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European Biodiversity Partnership



**LIFE
MAPPER**
MAPping, PROtecting, and Restoring Marine Ecosystems



Mapping key marine habitats in the mediterranean:
from fragmented records to a basin-wide evidence
base for conservation and restoration

Simonetta Frascchetti

University of Naples
Federico II Frascchetti

European Marine Board Webinar 15 October 2026



The issue



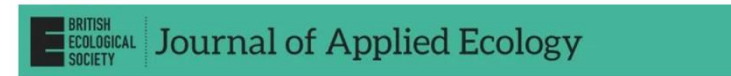
The Nature Restoration Regulation (NRR) has been approved by the EU with the objective to halt and reverse biodiversity loss

Knowledge of the **distribution, extent, and condition of European habitats**, especially marine habitats, is critical to accurately assess the proportion of habitats in poor condition

Comprehensive marine habitat maps are needed to effectively protect and restore marine habitats

A Global Map of Human Impact on Marine Ecosystems

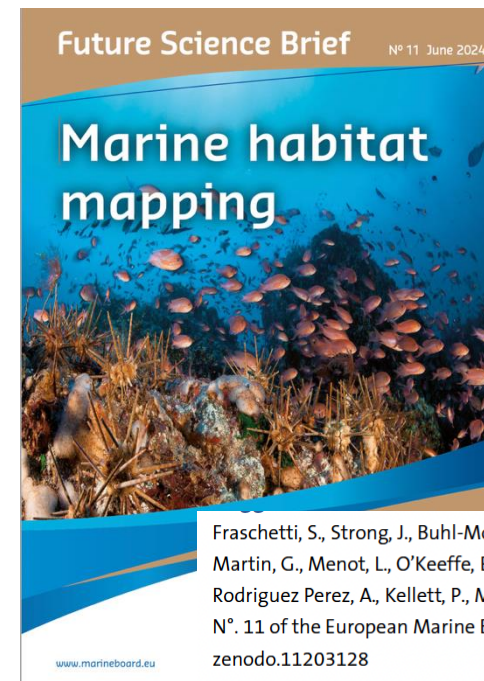
Benjamin S. Halpern,^{1,†} Shaun Walbridge,^{1,*} Kimberly A. Selkoe,^{1,2,*†} Carrie V. Kappel,¹ Fiorenza Micheli,³ Caterina D'Agrosa,^{4,†} John F. Bruno,⁵ Kenneth S. Casey,⁶ Colin Ebert,¹ Helen E. Fox,⁷ Rod Fujita,⁸ Dennis Heinemann,⁹ Hunter S. Lenihan,¹⁰ Elizabeth M. P. Madin,¹¹ Matthew T. Perry,¹ Elizabeth R. Selig,^{6,12} Mark Spalding,¹³ Robert Steneck,¹⁴ Reg Watson¹⁵



PERSPECTIVE | Open Access |

Priority research questions to generate decision-grade data to enable coastal ecosystems to mitigate the climate and nutrient crises

Watson, G. J., and other 46 Authors 2026



Contents lists available at ScienceDirect

Journal of Experimental Marine Biology and Ecology

journal homepage: www.elsevier.com/locate/jembe

How many habitats are there in the sea (and where)?

Simonetta Fraschetti*, Antonio Terlizzi, Ferdinando Boero

Fraschetti, S., Strong, J., Buhl-Mortensen, L., Foglini, F., Gonçalves, J. M. S., González-Irusta, J. M., Lillis, H., Lindegarth, M., Martin, G., Menot, L., O'Keeffe, E., Pascoal, A., Salomidi, M., Schoening, T. (2024) Marine habitat mapping. Alexander, B., Rodriguez Perez, A., Kellett, P., Muñoz Piniella, A., Bayo Ruiz, F., Bairaktari, K., Heymans, J. J. [Eds.] Future Science Brief N°. 11 of the European Marine Board, Ostend, Belgium. ISSN: 25593-5232. ISBN: 9789464206234. DOI: 10.5281/zenodo.11203128

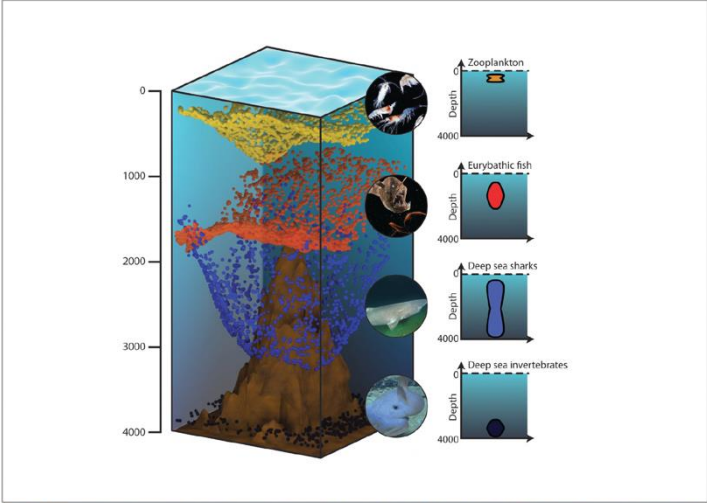
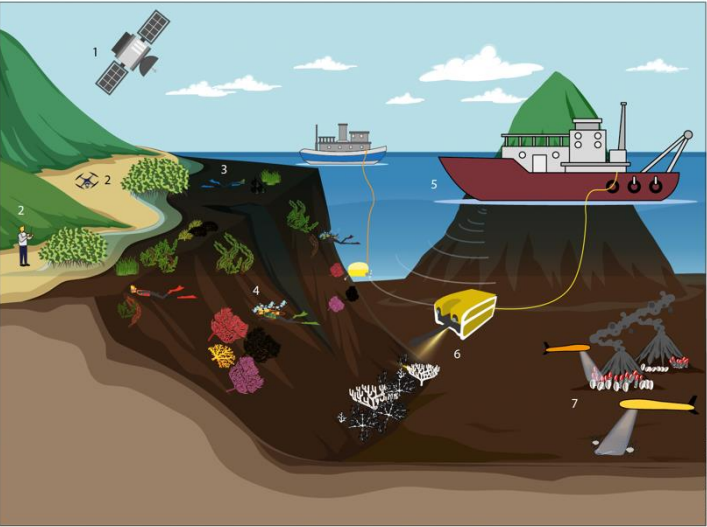
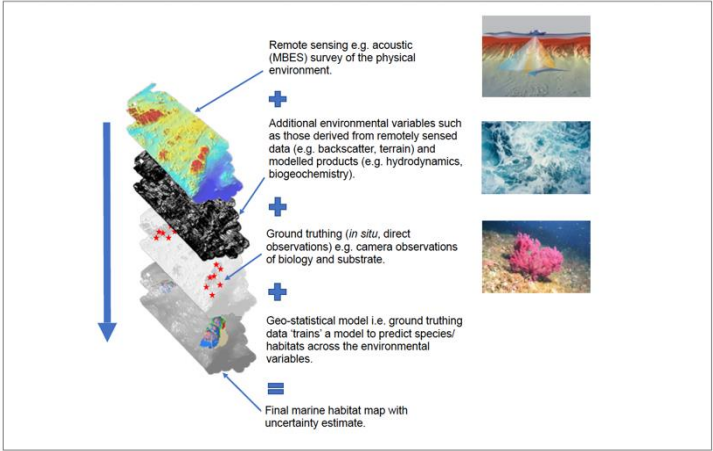
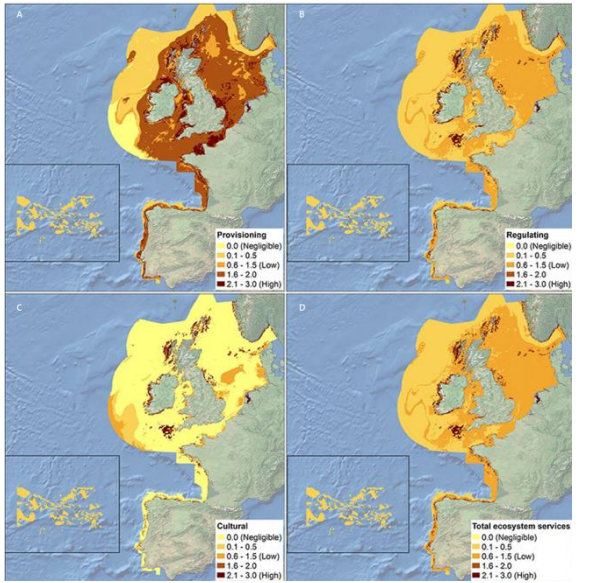
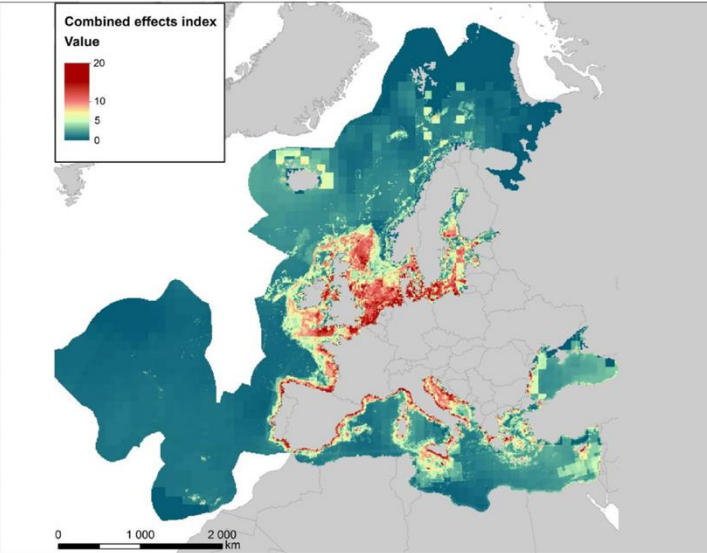


Figure 2.2 Graphical representation showing the integration of benthic habitat and water column data to show the three-dimensional structure of a deep-sea ecosystem. Three-dimensional marine habitat mapping includes multiple depth ranges of the distribution of biodiversity and includes



	PLATFORM	DATA TYPE	EUNIS LEVEL ACHIEVABLE	FIT-FOR PURPOSE USES	POTENTIAL EXTENT [km ²]	RESOLUTION [m]	COST [€/km ²]
Remote sensing	Satellite	Gravity data to measure bathymetry/ images	Up to 4	Large-scale/low-resolution inferences on physical/ biological habitats, predictive modelling	10 trillion	1000	0.5
	Ship >1000m water depth	MBES/SSS	Up to 3	Large-scale/low-resolution inferences on physical habitats, predictive modelling	1000	100	5.1
Remote sensing and in situ observations	AUV	MBES/SSS and images	Up to 3	Small-scale/high-resolution inferences on physical habitats, predictive modelling	10	1	3.2
	UAV/drone <10 m water depth	Images	Up to 6	Mapping of biological habitats, predictive modelling, in situ observations	0.1	1	0.5
In situ observations	ROV	Images	Up to 6	Mapping of biological habitats	0.1	<0.01	4.3
	Small boat <20 m water depth	Images from drop cameras	Up to 6	Mapping of biological habitats, predictive modelling	1	10	1.6
	SCUBA diving	Images and in situ observations (e.g. species lists)	Up to 6	Mapping of biological habitats, direct mapping of features	1	10	4
	Sampling (grabs, dredges, etc., using small/big vessels)	Sediment and faunal sample	Up to 6	Mapping of biological habitats, predictive modelling	0.1	1	8



Project Title: Life-Mapper

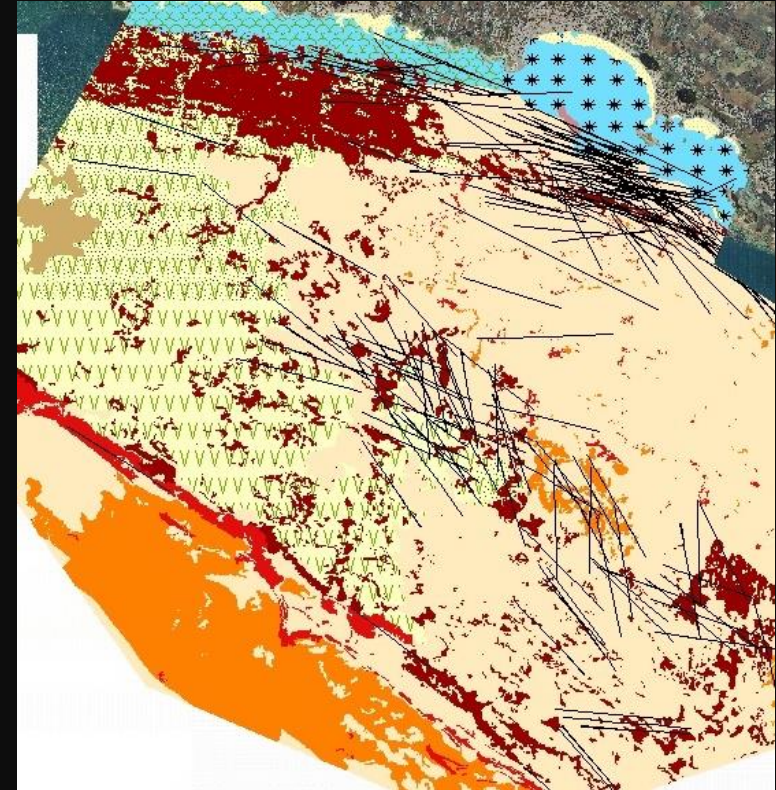


- **Project Location** – European seas
 - **Total budget** – €1,290,850.61
 - **% EC Co-funding:** 90%
 - **Duration:** 36 months
 - **Coordinator:** Federica Foglini
- Beneficiaries:** CNR, UNINA, UNIVPM,
- ISPRA, Space42, UoG, UAEGEAN



Life Mapper aims

1. **Habitat Mapping:** develop clear guidelines for mapping the marine habitats listed in Annex II of the NRR
2. **Habitat condition assessment:** select methodologies to assess habitat condition and thresholds of change
3. **Restoration Measures:** develop a set of guidelines to support the selection of restoration measures targeting habitats and species of the NRR, together with the identification of knowledge gaps in marine restoration
4. **Spatial prioritization for conservation and restoration:** provide a framework for spatial prioritization to guide conservation and restoration actions



Consolidate and synthesize existing knowledge, methodologies, and best practices in habitat mapping, conservation and marine restoration

Life Mapper outcomes



THE LIFE MAPPER MANUAL



Integrates fragmented data, methodologies, and best practices.



Enhances knowledge and understanding of the **distribution**, **condition**, and **extent** of habitats and species listed in Annex II of the NRR.



Provides targeted **recommendations** to close existing knowledge gaps.



Guides future efforts and investments in **marine restoration**.



THE LIFE MAPPER KNOWLEDGE PLATFORM



A dynamic hub with **user-friendly** navigation and **searchable content**.



Downloadable resources including **articles**, **datasets**, and **interviews**.



Integrated with other **EU initiatives** and **projects** to facilitate **knowledge exchange**.



Content is **regularly updated** to ensure user engagement and the application of relevant information.



Supports **informed decision-making** for researchers, managers, policymakers and stakeholders.



THE LIFE MAPPER GEOPORTAL

Integrates available **Web Mapping Services** and links to other portals developed at **European and national level**.



EMODnet



National Portals



EU Initiatives



Other Platforms



Marine Strategy Framework Directive (MSFD)

LIFE MAPPER KNOWLEDGE PLATFORM

Browse the curated chapters, follow the video tutorials, or run a free-text search across every Life Mapper resource.

FREE SEARCH

Search across all contents...



Best practices, methods and tools
for **mapping, assessing and restoring**
marine habitats, in line with the **Nature**
Restoration Regulation



THE MANUAL CHAPTERS

1



TOPIC 1

Habitat mapping:
knowledge status
and gaps.
How to map, and
how much does it cost?



2



TOPIC 2

Assessing habitat
condition:
methods and
indicators



3



TOPIC 3

Estimation of
restoration costs



4



TOPIC 4

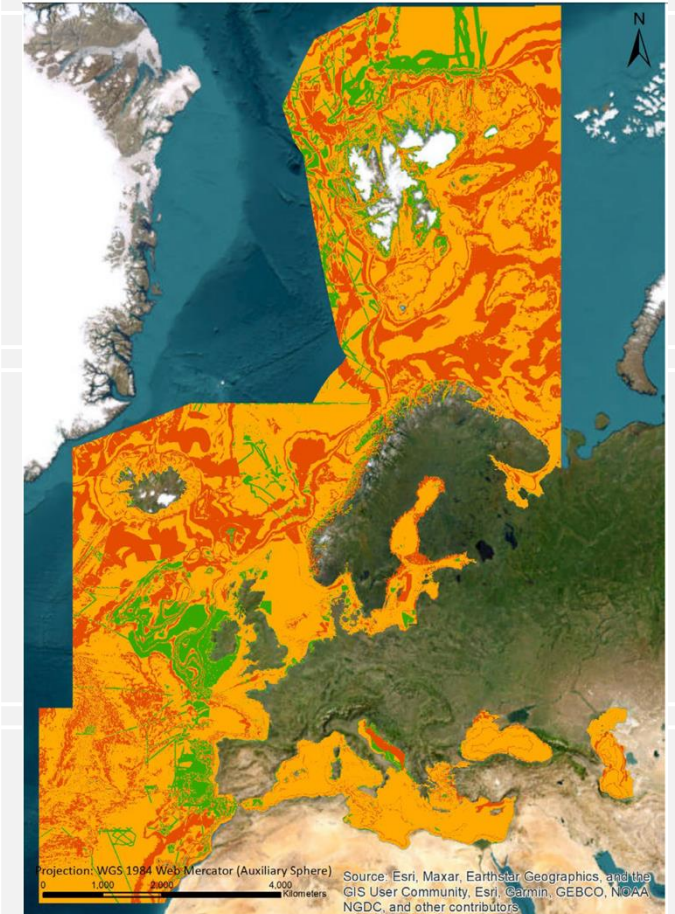
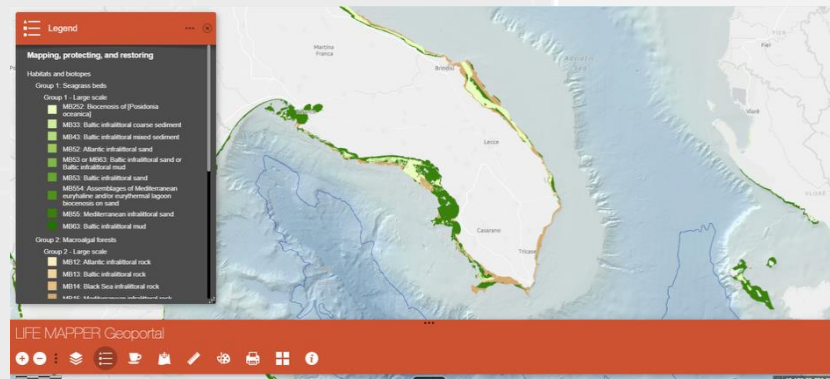
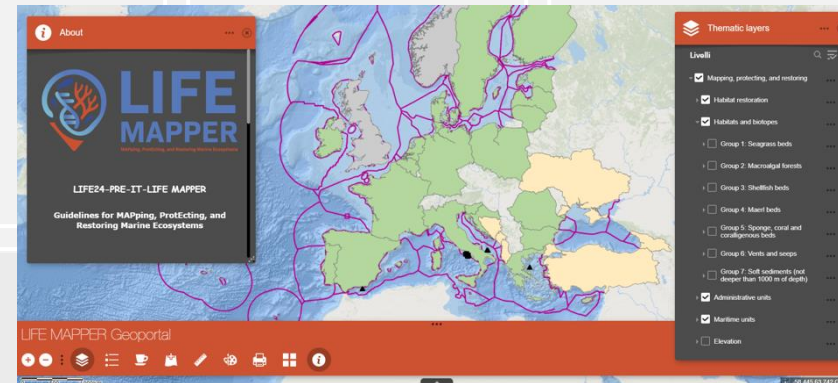
Spatial prioritization:
where to map,
where to conserve
and where to restore



Methodology: systematic reviews and questionnaires

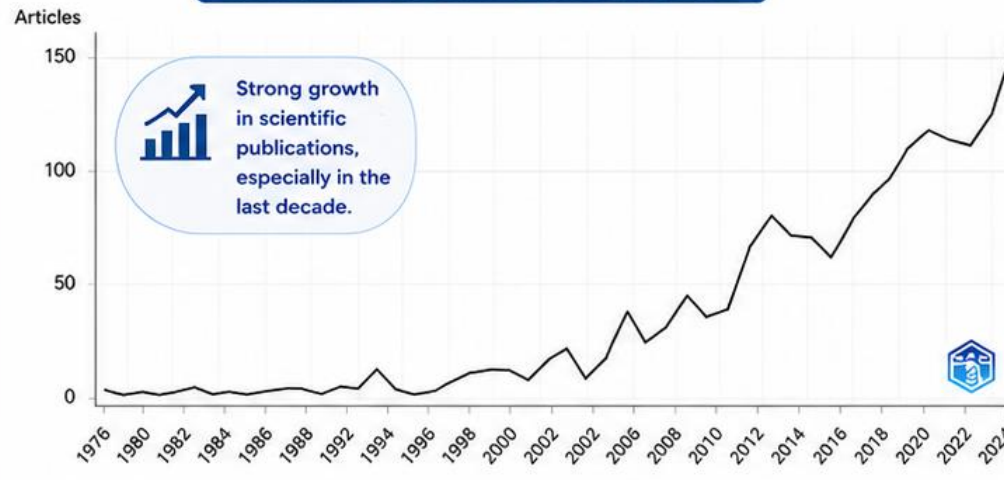
Where are the habitats?

- **Overview of what has been mapped, how and where at Eu scale**, identifying critical gaps in habitat types and geographic extent, including the deep sea, Natura 2000 sites and other MPA's across all regional seas
- **LIFE MAPPER Geoportal** is integrating existing OGC-compliant geospatial services and interoperable habitat mapping datasets at different spatial scales, building on national and European infrastructures and ensuring compatibility with emerging platforms and services.



Systematic review of literature reporting habitat mapping knowledge

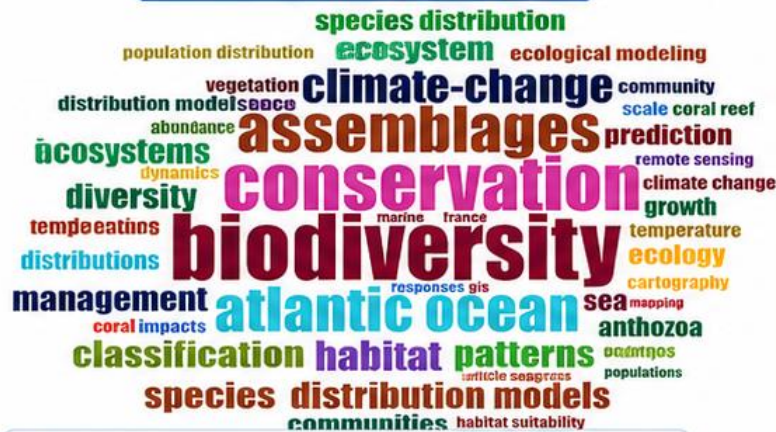
ANNUAL SCIENTIFIC PRODUCTION



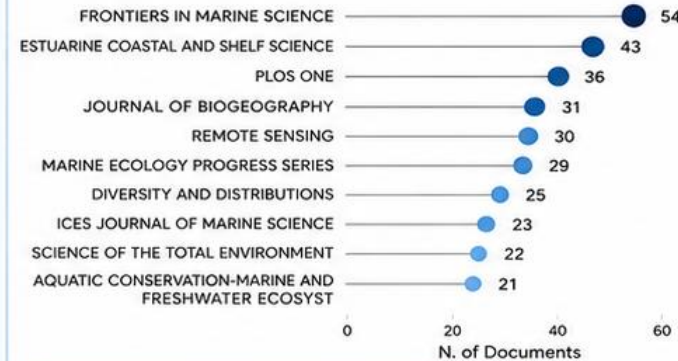
COUNTRY SCIENTIFIC PRODUCTION



TOP RESEARCH TOPICS



MOST RELEVANT SOURCES



Marine science, coastal studies and biodiversity journals are the main knowledge sources.

2285
papers

Review completed and
chapter ready by
November 2026



INCREASING SCIENTIFIC OUTPUT

A significant rise in publications over the years, with an acceleration in the last decade.



GEOGRAPHIC CONCENTRATION

Research efforts are mainly focused in Europe, North America and Australia.



DIVERSE RESEARCH THEMES

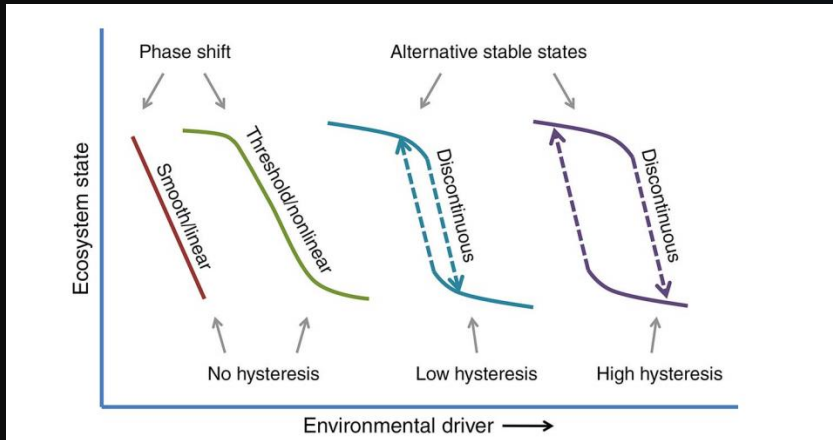
Strong attention to biodiversity, conservation, climate change, habitats and ecosystem dynamics.



KEY KNOWLEDGE SOURCES

Top journals in marine science, ecology and environmental studies lead the field.

How much do we know about habitat condition and thresholds of change



Assessment of habitat condition and Favorable Reference Areas



Take part in the Life-Mapper questionnaire

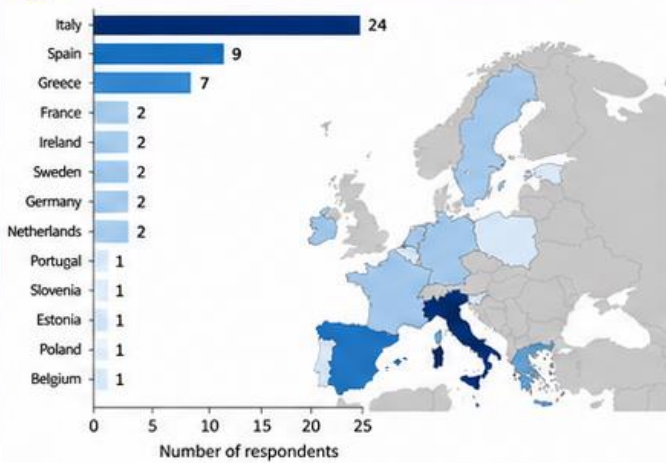
LIFE-MAPPER project aims to support EU Member States in implementing the NRR, the MSFD and the Habitats Directive by developing guidelines for marine habitat mapping, condition assessment and restoration planning.

This questionnaire is designed to gather YOUR expert knowledge on:

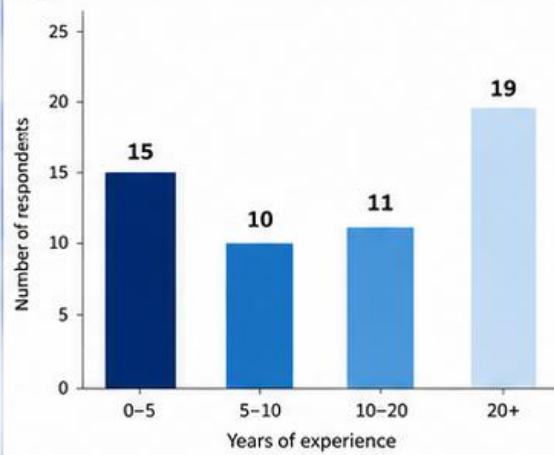
- methods and indicators used for habitat condition assessment
- existence of reference conditions and thresholds.

Questionnaire: Finding knowledge gaps habitat condition and FRA

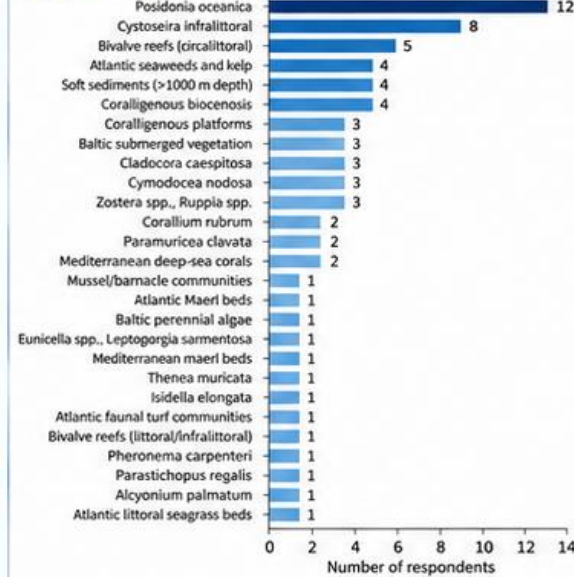
1. RESPONDENTS BY COUNTRY (NATIONALITY)



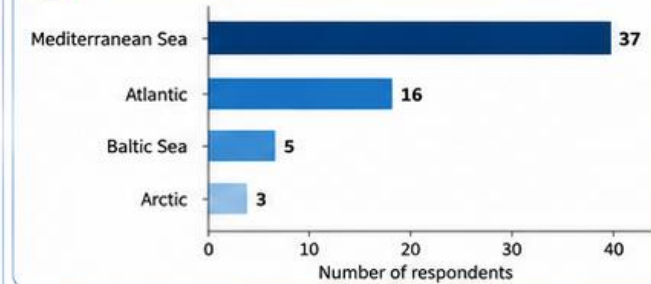
2. RESPONDENTS BY YEARS OF EXPERIENCE



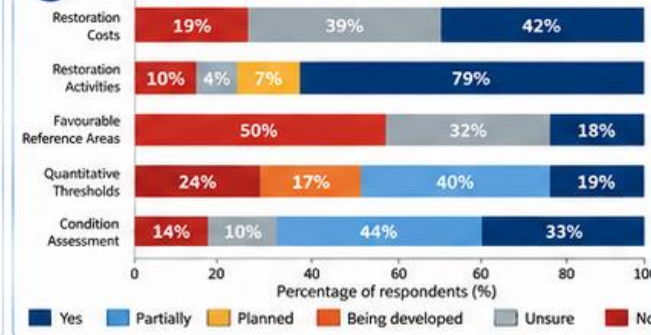
3. HABITATS COVERED BY RESPONDENTS



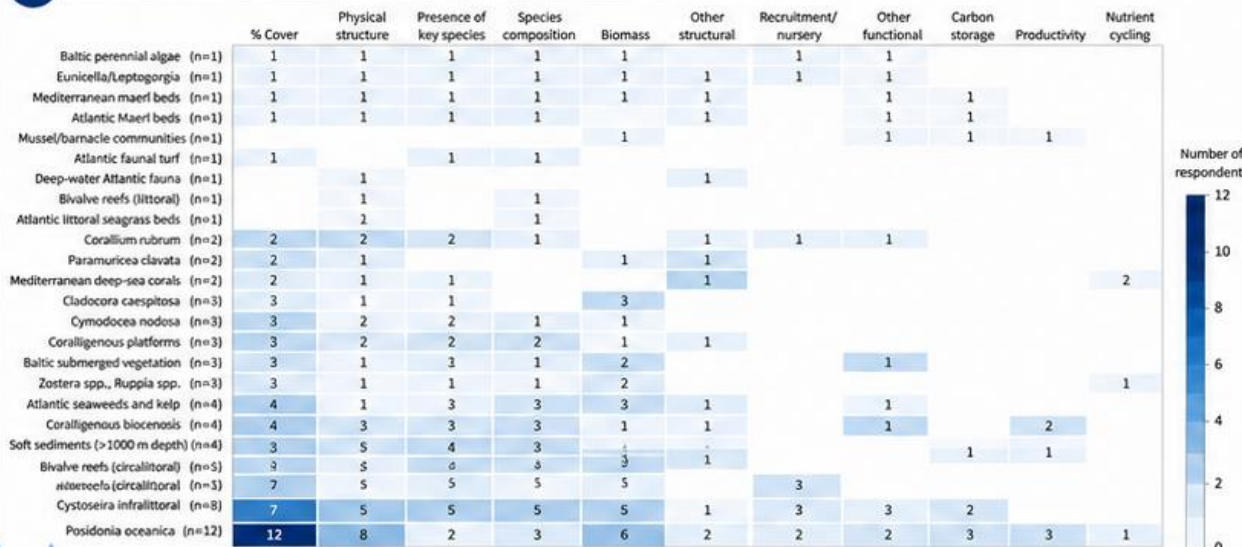
4. MARINE REGION OF OPERATION



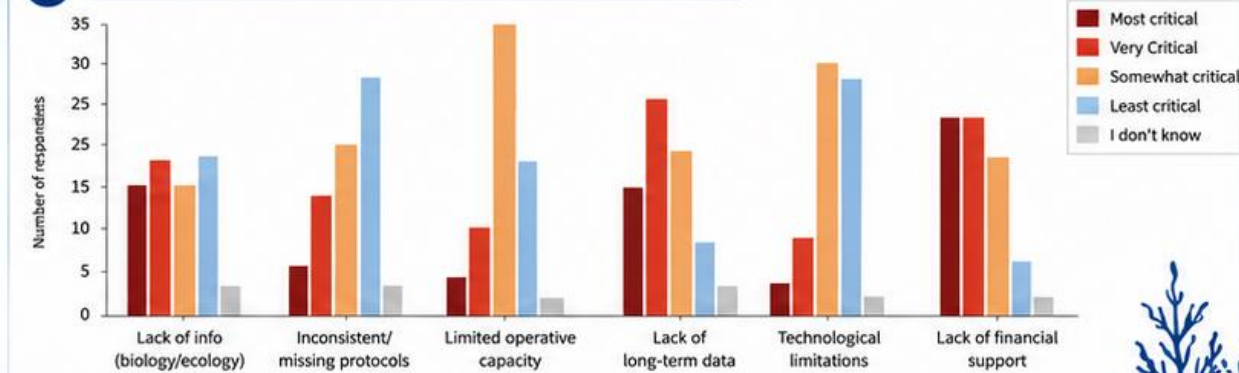
5. SURVEY RESULTS: KEY THEMES



6. INDICATORS FOR CONDITION ASSESSMENT BY HABITAT



7. METHODOLOGICAL ISSUES FOR CONDITION ASSESSMENT



Habitat condition and thresholds of change

Direct observation of increasing recovery length

Experimental Perturbations Modify the Performance of Early Warning Indicators of Regime Shift

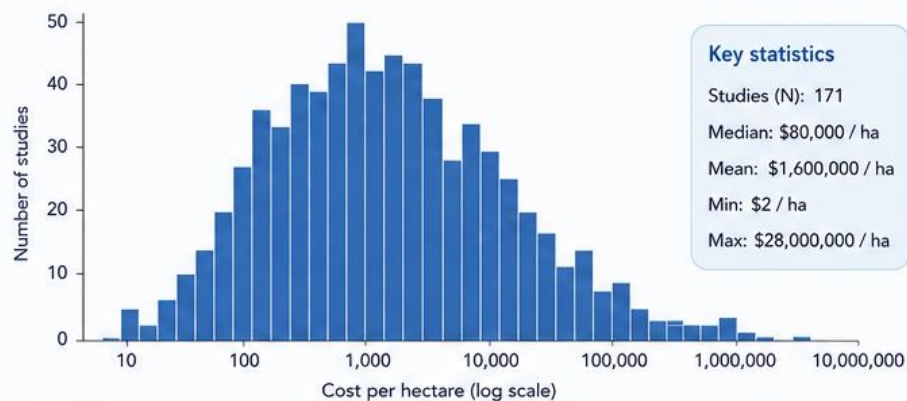
before	A	B	C	D	E	F	G
Luca Rindi ^{1*}	Key words	Title of the article	Year	Authors	Link	MSFD Marine Regions	Subregion
1							
An integra Mediterrar		An ecosystem-based approach to evaluate the ecological quality of Mediterranean undersea caves	2015	Rastorgueff, P. A., Bellan-Santini, D., Bianchi, C. N., Bussotti, S., Chevaldonné, P., Guidetti, P., ... & Personnic, S.	http://dx.doi.org/10.1016/j.ecolind.2015.02.014	Mediterranean Sea	Western Mediterranean
47		Improvement of the ESCA index for the evaluation of ecological quality of coralligenous habitat under the European Framework Directives	2015	Piazzì, L., Gennaro, P., Cecchi, E., & Serena, F.	http://dx.doi.org/10.12681/mms.1029	Mediterranean Sea	Western mediterranea
48							

(biodiversity assessments of key habitats) and the impact and resilience **tipping points** related to **multiple drivers** including broadscale latitudinal comparisons.

Estimation of restoration costs

1. DISTRIBUTION OF RESTORATION COSTS (ALL ECOSYSTEMS)

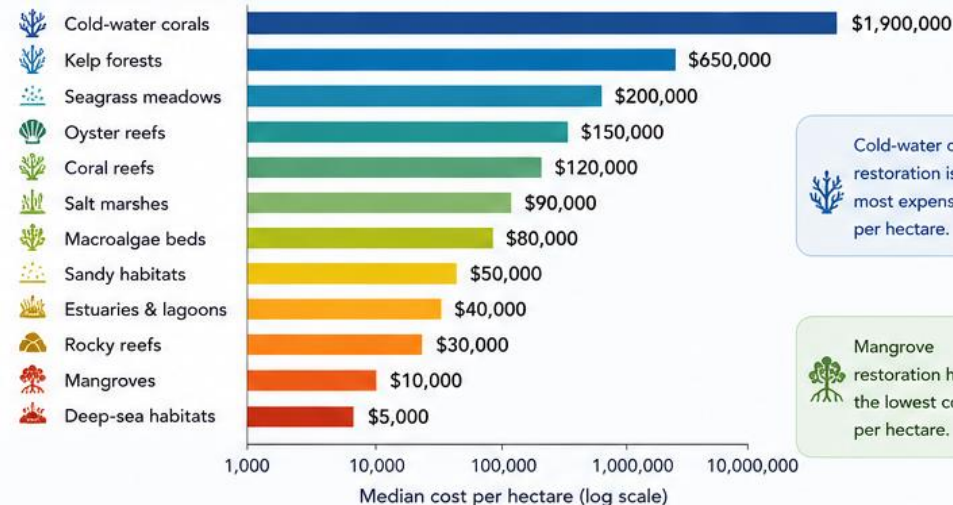
Cost per hectare (2024 international USD)



Costs are right-skewed: mean costs are much higher than median. The median (\$80,000/ha) is a more reliable benchmark for planning.

2. MEDIAN COST PER HECTARE BY ECOSYSTEM TYPE

(2024 international USD)



Cold-water coral restoration is the most expensive per hectare.

Mangrove restoration has the lowest costs per hectare.

3. COSTS BY COST CATEGORY (MEDIAN COST PER HECTARE)

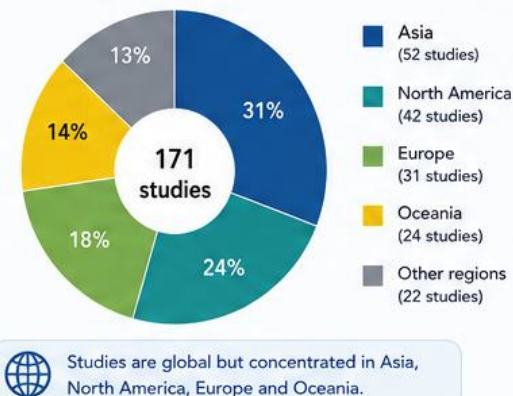
(2024 international USD)



Many studies report only upfront capital costs, so full lifecycle costs are likely underestimated.

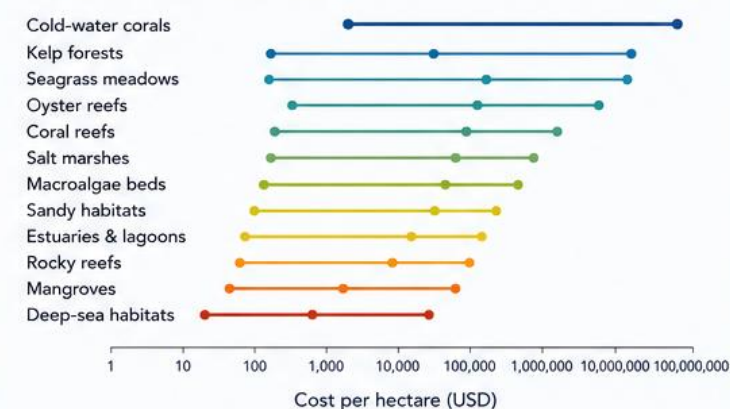
4. GEOGRAPHIC DISTRIBUTION OF STUDIES

(Number of studies)



5. COST RANGE BY ECOSYSTEM (MIN-MAX COST PER HECTARE)

(2024 international USD, log scale)



KEY TAKEAWAYS



Restoration costs vary by several orders of magnitude depending on ecosystem type, methods and location.



The median cost per hectare across all ecosystems is ~\$80,000 (2024 USD).



Cold-water corals are the most expensive; mangroves the least expensive to restore.



Most studies report only upfront costs, likely underestimating true full lifecycle restoration costs.

Systematic Conservation-Restoration planning

- effective allocation of available resources for prioritizing conservation and restoration actions
- ensuring that restoration efforts are ecologically meaningful and contribute effectively to broader conservation and sustainability goals.

Trends in
Ecology & Evolution

Review

Advances in systematic conservation planning to meet global biodiversity goals

Sylvaine Giakoumi^{1,27,*}, Anthony J. Richardson^{2,3}, Aggeliki Doxa^{4,5}, Stefano Moro¹, Marco Andreollo⁶, Jeffrey O. Hanson⁷, Virgilio Hermoso⁸, Tessa Mazar⁹, Jennifer McGowan², Heini Kujala¹⁰, Elizabeth Law¹¹, Jorge G. Álvarez-Romero^{12,13}, Rafael A. Magris¹⁴, Elena Gissi^{15,27}, Nur Arafeh-Dalmau^{2,16}, Anna Metaxas¹⁷, Elina A. Virtanen^{10,18}, Natalie C. Ban¹⁹, Robert M. Runya²⁰, Daniel C. Dunn², Simonetta Fraschetti^{21,27}, Ibon Galparsoro²², Robert J. Smith²³, Francois Bastardie²⁴, Vanessa Stelzenmüller²⁵, Hugh P. Possingham², and Stelios Katsanevakis²⁶

CellPress
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**LIFE
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MAPping, Protecting, and Restoring Marine Ecosystems

Spatial Planning Principles for Marine Ecosystem Restoration

Sarah E. Lester^{1*}, Alexandra K. Dubel², Gema Hernán², Jennifer McHenry¹ and Andrew Rassweiler²

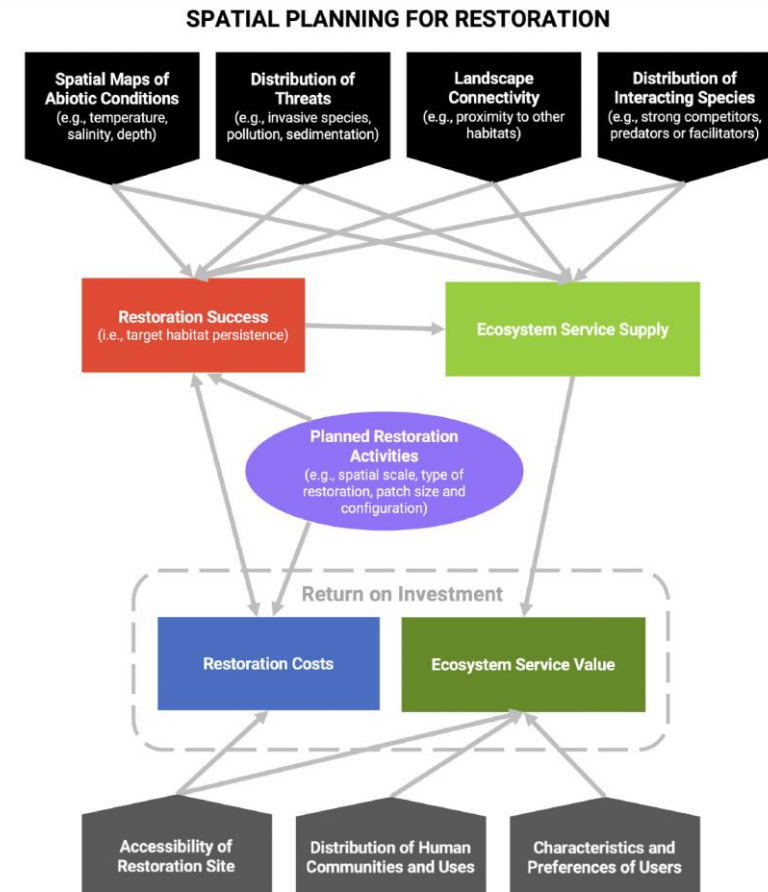
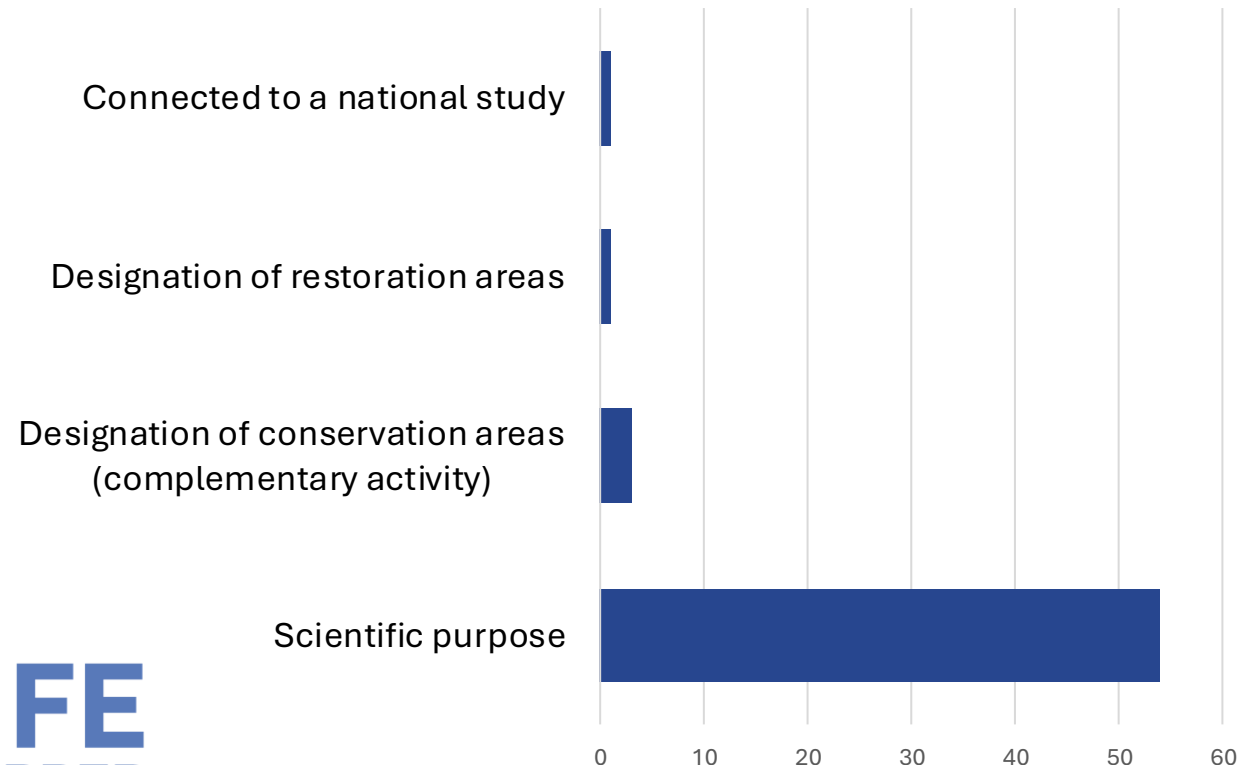


FIGURE 2 | Conceptual figure of sources of spatial variation that influence restoration success, ecosystem service supply and value, and restoration costs. Accounting for these sources of spatial variation in restoration planning and site selection has the potential to improve return on investment, which we use here broadly to refer to the ecological and ecosystem service benefits (i.e., return) and the financial and social costs (i.e., investment) of restoration.

Preliminary results

Objectives of Using Systematic Conservation Planning (SCP) Tools in Restoration Planning:



- ☐ SCP tools have been used predominantly in scientific and methodological studies rather than for the practical designation of restoration areas or the design of restoration interventions.
- ☐ Only one study applied SCP tools to design restoration areas for real-world implementation.
- ☐ Two studies incorporated restoration within broader conservation planning frameworks, where restoration served as a complementary measure.
- ☐ Only one study was connected to a national initiative

What do we expect?

- Our ambition with LIFE MAPPER is to support Member States with robust scientific knowledge, harmonised methods and practical tools to navigate the complex challenges of marine habitat assessment and restoration, and ultimately turn ambitious policy targets into effective action.

Mediterranean Marine Science

Indexed in WoS (Web of Science, ISI Thomson) and SCOPUS

www.hcmr.gr

DOI: <https://doi.org/10.12681/mms.43060>

Research Article

Updated distribution mapping of *Posidonia oceanica* meadows, coralligenous assemblages and marine caves in the Mediterranean Sea: implications for conservation and restoration

**Vasilis GEROVASILEIOU^{1,2}, Antonio SÁNCHEZ-ESPINOSA³, David RODRÍGUEZ-RODRÍGUEZ³,
Simonetta FRASCHETTI^{4,5,6}, Inés MAZARRASA⁷, Cyrine BOUAFIF⁸, Atef OUERGHI⁸
and Dania ABDUL MALAK³**