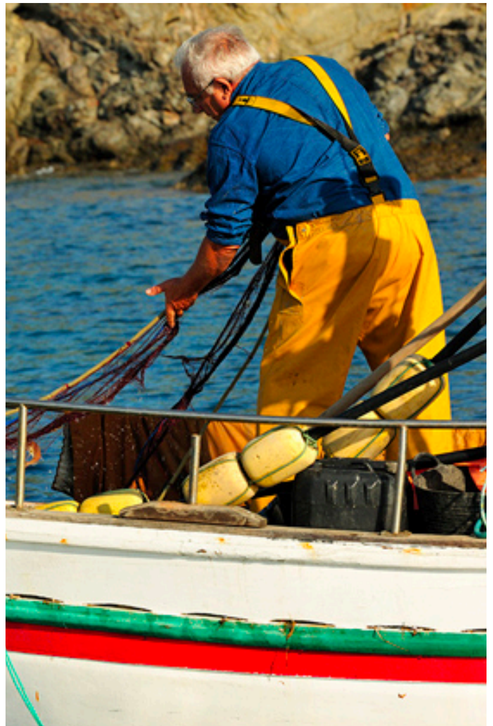
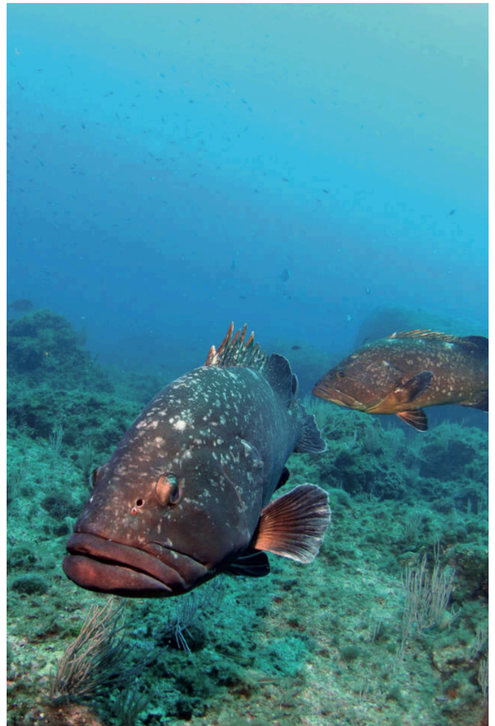




Third Natura 2000 marine biogeographical seminar for the Mediterranean and Black Sea regions

European Commission's DG Environment
French Ministry of Ecological Transition French Biodiversity Agency

12-14 March 2024
Marseille

Ecological and socio-economic benefits of strictly protected MPAs and scientific principles for their establishment

Speaker

Charles Loiseau

CRIOBE (CNRS-PSL-UPVD)
Joachim Claudet's lab

CRIOBE UAR3278 Centre de Recherches Insulaires et Observatoire de l'Environnement
École Pratique des Hautes Études | PSL | CNRS | UP VD

loiseau.charles@gmail.com

What is strict protection ?

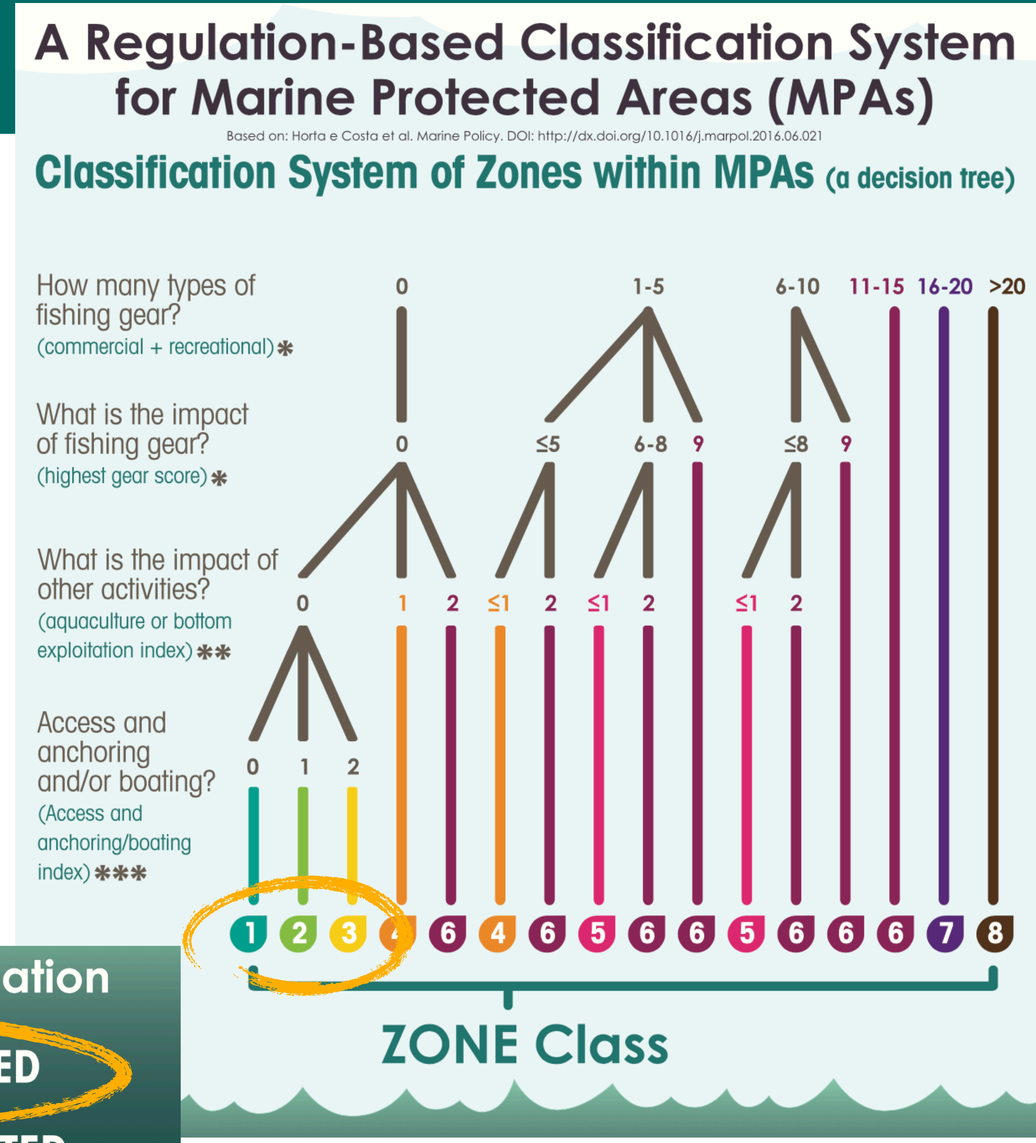
EUROPEAN COMMISSION

COMMISSION STAFF WORKING DOCUMENT

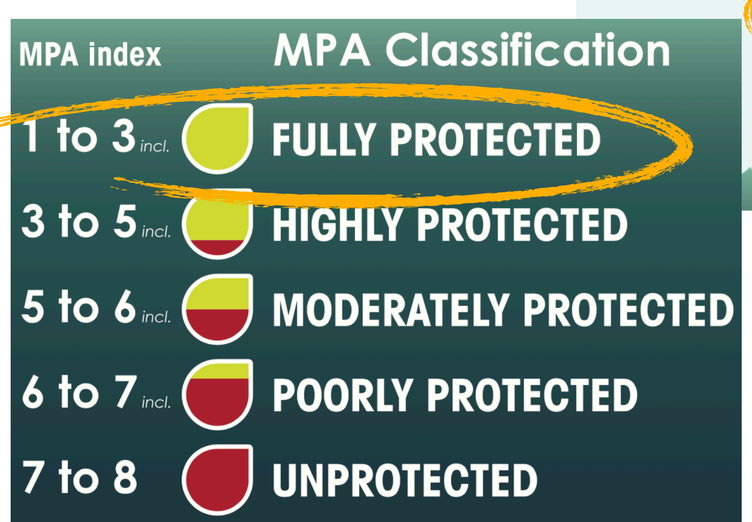
Criteria and guidance for protected areas designations

« Strictly protected areas are fully and legally protected areas »

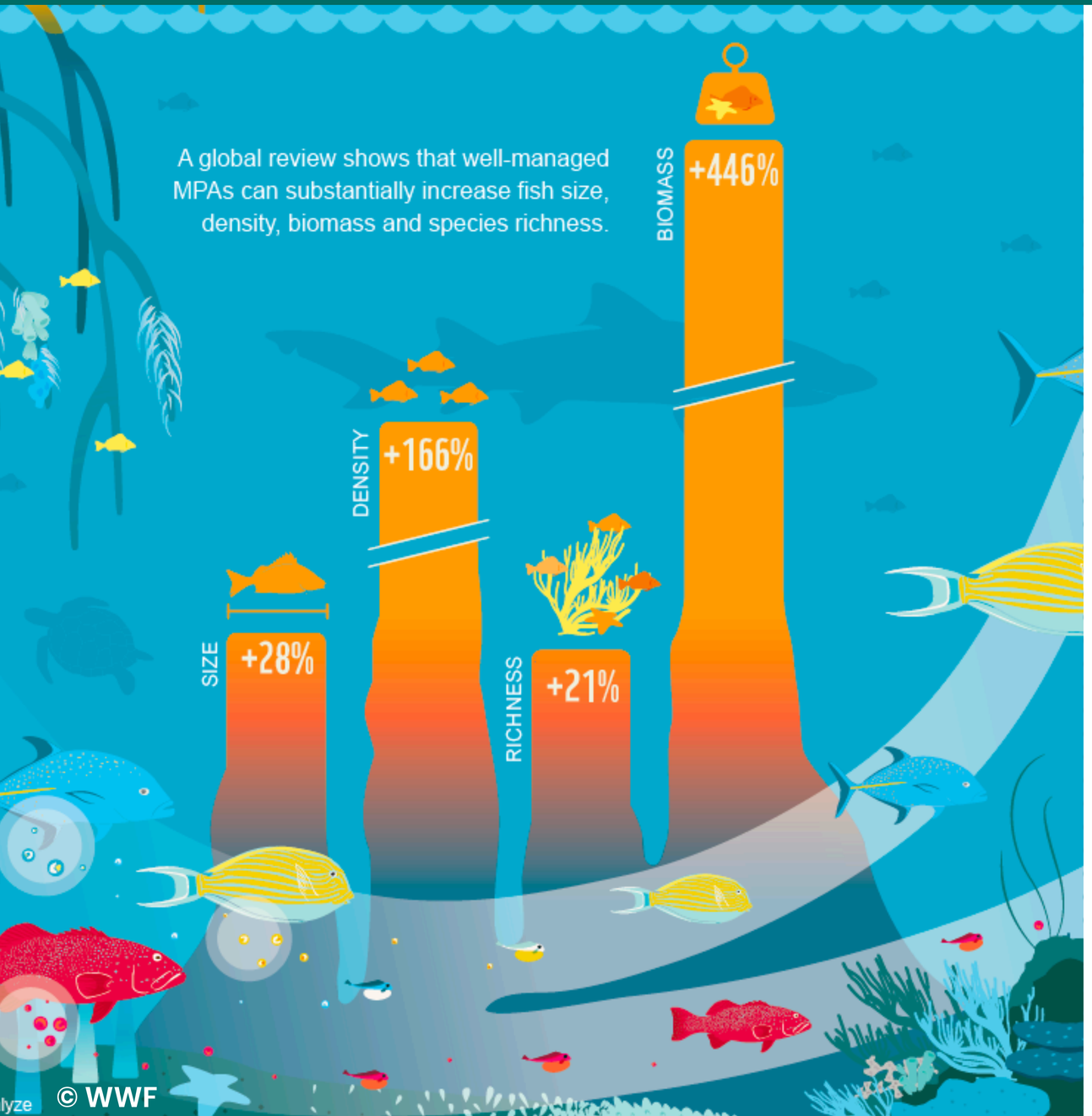
« Strictly protected areas will be non-intervention areas where only limited and well-controlled activities […] will be allowed, […] such as non-intrusive and strictly controlled recreational activities »



Horta e Costa et al. 2016

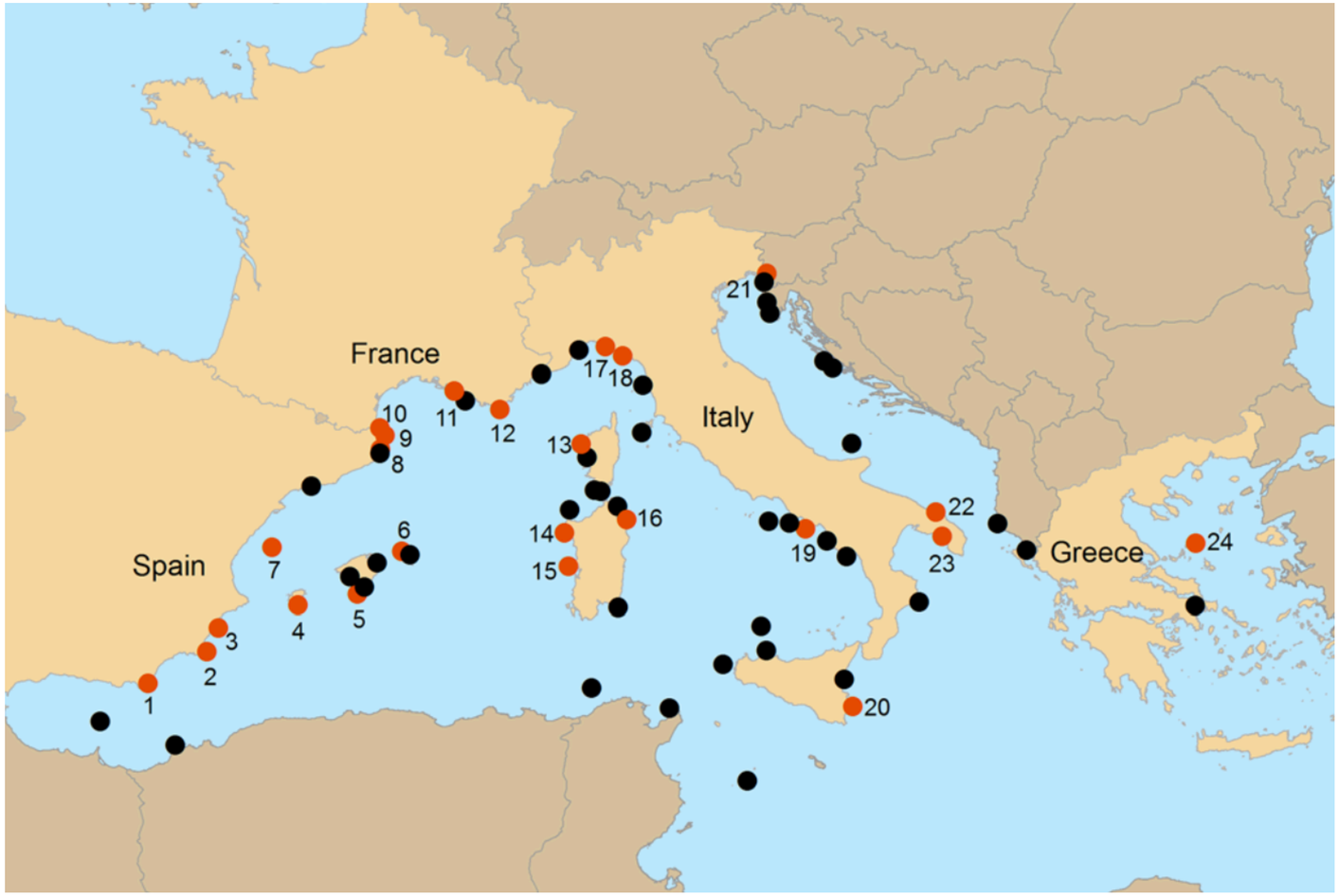


Benefits in fully protected MPAs



Lester et al. 2007

Benefits in fully protected MPAs in the Mediterranean Sea



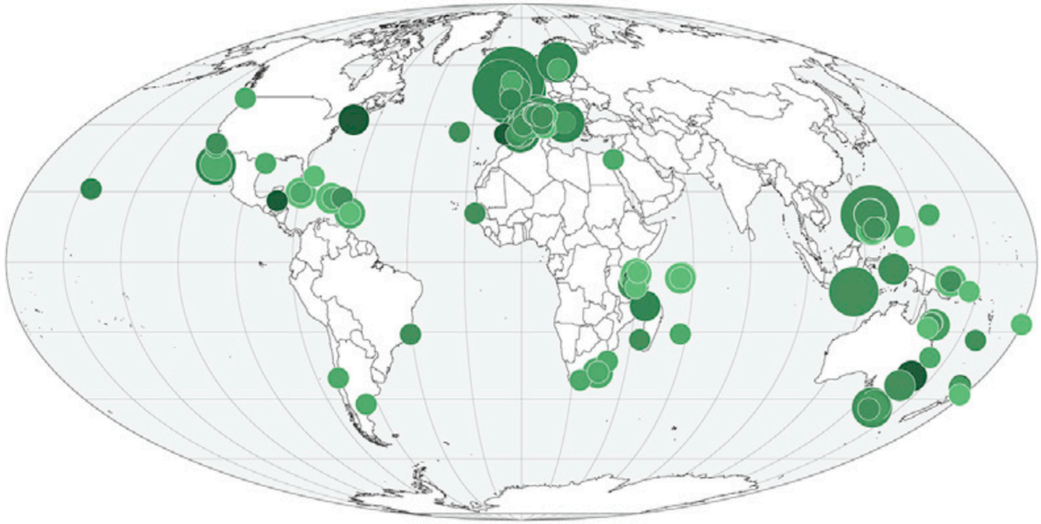
Giakoumi et al. 2017

In MPA with full protection (at least one zone) compared surrounding unprotected areas:

- x 2.3 greater total fish biomass
- x 1.4 greater total fish density

Benefits in fully protected MPAs

Jacquemont et al. 2022

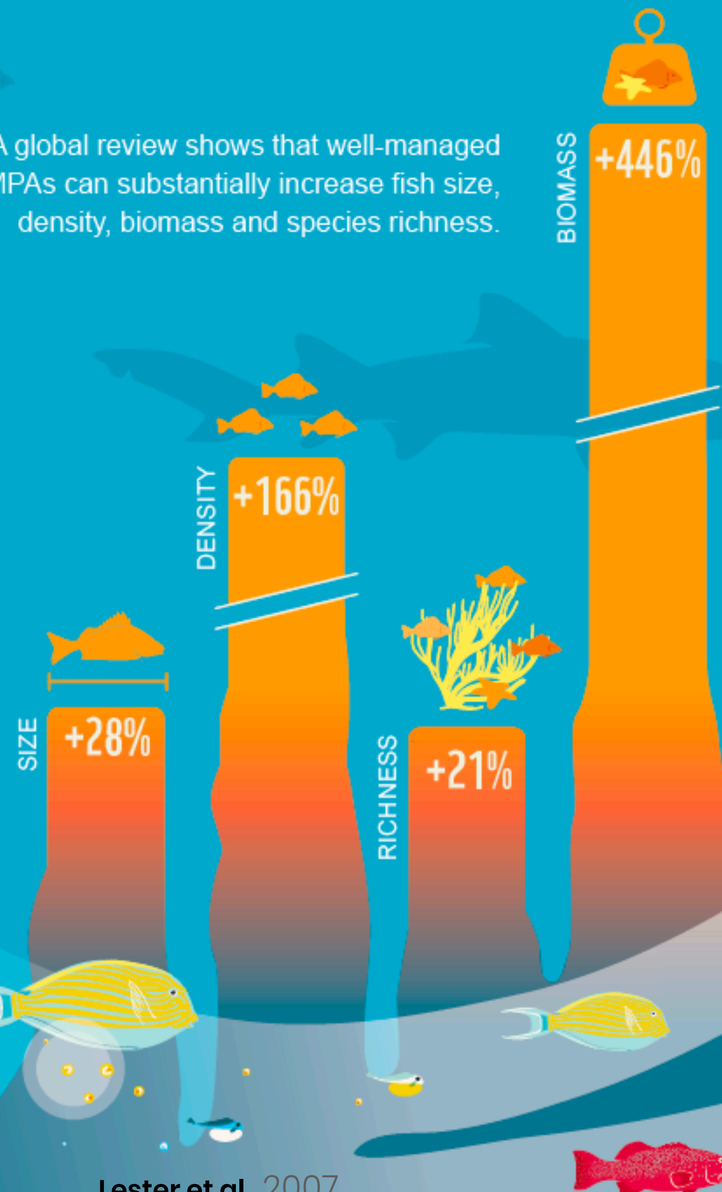


Positive effect of fully protected MPAs on:

- Biodiversity

Benefits export outside fully protected MPAs

A global review shows that well-managed MPAs can substantially increase fish size, density, biomass and species richness.



Lester et al. 2007

SPILLOVER

AND INVERTEBRATES

MPAs CAN PUMP FISH INTO ADJACENT AREAS

In Columbretes Islands MPA (Spain):

Loss of fishing grounds: 32% of the area

Number of lobsters caught: + 21%

Biomass of lobsters caught: +41%

Goni et al. 2010

DISPERSAL

MPAs CAN EXPORT LARVAE INTO ADJACENT AREAS

In Torre Guaceto MPA (Italy)

Large seabreams in the fully protected area produce eggs and larvae that disperse to fished areas more than 100 km away.

Di Franco et al. 2012

© WWF

Multiple socio-ecological benefits of fully protected MPAs

Jacquemont et al. 2022

Positive effect of fully protected MPAs on:

- Biodiversity
- Income for fishermen

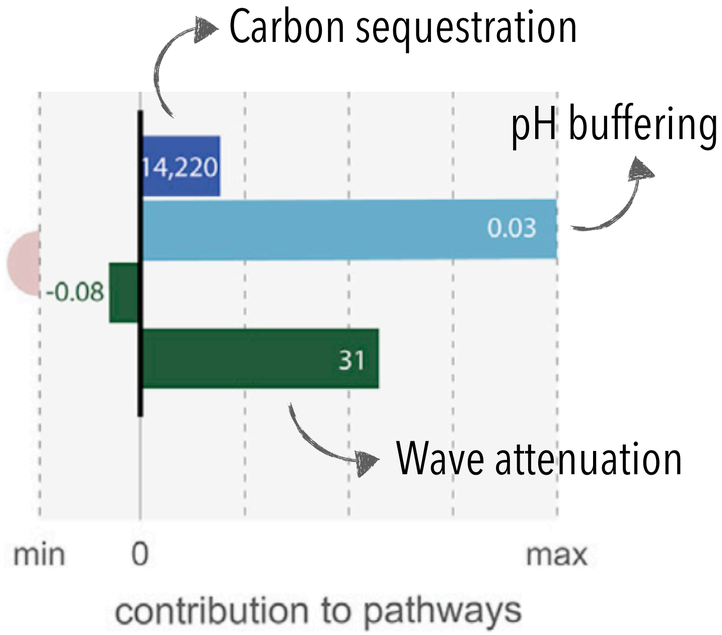
Multiple socio-ecological benefits of fully protected MPAs

Jacquemont et al. 2022

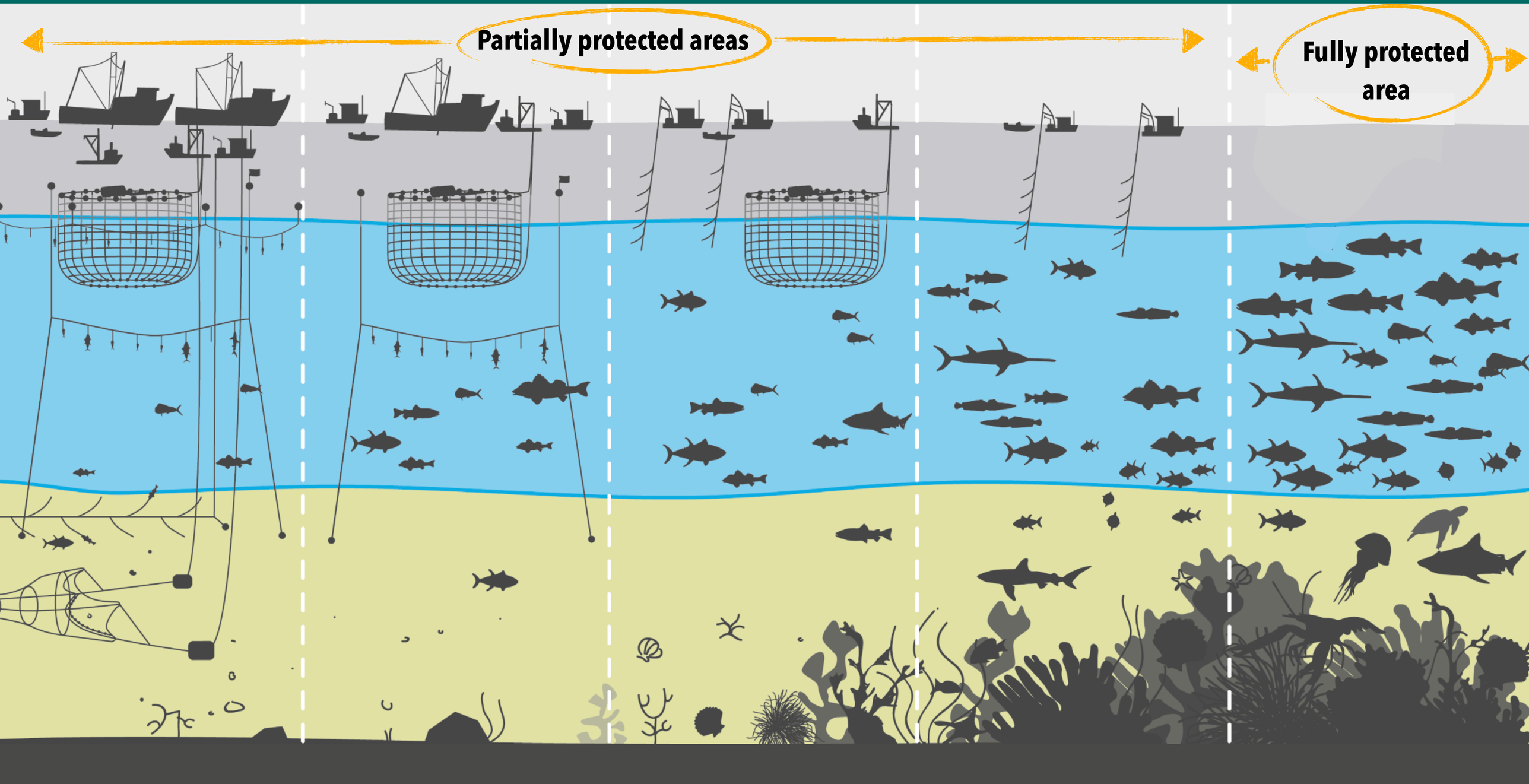
Positive effect of fully protected MPAs on:

- Biodiversity
- Income for fishermen
- Foods security through an increase in catch per unit of effor
- Climate change mitigation through different pathways

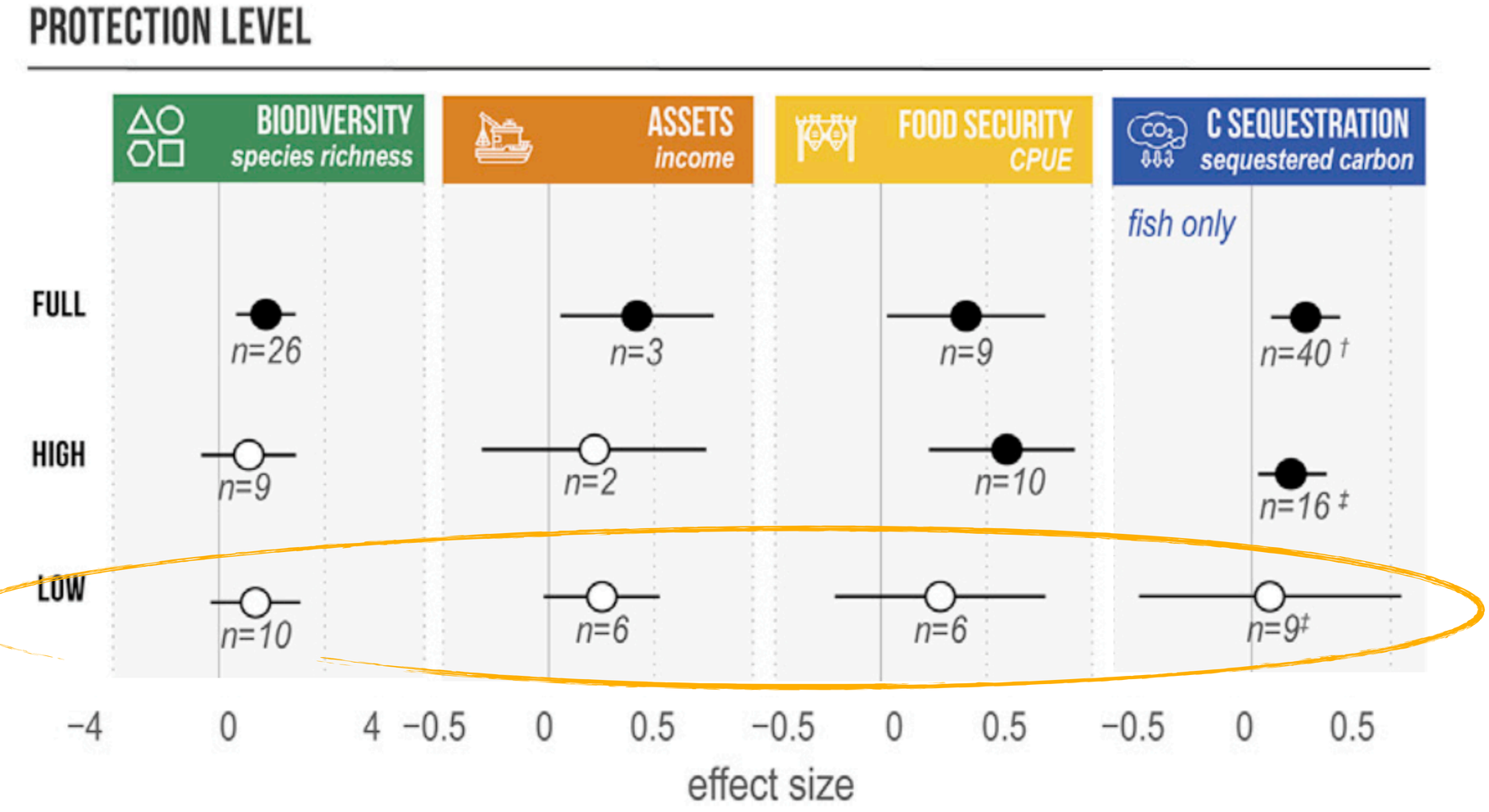
Seagrass
(266,562 km²)



Marine Protected Areas are far from being all fully protected



What about not fully protected MPAs ?



When MPAs don't implement regulations allowing the reduction of human pressures on ecosystem components, no socio-ecological benefits are expected

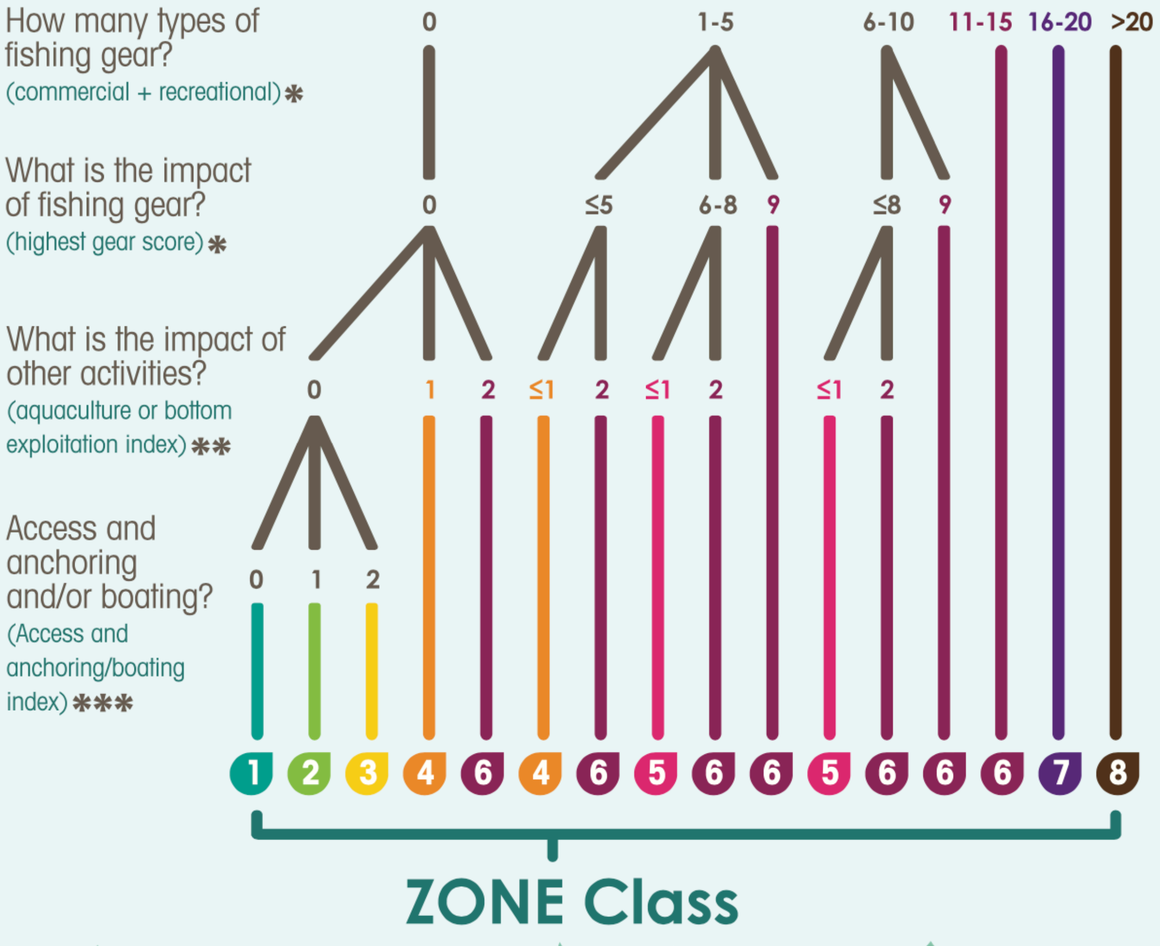
Jacquemont et al. 2022

A MPA classification based on their regulations

A Regulation-Based Classification System for Marine Protected Areas (MPAs)

Based on: Horta e Costa et al. Marine Policy. DOI: http://dx.doi.org/10.1016/j.marpol.2016.06.021

Classification System of Zones within MPAs (a decision tree)



A Regulation-Based Classification System for Marine Protected Areas (MPAs)

Based on: Horta e Costa et al. Marine Policy. DOI: http://dx.doi.org/10.1016/j.marpol.2016.06.021

Classification System of MPAs

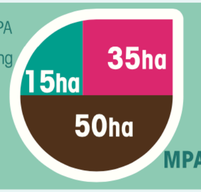
ZONE Class 1 2 3 4 6 4 6 5 6 6 5 6 6 6 7 8

Next stage: how to classify MPAs

An MPA index is calculated based on the area each ZONE Class occupies within the MPA

$$\text{MPA index} = \text{SUM}\left(\text{ZONE}_i\ \text{Class} \times \frac{\text{Area ZONE}_i}{\text{Area MPA}}\right)$$

Example of a multiple-use MPA with 3 zones (and corresponding zone classes) occupying different areas



EXAMPLE

MPA with 100 ha of total area

15ha class 1 + 35ha class 5 + 50ha class 8

$$\text{MPA index} = \left(1 \times \frac{15}{100}\right) + \left(5 \times \frac{35}{100}\right) + \left(8 \times \frac{50}{100}\right) = 5.9$$

MPA index	MPA Classification
1 to 3 incl.	FULLY PROTECTED
3 to 5 incl.	HIGHLY PROTECTED
5 to 6 incl.	MODERATELY PROTECTED
6 to 7 incl.	POORLY PROTECTED
7 to 8	UNPROTECTED

Horta e Costa et al. 2016

Zupan et al. 2018

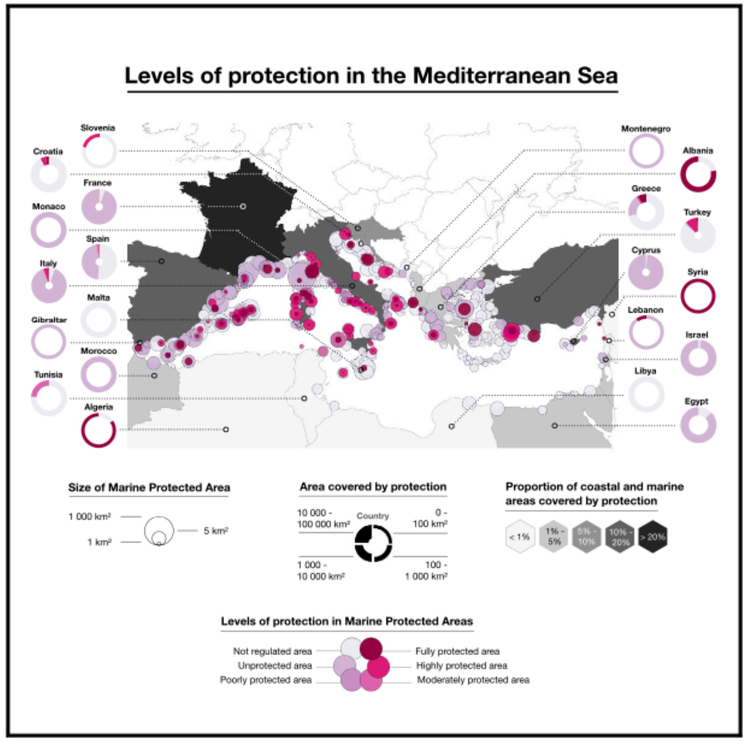
Levels of protection in Mediterranean MPAs

One Earth

Article

Underprotected Marine Protected Areas in a Global Biodiversity Hotspot

Graphical Abstract



Highlights

- 6.01% of the Mediterranean is covered by protection
- In 95% of this area, regulations are not stronger inside than outside MPAs
- Only 0.23% of the Mediterranean is fully or highly protected
- Protection is unevenly distributed across political boundaries and eco-regions

Authors

Joachim Claudet, Charles Loiseau, Marta Sostres, Mirta Zupan

Correspondence

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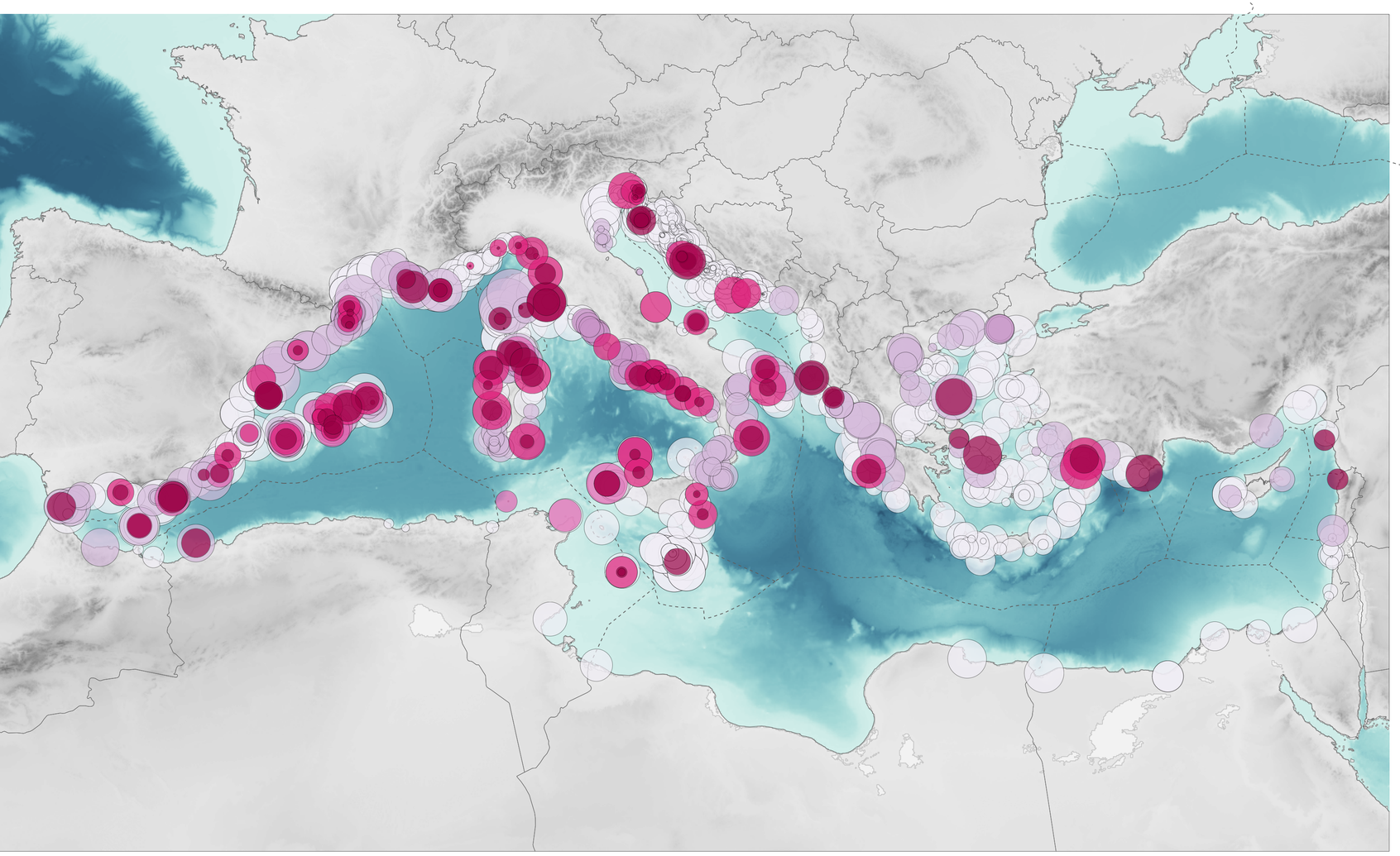
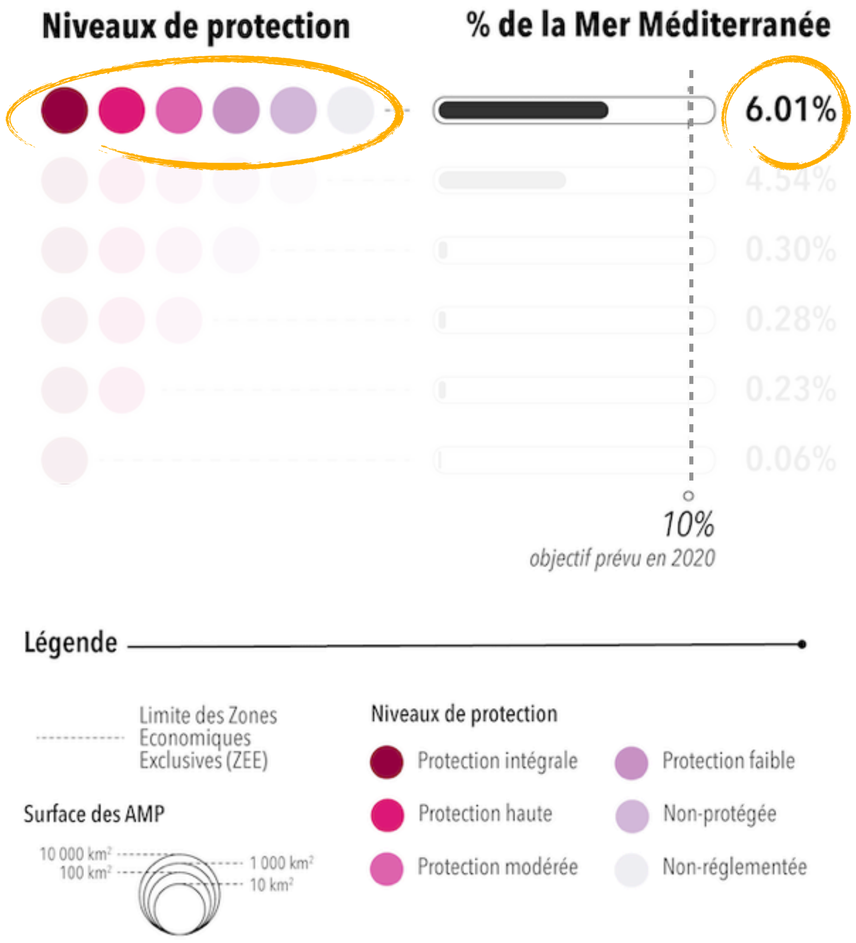
In Brief

While the ocean is central to human well-being, an expanding human footprint is placing it at risk. Among the 1,062 marine protected areas in the Mediterranean Sea, 72% of the protected areas lack regulations that can reduce human impacts on biodiversity. The most effective levels of protection represent only 0.23% of the basin. Protection levels should be increased and more evenly distributed across political boundaries and eco-regions to deliver tangible benefits for biodiversity conservation.

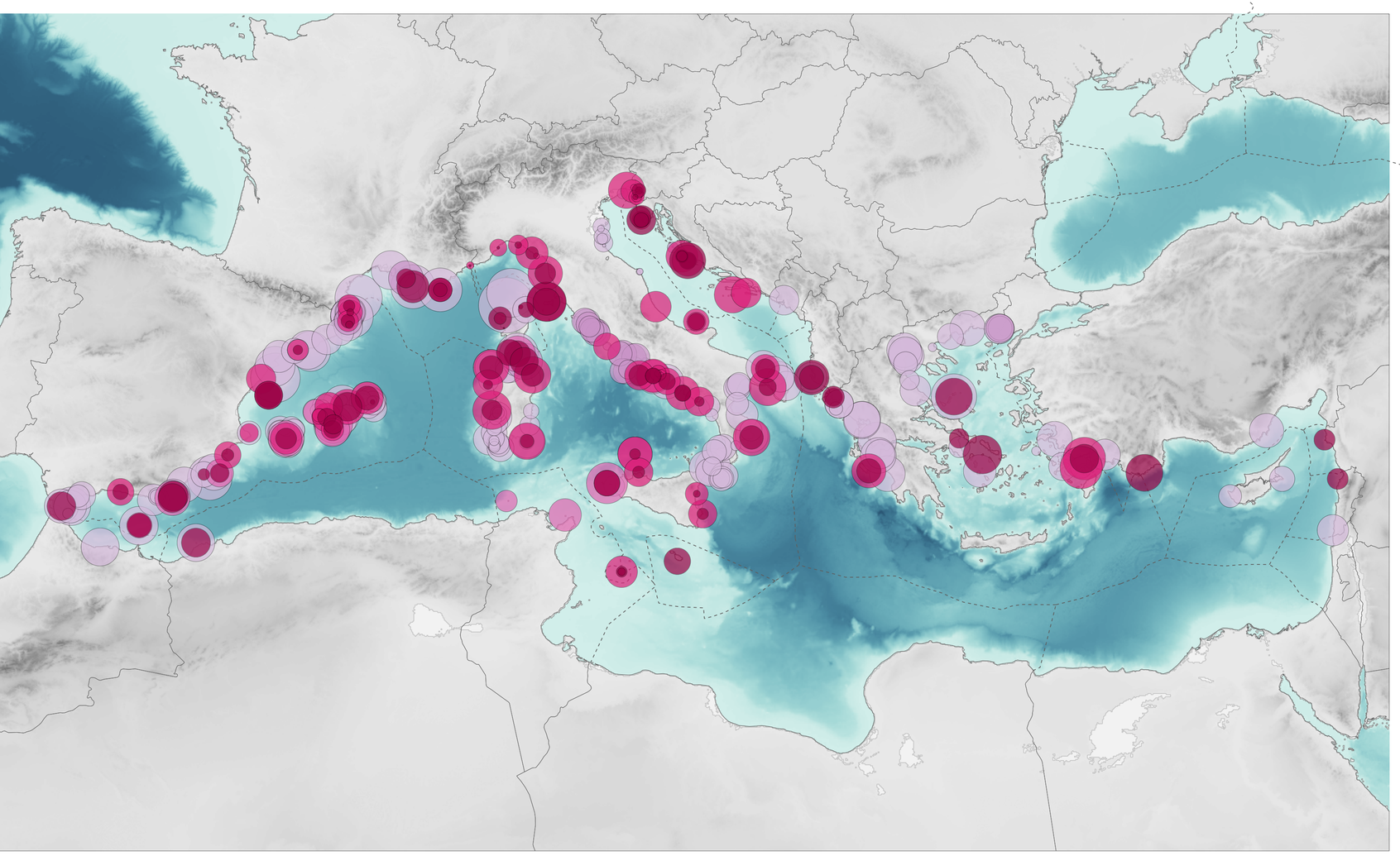
Levels of protection in Mediterranean MPAs

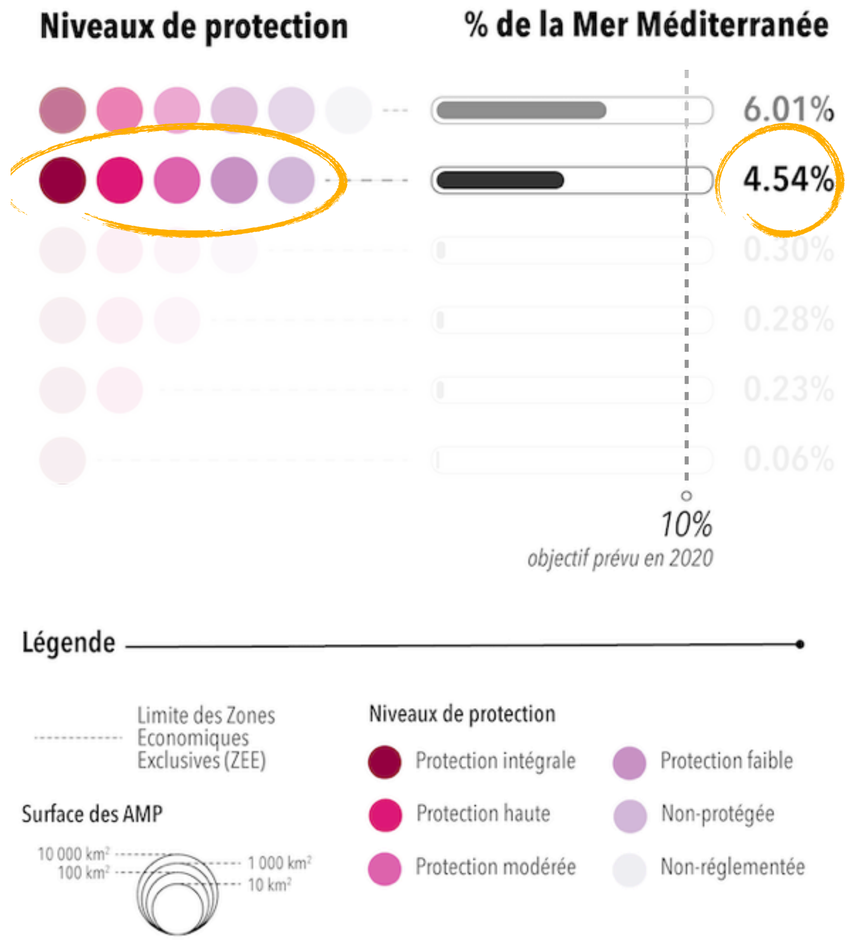




Claudet et al. 2020

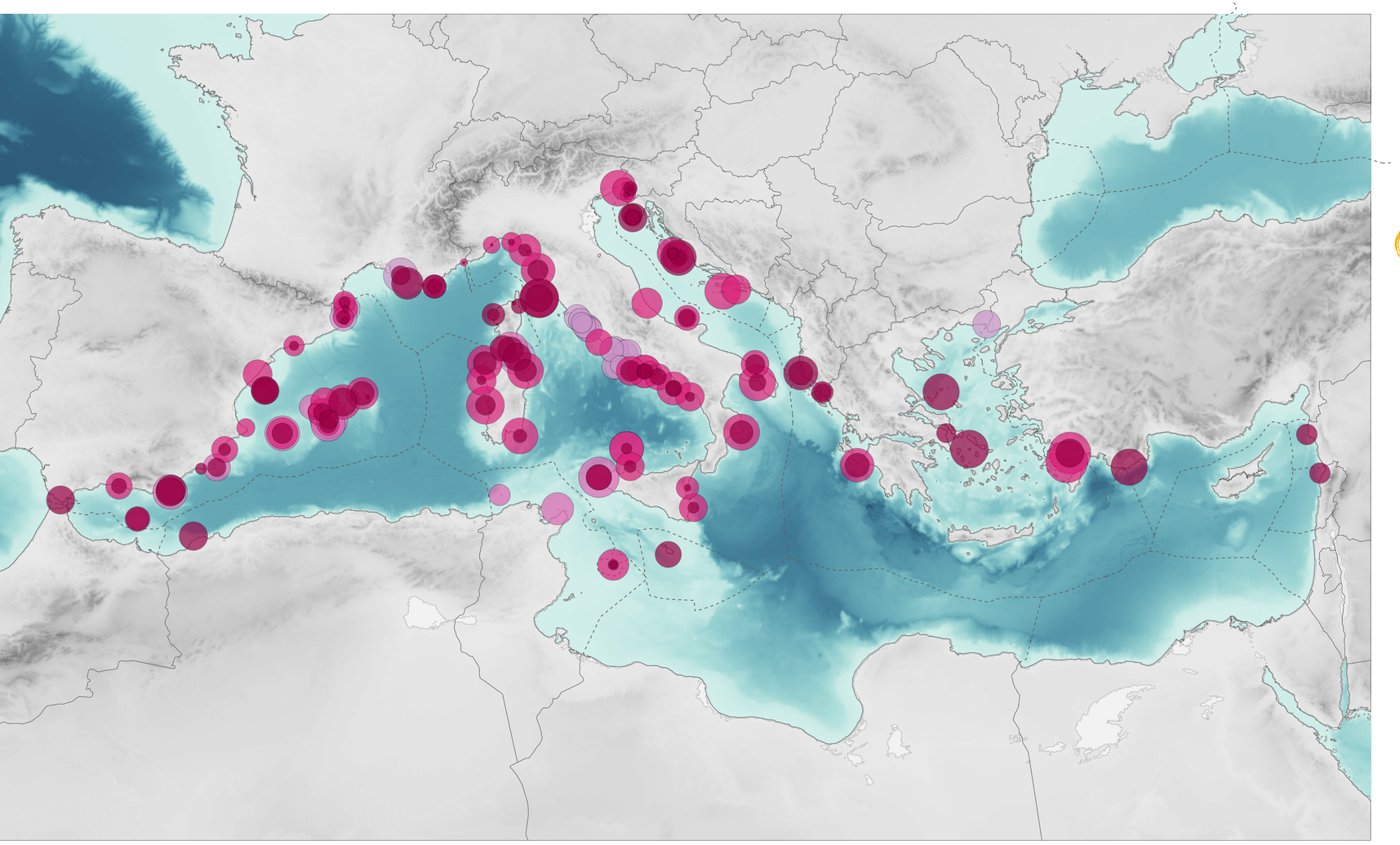
Levels of protection in Mediterranean MPAs

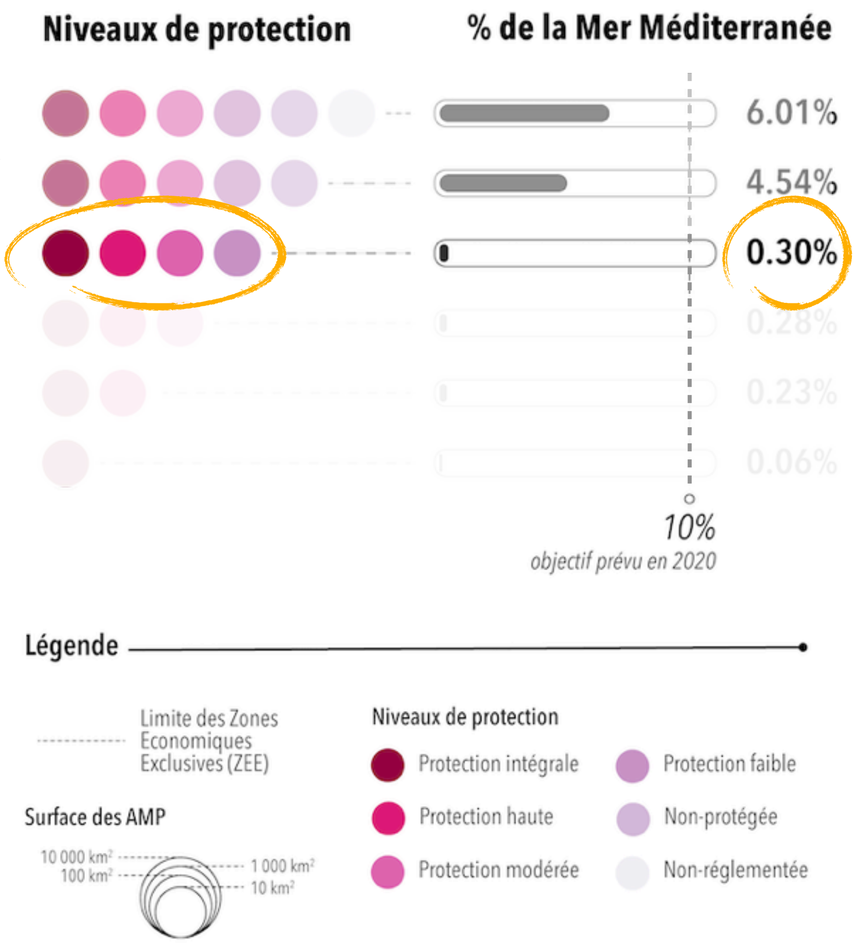




Claudet et al. 2020

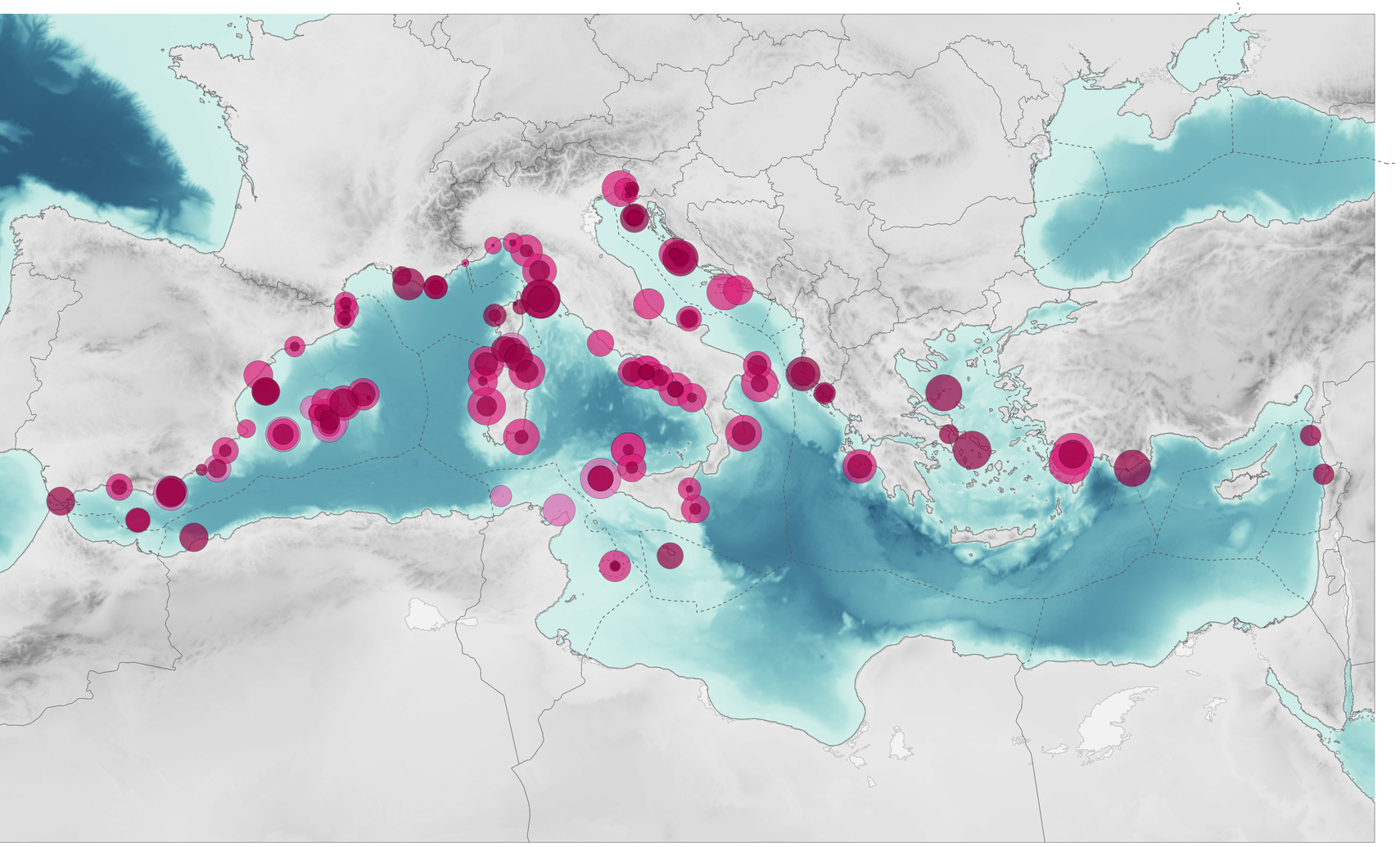
Levels of protection in Mediterranean MPAs

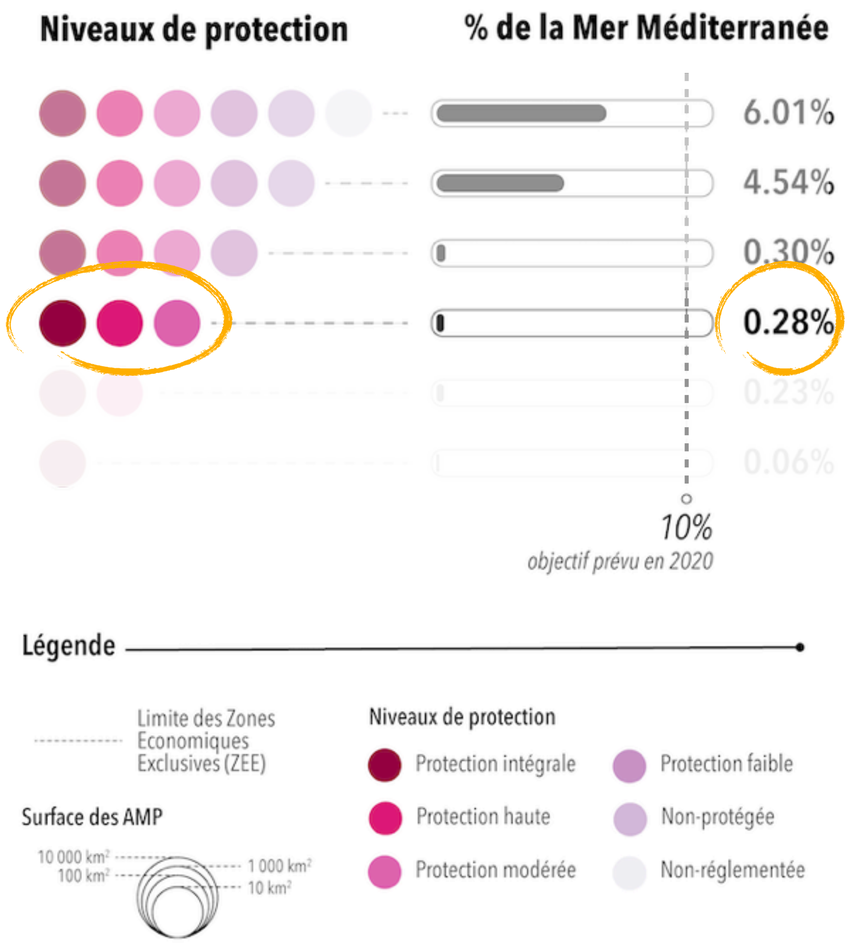




Claudet et al. 2020

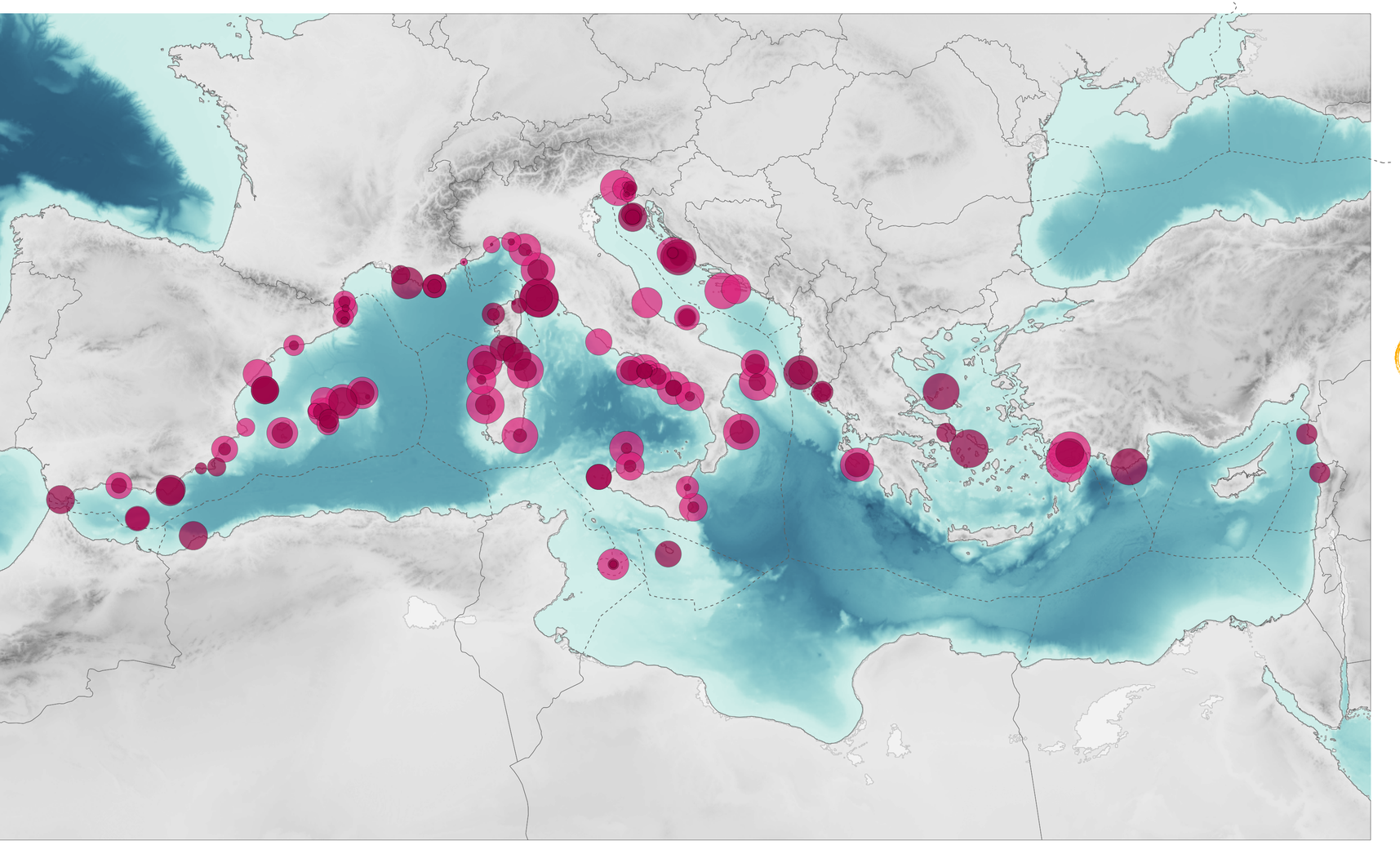
Levels of protection in Mediterranean MPAs

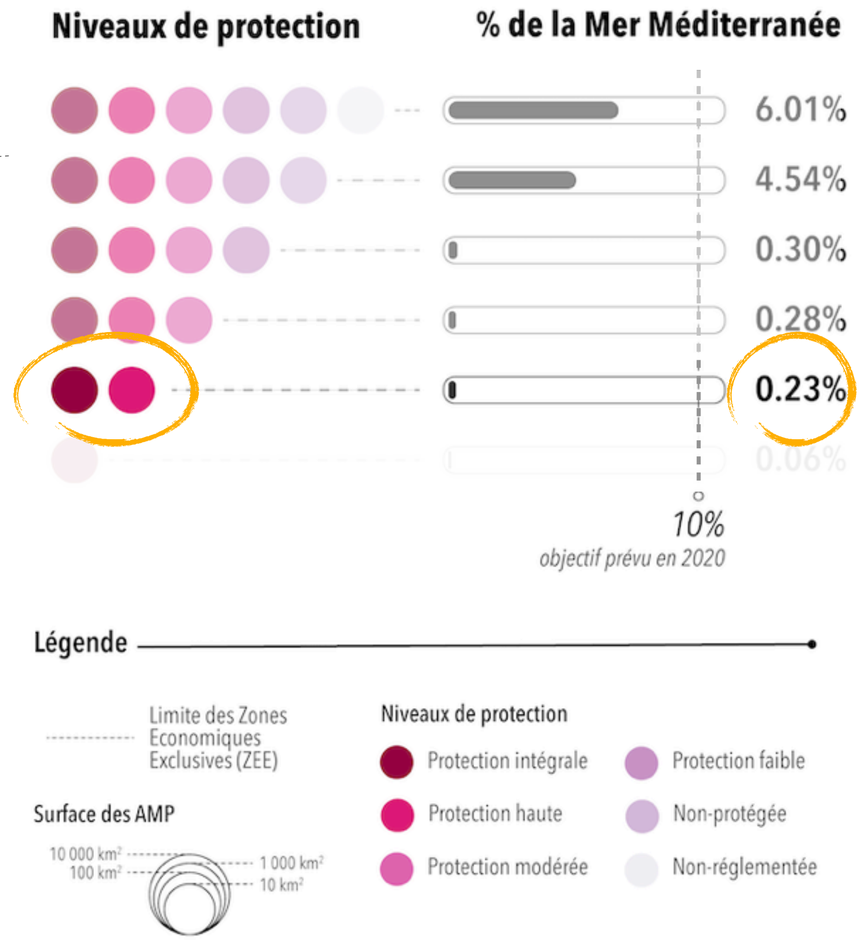




Claudet et al. 2020

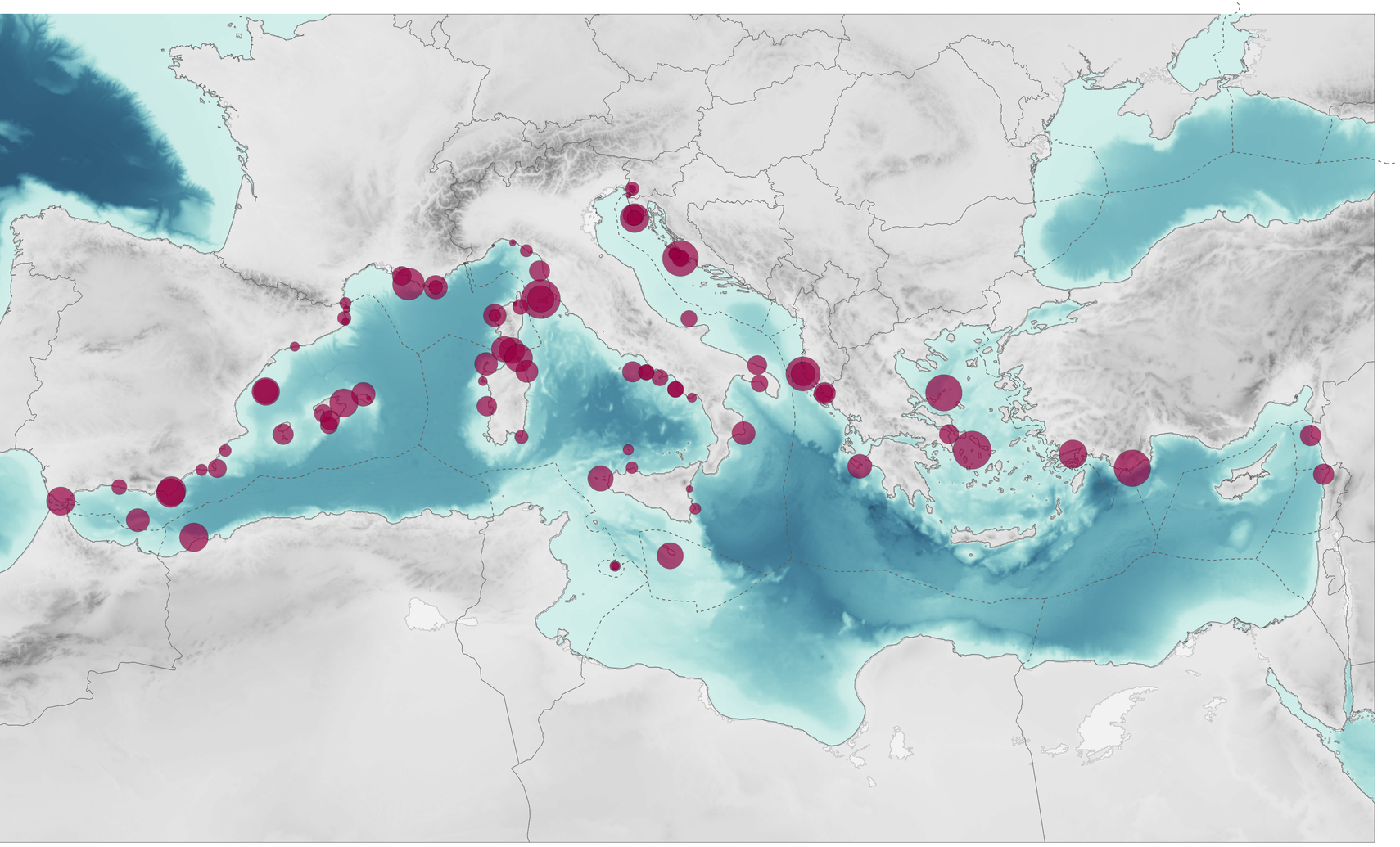
Levels of protection in Mediterranean MPAs

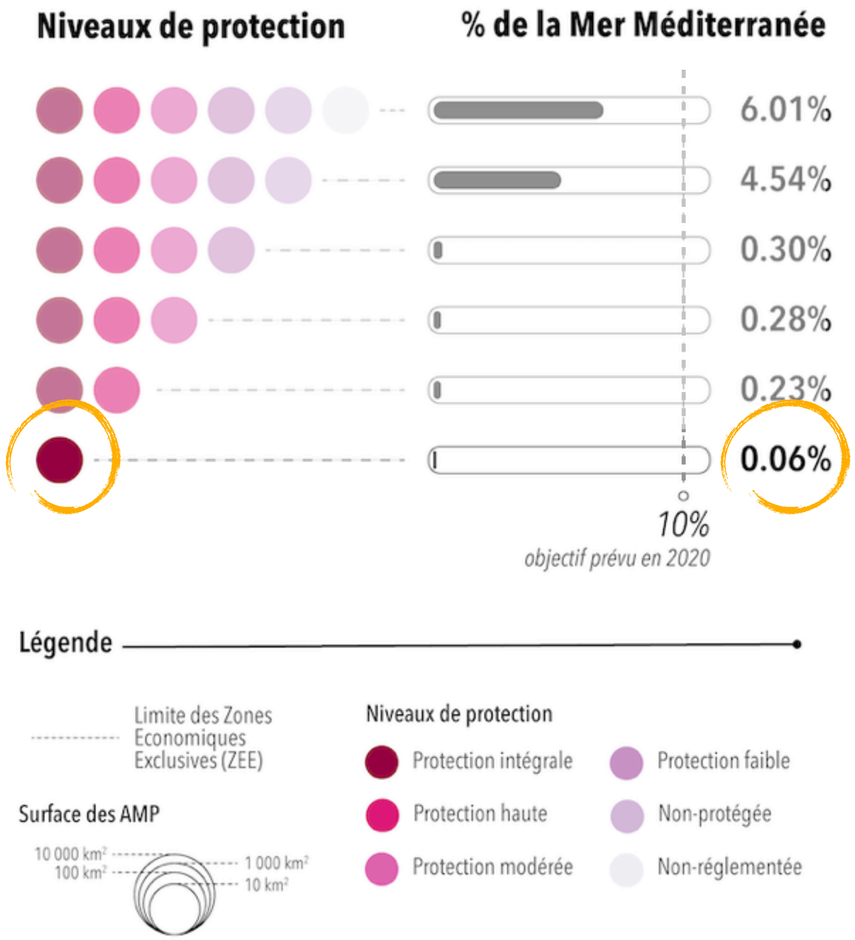




Claudet et al. 2020

Levels of protection in Mediterranean MPAs





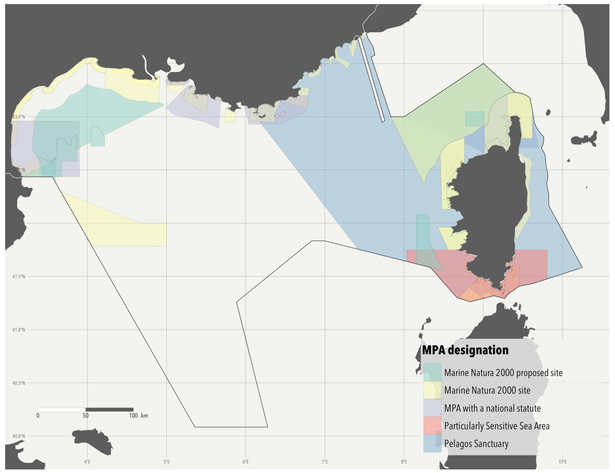
Claudet et al. 2020

How to prioritize area for strict protection ?

© Lauric Thiault

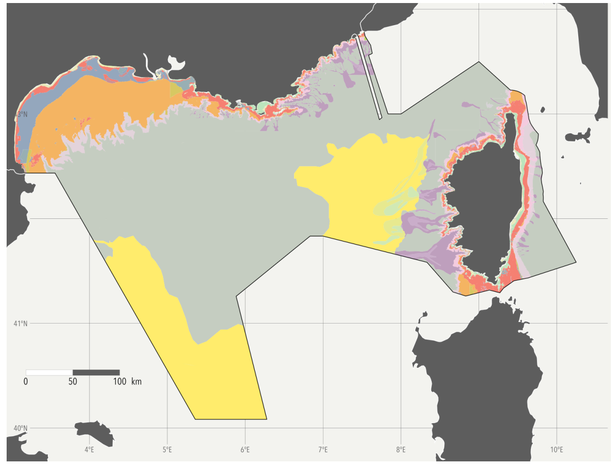
Systematic conservation planning approach for strict protection

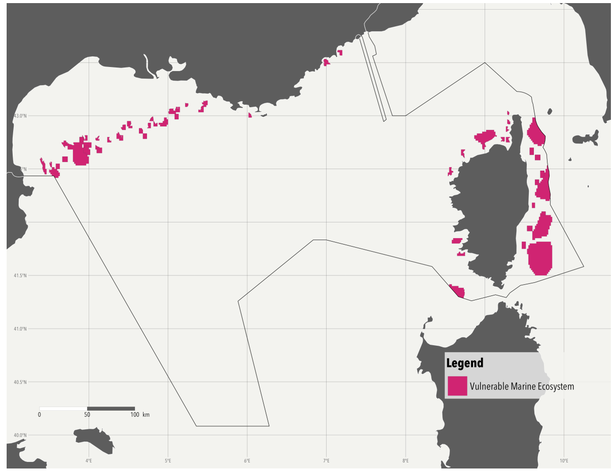
Objectives and targets



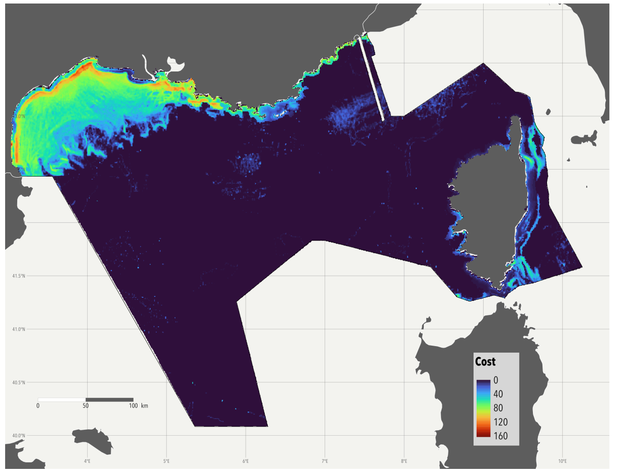
10% of marine realm under strict protection by 2030 in a « functional, representative and ecologically coherent network ».

Ecological features





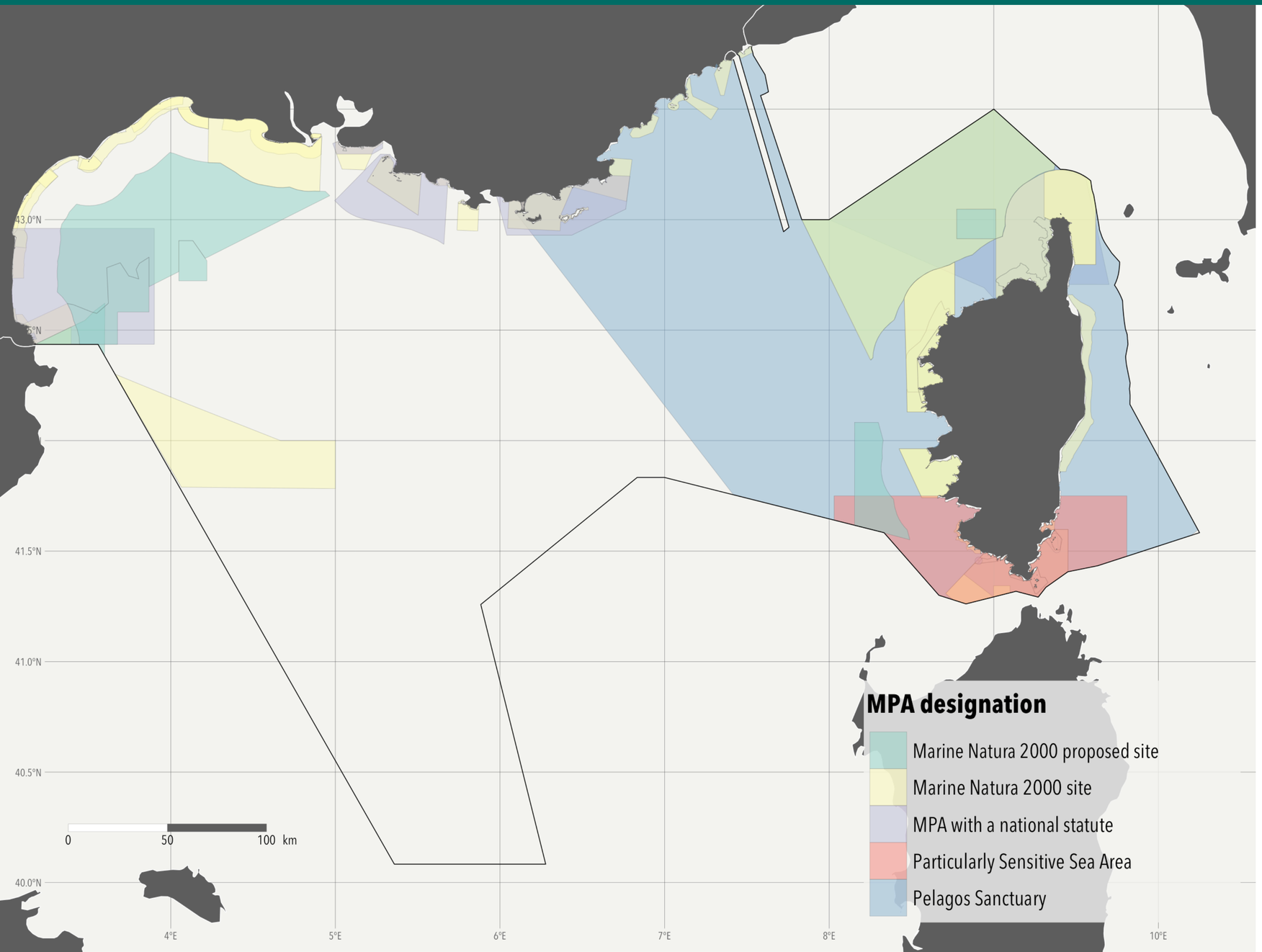
Cost



Constraints

EU 2022

Objectives and targets



55%

of French waters in the Mediterranean Sea are under various protection statut

< 0.1%

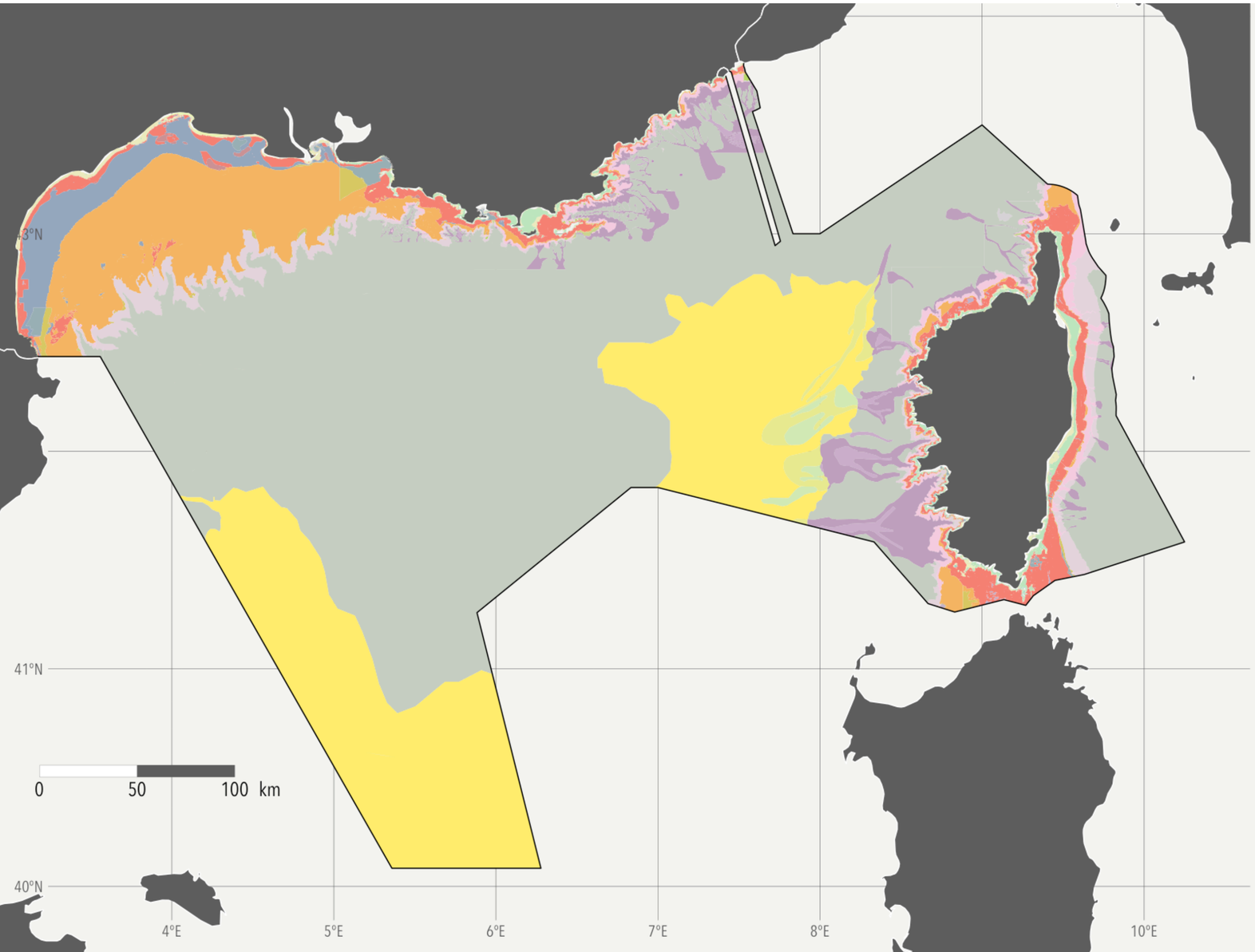
are fully protected

Objectives

30% in 2030 including 10% of strong protection (French version of strict protection), firstly to be settle in already existing MPAs in a coherent* way

* Representative, large enough, replicated, in network.

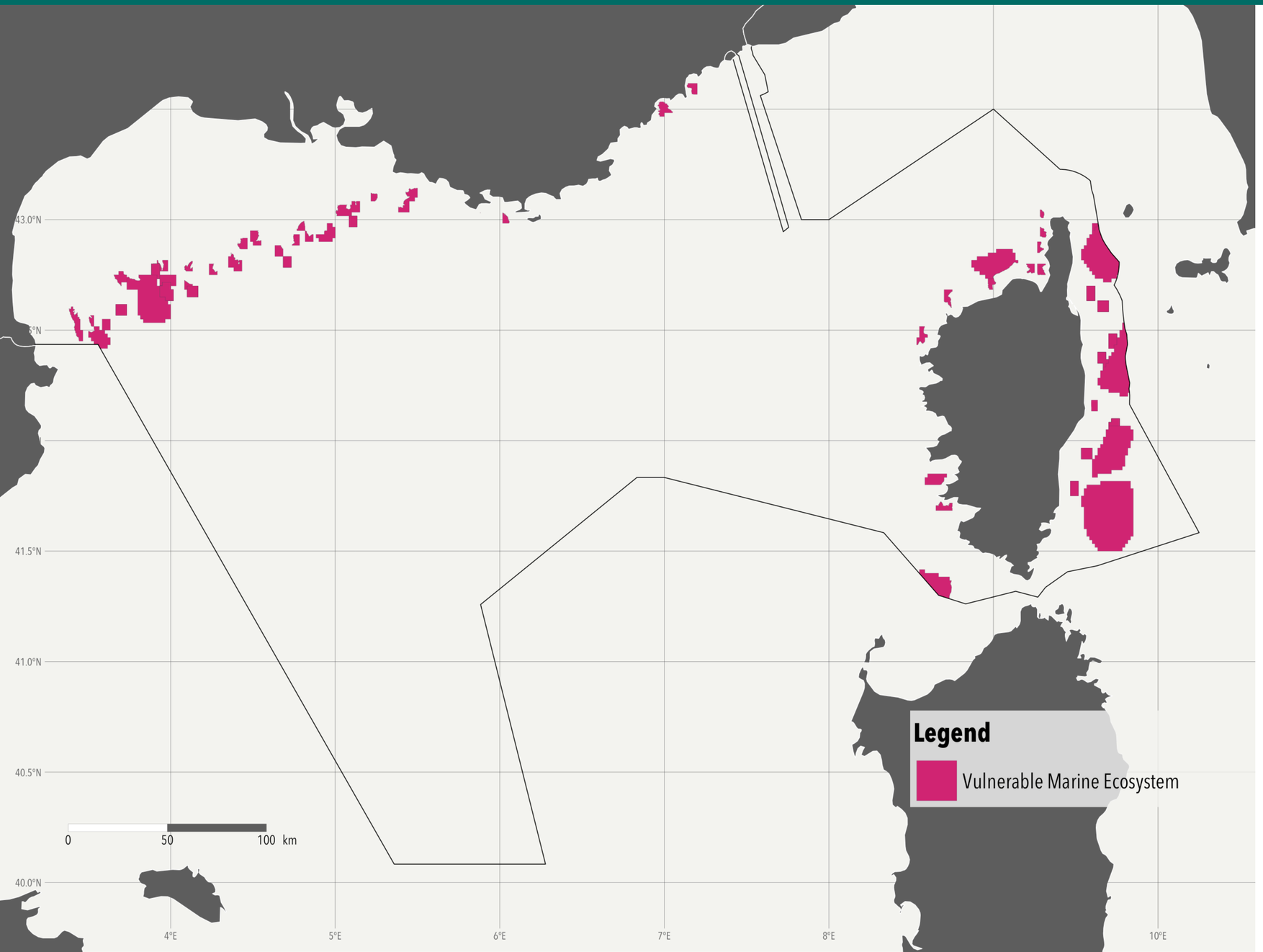
Ecological features: EUNIS habitats



EUNIS habitats

- MB15: Mediterranean infralittoral rock
- MB252: Biocenosis of [Posidonia oceanica]
- MB35: Mediterranean infralittoral coarse sediment
- MB55: Mediterranean infralittoral sand
- MB65: Mediterranean infralittoral mud
- MC151: Coralligenous biocenosis
- MC251: Coralligenous platforms
- MC35: Mediterranean circalittoral coarse sediment
- MC45: Mediterranean circalittoral mixed sediment
- MC451: Biocenosis of Mediterranean muddy detritic bottoms
- MC651: Biocenosis of Mediterranean circalittoral coastal terrigenous muds
- MD151: Biocenosis of Mediterranean shelf-edge rock
- MD451: Biocenosis of Mediterranean open-sea detritic bottoms on shelf-edge
- MD651: Biocenosis of Mediterranean offshore circalittoral coastal terrigenous muds
- ME15: Mediterranean upper bathyal rock
- ME35: Mediterranean upper bathyal coarse sediment
- ME45: Mediterranean upper bathyal mixed sediment
- ME55: Mediterranean upper bathyal sand
- ME65: Mediterranean upper bathyal mud
- MF15: Mediterranean lower bathyal rock
- MF35: Mediterranean lower bathyal coarse sediment
- MF45: Mediterranean lower bathyal mixed sediment
- MF55: Mediterranean lower bathyal sand
- MF65: Mediterranean lower bathyal mud
- MG35: Mediterranean abyssal coarse sediment
- MG55: Mediterranean abyssal sand
- MG65: Mediterranean abyssal mud

Ecological features: Vulnerable Marine Ecosystems



VME are designated according to one or more of these criteria:

Uniqueness

Functional significance

Fragility

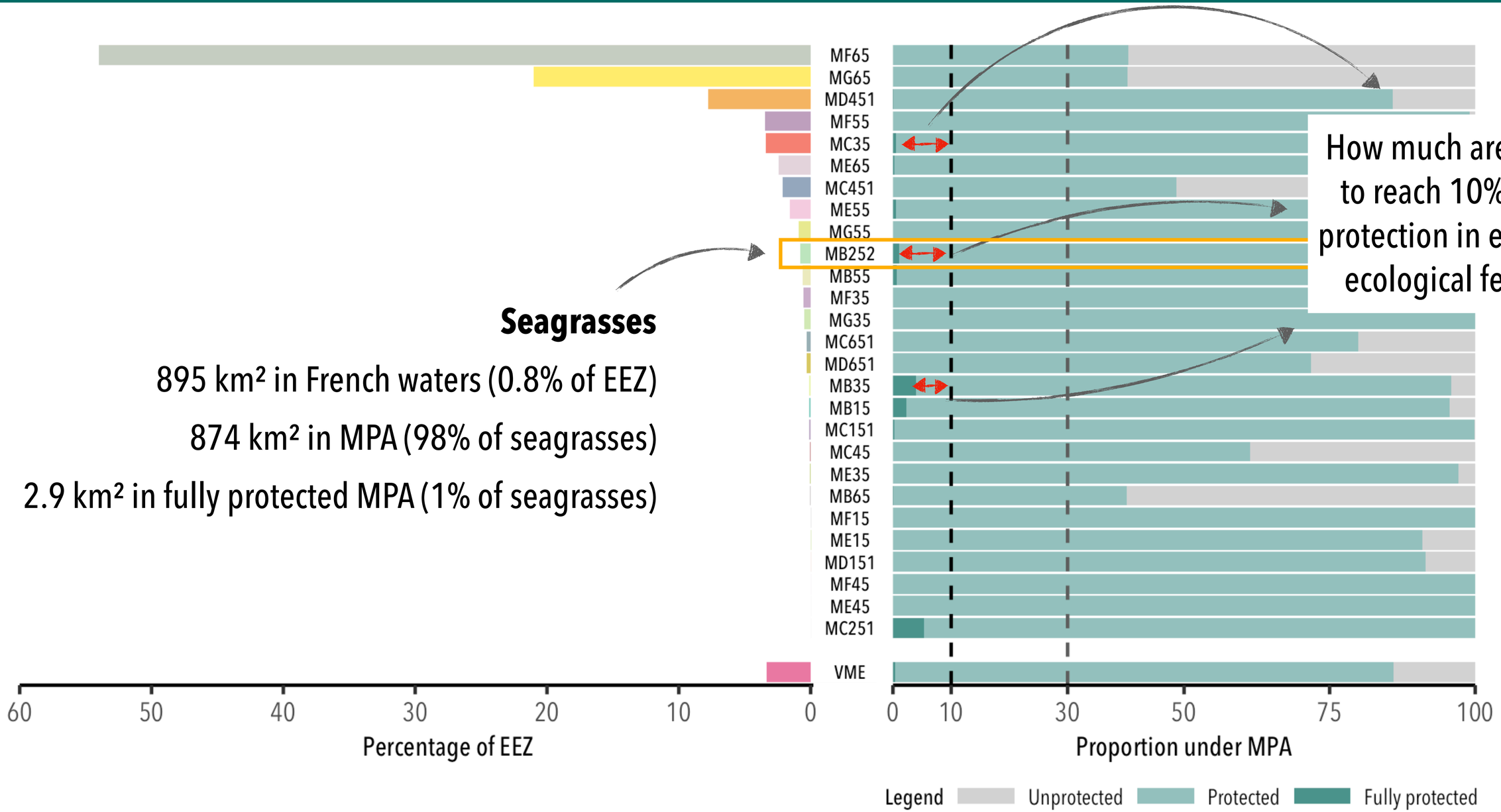
Low recovery

Structural complexity

FAO 2009

In the Mediterranean Sea, mainly composed of cold-water coral reefs, and deep-sea sponge aggregations

Ecological features: setting targets



Seagrasses

895 km² in French waters (0.8% of EEZ)

874 km² in MPA (98% of seagrasses)

2.9 km² in fully protected MPA (1% of seagrasses)

How much area remain to reach 10% of strict protection in each of our ecological features ?

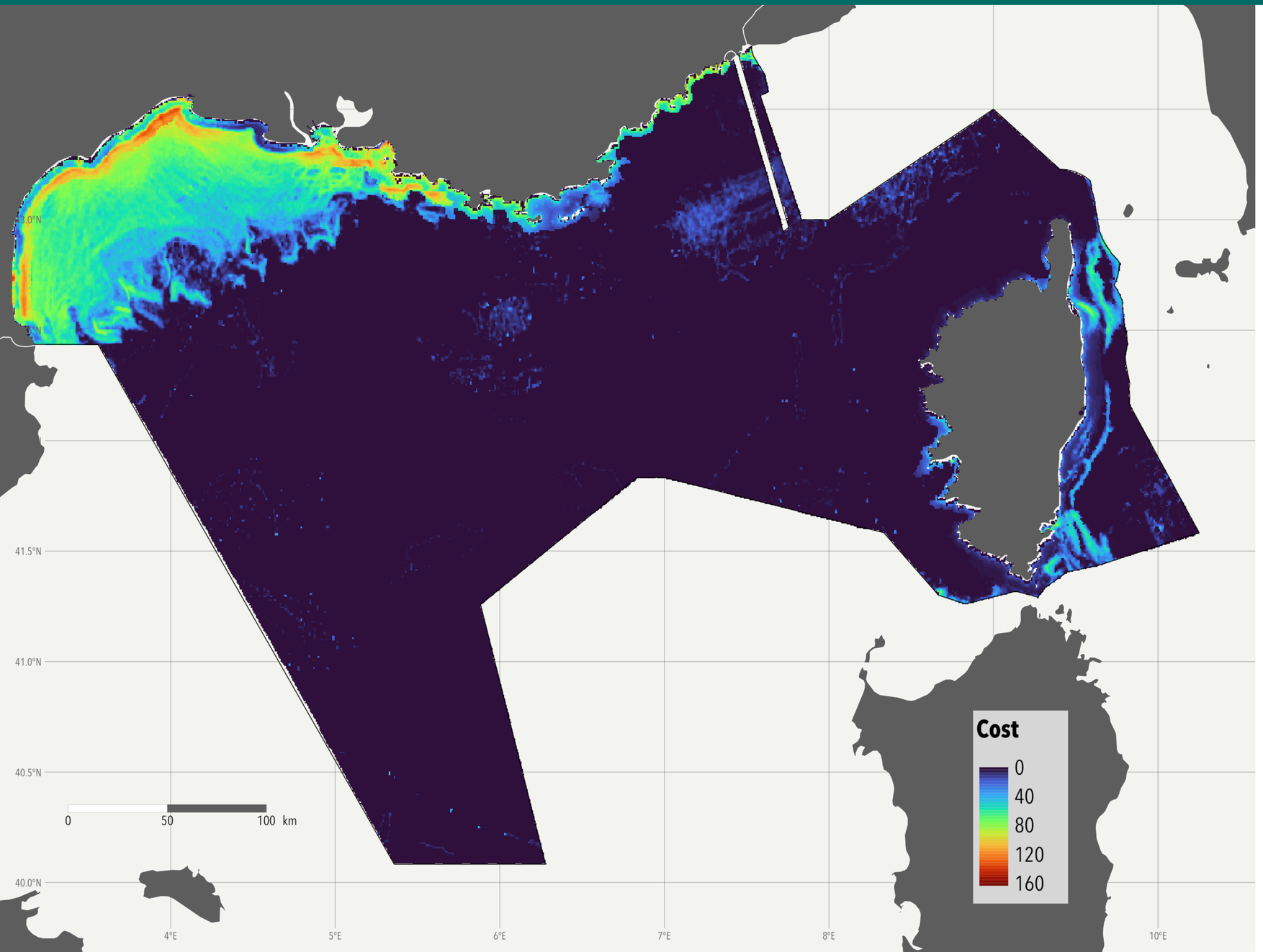
Ecological features: setting targets

Seagrasses

Target of 9.2%

Meaning the percentage of each ecological features inside MPAs that are required to reach 10% of each under strict protection

Conservation cost: distribution and intensity of fishing activities



Coastal fisheries

Data based on catch

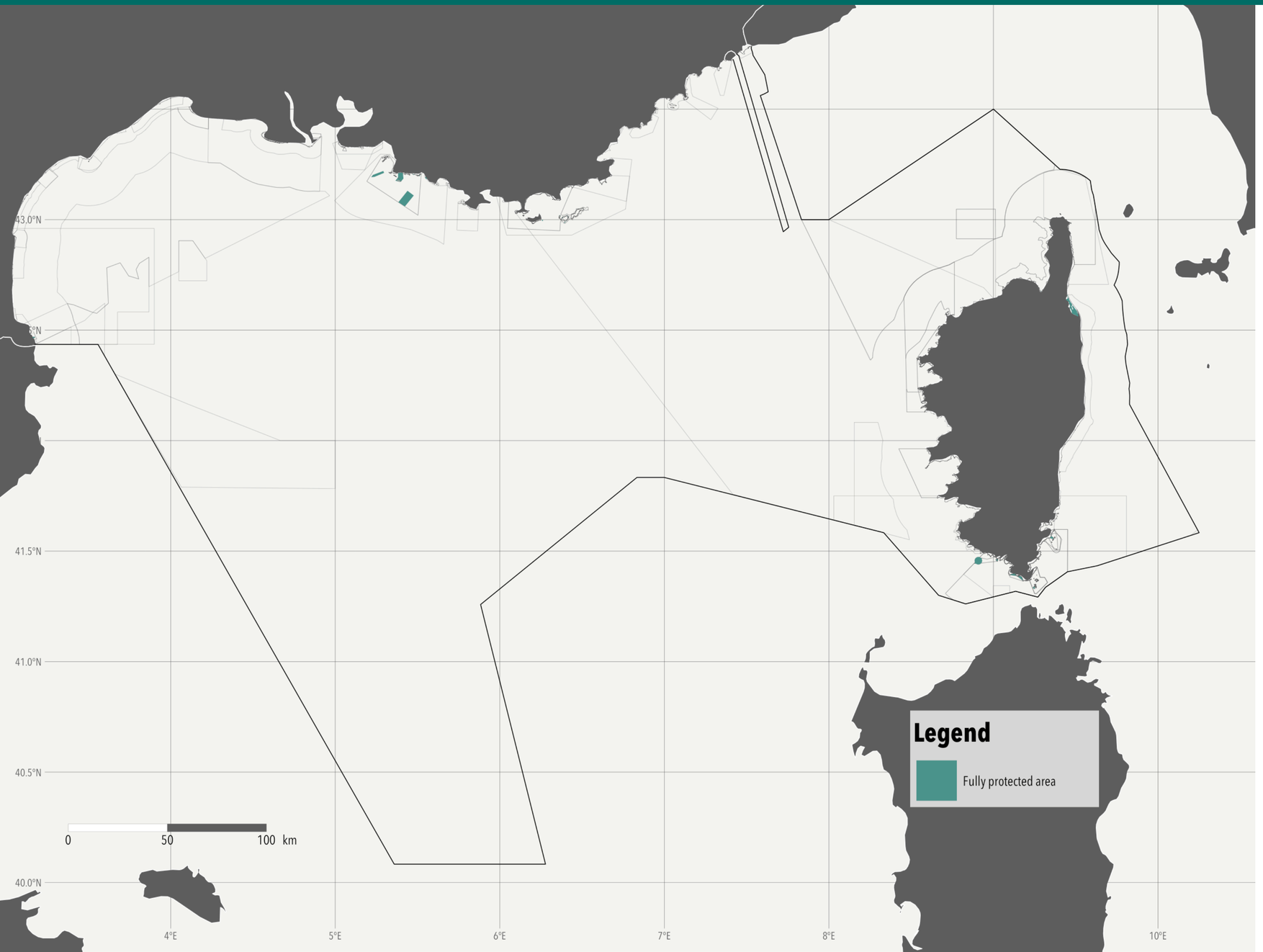
From Halpern et al. 2008 - Watson et al. 2018

Offshore fisheries

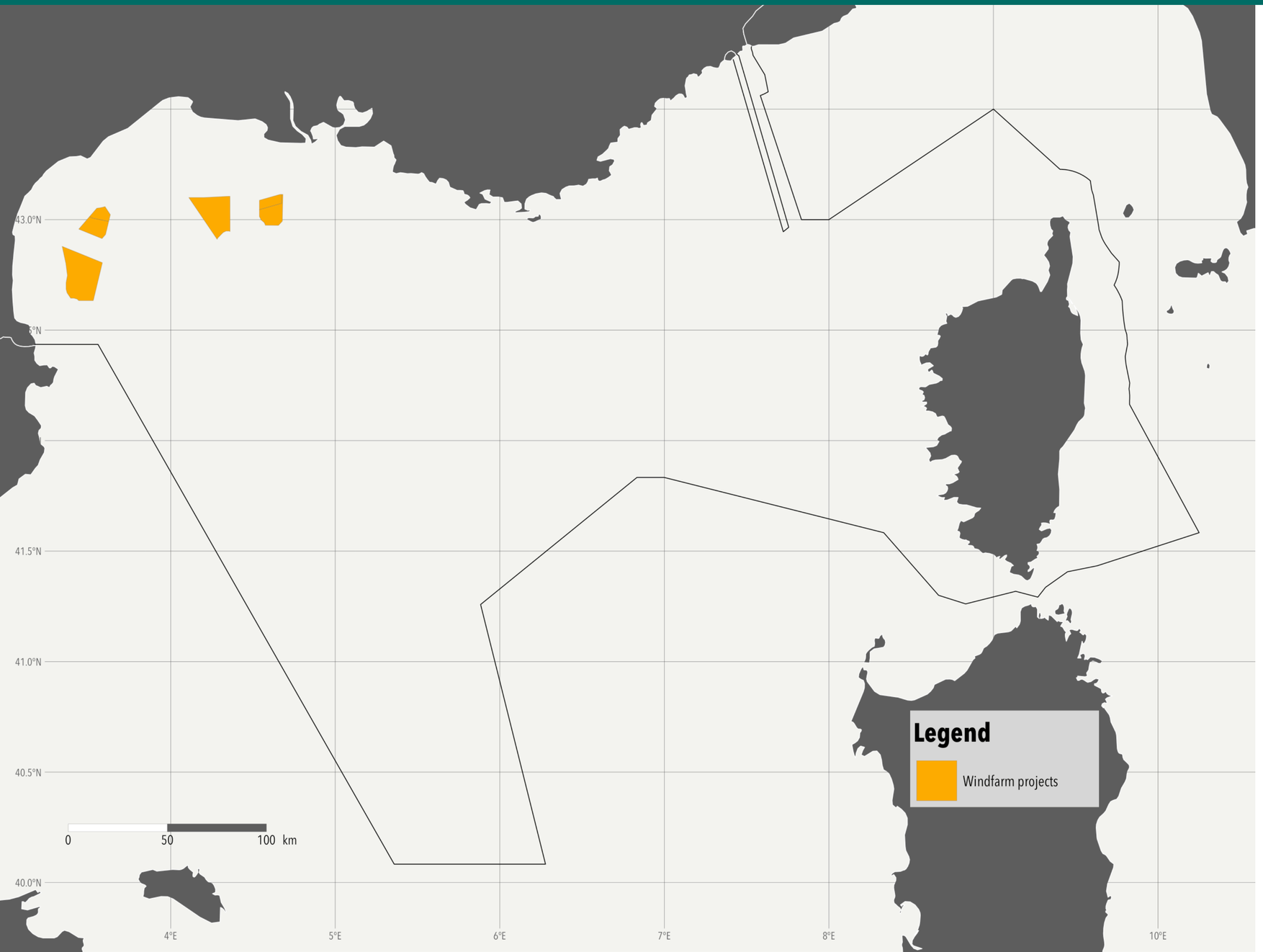
Data based on AIS

From GlobalFishingWatch

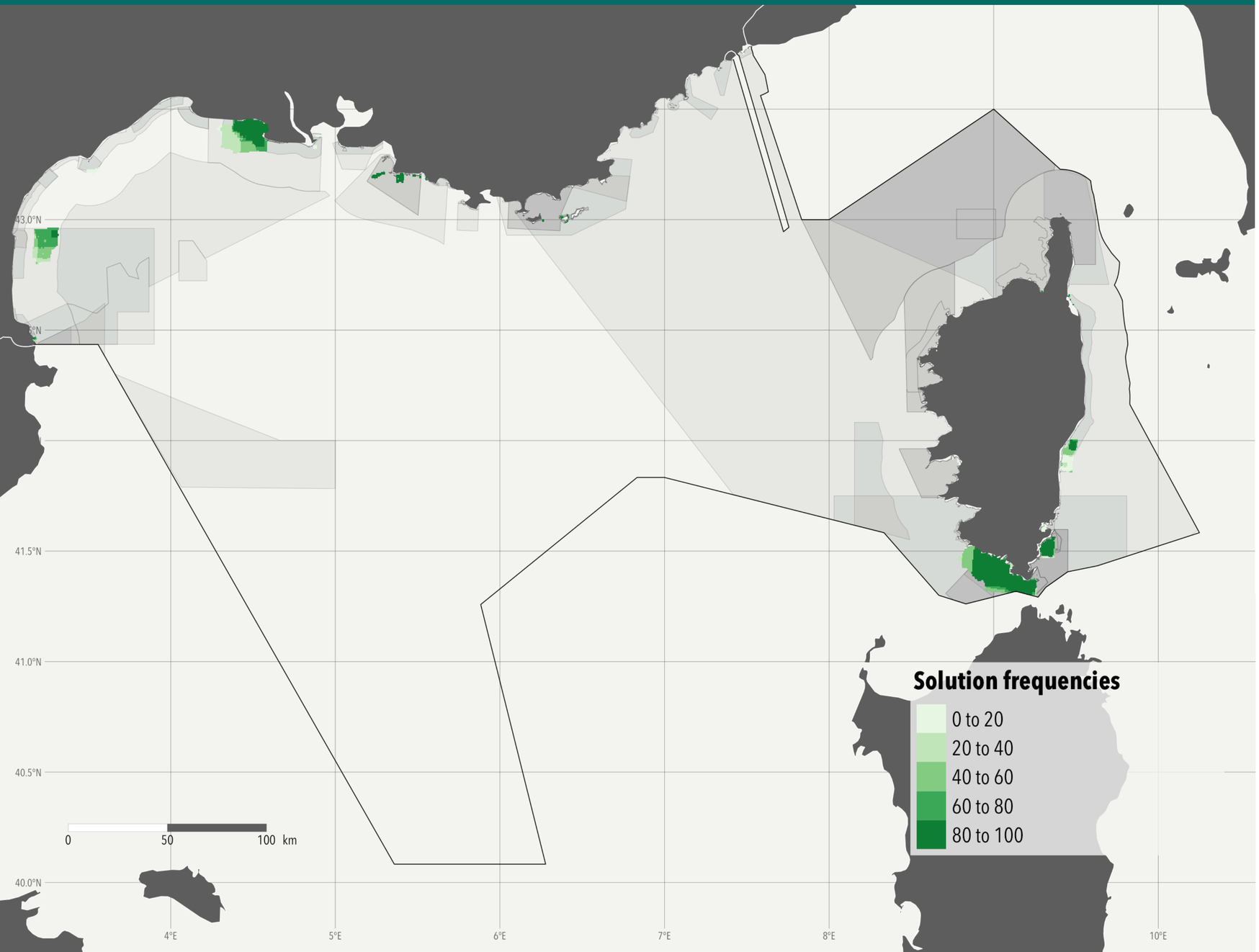
Constraints: ensure to prioritize area already fully protected

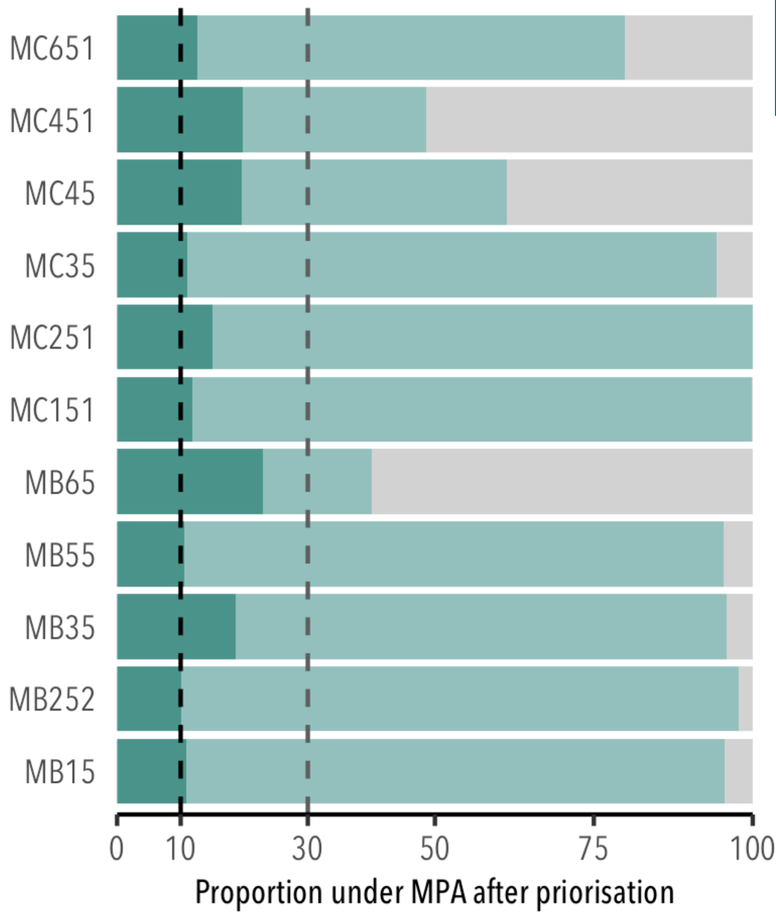


Constraints: ensure to not prioritize wind-farm projects



Preliminary results of the priorisation for coastal habitats



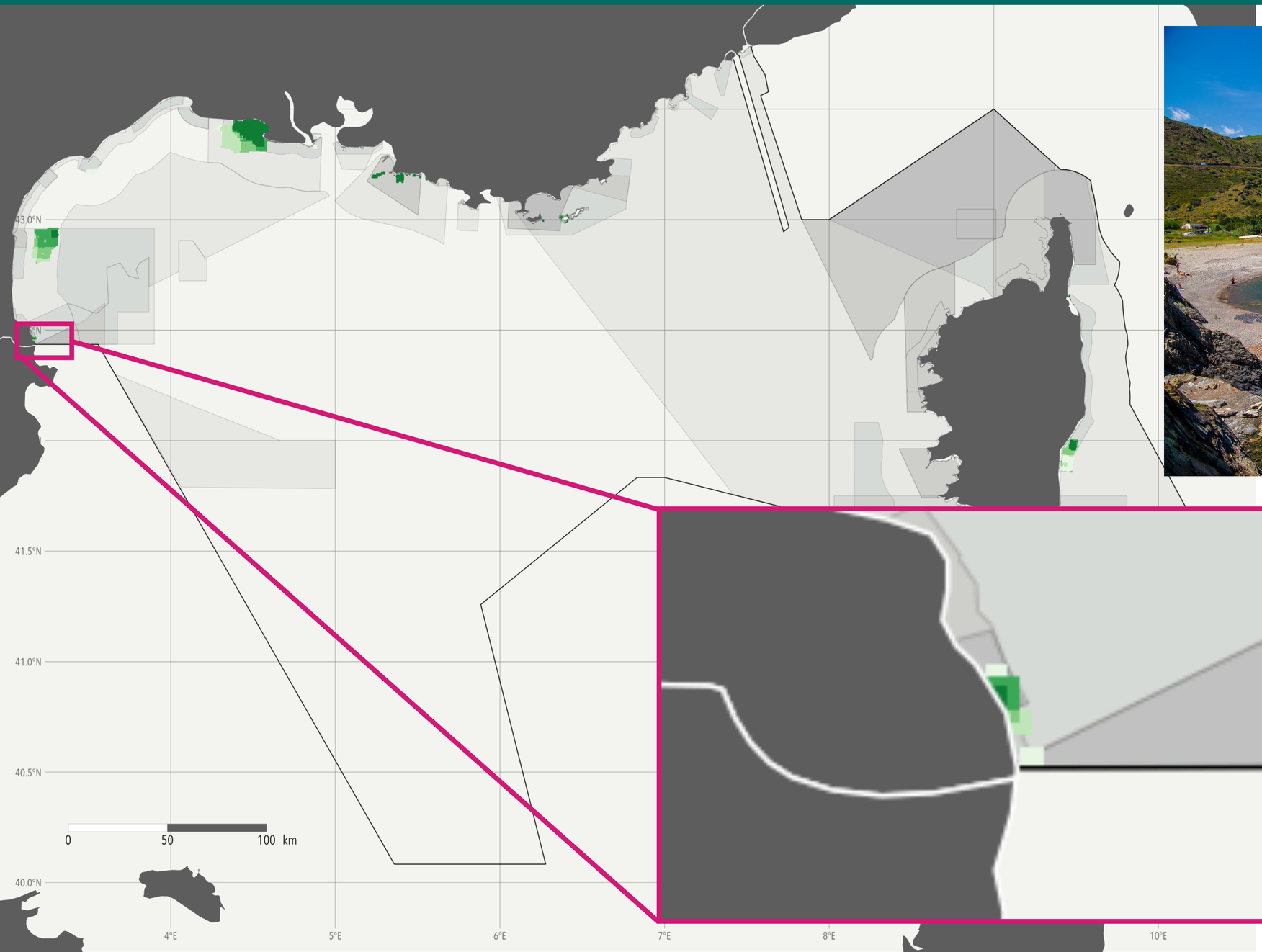


Cost of the priorisation

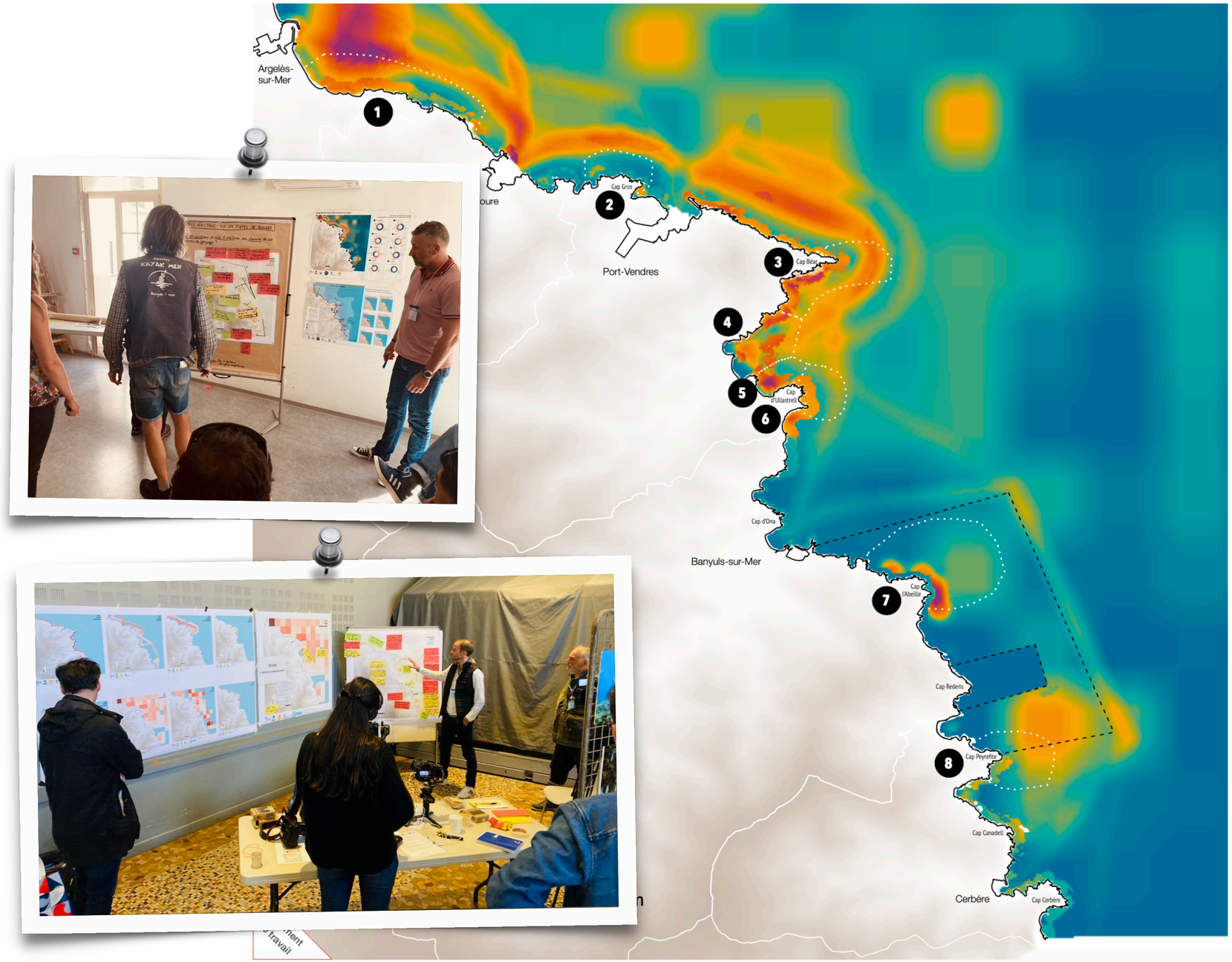
8%*

* meaning 8% of the total cost relative to fishing effort is impacted by the priorisation

The case of the Natural Reserve Marine of Cerbère-Banyuls

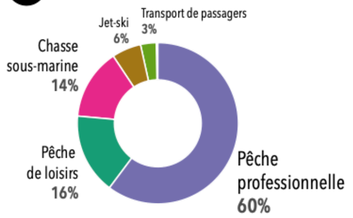


Cumulative impact assessment as a tool to prioritize management measures

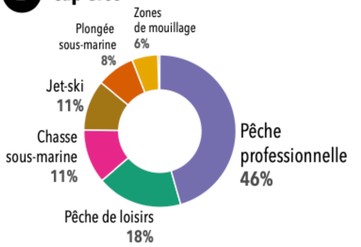


Contributions individuelles des usages au risque d'effet cumulé dans les zones à enjeux de biodiversité

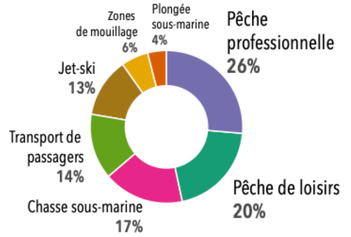
1 Herbier du Porteil



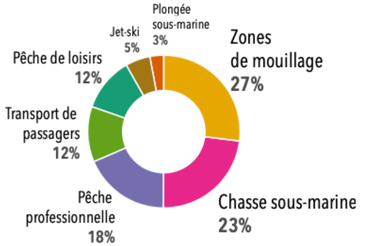
2 Cap Gros



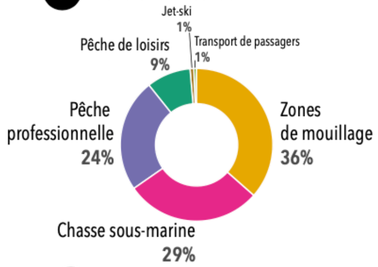
3 Cap Béar



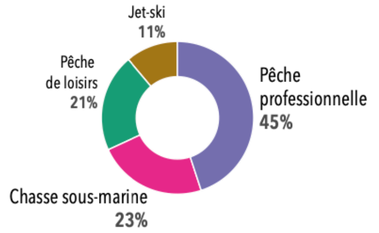
4 Paulilles



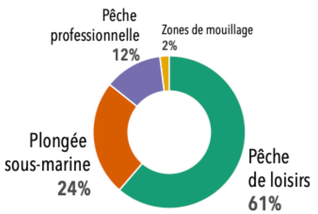
5 Herbier du Fourat



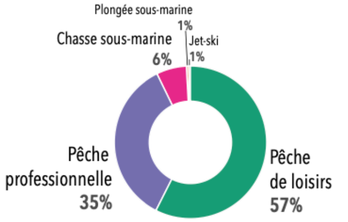
6 Cap Ullastrell

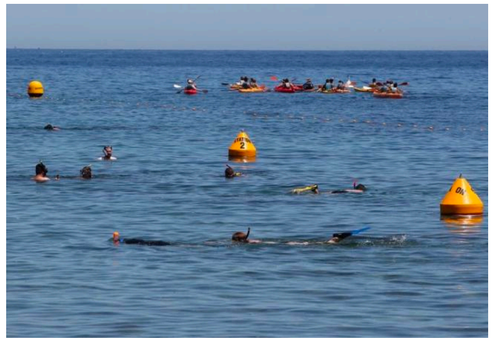


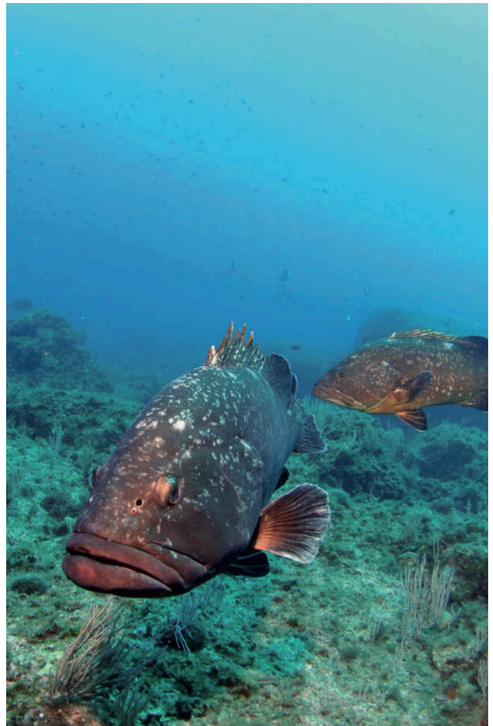
7 Cap l'Abeille



8 Cap Peyrefite







Third Natura 2000 marine biogeographical seminar for the Mediterranean and Black Sea regions

European Commission's DG Environment / French Ministry of Ecological Transition/French Biodiversity Agency

12-14 March 2024
Marseille

Ecological and socio-economic benefits of strictly protected MPAs and scientific principles for their establishment

THANK YOU !

Speaker

Charles Loiseau

CRIOBE (CNRS-PSL-UPVD)

Joachim Claudet's lab

CRIOBE UAR3278 Centre de Recherches Insulaires et Observatoire de l'Environnement

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