SEA-UNICORN

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Sustainable Blue Economy through the COST Action **SEA-UNICORN** (Unifying approaches to Marine Connectivity for Improved Resource Management for the Seas)

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2021 2030 United Nations Decade of Ocean Science for Sustainable Development

NIOZ Sea Research

University of Essex

KU LEUVEN

LISBOA UNIVERSIDADE DE LISBOA

afbi AGRI-FOOD & BIOSCIENCES INSTITUTE

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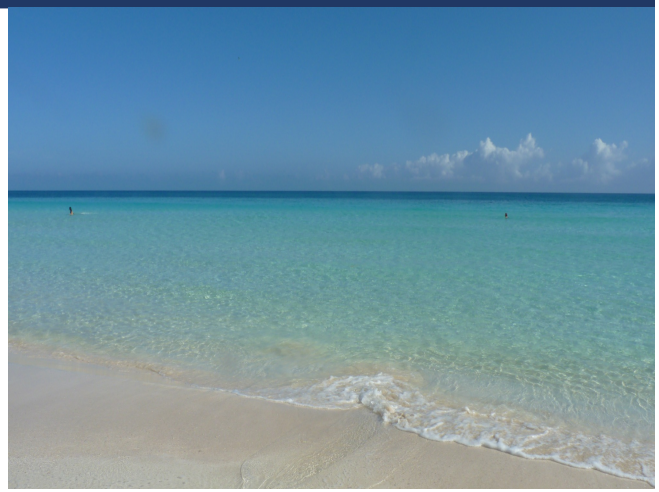

- Oceans and seas cover more than 70% of the Earth and deliver multiple ecosystem services
- Marine ecosystems are highly vulnerable to anthropogenic pressures, and most experience multiple, concurrent threats from local and global pressures
- Unprecedented losses in marine biodiversity are occurring, compromising the health of ecosystems
- Given the importance of marine wildlife rapid and informed actions are needed to mitigate unwanted consequences of ongoing changes.

Planning sustainable development of the world's oceans requires a thorough understanding of marine biodiversity and its role in the healthy functioning of ecosystems

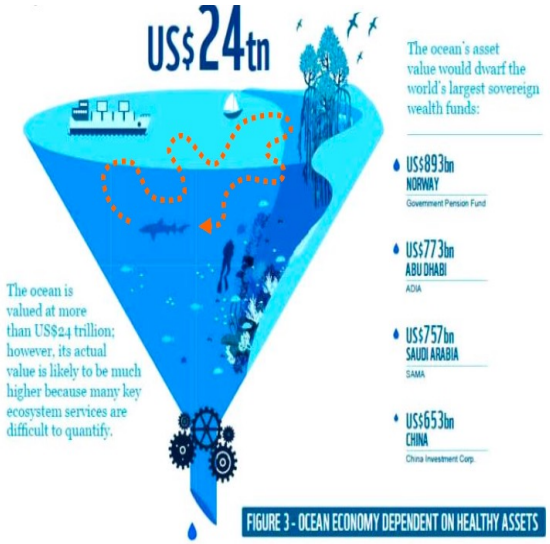

FIGURE 3 - OCEAN ECONOMY DEPENDENT ON HEALTHY ASSETS

Challenge

Connectivity = flow of organisms, matter & energy between habitat patches

An accurate knowledge of it is crucial to ensure a healthy and functioning Ocean …

… and match sustainable development goals

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14 LIFE BELOW WATER · 2 ZERO HUNGER · 12 RESPONSIBLE CONSUMPTION AND PRODUCTION · 13 CLIMATE ACTION

Gathering effective knowledge on Connectivity *can improve predictions of environmental change impacts and help refine management and conservation strategies for the Seas.*

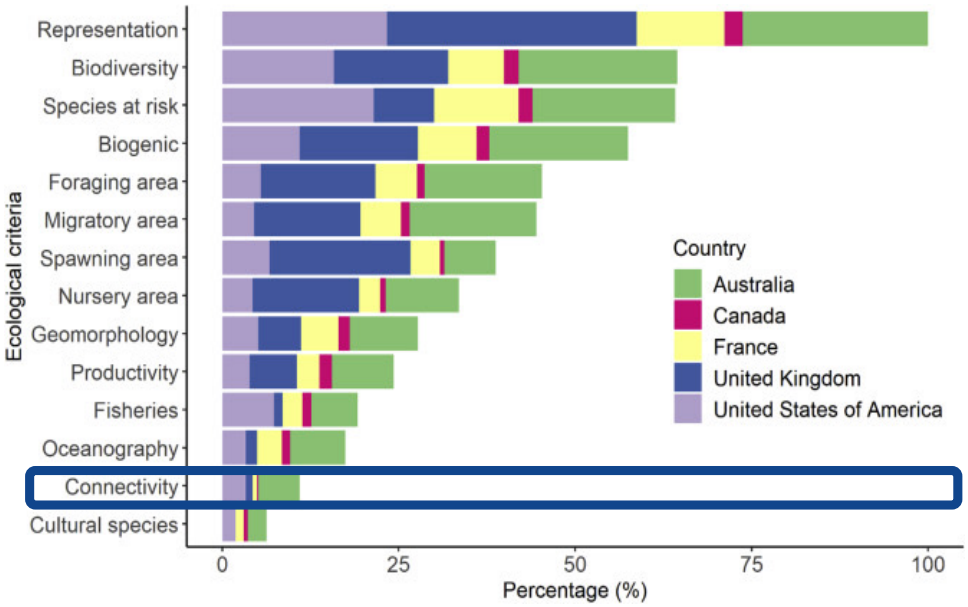
This is particularly challenging !!!!

Because marine ecosystems are very difficult to access and survey ...

Problem

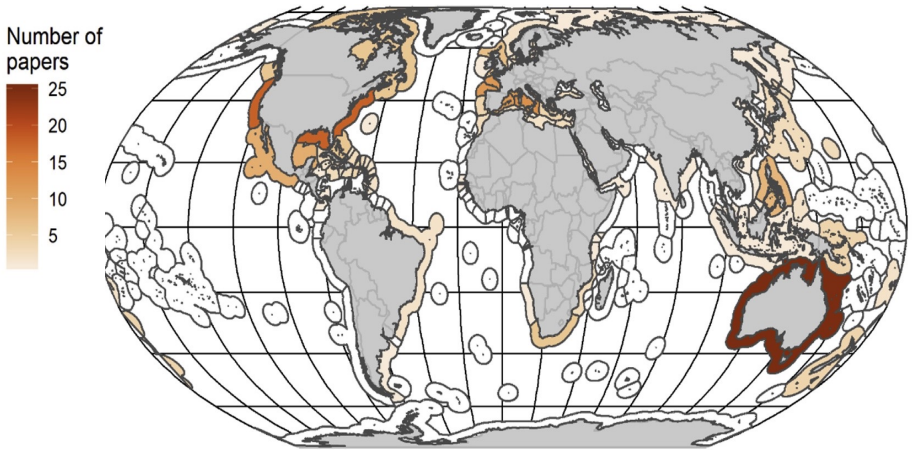
Gap for connectivity knowledge use in marine management & policy

Ecological criteria used in the design of 746 marine protected areas



Source: Balbar & Metaxas (2019)

Research effort on population connectivity in the design of marine protected areas



Barriers

LOCK 1

Lack of dialogue + complexity of the concept (semantics, readability)

"Numerous types of '*Connectivity*' are considered within ecological studies, definitions are inconsistently applied, and the methods for quantifying each type of connectivity vary."

Lapoint et al. (2015)

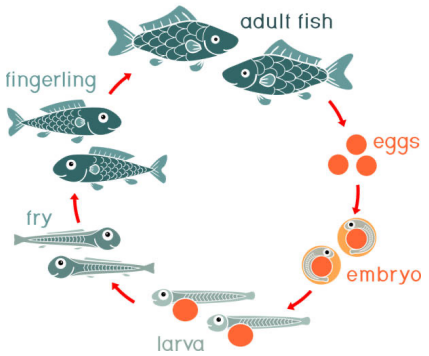
LOCK 2

Information = complex + difficult to gather at sea

= geographic dispersal over generations + lifetime movements

!!! for all organisms !!!

This requires a multidisciplinary approach



LOCK 1

Connectivity has several names…

In theoretical ecology

Connectivity → 2 intertwined components

Tischendorf & Fahrig (2000) - Oikos

Structural Connectivity

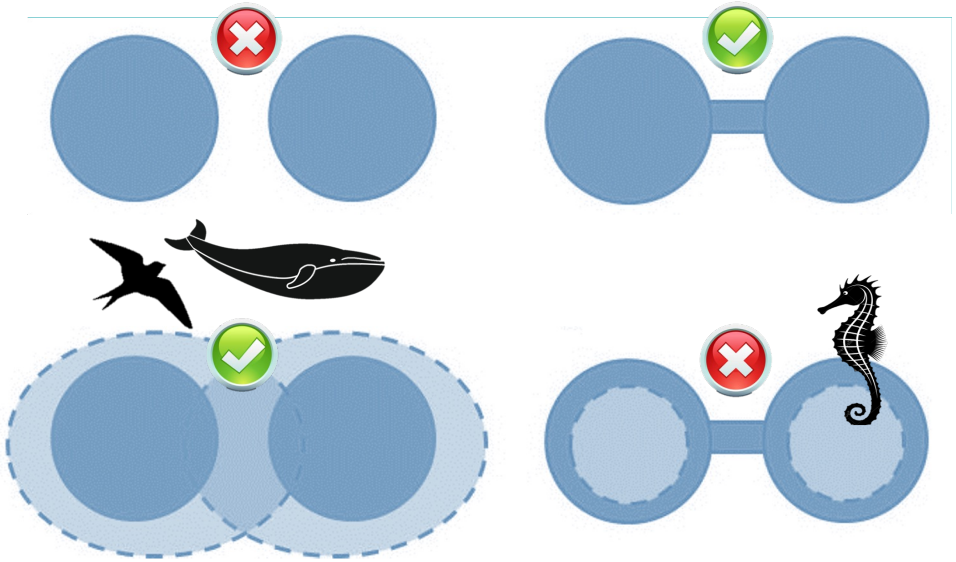
- = a feature of the landscape linked to its physicochemical characteristics (patches & boundaries)
- measures its heterogeneity & structuring, independently of any attributes of living organism(s) (Collinge & Forman 1998)

Functional Connectivity

- = all the movements of organisms, in response to the various elements of the landscape
  (Tischendorf & Fahrig 2000)
- It is caused, facilitated or hampered by *Structural Connectivity*

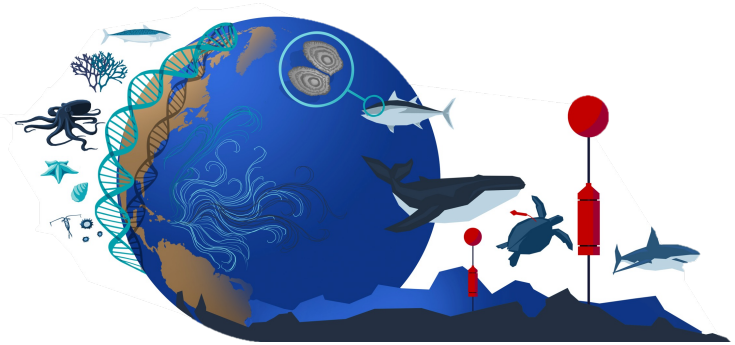
Distinguishing between them is very important !

Structural Connectivity does not imply *Functional Connectivity* (and vice-versa)



Source: SCALETOOL (http://scales.ckff.si/scaletool/)

Marine Functional connectivity



= all the movements of all marine organisms over their lifespan

(Tischendorf & Fahrig 2000)

= flux of…

Genes

- Genetic diversity
- Structure + resilience of populations

Species

- Biodiversity
- Stability + resilience of ecosystems

Biomass

- Carbon cycle
- Productivity
- Stability + resilience of food webs

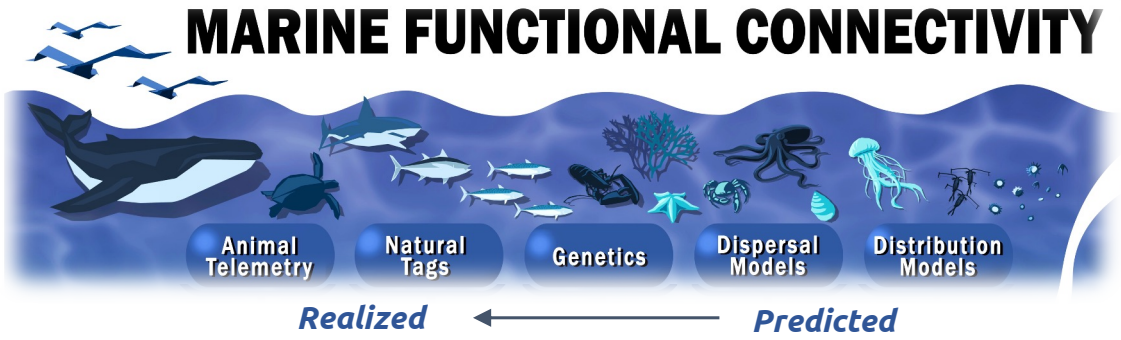
Lock 2

How to get a comprehensive image of MFC?

including at the community/ecosystem level

Problem

Varied techniques /disciplines study MFC
They differ in their assumptions + in the spatial, temporal and/or taxonomic scales at which they produce MFC knowledge.



Solution

⇒ To get a full picture of MFC, we **need to unify/integrate them under a common framework.**

When doing this, we need to

- build on the **practices & needs of community/ecosystem modelers**
  → universal descriptors of the lifetime movements of (exploited) species to feed projection models.
- build on the **practices & needs of marine stakeholders**
  → accurate & comprehensive connectivity metrics allowing to address societal issues (fisheries).

⇒ need for a global, multi- and trans-disciplinary approach

The European COST Action CA19107
(2020-2025)

SEA-UNICORN

Unifying Approaches to Marine Connectivity for Improved Resource Management for the Seas

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https://www.sea-unicorn.com

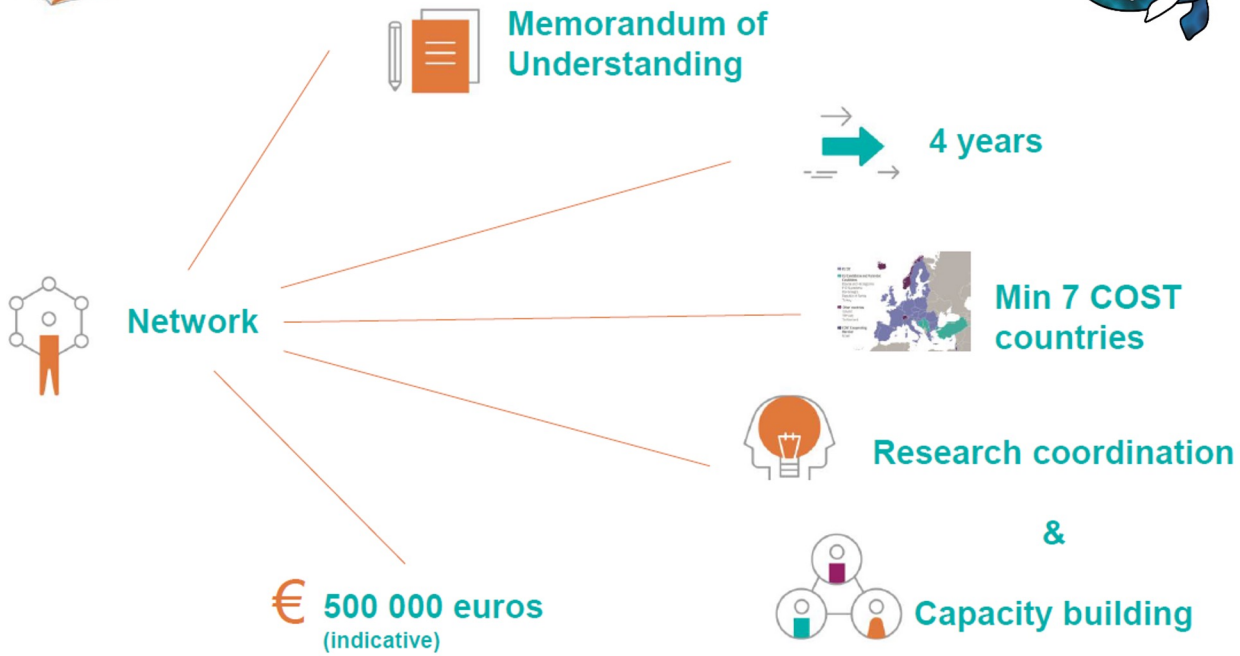
2021 2030

What is a COST Action?

What is NOT a COST Action?

- Research and Innovation project
- Fixed consortium

More info at:
https://www.cost.eu/actions/CA19107



Evolution of our network

(Oct. 2021 → Oct. 2022)

SEA-UNICORN
Unifying Approaches to Marine Connectivity for Improved Resource Management for the Seas

171 ⟶ 273 participants

(from 35 ⟶ 37 countries)

- **31 COST member states**
- **1 Cooperating Member** (Israel)
- 3 **Near Neighbour Countries** (Algeria, Morocco, Tunisia)
- **+ 1 Partner Member** (South Africa)
- **2 International Partner Countries:** (Australia & USA)

The network at a glance

https://www.sea-unicorn.com

1 - Gather operational MFC (and associated) data for protecting marine biodiversity

Important knowledge gaps on MFC need to be filled before we can integrate information about population size & structure and the spatio-temporal dynamics of linkages among populations into conservation decision-making.

2 - Produce adequate MFC (and associated) knowledge

Sustainable governance of the seas requires to be able to link species geographic distributions and movements across life stages to ecosystem function and services.

3 - Understand MFC drivers & forecasting its evolution in the face of Global Change

Effective policies for ocean management require a comprehensive understanding of present-day MFC and reliable projections of its evolution.

Approach

A vast pluridisciplinary network

- **≠ scientists that investigate MFC**
- **Ecological modelers** (ex: end-to-end, meta-population, meta-ecosystems, socio-ecosystems models)
- **Managers and policymakers** (sea + littoral)

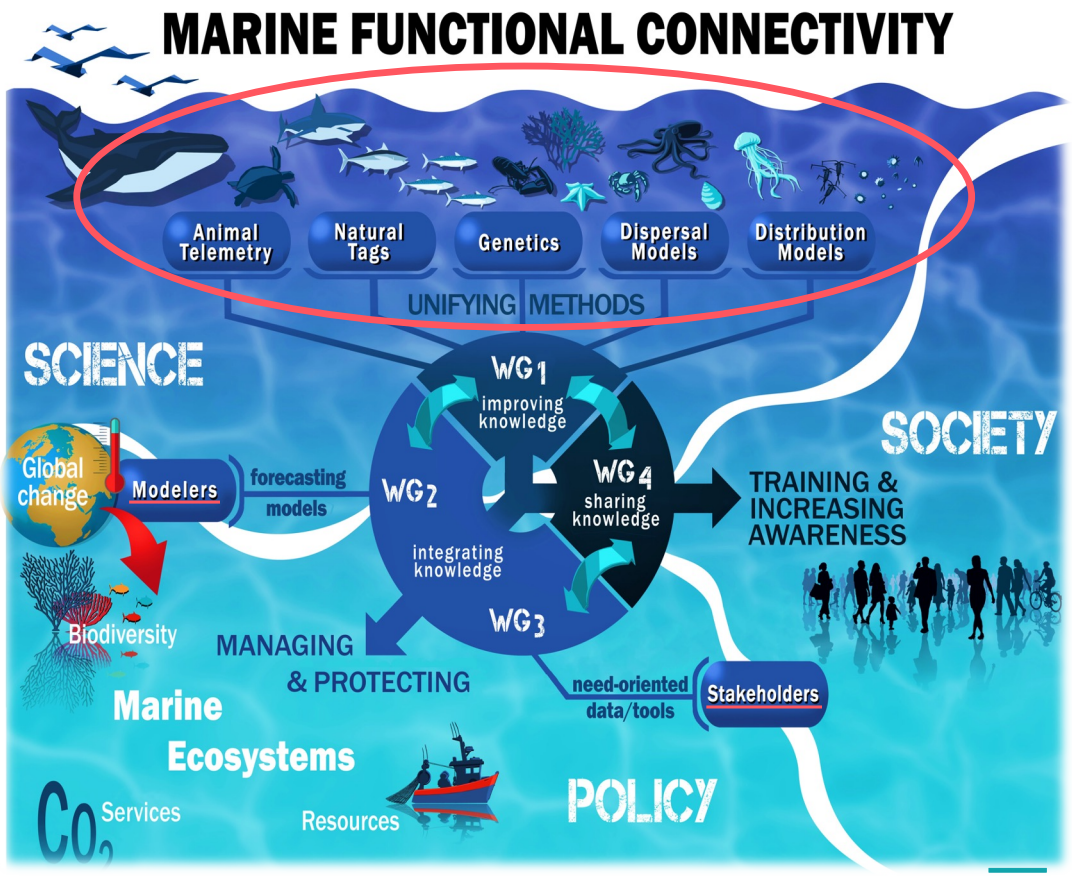
workshops | short-term missions | training schools

To …

- ✓ ***Identify*** *knowledge gaps/research priorities*
- ✓ ***Overcome*** *theoretical/technical barriers*
- ✓ ***Improve*** *decision support tools*

→ guidelines, review articles, white papers…
→ Joint submission of research projets

→ A more integrated, comprehensive and useful vision of MFC



Our main aims (2020 → 2024)

1. Synthesize existing **knowledge on MFC & its drivers**
   → *find where coordinated efforts would produce most significant advances*

2. **Harmonize MFC research** + promote data integration across disciplines
   → *address theoretical/technical limitations*
   → *build a universal framework for MFC research (allowing concepts & data integration)*

3. Bridge gaps between MFC & **complementary research disciplines**
   → *produce MFC data/metrics that can be incorporated into projection models*

4. Bridge gaps between MFC scientists, **policymakers, managers & end-users**
   → *improve the format & quality of MFC data for decision-making*
   → *catalyse the implementation of MFC research-based policies*

5. **Disseminate MFC knowledge** to a wide audience
   → *promote global awareness on MFC and its importance*

Our capacity-building Objectives

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1. Strengthen Europe's research & innovation capacities
2. Share multidisciplinary expertise
3. Trigger interdisciplinary interactions
4. Facilitate international cooperation + spread scientific excellence
5. Promote geographical, age & gender balance
5. Contribute to the emergence of the 'next generation' of MFC scientists
7. Initiate MFC scientists to the specific needs of policymakers & managers
8. Inform on | the ecological & economic importance of MFC
the need to incorporate MFC knowledge into sustainable development plans

Endorsement of SEA-UNICORN (September 2021)

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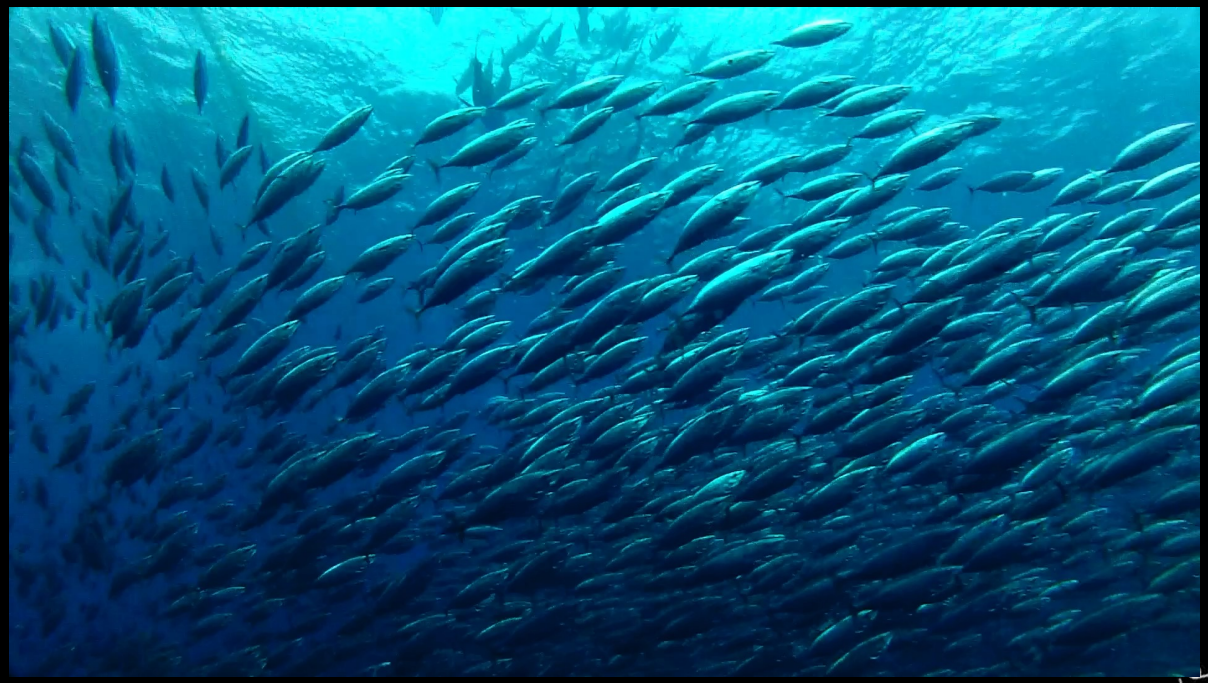
promotional video



The symposium will offer following workshops:

Geohistorical perspectives on functional connectivity patterns (organised by Konstantina Agiadi & Bryony Caswell, PAGES-Q Mare)

Marine connectivity, marine policy and stakeholder engagement (organised by Yael Teff-Seker, University of California Davis & Anna Maria Addamo, European Commission - Joint Research Center)

Deadline for Abstract Submission

DECEMBER, 5 2022

@SeaUnicorn2020

https://www.researchgate.net/profile/Audrey-Darnaude

https://www.linkedin.com/groups/9024560/

THANK YOU !

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