepidorhombus_whiffiagonis	425	600	4.2	50	400	BENTHIC	SEAFLOOR
1072	Lepidotrigla_cavillone	115	200	3.2	30	450	BENTHIC	SEAFLOOR
1073	Lepidotrigla_dieuzeidei	100	150	3.7	60	250	BENTHIC	SEAFLOOR
1074	Lestidiops_jayakari_jayakari	NaN	NaN	4.2	50	2000	PELAGIQUE	BATHYPELAGIQUE
1075	Lestidiops_sphyrenoides	NaN	NaN	4.5	50	600	PELAGIQUE	MESOPELAGIQUE
1076	Lesueurigobius_friesii	50	100	3.2	10	130	BENTHIC	SEAFLOOR
1077	Lesueurigobius_sanzi	NaN	NaN	3.6	40	100	BENTHIC	SEAFLOOR
1078	Lesueurigobius_suerii	50	80	3.5	20	100	BENTHIC	SEAFLOOR
1079	Leucoraja_circularis	700	1200	3.5	70	250	BENTHIC	SEAFLOOR
1080	Leucoraja_fullonica	950	1150	3.5	100	400	BENTHIC	SEAFLOOR
1081	Leucoraja_melitensis	NaN	NaN	3.3	60	600	BENTHIC	SEAFLOOR
1082	Leucoraja_naevus	650	720	3.9	50	200	BENTHIC	SEAFLOOR



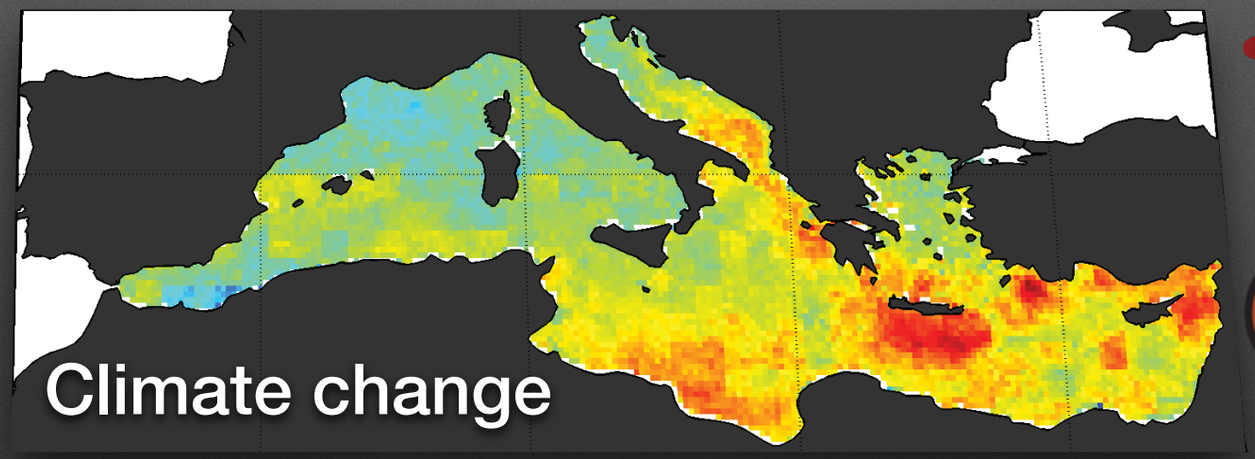


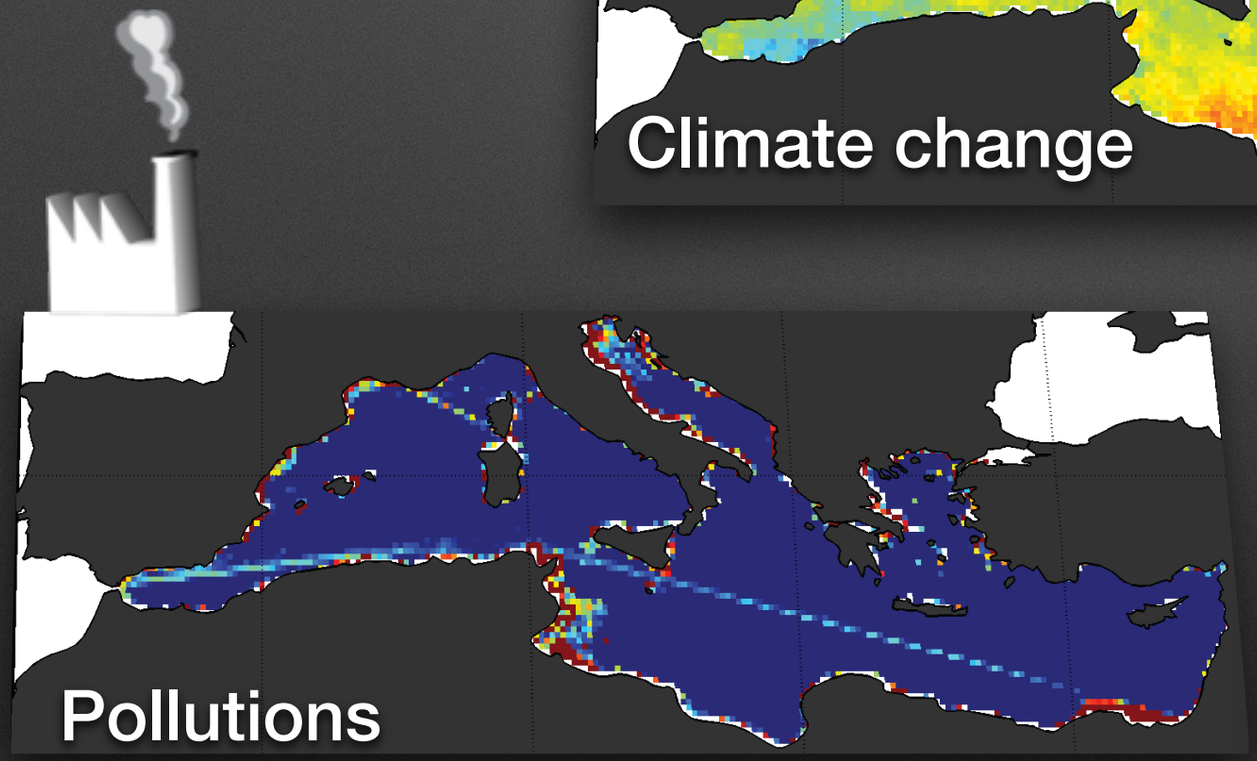
Materials : Anthropogenic pressures

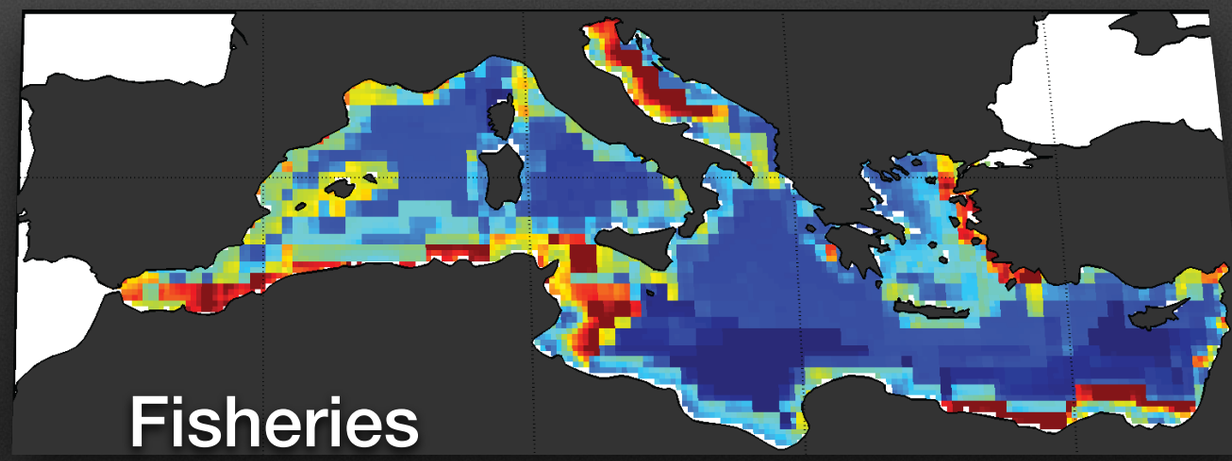
Human pressures are gathered:

+ Halpern et al. (2008) and Coll et al. (2010)
+ IUCN (2013)

14 Parameters gathered and summarized into 3 categories:

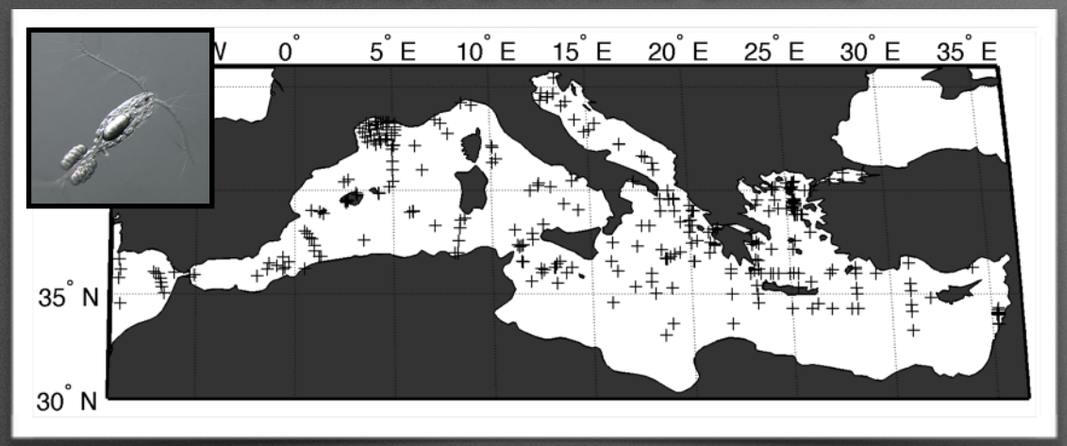






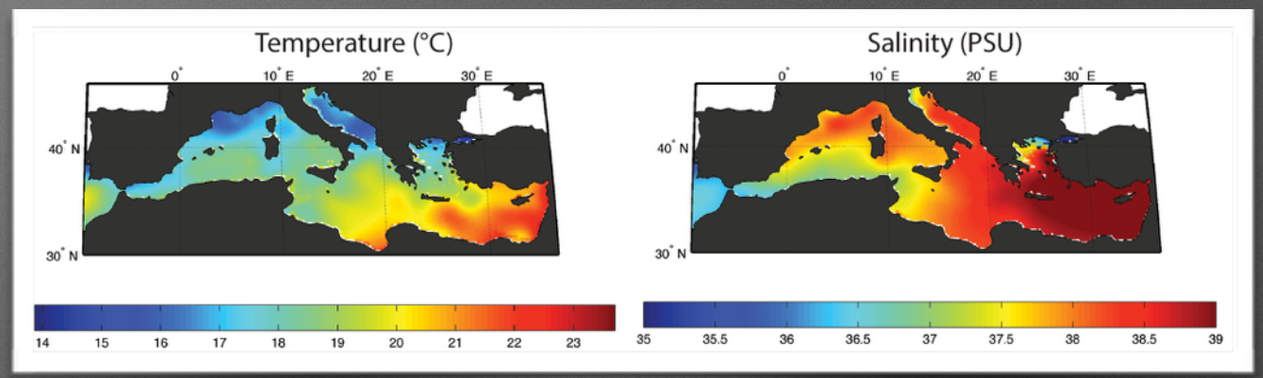
Methods: spatial distribution models

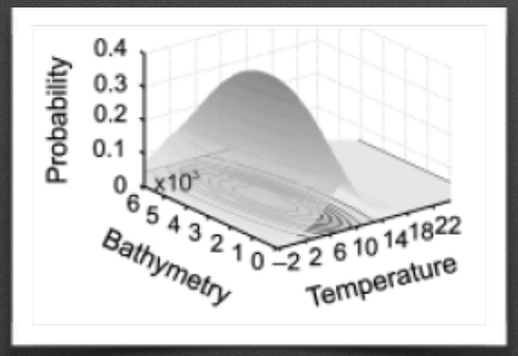
Presence Oithona similis



+

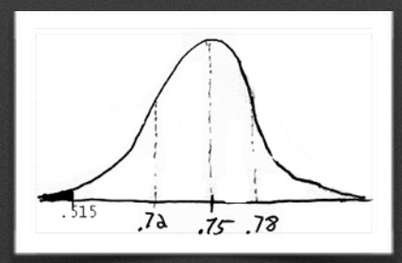
Best Environmental parameters and layer





Six environmental niche models (Hutchinson,1957) used: Enfa, Gower, NPPEN, Maxent, GARP, BioClim

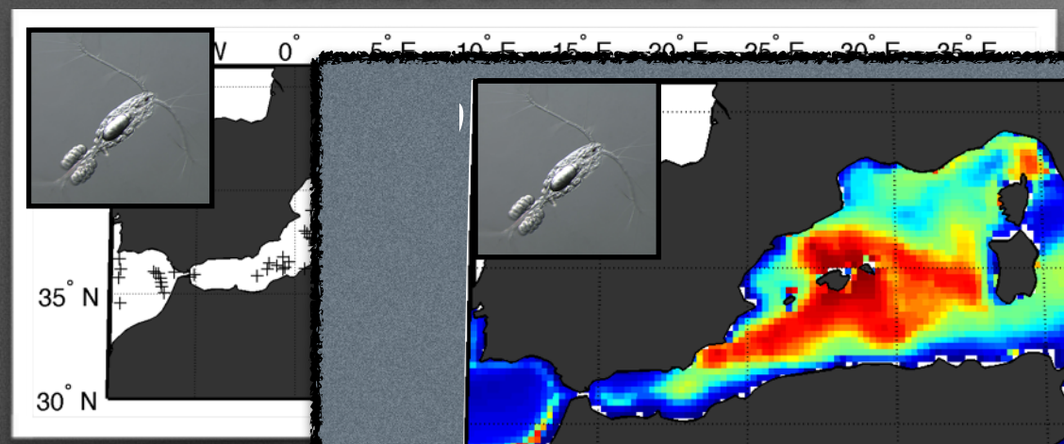
Index of Hirzel et al. (2006) to evaluate the probability of presence for each model and species + Expert knowledge

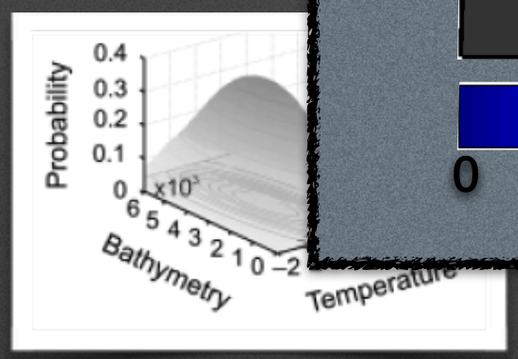


Model averaging weighted by Hirzel index

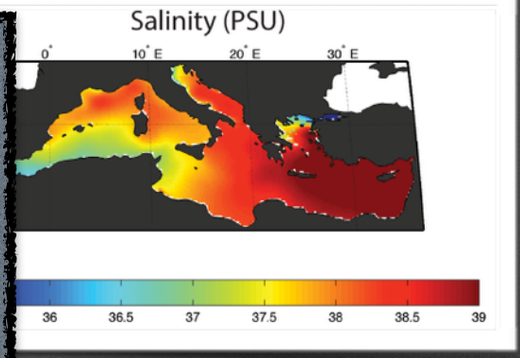
Methods: spatial distribution models

Presence Oithona similis



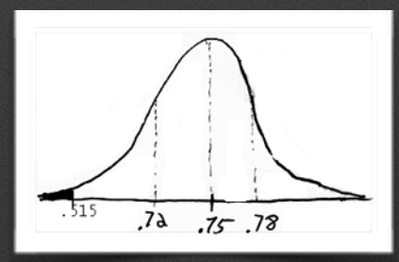


Best Environmental parameters and layer



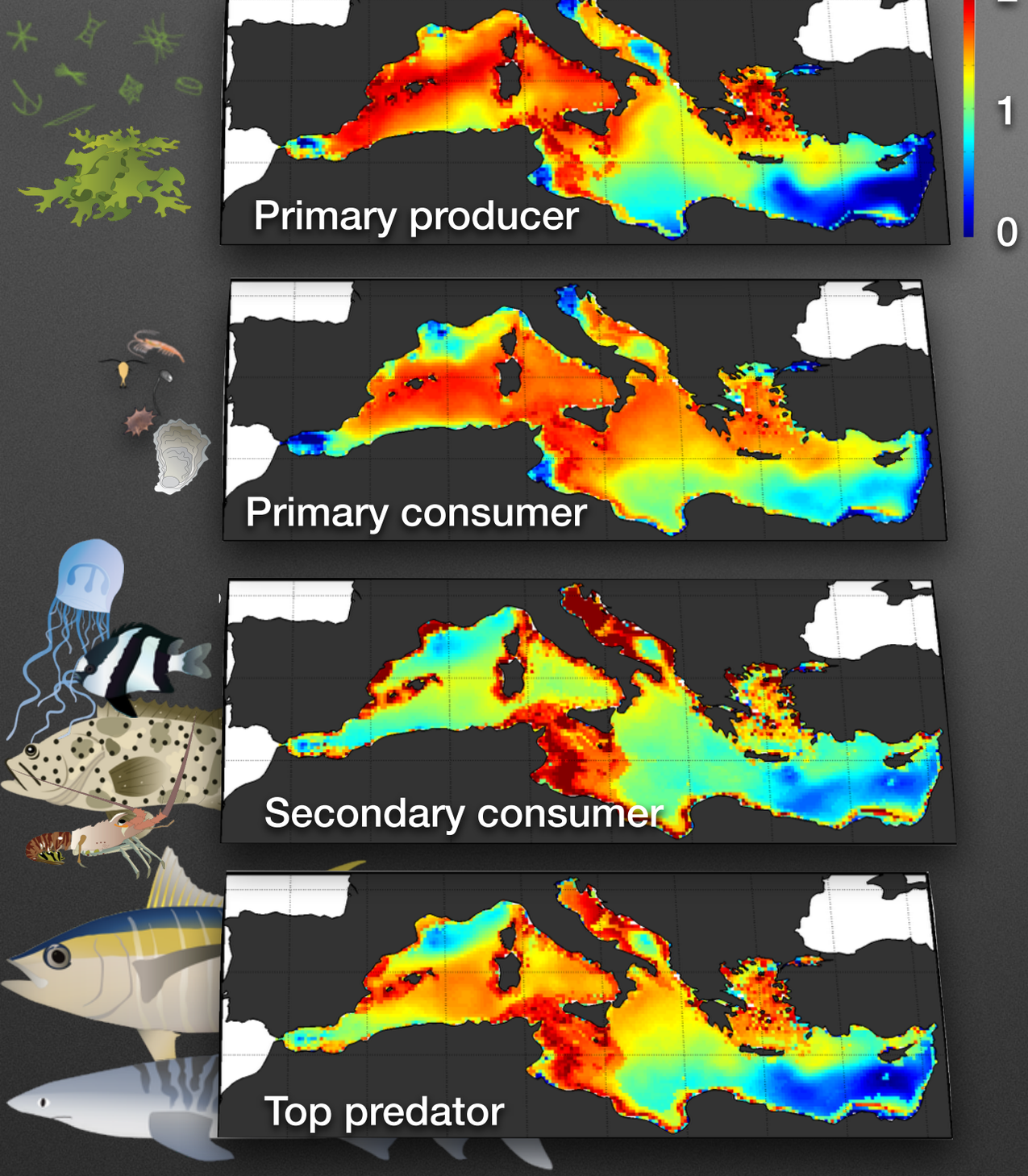
inson,1957)
RP, BioClim

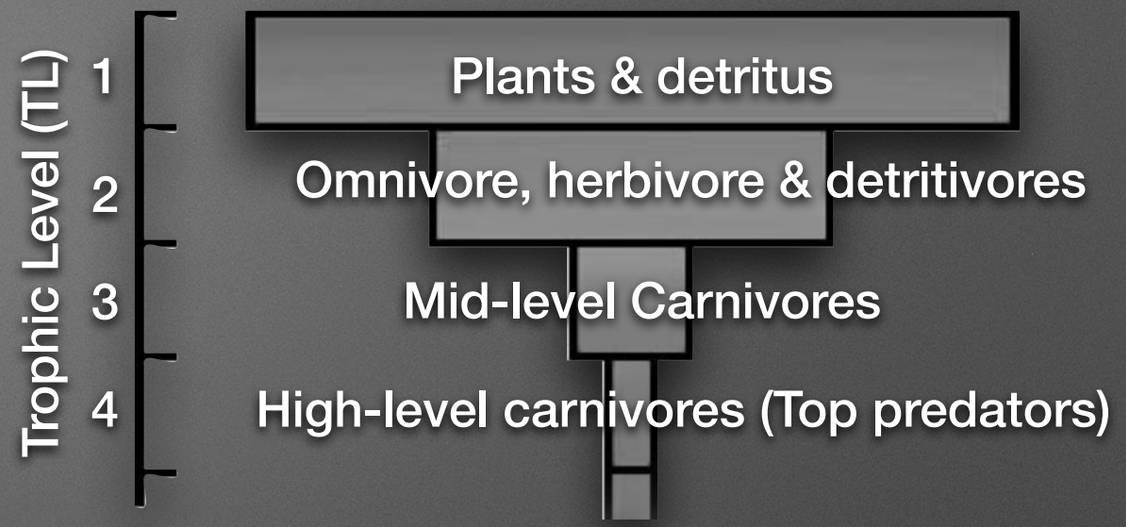
Index of Hirzel et al. (2006) to evaluate the probability of presence for each model and species + Expert knowledge



Model averaging weighted by Hirzel index

Biodiversity of the Mediterranean sea

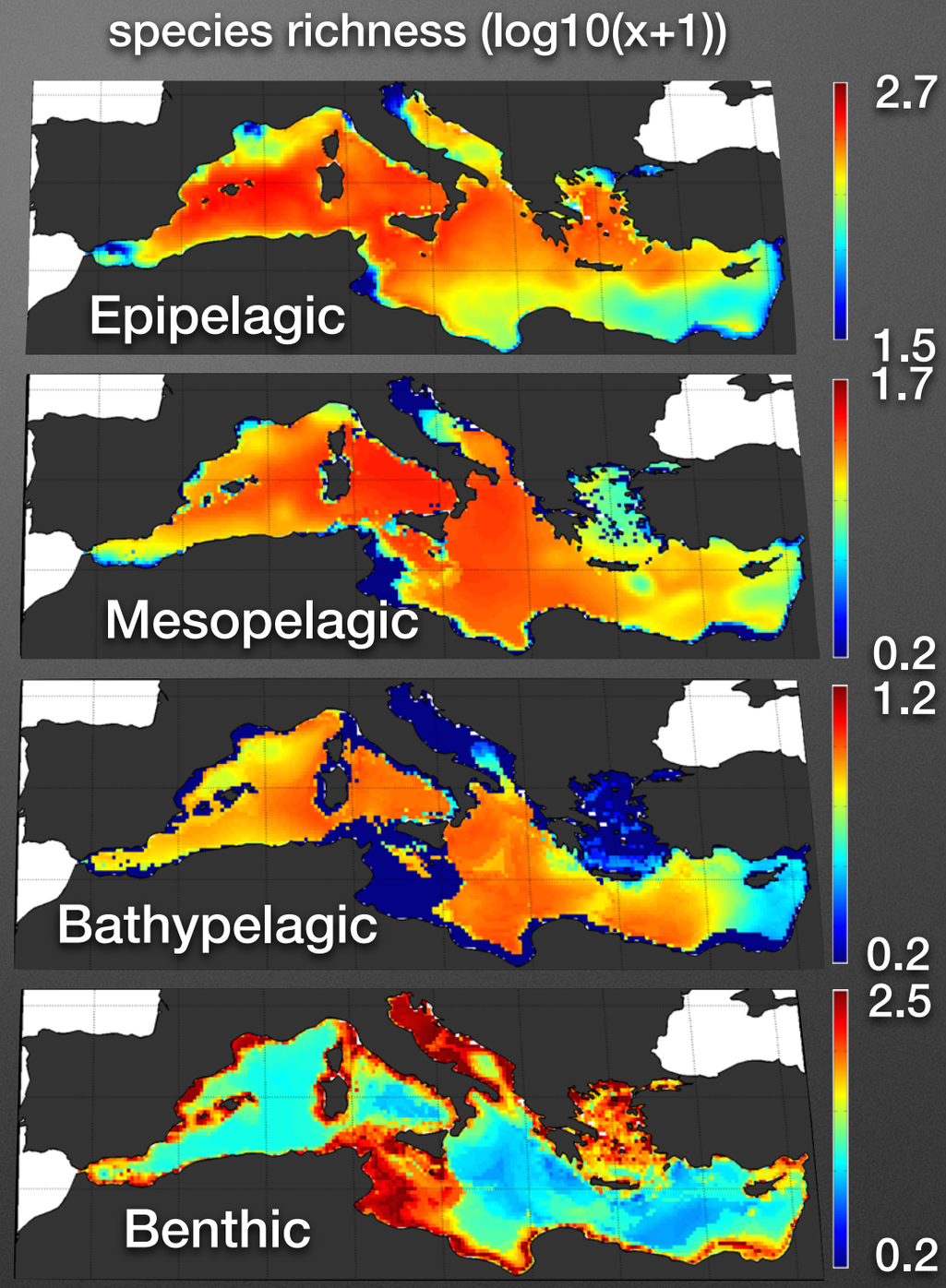




High spatial variability in the biodiversity gradient between trophic level

Importance of taking into account **all trophic levels** to evaluate the biodiversity gradient

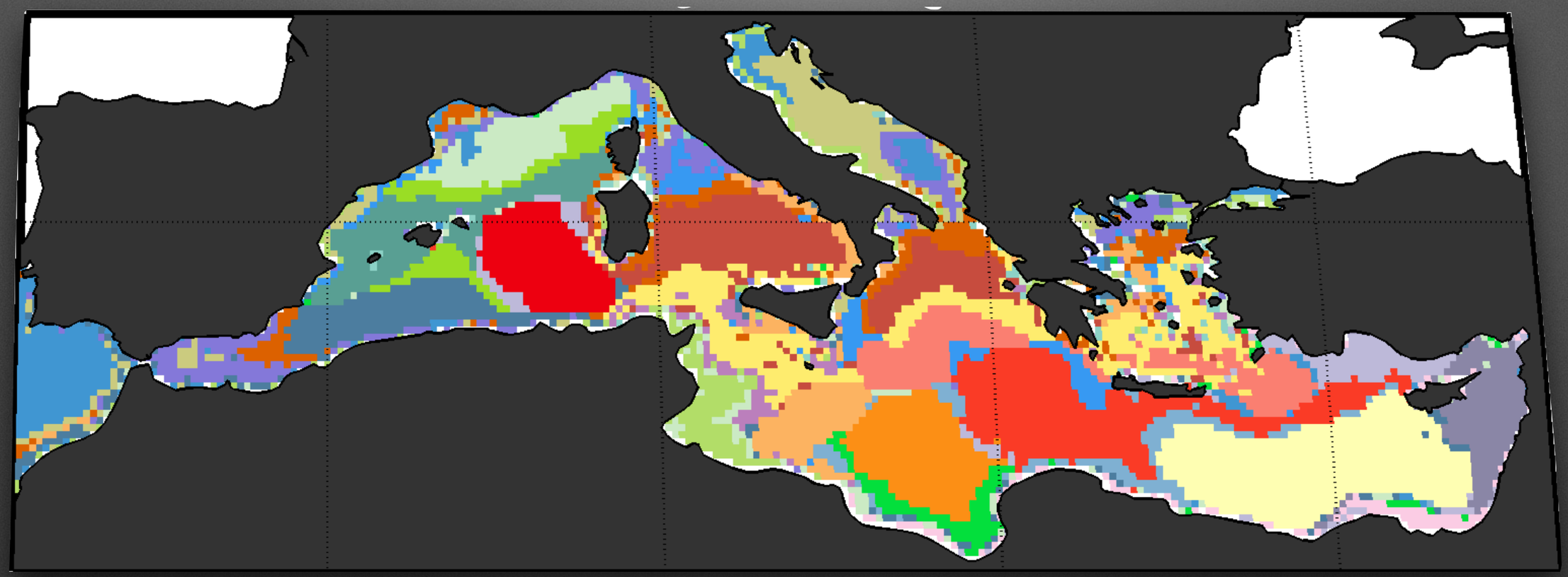
Biodiversity of the Mediterranean sea



No congruent macro-ecological gradients between layers

Importance of the vertical dimension

Ecoregionalisation of the Mediterranean sea



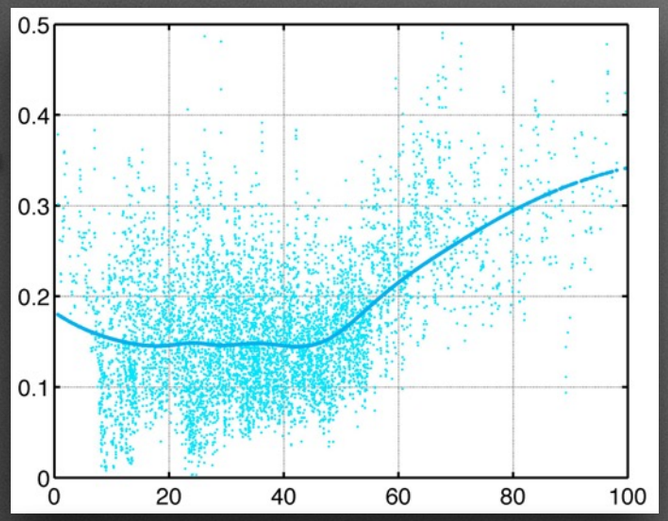
25 ecosystems are found in the Mediterranean sea.

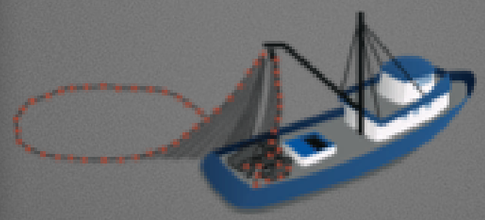
Each ecosystem represents a specific:
- Species association and dominant species at each trophic level
- Environmental biotope

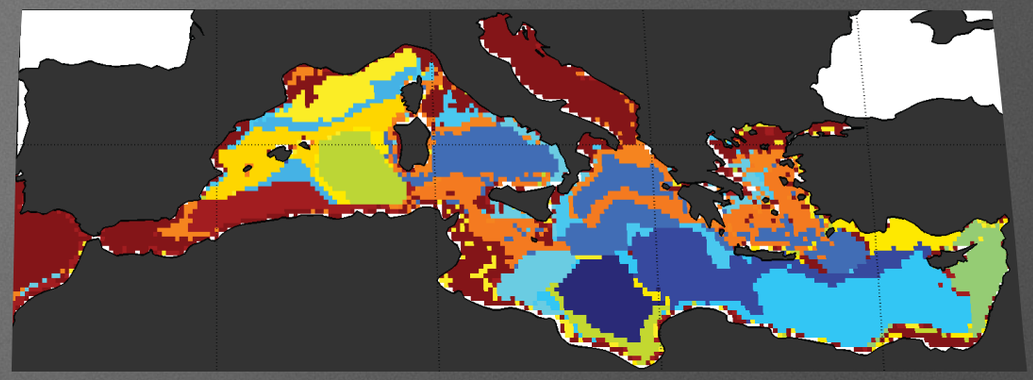
Approximation of the spatial distribution of MS marine ecosystems

Anthropogenic Impact on MS ecosystems

Fisheries activity

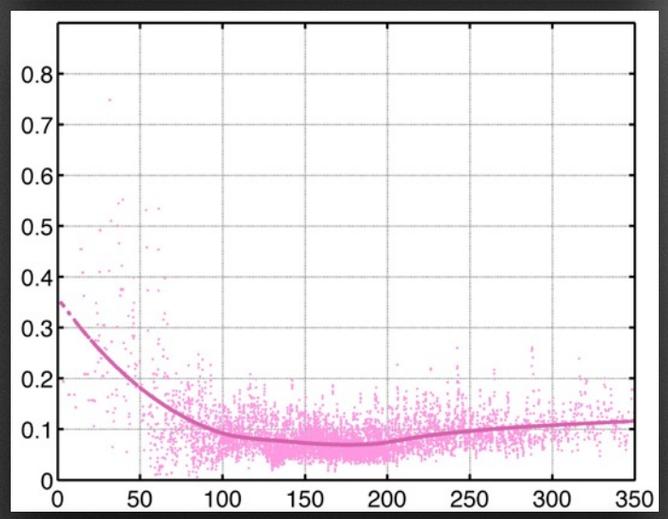


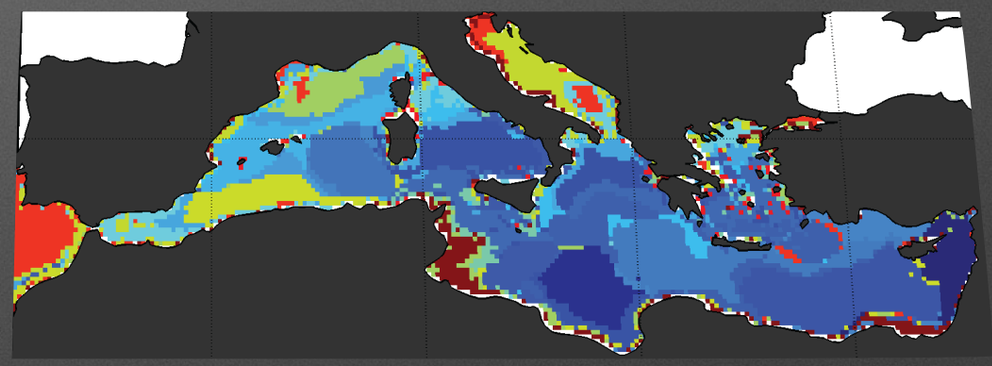




Fisheries activity

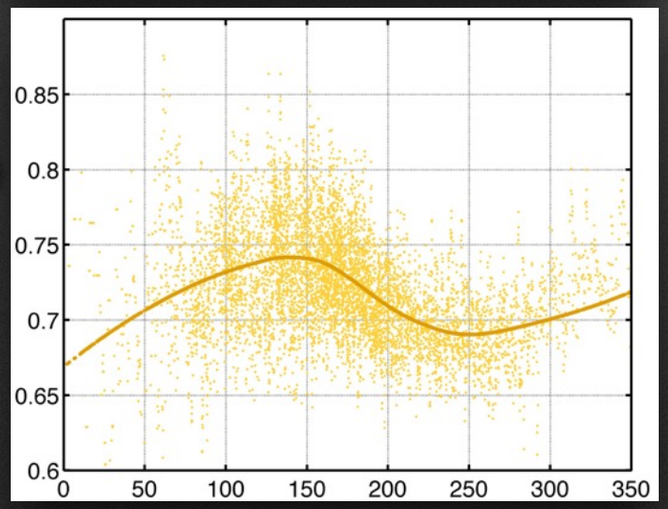
Pollutions

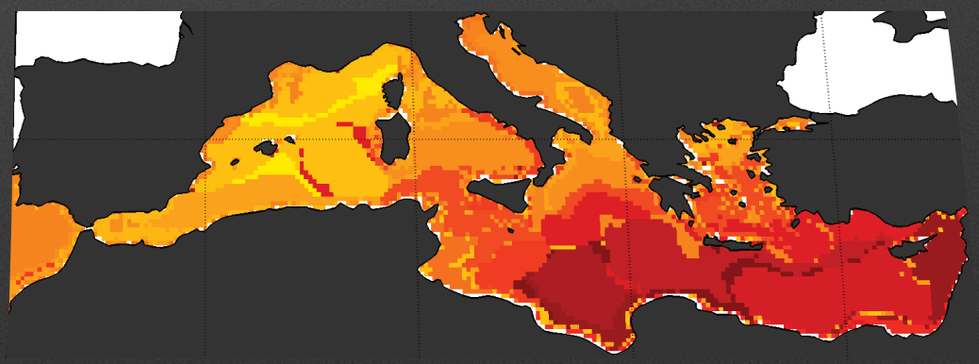




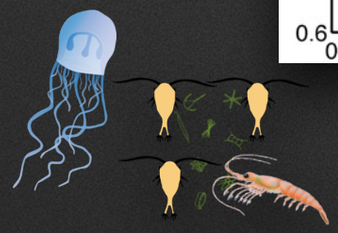
Pollutions

Climate change

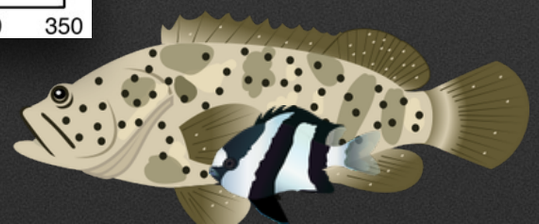




Climate change



Biodiveristy



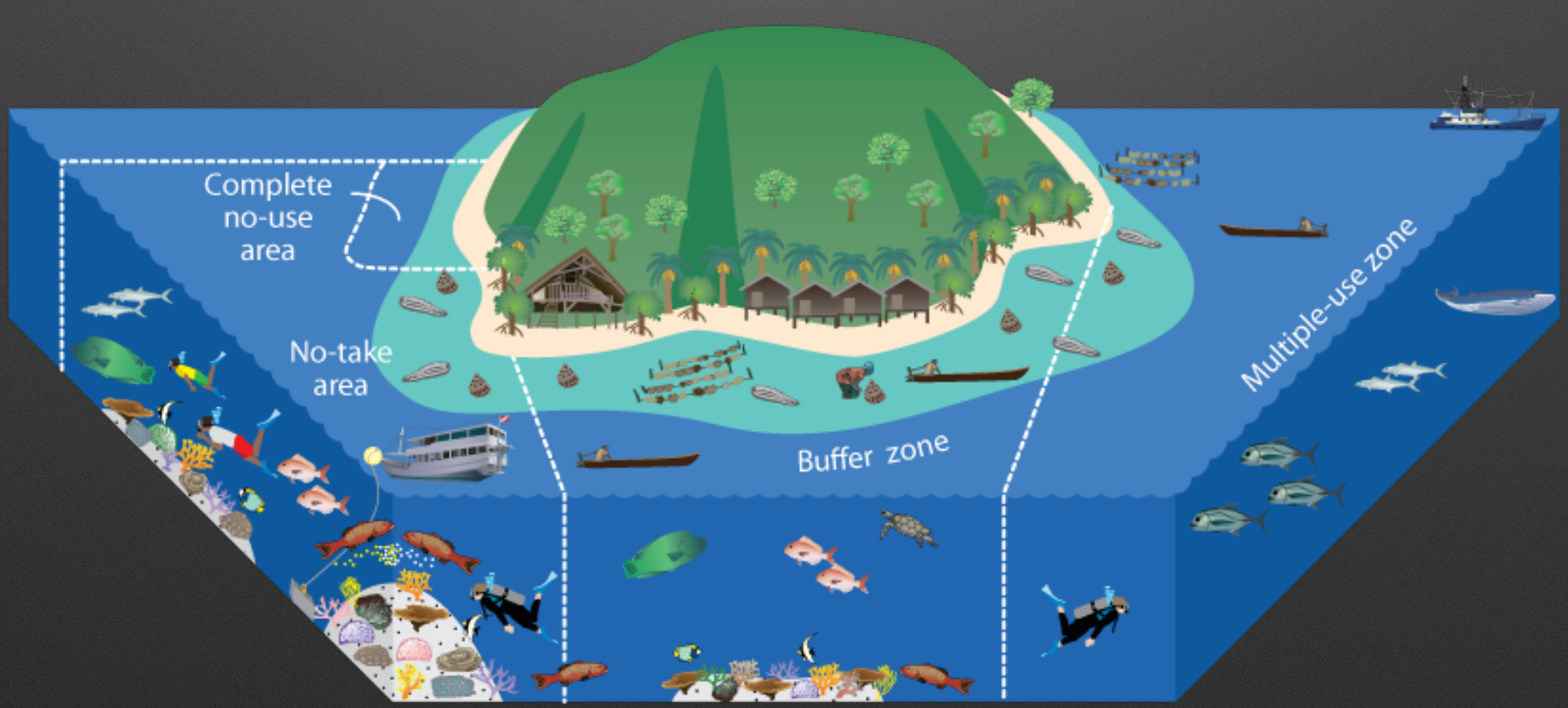
MPAs distribution

Effective MPAs are selected:

- to reduce fishing pressure and/or pollution level on high-medium biodiversity area

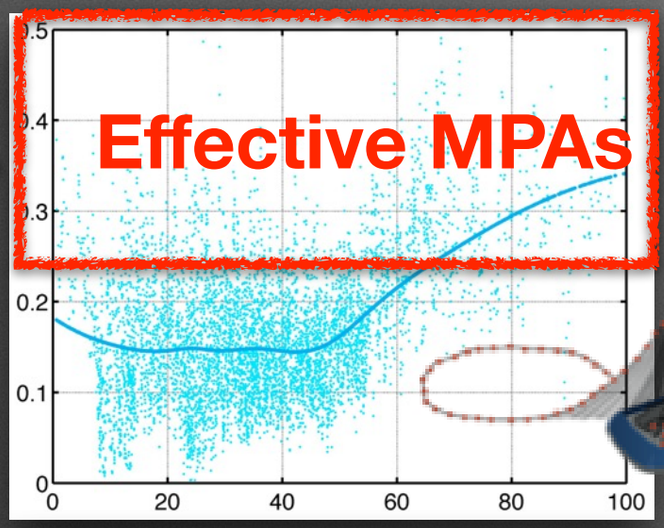
- need to be in areas that will not be too altered by climate change

- are in a same ecosystem and dynamically connected by the current

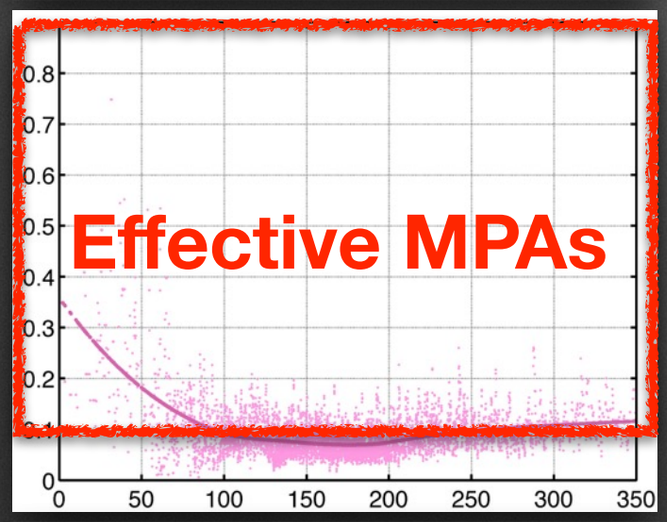


Potential MPAs distributions

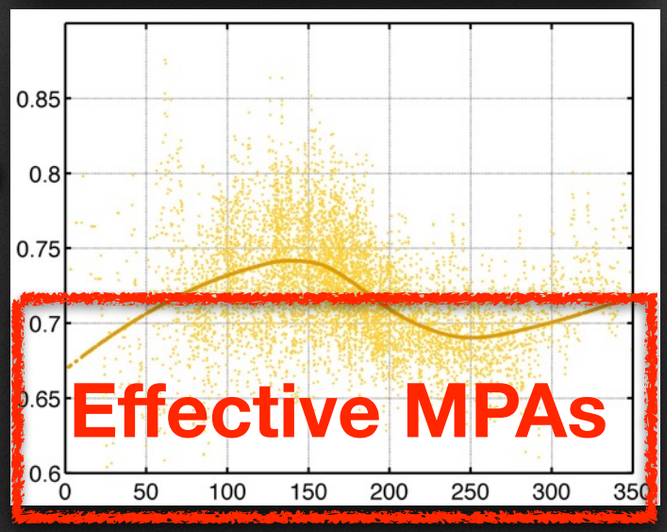
Fisheries activity



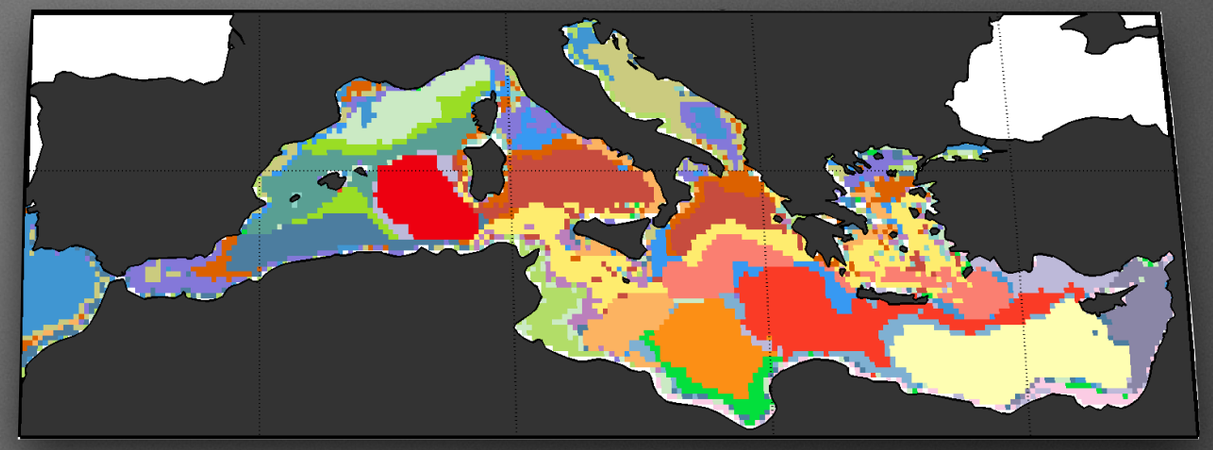
Pollution



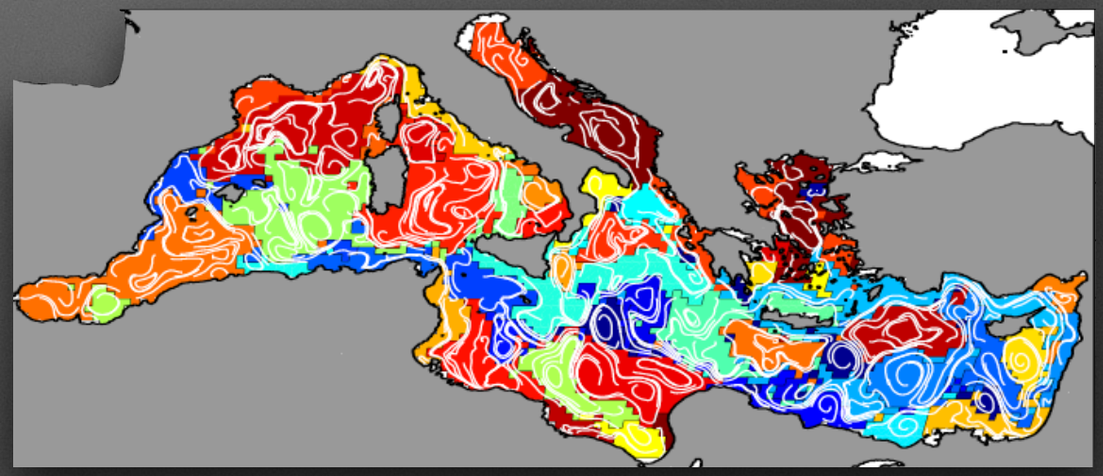
Climate change



Biodiveristy



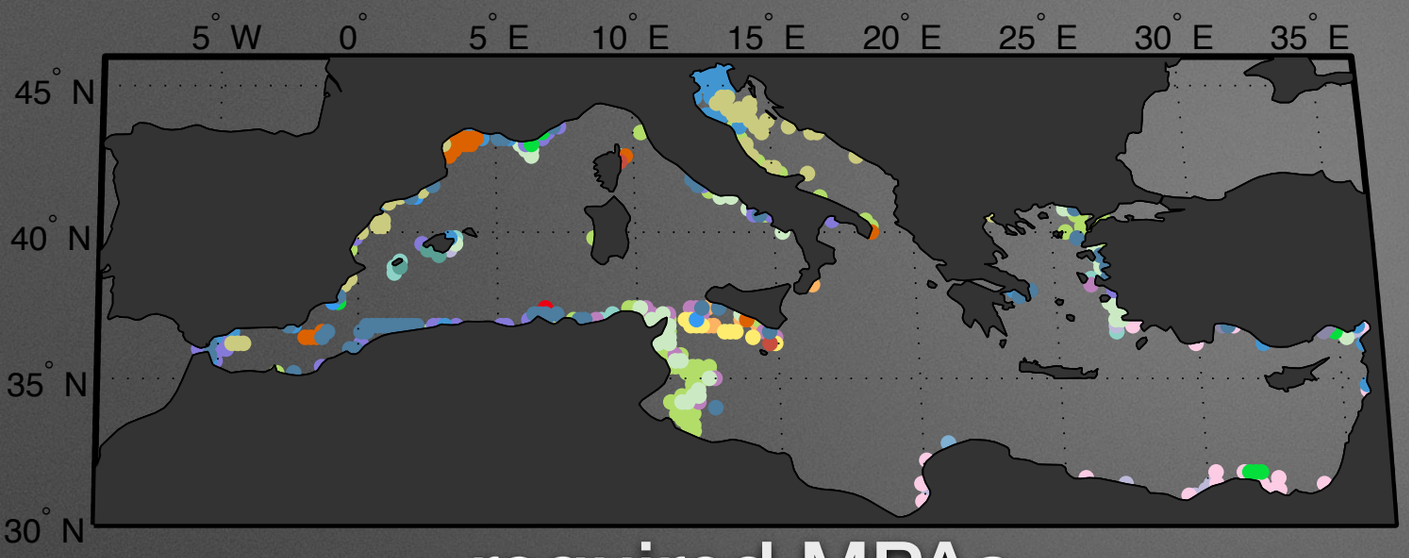
Marine ecosystems



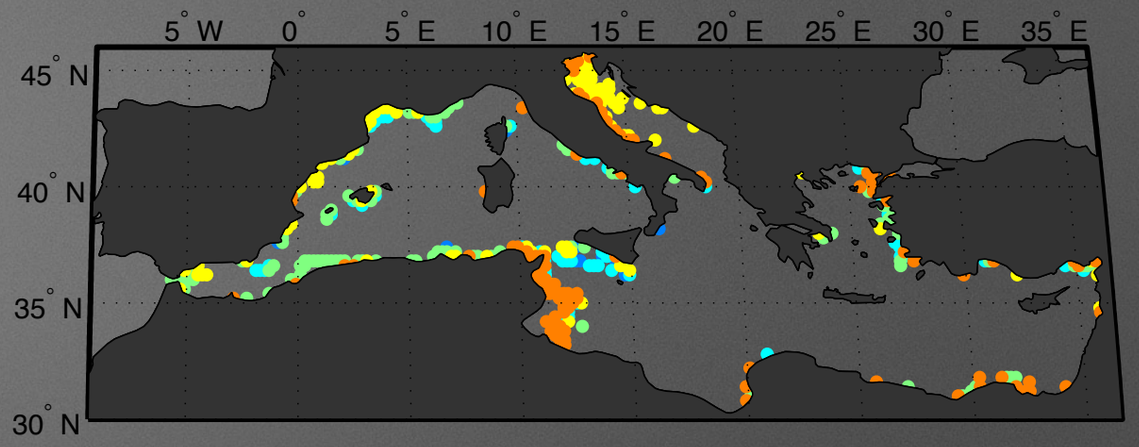
Connectivity

Exclusive Economical Zone

Potential MPAs distributions

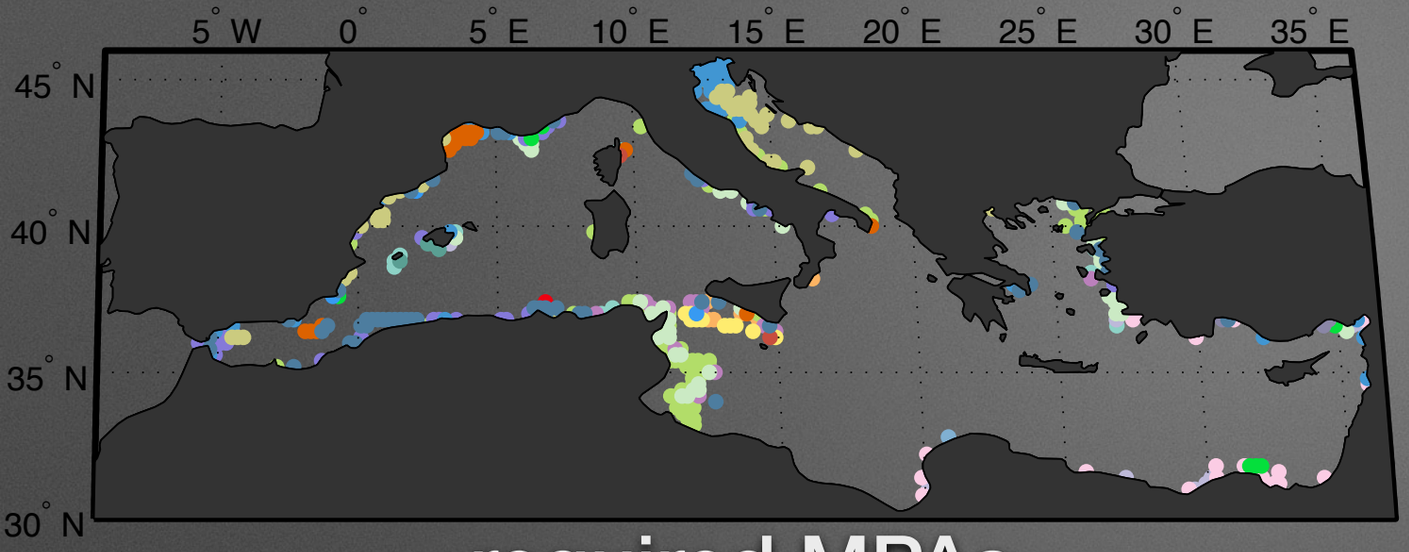


required MPAs

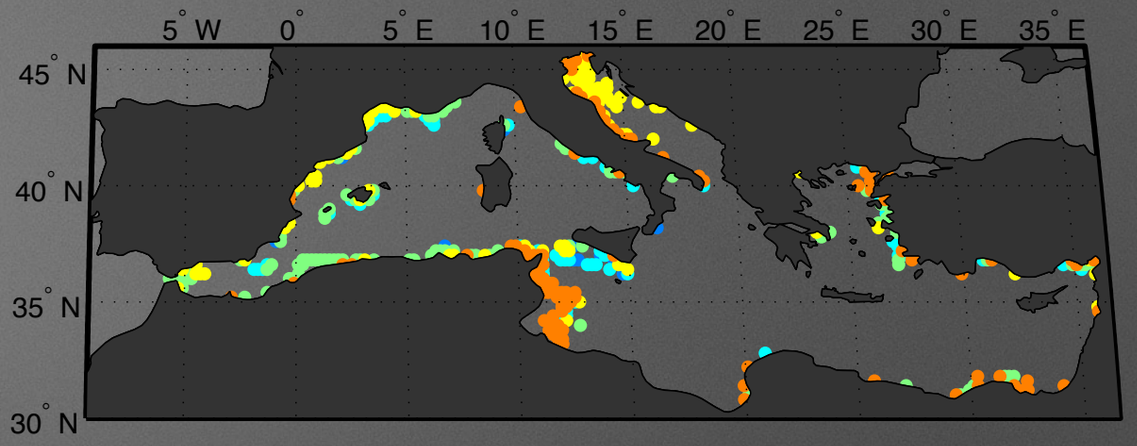


Priority

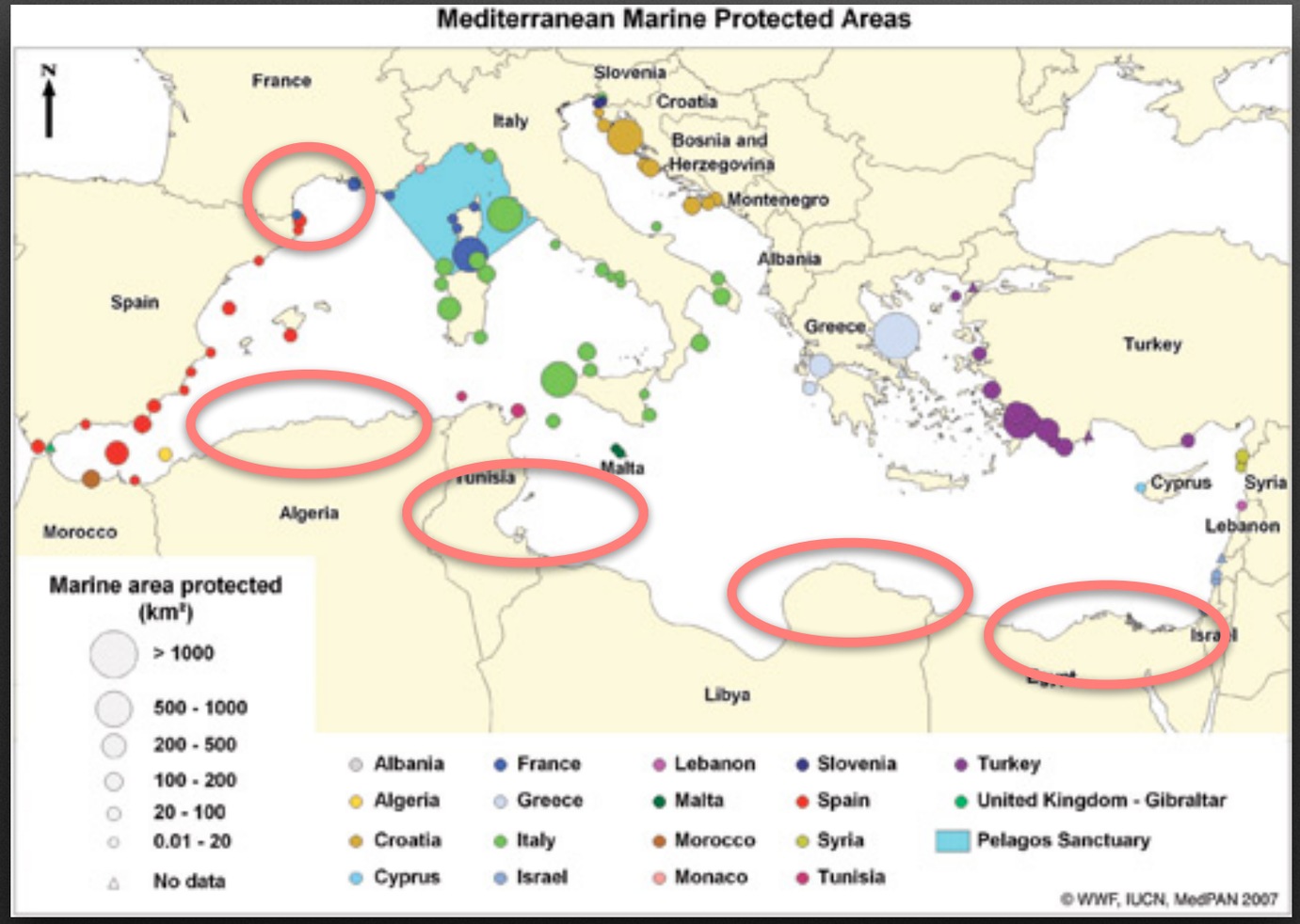
Potential MPAs distributions



required MPAs

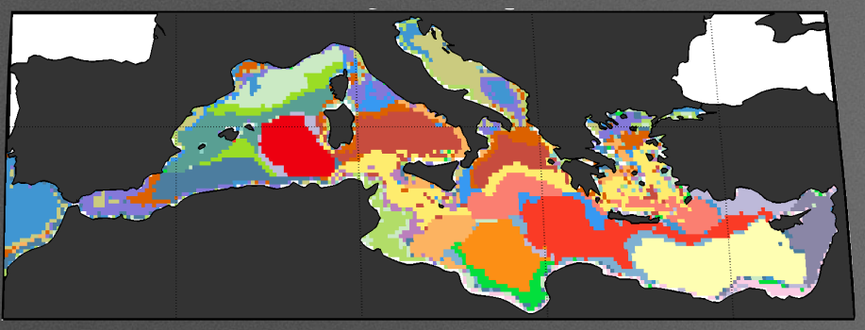


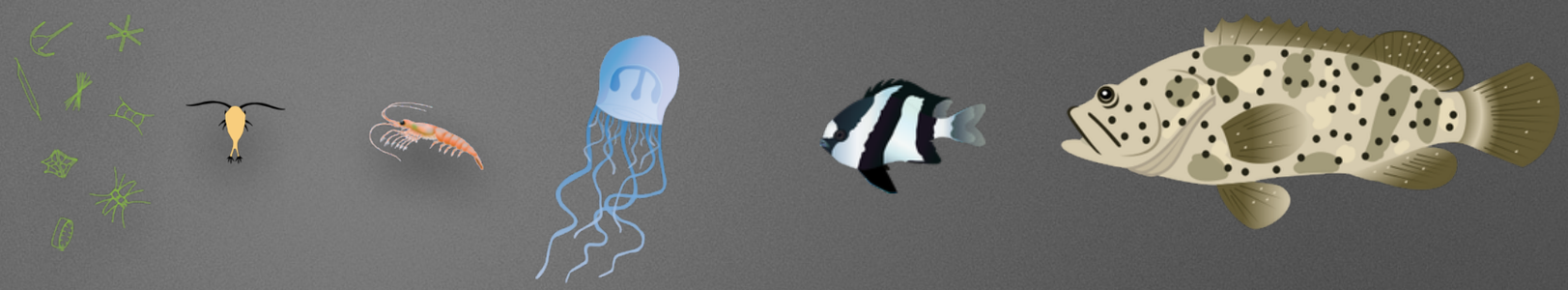
Priority



Present situation

Conclusions & Caveats





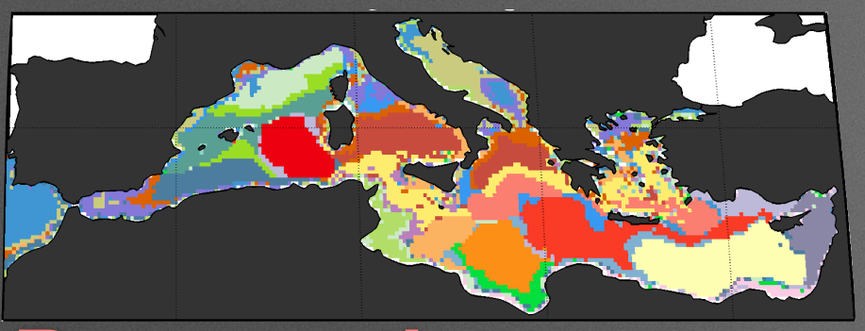
CONCLUSIONS

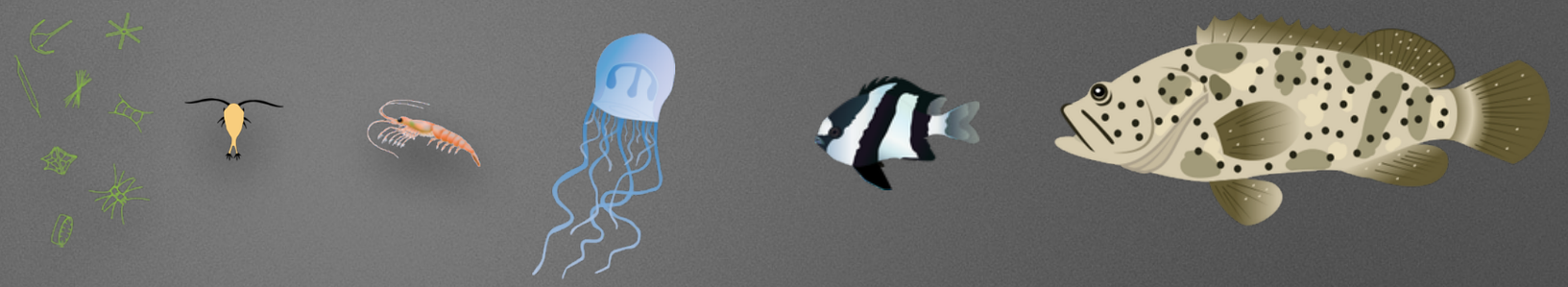
- **To capture the main biodiversity pattern in the MS, all type of organisms and vertical features need to be taken into account**

- **Each region of the basin is at least altered by one type of anthropogenic pressure**

- **There is an increasing need of biodiversity protection : MPAs**
  The present implementation of MPAs are encouraging but hot spots of Perturbation are still not protected

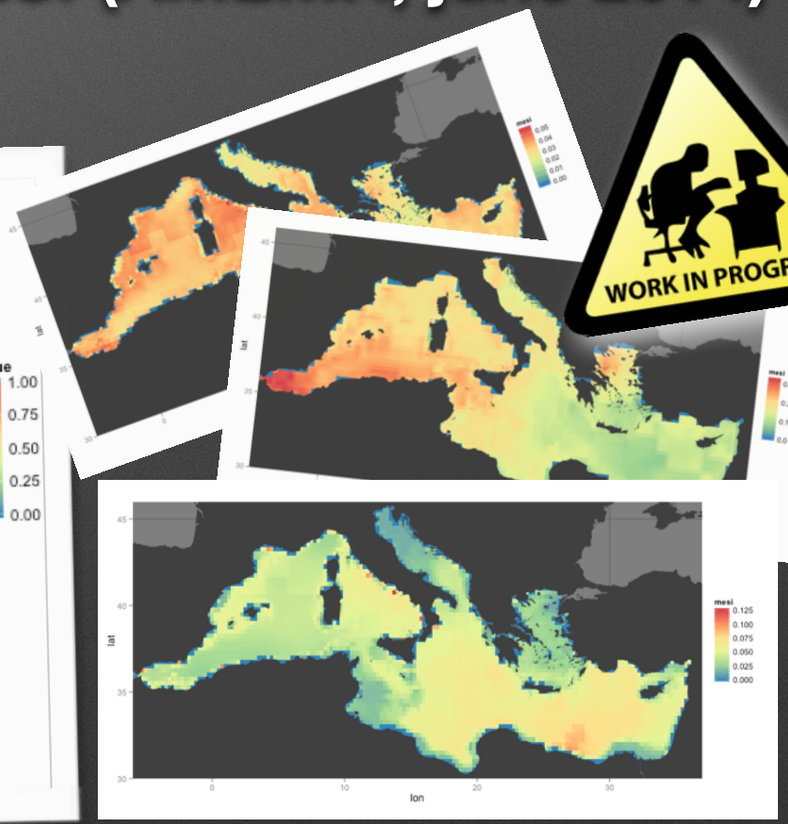
Perspective





Perspective

- Implementation of Ecosystem services index: MESI (AMEMR, june 2014)



Thank you for your attention
Any questions ?

Gabriel Reygondeau

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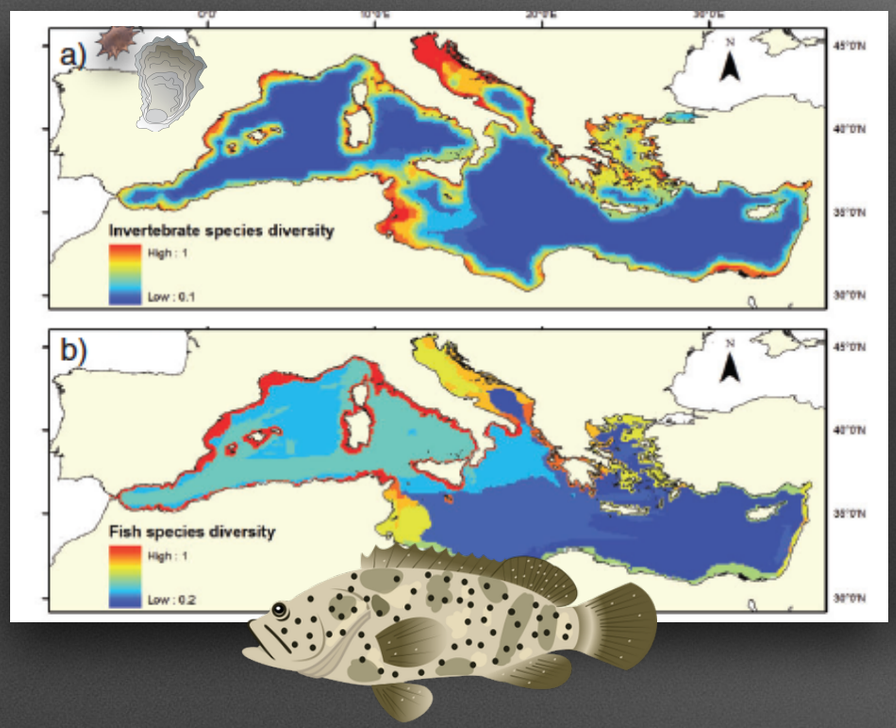
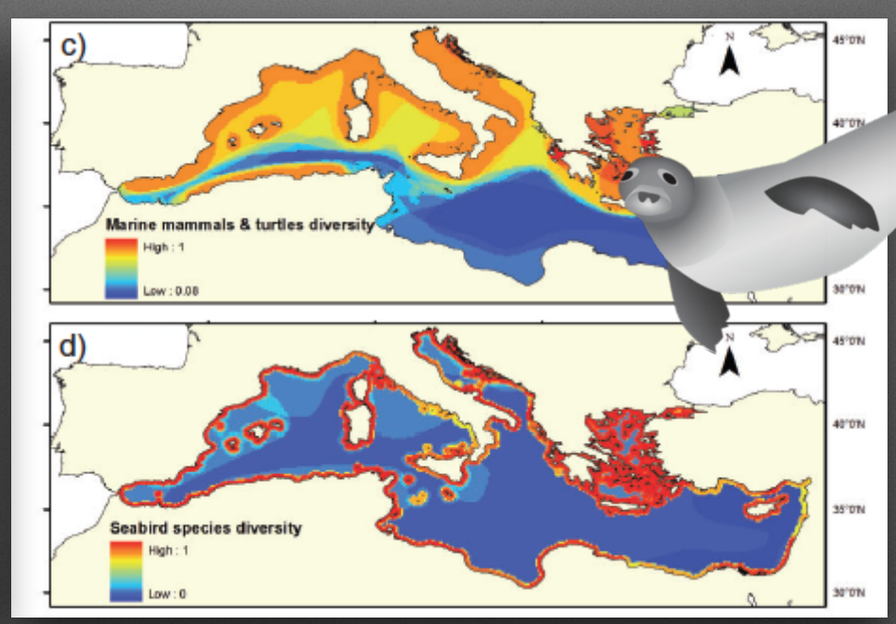
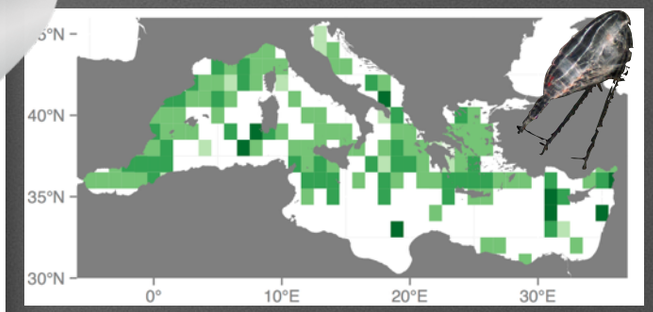
Représentant Skema: Christophe Mocquet
Directeurs du Projet: Xavier Durieu de Madron, Cecile Guieu & Philippe Koubbi

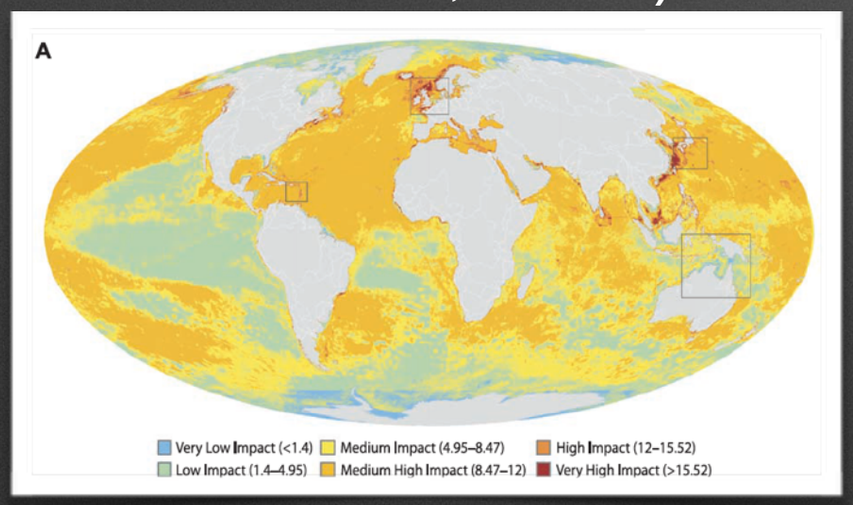
Context of the study

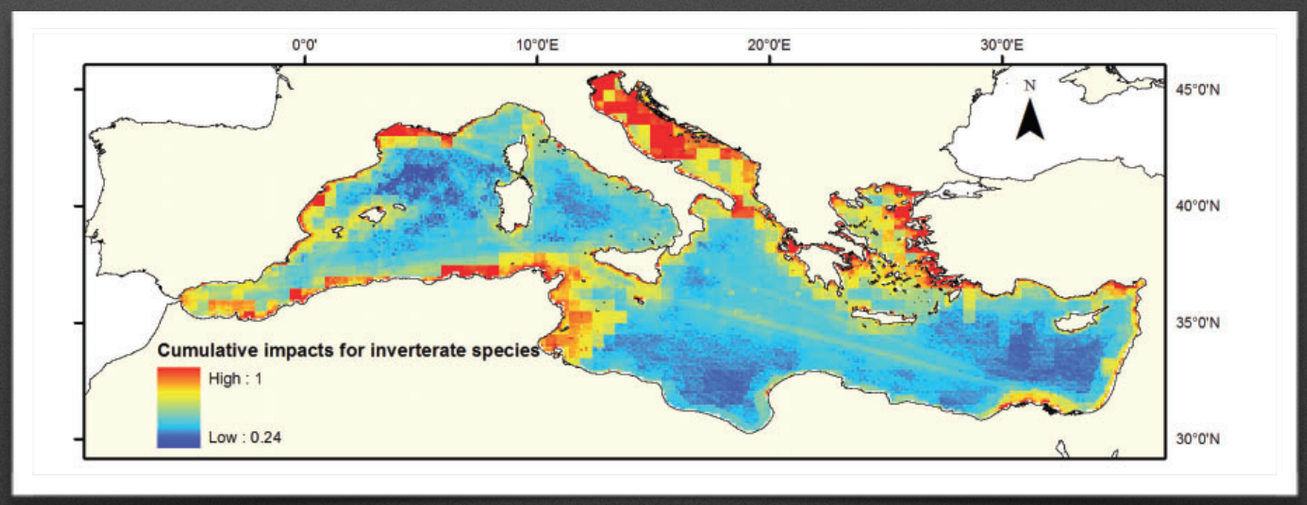






- Several studies have attempted to map MS biodiversity (Coll et al., 2012; Benedetti et al., 2014)





- Identify the main potential threat by creating new indices (Halpern et al., 2014; Coll et al., 2012)