



Deliverable 2.3

**State of the art overview of the current
protection and restoration measures in
place**

**State of the art overview of the current
protection and restoration measures
in place**



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Grant Agreement number	101060707
Project title	MSP4BIO: IMPROVED SCIENCE-BASED MARITIME SPATIAL PLANNING TO SAFEGUARD AND RESTORE BIODIVERSITY IN A COHERENT EUROPEAN MPA NETWORK
Deliverable title	State of the art overview of the current protection and restoration measures in place
Deliverable number	D2.3
Deliverable version	Final
Contractual date of delivery	31/07/2023
Actual date of delivery	31/08/2024
Document status	Final version
Document version	2
Online access	Yes
Diffusion	Public
Nature of deliverable	Report
Work Package	2
Partner responsible	CNR
Contributing Partners	UAC, VLIZ, UN, HELCOM, CCMS, SPRO, NIMRD, GMU, PAP/RAC, CEREMA
Authors	Martina Bocci, Lucia Bongiorno, Matthieu Bekaert, Eléonore Cambra, Marcello Magaldi, Inne Withouck, Fien De Raedemaecker, Morgane Bouvet, Marina Marković, Ivan Sekovski, Margarita Stancheva, Hristo Stanchev, Volcy Boilevin, Débora Gutierrez, Helena Calado, Panagiotis Georgiou, Alina Spinu, Victor Nita, Neil Alloncle, Claire Boudy, Kemal Pinarbasi, Lotta Ruokanen, Magdalena Matczak, Joanna Pardus, Jacek Zaucha



Editors	Helena Calado, Riku Varjopuro
Approved by	Ivana Stojanovic
Project Officer	Victoria Beaz Hidalgo
Abstract	<p>A state-of-the-art overview of the main categories of conservation measures currently applied to protect marine ecosystems and species, considering international, European and national level measures is provided, including examples of Other Effective area-based Conservation Measures (OECMs). Some cases of marine restoration measures are also illustrated. The overview considers the test-site countries across all the European sea basins. Some representative cases of MPAs and OECMs are detailed based on desktop review and outcomes from interviews. Interviews have supported the identification of trade-offs between marine conservation and human uses, of challenges encountered in designation and management and of opportunities for transfer of the experience in other contexts.</p>
Keywords	Marine conservation, marine restoration, Area-based protection, OECM
Suggested citation	Bocci M., Bongiorno L., Bekaert M., Cambra E., Magaldi M., De Raedemaeker F., Bouvet M., Withouck I., Marković M., Sekovski I., Stancheva M., Stanchev H., Boilevin V., Gutierrez D., Calado H., Georgiou P., Spinu A., Nita V., Alloncle N., Boudy C., Pinarbasi K., Ruokanen L., Matczak M., Pardus J., Zaucha J. (2023) State of the art overview of the current protection and restoration measures in place (Deliverable – D2.3., under the WP2 of MSP4BIO project (GA n° 101060707)).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



HISTORY OF CHANGES		
VERSION	PUBLICATION DATE	CHANGE
1.0	31.07.2023	Initial version.
2.0	31.08.2024	Revised version: modified after comments from the reviewers. The interview methodology together with the template provided for the semi-structured interviews conducted for this deliverable is provided. Descriptions on the methodology have been expanded as well as descriptions of the relevance of the expert input to the conclusions of the report. In the Annexes, the template used to collect information from the interviewees is added.



Table of contents

Table of contents	5
Acronyms	11
Executive Summary	15
1 Introduction	16
2 Methodology	17
3 Area-based protection measures	24
3.1 Spatial marine protection	24
3.2 Sea-basin overviews	26
3.2.1 Baltic Sea	28
3.2.2 North Sea	30
3.2.3 Northeastern Atlantic	33
3.2.4 Mediterranean Sea	43
3.2.5 Black Sea	47
4 Restoration measures	51
4.1 Marine restoration	51
4.2 Sea-basin overviews	52
4.2.1 Baltic Sea	52
4.2.2 North Sea	64
4.2.3 Northeastern Atlantic	68
4.2.4 Mediterranean Sea	73
4.2.5 Black Sea	78
5 Cross-cases considerations	79
6 Conclusive remarks	97
7 References	98
Appendix – Template used to collect information from interviewees	105



Annex 1 – Designations at country level	107
Baltic Sea	108
North Sea	111
North-East Atlantic	114
Mediterranean Sea	120
Black Sea	128
Annex 2 – Examples of area-based protection measures	132
Baltic Sea	132
1. Protected area of Signilskär- Märket Islands (FI)	132
2. Marine Protected Area of the Vistula Lagoon and Vistula Spit (PL).....	136
3. Protected area of the Puck Bay and Hel Peninsula (PL).....	141
North Sea	146
1. SSMO Closed Areas (UK, Scotland)	146
2. North-western North Sea Sandeel Fishery Closure (UK, Scotland).....	152
3. Eastern IFCA and the Wash and North Norfolk Coast SAC (UK, England).....	157
4. Fisheries restriction measures around protected wreck sites (BE)	163
5. Vlaamse Banken SAC (BE)	171
6. Wadden Sea protection measures in place (NE, DE, DK)	177
Northeastern Atlantic	179
1. Dori underwater archaeological park (PT)	179
2. The Nature Reserve Berlengas (PT)	182
3. Limpets catches – seasonal restricted areas (PT)	185
4. Ilhas Selvagens (PT)	188
5. Marine Park Professor Luis Saldanha / Arrabida Natural Park (PT)	190
6. A Special Protection Area in Glenan Islands (FR).....	193
7. A Special Area of Conservation in the Gulf of Morbihan (FR).....	197
Mediterranean Sea	202



1. Proposition for a North-Western Mediterranean Particularly Sensitive Sea Area (PSSA) (FR, IT, MO, SP)	202
2. Important Marine Mammal Area (IMMA) Western Ligurian Sea and Genoa Canyon (IT) 207	
3. Natural Marine Park of the Gulf of Lion and the National Natural Marine Reserve Cerbère-Banyuls (FR)	213
4. Portofino Marine Protected Area (IT)	225
5. Jabuka /Pomo Pit Fishery Restricted Area (HR, IT)	228
Black Sea	238
1. Kaliakra Natural Reserve/protected area (BG)	238
2. Danube Delta marine area (RO)	245
Annex 3 – Examples of restoration measures	252
Baltic Sea	252
1. The Puck Bay and Hel Peninsula (PL).....	252
North Sea	254
1. Firth of Dornoch Native Oyster Restoration (UK, Scotland)	254
2. Borkum Reefground (BRG) Biogenic reef restoration (DE).....	256
3. UNITED project oyster reef restoration (BE)	258
North-East Atlantic.....	260
1. Flat Oyster Recovery (FOREVER project), Brittany (FR).....	260
2. Parque Marinho Luís Saldanha (PT)	263
Mediterranean Sea	265
1. LIFE DREAM “Deep REef restoration And Marine litter removal” (GR, IT, SP)	265
2. Installation of eco-friendly buoys to reduce the impact of anchoring on Posidonia meadows (HR)	271
Black Sea	277
1. Atanasovsko Lake (BG)	277

List of Figures



<i>Figure 1 Overview of the examples of area-based protection measures described in this study.....</i>	<i>27</i>
<i>Figure 2 Overview of the ten IFCAs in place in England (source map: Association of IFCAs, (AIFCA, 2023)).</i>	<i>32</i>
Figure 3. The five main regions of OSPAR Convention: I) Arctic Waters, II) Greater North Sea, III) Celtic Seas, IV) Bay of Biscay and Iberian Coast, V) Wider Atlantic. Reprinted from The North-East Atlantic, by the OSPAR Commission, 2023, https://www.ospar.org/convention/the-north-east-atlantic . Copyright © 2015 - 2023 OSPAR Commission.	34
Figure 4 Mainland Portugal and Autonomous Regions (Azores, Madeira).	37
Figure 5 Coastal and marine protected Areas on Portugal (Mainland).	38
Figure 6 Coastal and marine protected Areas on Natural Island Parks in the Azores...	40
Figure 7 Azores Marine Park	41
Figure 8 Coastal and marine protected Areas on Madeira region.....	42
Figure 9 GFCM Fishery Restricted Areas (FAO, 2022).	44
Figure 10 Overview of Occurrence of high-risk fishing within marine protected areas (MPAs) designated for habitat protection under the EU Habitats Directive. Countries whose waters were included in the analysis (marine EU Member States and the United Kingdom) are shaded dark grey. Source: Perry et al. (2022).	91



List of Tables

<i>Table 1 Uses and human activities. Source: Directive (EU) 2017/845 – Tab. 2b.</i>	20
<i>Table 2. Anthropogenic pressures. Source: Directive (EU) 2017/845 – Tab. 2a.</i>	21
<i>Table 3. Ecological criteria for area-based protection measures. List defined for the scope of this deliverable.</i>	22
<i>Table 4. Type of impact. List defined for the scope of this deliverable.</i>	22
<i>Table 5. Ecological targets for restoration. List defined for the scope of this deliverable.</i>	23
<i>Table 6. Type of restoration measures. List defined for the scope of this deliverable.</i>	23
<i>Table 7. MPAs in the Black Sea</i>	47
<i>Table 8. Protected areas in Bulgaria</i>	48
<i>Table 9. Summary table of the restoration measures put in place for coastal habitats in the Baltic Sea (HELCOM ACTION 2021).</i>	54
<i>Table 10 Overview of restoration measures in place in Scotland.</i>	65
<i>Table 11. Examples (non-exhaustive list) of existing restoration measures for marine and coastal ecosystems in France.</i>	69
<i>Table 12. Examples (non-exhaustive list) of restoration measures for marine and coastal ecosystems in Italy.</i>	75
<i>Table 13. Summary of the examples of protected sites in different sea basins and countries, along with their ecological criteria and anthropogenic pressures</i>	80
<i>Table 14. Summary of the examples of protected sites in different sea basins and countries, along with the trade-offs applied and the challenges for implementation or the opportunities for strengthening the measures established.</i>	85
<i>Table 15 Spatial coverage of HELCOM MPAs and Natura2000 areas in the Baltic Sea countries.</i>	108
<i>Table 16 Spatial coverage per designation type for North Sea wide designations and for the Belgian, Danish, German and Scottish part of the North Sea. Some of the Natura 2000 designations are split up into types B or C, where B = designated under the Habitats Directive, and C = designated under the Birds and Habitats Directive.</i>	111
<i>Table 17 Protected areas designation in metropolitan France.</i>	114



<i>Table 18 Number and types of conservation measures in the subdivision mainland Portugal.....</i>	<i>116</i>
<i>Table 19 Number and types of conservation measures in the Autonomous Region of the Azores.....</i>	<i>117</i>
<i>Table 20 Number and types of conservation measures in Madeira.</i>	<i>119</i>
<i>Table 21. Designations in Albania</i>	<i>120</i>
<i>Table 22. Designations in Bosnia and Herzegovina</i>	<i>121</i>
<i>Table 23. Designations in Croatia.....</i>	<i>122</i>
<i>Table 24. Designations in Italy.....</i>	<i>123</i>
<i>Table 25. Designations in Montenegro</i>	<i>125</i>
<i>Table 26. Designations in Spain</i>	<i>126</i>
<i>Table 27. Designations in Slovenia.....</i>	<i>127</i>
<i>Table 28. Designations in Bulgaria</i>	<i>128</i>
<i>Table 29. Designations in Romania.....</i>	<i>130</i>



Acronyms

Acronym	Meaning
ABMT	Area-Bases Management Tool
ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area
ADREMCA	Association pour la défense, la recherche et les études de la côte aquitaine
AIFCA	Association of IFCAs
AL	Albania
AMCEZ	Autre Mesure de Conservation Efficace par Zone
APM	Associated Protective Measures
ARS	Artificial Reef Structures
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
BD	BioDiversity
BDS	BioDiversity Strategy
BE	Belgium
BG	Bulgaria
BIAMS	Before-Intermediate-After Multiple Sites
BPNS	Belgian Part of the North Sea
BRG	Borkum Reefground
BSAP	Baltic Sea Action Plan
CBD	Convention of Biological Diversity
CCFP	Community of Communes Pays Fouesnantais
CCH	Cetacean Critical Habitat
CFP	Common Fishery Policy
COP	Conference of Parties
CPUE	Catch Per Unit of Effort
CRC	Comité Régional de la Conchyliculture
CWC	Cold Water Corals
DABI	Drivers, Added Values, Barriers, Impacts
DDTM	Direction Départementale des Territoires et de la Mer
DE	Germany
DFG	Derelict Fishing Gears
DG	Directorate General
DK	Denmark
DR	Deep Reefs
DWOR	Deep Water Oyster Reefs
EB	Ecosystem-based
EBM	Ecosystem-based management
EBSA	Ecologically or Biologically Significant Area
EC	European Commission
ECA	Emission Control Areas
EEA	European Environmental Agency



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Acronym	Meaning
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitats
EIA	Environmental Impact Assessment
EMFF	European Maritime and Fishery Fund
ESE	Ecological-Socio-Economic
EU	European Union
FAO	Food and Agriculture Organization
FEAMP	Fondo Europeo per gli Affari Marittimi e la Pesca
FI	Finland
FR	France
FRA	Fishery Restricted Areas
GA	Grant Agreement
GES	Good Environmental Status
GFCM	General Fisheries Commission for the Mediterranean
GSA	Geographic Sub Area
HR	Croatia
IBA	Important Bird Area
ICNF	Institute for Nature Conservation and Forests
IFCA	Inshore Fisheries Conservation Authorities
IFCN	Instituto das Florestas e da Conservação da Natureza
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
IMMA	Important Marine Mammal Area
IMO	International Maritime Organization
IMP	Integrated Maritime Policy
ISPRA	Italian National Institute for Environmental Protection and Research
IT	Italy
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
LTER	Network for ecological research in the Long TErm
MAB	Man and Biosphere Program
MAP	Mediterranean Action Plan
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee
MFSD	Marine Strategy Framework Directive
MMPATF	Marine Mammal Protected Areas Task Force
MN	Natural Monument
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
MSP	Maritime Spatial Planning
MU	Multi-Use
NAMMC	North Atlantic Marine Mammal Commission
NASCO	North-Atlantic Salmon Conservation Organisation
NCA	Nature Conservation Area



Acronym	Meaning
NE	North-East
NEAFC	North-East Atlantic Fisheries Commission
NGO	Non-Governmental Organization
NMPGL	Natural Marine Park of the Gulf of Lion
NNAP	National Network of Protected Areas
NORA	Native Oyster Restoration Alliance
NRL	Nature Restoration Law
NTZ	No-Take Zone
NW	North-West
OECD	Other Effective area-based Conservation Measure
OFB	Office Français de la Biodiversité
PL	Poland
PMA	Azores Marine Park
PMF	Priority Marine Features
PNI	Island Natural Park
PNM	Marine Natural Park
PPA	Partially Protected Area
PSSA	Particularly Sensitive Sea Area
PT	Portugal
RAC	Regional Activity Center
RNMCB	Réserve Naturelle Nationale (RNN) Marine de Cerbère-Banyuls
RNN	Réserve Naturelle Nationale
RNP	Regional Nature Park
ROV	Remoted Operated Vehicle
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCI	Site of Community Importance
SEA	Strategic Environmental Assessment
SIC	Site of Community Importance
SIMP	Single integrated management plan
SIN	Contaminated Site of National Interest
SMIDDEST	Syndicat Mixte pour le Développement Durable de l'Estuaire de la Gironde
SNAC	European conservation
SP	Spain
SPA	Special Protected Area
SPAMI	Special Area of Mediterranean Importance
SSMO	Shetland Shellfish Management Organisation
SSSI	Site of Special Scientific Interest
STECF	Scientific, Technical and Economic Committee for Fisheries
TSS	Traffic Separation Scheme
UCH	Underwater Cultural Heritage
UK	United Kingdom
UN	United Nations



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Acronym	Meaning
UNEP	United Nations Environmental Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
VHF	Very high frequency
VME	Vulnerable Marine Ecosystems
VMS	Virtual Memory System
WCPA	WCPA
WSP	Wadden Sea Plan
ZAPISKA	
ZMEL	Zones de mouillages et d'équipements légers
ZPF	Zones de Protection Fortes
ZPS	Zona di Protezione Speciale
ZSC	Zona Speciale di Conservazione
ZTB	Zona di Tutela Biologica



Executive Summary

A state-of-the-art overview of the main categories of area-based protection measures currently applied to preserve marine ecosystems and species is provided, considering international, European and national level measures. Some cases of marine restoration measures are also illustrated. The overview considers some test-site countries across all the European sea basins. For each country, a list of typologies of area-based protection measures (designations) is compiled, including measures which address biodiversity protection both directly (Marine Protected Areas - MPAs) or indirectly (Other Effective area-based Conservation Measures - OECMs). Some illustrative cases of MPAs and OECMs are selected and described in detail based on desktop review and outcomes from interviews. The overall analysis has highlighted that area-based protection measures are definitively a powerful tool for biodiversity protection to be considered within Maritime Spatial Planning (MSP) but gaps and difficulties are being encountered, in the designation, as well as in the implementation phase, which demand further improvement of governance and stakeholder engagement. Particularly, interviews have supported the identification of trade-offs undertaken between marine conservation and human uses and of opportunities to transfer the experience in other contexts. Protection and restoration measures are complementary tools that should be applied as much as possible in combination with MPAs, to maximize their synergistic effects. Spatial and temporal scales have been identified as key elements to be considered in order to achieve the objectives of protection and restoration measures.



1 Introduction

MSP4BIO is a 3-year Horizon Europe project that aims to develop an integrated and modular Ecological-Socio-Economic (ESE) management framework for protecting and restoring marine ecosystems. The project builds on, and integrates, existing knowledge and results from multiple origins, including other relevant projects and initiatives. The ESE framework will support the spatial planning and management of coastal, offshore, and deep-sea ecosystems in times of accelerated changes. This framework will identify an improved set of biodiversity and climate-related prioritisation criteria for MPAs based on the best available scientific knowledge, and will link this environmental knowledge with socio-economic considerations.

The aim of WP2 is to conduct an initial overview and gap analysis on available data, criteria and spatial measures to protect biodiversity, thus forming the basis for the entire project. It provides an overview of all relevant data and information to understand the shortcomings and opportunities for an improved safeguarding of biodiversity in the frame of MSP. Particularly, Task 2.3, aims to provide a compilation of the protection measures currently in place in European sea basins to safeguard biodiversity. The aim is to provide a picture of the variety of measures in place and favour the exchange of good practices, as well as identification of gaps. The analysis will serve as a state-of-the-art inspiration for the identification of criteria and guidelines under WP3, WP4 and WP6.

This deliverable presents a state-of-the-art overview of the main categories of conservation measures (Marine Protected Areas – MPAs) currently applied to protect marine ecosystems and species, considering international, European and national level measures. The overview also considers Other Effective area-based Conservation Measures (OECMs). Some examples of marine restoration measures are also illustrated.

Concepts and definitions of area-based protection measures are provided in chapter 3.

The deliverable contains the following chapters: Chapter 1 provides an introduction; Chapter 2 illustrates the approach to this study and details the methodology undertaken; Chapter 3 provides an overview of the area-based protection measures at the level of the European sea basin: Baltic Sea, North Sea, North-eastern Atlantic, Mediterranean Sea, Black Sea. Chapter 4 presents some examples of marine restoration cases and pilot tests in the different sea-basins. Chapter 5 provides cross-cutting reflections, across the cases illustrated. Chapter 6 reports some concluding remarks. Chapter 7 contains the bibliographic references. Information reported in the Annexes also represent a valuable part of this deliverable. Annex 1 report tables illustrating designations for area-based protection measures identified at country level in the five sea basins. Several examples of area-based protection measures collected across sea basins are presented in Annex 2. Some examples of restoration measures are illustrated in Annex 3.



2 Methodology

With the objective to identify and describe the types of area-based protection measures and some examples of restoration measures in place in the [European sea basins](#)¹, a screening was performed considering some test-site countries (both EU and not-EU) across the sea basins. Namely, the following countries were screened:

- Baltic Sea: all countries
- North Sea: Belgium, Denmark, Germany, Scotland
- North-East Atlantic: France, Portugal
- Mediterranean Sea: Albania, Bosnia-Herzegovina, Croatia, France, Italy, Montenegro, Slovenia, Spain
- Black Sea: Bulgaria, Romania

The following research activities were undertaken:

1. For each country, a list of typologies of area-based measures (designations) was compiled, including measures which address biodiversity protection both directly or indirectly, such as MPAs, Natura 2000 sites, Important Bird Areas, Key Biodiversity Areas but also Particularly Sensitive Sea Areas (PSSAs, as defined by IMO, fishery managed areas etc.). As a starting point for data collection [Marine Protection Atlas database](#) was used. The Protected Planet [Global database](#), the [IMO PSSA Interactive Web Site](#) are other examples of sources used. Data at national level were also integrated. **The results of this part of the analysis are provided in the tables included in Annex 1**, reporting Designations at country level.
2. Some illustrative cases of MPAs and OECMs were selected within each sea basin and described in detail. For this purpose, fact sheets have been compiled, containing the following information:
 - Designation type
 - Designation level (subnational, national, regional, European or international level)
 - Type of area (coastal, offshore, deep sea)
 - Uses and human activities in place in the area (the most relevant), with reference to the ones identified under MSFD (Table 1)
 - Anthropogenic pressures in marine environment (the most relevant): with reference to the ones identified under MSFD (Table 2)

¹ To ensure the feasibility of the activities under this task, the scope of the analysis was limited to the EU sea basins indicated in the text, without considering the Arctic Ocean, nor the Europe's outermost region. Instead, the North Sea has been considered because some interesting cases have been identified that were considered to bring valuable elements to this study.



- Ecological criteria: to be selected from a closed list (Table 3)
- Management measures: availability of a management plan for the area was checked and measures described
- Trade-offs between sea uses and marine protection
- Coexistence and multi-use of the sea: present good practices.

In the case of OECMs the following additional elements were collected:

- Policy context in which the measure has been established
- Main economic sector(s) involved in the OECMs
- Main environmental impacts targeted
- Direct and indirect implications for biodiversity and ecosystem protection of the OECM
- Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring:
- Opportunities for establishing this type of OECMs in other areas of the sea-basins
- Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation
- Potential for strengthening of protection measures

Compilation of factsheets was initially based on a **desktop analysis**. In many cases, the knowledge gathered was complemented by information gathered through **semi structured interviews**. The goal of the interviews was to showcase the success of practices but also to highlight trade-offs undertaken between marine conservation and human uses. Interviews brought numerous insights on the process of MPA designation, that cannot be deduced only from documentation. In total, across all the examples illustrated in this deliverable, 32 interviewees were engaged, including 8 MSP Authorities or planners/experts, 7 representatives of other public authorities, 7 scientists, 8 MPA planners/managers and 2 representatives of Non Governmental Institutions (NGOs).

It is worth noting that interviewees contacted under this task are generally other than the ones involved in the Communities of Practices. Only in a few cases they coincide. **The template used used to collect information from the interviewees is reported in Appendix to this document.**

The results of this part of the analysis are provided in the factsheets included in Annex 2.

3. Sea-basin overviews about area-based protection measures have been prepared based on desktop analysis and capitalizing from activities 1 and 2 above (chapter 3).



4. Examples of cases and projects dealing with **marine restoration** were scanned at the national level, for some of the countries considered. The work was undertaken mainly with the aim to identify eventual links between restoration and conservation. Lists of cases were provided at country level, where information was available. Some representative cases of restoration were selected (where available) and described in some detail. For this purpose, factsheets have been compiled, containing the following information:
- Type of area: coastal, offshore, deep sea
 - Uses and human activities in place in the area (the most relevant): with reference to MSFD, see
 - Table 1 below)
 - Type of impact: to be selected from a closed list (see Table 4 below)
 - Ecological target for restoration: to be selected from a closed list (see



- Table 5 below)
- Typology of measure: to be selected from a closed list (see Table 6 below).

The results of this part of the analysis are provided in the factsheets included in Annex 3.

NOTES

- Despite the effort to define a standard for data collection during desktop analysis and interviews, it has not been possible to harmonize all data. Therefore, results from country analysis show some differences in some cases. Particularly, fact sheet reported in Annex 2 and Annex 3 still show some degree of heterogeneity e.g. in the level of detail the information is provided, as well as in some interpretation of some parts of the analysis (e.g. trade-offs between sea-uses and marine protection).
- Regarding the tables with designations reported in Annex 1, it is worth noting that in most of the countries examples of nested protection have been found, with different designations overlapping in the same area. Therefore, data provided about the spatial extent of the single designations shouldn't be added, to avoid overestimation of the overall protected area in each country.
- It is worth noting that bibliographic references related to the information provided in the factsheets are included at the end of each single factsheet (Annex 2 and Annex 3), to ease consultation. All other bibliographic references are provided in Chapter 7.

Table 1 Uses and human activities. Source: Directive (EU) 2017/845 – Tab. 2b.

Use	Activity
Physical restructuring of rivers, coastline or seabed (water management)	Land claim Canalisation and other watercourse modifications Coastal defence and flood protection Offshore structures (other than for oil/gas/renewables) Restructuring of seabed morphology, including dredging and depositing of materials
Extraction of non-living resources	Extraction of minerals (rock, metal ores, gravel, sand, shell) Extraction of oil and gas, including infrastructure Extraction of salt Extraction of water
Production of energy	Renewable energy generation (wind, wave and tidal power), including infrastructure Non-renewable energy generation Transmission of electricity and communications (cables)
Extraction of living resources	Fish and shellfish harvesting (professional, recreational) Fish and shellfish processing*



Use	Activity
	Marine plant harvesting Hunting and collecting for other purposes
Cultivation of living resources	Aquaculture — marine, including infrastructure Aquaculture — freshwater Agriculture Forestry
Transport	Transport infrastructure Transport — shipping Transport — air Transport — land
Urban and industrial uses	Urban uses Industrial uses Waste treatment and disposal
Tourism and leisure	Tourism and leisure infrastructure Tourism and leisure activities
Security/defence	Military operations (subject to Article 2(2))
Education and research	Research, survey and educational activities

Table 2. Anthropogenic pressures. Source: Directive (EU) 2017/845 – Tab. 2a.

Type	Pressure
Biological	Input or spread of non-indigenous species
	Input of microbial pathogens
	Input of genetically modified species and translocation of native species
	Loss of, or change to, natural biological communities due to cultivation of animal or plant species
	Disturbance of species (e.g. where they breed, rest and feed) due to human presence
	Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)
Physical	Physical disturbance to seabed (temporary or reversible)
	Physical loss (due to permanent change of seabed substrate or morphology and to extraction of seabed substrate)
	Changes to hydrological conditions
Substances, litter and energy	Input of nutrients — diffuse sources, point sources, atmospheric deposition
	Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides) — diffuse sources, point sources, atmospheric deposition, acute events
	Input of litter (solid waste matter, including micro-sized litter)



Type	Pressure
	Input of anthropogenic sound (impulsive, continuous)
	Input of anthropogenic sound (impulsive, continuous)
	Input of water — point sources (e.g. brine)

Table 3. Ecological criteria for area-based protection measures. List defined for the scope of this deliverable.

Protection of species (bird)
Protection of species (mammal)
Protection of species (reptile)
Protection of species (fish)
Protection of species (invertebrates)
Protection of species (plant/algae)
Protection of habitat (coastal - hard bottom)
Protection of habitat (coastal - soft bottom)
Protection of habitat (pelagic)
Protection of habitat (deep sea)

Table 4. Type of impact. List defined for the scope of this deliverable.

Degraded ecosystems in eutrophicated coastal areas (e.g. coastal cities, river estuaries)
Degraded ecosystems in highly polluted coastal areas (e.g. ports, coastal industrial sites)
Degraded marine vegetation
Degraded benthic community (soft bottom habitats)
Degraded benthic community (hard bottom habitats)
Overexploited fish stock
Deterioration of nesting habitats for marine species
Deterioration of spawning and nursery habitats for marine specie
Other (to be specified)



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 5. Ecological targets for restoration. List defined for the scope of this deliverable.

Marine vegetation
Soft bottom habitats
Hard bottom habitats
Fish stocks
Deep sea species/communities
Nursery grounds
Other (to be specified)

Table 6. Type of restoration measures. List defined for the scope of this deliverable.

Waste water treatment
Remediation of contaminated sites (e.g. dredging of contaminated sediments)
Installation of artificial substrates
Fisheries management measures
Other (to be specified)



3 Area-based protection measures

3.1 Spatial marine protection

In the context of marine management, **Area-Based Management Tools (ABMTs)** are identified as instruments that entail “the implementation of a system of rights and duties in a particular management area, under the responsibility of a designated authority, and [ABMTs] tend to afford high levels of protection” (Gissi et al., 2022, based on UNGA, 2007; Prior, Chircop and Roberts, 2010). ABMTs include marine protected areas (MPAs) and Other Effective area-based Conservation Measures (OECMs).

Marine Protected Areas (MPAs) are defined under IUCN as “A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (IUCN-WCPA, 2008). They are a fundamental tool available to policymakers, planners, managers and communities to protect biodiversity and halt the decline of marine ecosystems and the benefits they provide. MPAs prioritize the nature conservation and are the primary area-based tool for marine biodiversity conservation (Vilas et al., 2020). MPAs comprise a number of different designations (as exemplified in the collection of data at country level reported in Annex 1) e.g. Natura 2000 sites under the Habitat and Birds Directives, Ramsar sites designated under the Ramsar Convention, (“The Convention on Wetlands”), Biosphere Reserves nominated at national level under the provisions of UNESCO, as well as marine parks and other types of protected areas.

Beside MPAs, other spatial tools can be put in place at sea to support biodiversity conservation: **Other Effective area-based Conservation Measures (OECMs)** have been defined under the Convention of Biological Diversity as “Geographically defined areas other than Protected Areas, which are governed and managed in ways that achieve positive and sustained long-term outcomes for the *in situ* conservation of biodiversity with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values” (CBD, 2018).

In the fisheries context, effective management can conserve biodiversity by protecting marine species and habitat, thus promoting the sustainable management of resources that are critical to food security. Spatially defined fishery measures can be established, which produce positive, long-term and *in situ* biodiversity outcomes, in addition to the intended fishery outcomes. These measures can be qualified as OECMs. (FAO, 2022).

Targets for MPAs and OECMs have been set at international, as well as at European level. The Aichi Target 11, defined under Convention of Biological Diversity (Strategic Plan for Biodiversity 2011-2020), as well as the United Nations Sustainable Development Goal 14.5 indicate the objectives to protect 10 % of the ocean by 2020. More recently, the



Global Biodiversity Framework, called for 30 % of the earth's land and sea to be conserved through the establishment of protected areas (PAs) and other area-based conservation measures (OECMs).

The European Biodiversity Strategy 2030 also set the objectives for nature protection by 2030 as: 1. Legally protect a minimum of 30 % of the EU's land area and 30 % of the EU's Seas and integrate ecological corridors, as part of a true Trans-European Nature Network ; 2. Strictly protect at least a third of the EU's protected areas, including all remaining EU primary and old-growth forests; 3. Effectively manage all protected areas, defining clear conservation objectives and measures, and monitoring them appropriately.

The main legal instruments for the designation and management of MPAs in Europe are the Habitats and Birds Directives and the Marine Strategy Framework Directive ('Marine Directive'). The development of a coherent and well-managed network of MPAs is also supported by EU legislation regulating maritime sectors. In particular, the Maritime Spatial Planning Directive requires countries to adopt an ecosystem-based approach to the management of human activities at sea, and the Common Fisheries Policy (CFP) Regulation enables Member States to agree on fisheries management measures in their offshore MPAs where other Member States have a direct interest in the fishery (Article 11 of the Common Fisheries Policy).

According to [EEA \(2023\)](#), over the last decade, the total area covered by MPAs in the EU has increased substantially: from 5.9 % in 2012 to 12.1 % in 2021 thanks to the expansion of the Natura 2000 network and protected areas established national level. Although this trend is positive, the area protected will need to expand at a significantly faster rate than it has in the last decade if the EU is to meet the 30% biodiversity strategy target by 2030 (EEA, 2023).

Apart from the extension in space, a critical element to be considered is the level of protection. Under the IUCN definition (IUCN, 2008), as well as in practical applications, marine protected areas encompass numerous levels of protection and many different combinations of uses that are allowed or not allowed, with consequent impacts on biodiversity.

In addition, effective management also represents a major issue. In fact, although more than 10 % of EU seas are now designated as MPAs, most of these areas are poorly or not managed, with missing management plans / planning schemes and/or management measures poorly or not implemented. Moreover, there is a general lack of resources for managing monitoring and enforcement in MPAs with the consequence of little effective protection in place.

These issues are exemplified in results of the research conducted in this study and reported in the following chapters and in the Annexes. Limitations as well as success



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



elements are evident in all the cases described which document the complexity of marine conservation but also the number of tools developed and the growing level of experience on the ground for planners, managers and decision makers.

3.2 Sea-basin overviews

This paragraph provides a synthetic description on the state of implementation of spatial protection measures in the different sea-basins, with focus on the selected test-site countries. Type of designations occurring at country level are illustrated in the tables of Annex 1. As indicated already in chapter 2, it is worth noting that, in several cases, different types of designation overlap, and this has to be considered when considering the extension of the respective areas. Examples of area-based protection measures identified across the countries are reported in Annex 2, considering MPAs and OECMs (these including fisheries management areas). Figure 1 provides an overview of the location of the examples described in Annex 2.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.

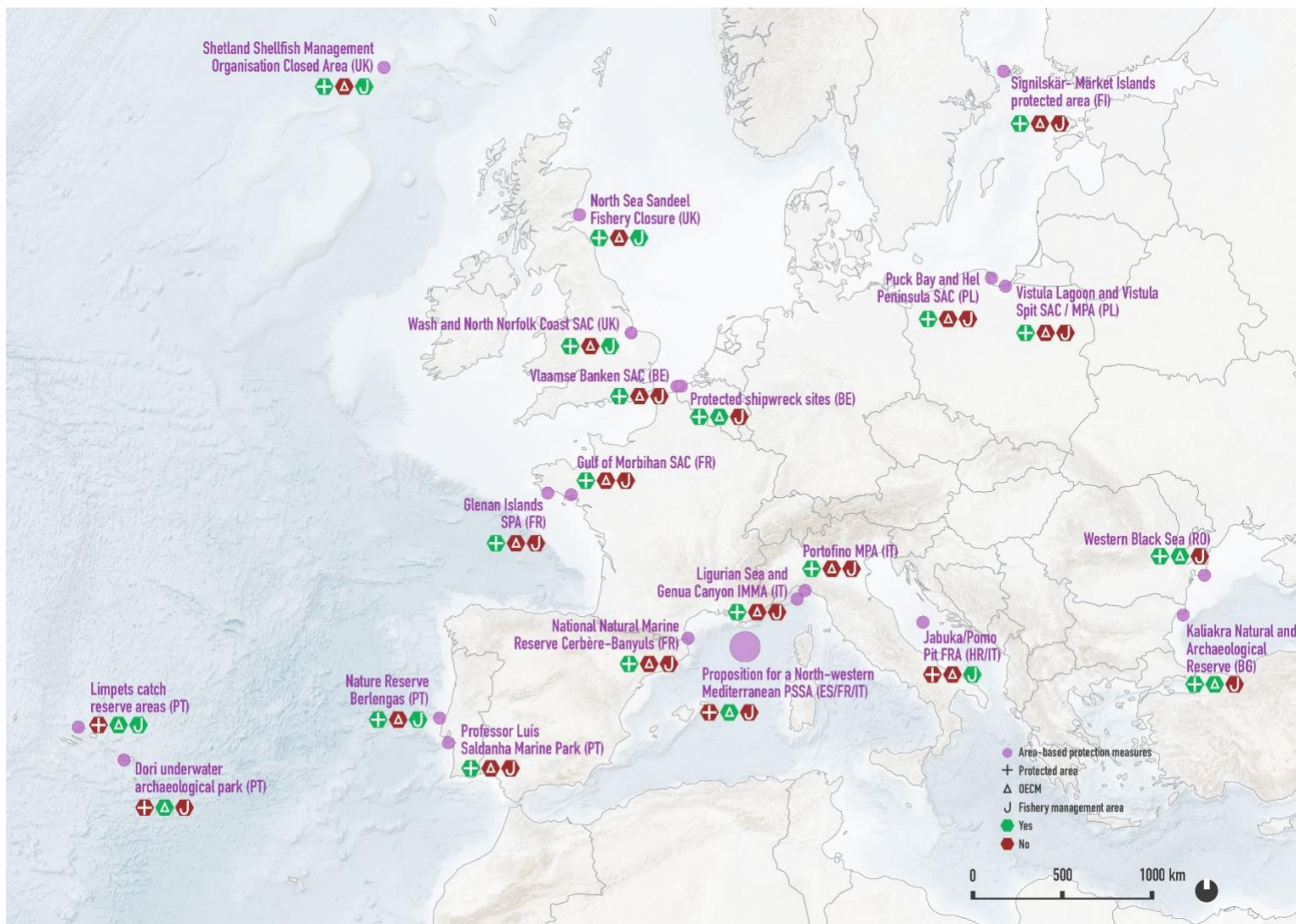


Figure 1 Overview of the examples of area-based protection measures described in this study.



3.2.1 Baltic Sea

The Baltic Sea covers an expansive area of 397,978 km² and is a partially enclosed sea basin. It is surrounded by nine countries, including Denmark, Germany, Poland, Lithuania, Latvia, Estonia, Finland, Sweden, and Russia. The sea can be divided into several sub-regions, namely the Gulf of Finland, the Gulf of Bothnia, the Gulf of Riga, Baltic Proper (including the Gulf of Gdansk), the Danish Straits, and the Kattegat. Characterized by its relatively shallow depths, with an average of just 54 meters, the Baltic Sea is a brackish water ecosystem. It supports a rich biodiversity and exhibits a high level of biological production. The coastal areas serve as crucial breeding and nursery grounds for a wide variety of fish and invertebrates, while the deeper waters provide a habitat for pelagic fish species such as herring and sprat.

Area-based protection plays a crucial role in protecting and preserving the unique and fragile ecosystem of the Baltic Sea. The Baltic Sea faces numerous environmental challenges that require dedicated conservation efforts. Area-based protection strategies focus on designating and managing protected areas to safeguard critical habitats, maintain biodiversity, and mitigate human impacts.

Protected area designation and management in the Baltic Sea region follow a complex framework involving various conservation schemes and overlapping boundaries. Traditionally, the establishment of Marine Protected Areas (MPAs) in the Baltic has focused on safeguarding specific species, habitats, or ecosystem processes under regional conventions, national law, or the Birds and Habitats Directives. The spatial protection of the Baltic Sea is characterized by multiple schemes coexisting in the same geographic location, with Natura 2000 areas often designated as HELCOM MPAs and smaller Natura 2000 areas merging into larger HELCOM MPAs. However, differences arise in terms of shape, as Natura 2000 areas may include inland regions, while HELCOM MPAs are limited to the coastal zone and marine areas. Notably, the HELCOM MPA network encompasses Russian waters, whereas the Natura 2000 network is confined to marine areas under EU jurisdiction, except for MPAs designated by the Russian Federation. Among the 188 HELCOM MPAs, all but two incorporate significant Natura 2000 components.

The HELCOM MPA Network, established by the Helsinki Commission (HELCOM), serves as a comprehensive system of MPAs in the Baltic Sea region. Its primary objective is to protect and conserve critical marine habitats, species, and ecosystems while promoting the sustainable use of the Baltic Sea's resources. The creation and management of HELCOM MPAs involve collaboration among the Baltic Sea countries and oversight by national authorities.



As of December 2022, the HELCOM MPA network covers an approximate area of 59,232 km². Out of this total MPA area, 34,600 km² (58.4%) is either fully or partially managed according to the HELCOM MPA database. There is an expectation of a significant increase in spatial coverage in the future, driven by the high level of ambition expressed by countries through commitments under the [Baltic Sea Action Plan \(BSAP\)](#), HELCOM Recommendations, and the ongoing implementation of the EU Biodiversity Strategy 2030 (EU BDS).

In the following sections, the concept of spatial protection in the Baltic Sea region will be explored, with a focus on the Baltic Sea Action Plan and the designations at the country level. To provide a comprehensive overview, a table is included (Table 7), showcasing the spatial coverage of HELCOM Marine Protected Areas (MPAs) and Natura 2000 areas in the Baltic Sea countries. Furthermore, specific examples of area-based protection measures will be analysed, with fact sheets being presented for three protected areas: Signilskär-Märket Islands - Finland, the Vistula Lagoon and Vistula Spit - Poland, and the Puck Bay and Hel Peninsula - Poland. These examples will reveal the protected areas' characteristics, management strategies, and conservation efforts, showcasing their contribution to the Baltic Sea region's conservation goals.

In the Baltic Sea a PSSA was created by IMO Resolution MEPC.136(53) in 2005 with the overall goal to protect the sensitive brackish-water ecosystem of the Baltic Sea from international shipping activities, which were expected to intensify. Associated Protective Measures (APMs) have been identified, such as: (a) Two traffic separation schemes (TSSs) were established, one in Bornholmsgat and another to the north of Rügen; (b) An inshore traffic zone south of Gedser was introduced; (c) A deep-water route off Gotland Island was established in order to organize traffic of ships with a draught of more than 12 m; (d) Norra Midsjöbanken and Hoburgs Bank were designated as areas to be avoided in order to protect bird habitats, seals and mussel banks from oil spills (Word Maritime University, 2014).

The Baltic Sea Action Plan (BSAP), adopted by the HELCOM Contracting Parties in 2007 and updated in 2021, is HELCOM's strategic programme of measures and actions for achieving good environmental status of the sea, ultimately leading to a Baltic Sea in a healthy state. The plan includes several measures that are intended to regulate spatial protection in the region, both directly and indirectly. One of the most significant actions is Action B1, which calls for the establishment of a resilient, regionally coherent, effectively and equitably managed, ecologically representative, and well-connected system of marine protected areas (MPAs) by 2030. The network of MPAs must cover at least 30% of the marine area of the Baltic Sea, with at least 1/3 of that area being strictly protected. The plan also calls for the inclusion of Other Effective Area-based Conservation Measures (OECMs) that comply with the OECM criteria agreed by the Convention on Biological Diversity (CBD). This measure is crucial for ensuring the conservation and



resilience of biodiversity in the Baltic Sea, which is essential for maintaining the ecosystem's health.

Another important action is Action B2, which aims to support the coherence of the MPA network. This action calls for a common understanding of the OECM criteria and their use in the region, as well as the identification of OECMs in the Baltic Sea by 2025. This will ensure that the OECMs included in the network are effective in supporting the conservation and resilience of biodiversity, which will contribute to the long-term sustainability of the Baltic Sea ecosystem. In addition to the measures that have a direct impact on spatial protection in the Baltic Sea, there are also actions that have an indirect effect. These measures focus on assessing the effectiveness of the marine protected area (MPA) network and ensuring that it provides specific protection for threatened species and biotopes.

3.2.2 North Sea

The North Sea is a relatively shallow sea basin (average depth at 90m, deepest point at 700m) that stretches from the English Channel in the south to the Atlantic Ocean in the North. It is located on the continental shelf of Northwest Europe and is bordered by nine countries. The North Sea hosts a high intensity of human activities including shipping, fishing, renewable energy developments and offshore oil and gas activities (European MSP Platform, 2022). This study focuses on area-based protection measures occurring in Belgium, Denmark, Germany and Scotland.

Per country and per designation type, the areal coverage was summarised (Annex 1 - Table 16). To achieve this summary, for the Scottish designations the listings of MPAtlas (global database) and Naturescot (national database) were both considered, and a real coverage was converted from hectares to km². Information on protection levels (fully protected/implemented/designated) was not available in the Naturescot database, but the status could be retrieved from information available in the database, or the KAUBD database for Scottish Nature Conservation MPAs. The areal coverage for the North Sea area only was retrieved by filtering out the NE Atlantic records outside of the North Sea, as well as the terrestrial area of designations covering both land and sea area, using an area calculation function in QGIS for the designations for which shapefiles were available. In the case of Belgium, MPAtlas was compared with information at the national level, and missing designations were added, as well as OECMs (shipwrecks, PSSA, ...).

Comparing the area totals of designated, implemented and highly protected areas, it is apparent that across countries, there is a low proportion of designations that are fully protected (Annex 1 - Table 16). For Belgium and Denmark, the area covered by European Natura 2000 sites is generally greater than the coverage protected by national or subnational designations. For Scotland, the Nature Conservation MPAs also have a



significant spatial coverage as well as the Natura 2000 sites. For each of the countries, the OSPAR Marine Protected Areas represent a high spatial coverage. This could be attributed to how existing MPAs are adopted as OSPAR MPAs, including Natura 2000 sites (e.g. for Scotland (NatureScot, 2023)).

In addition to summaries of the spatial coverage per designation, a few case studies were selected across the North Sea that illustrate applications of area-based management tools: Other Effective area-based Conservation Measures (OECMs) as well as marine protected areas (MPAs). The first case study is found in the northern stretches of the North Sea in the coastal waters of the Shetland Isles, where the Shetland Shellfish Management Organisation (SSMO) has closed off areas for scallop fishing. At a later phase, these areas were also closed off for all licensed activities through the Shetland Islands Regional Marine Plan (SIRMP), e.g. for aquaculture and renewable energy infrastructure. A success factor of this OECM is that it created agency for the fisheries association to be involved in conservation planning processes.

Another example of an OECM in Scottish waters is the Northwestern North Sea sandeel fisheries closure, which has been in place since 1999 along the East coast of Scotland, in response to ICES advice that highlighted correlations between the introduction of a sandeel fishery in the 1990s and low breeding success at surrounding bird colonies. Sandeel are an important prey species for seabirds. The closure was a result of the advice highlighting the need for a precautionary approach. A success factor for this OECM is the involvement of different parties from the beginning, including the Royal Society for the Protection of Birds (RSPB). Since the closure, sandeel abundance has increased, but a recent paper highlights the challenge in isolating the effectiveness of the sandeel box from other environmental drivers that affect seabird demography (Searle *et al.*, 2023).

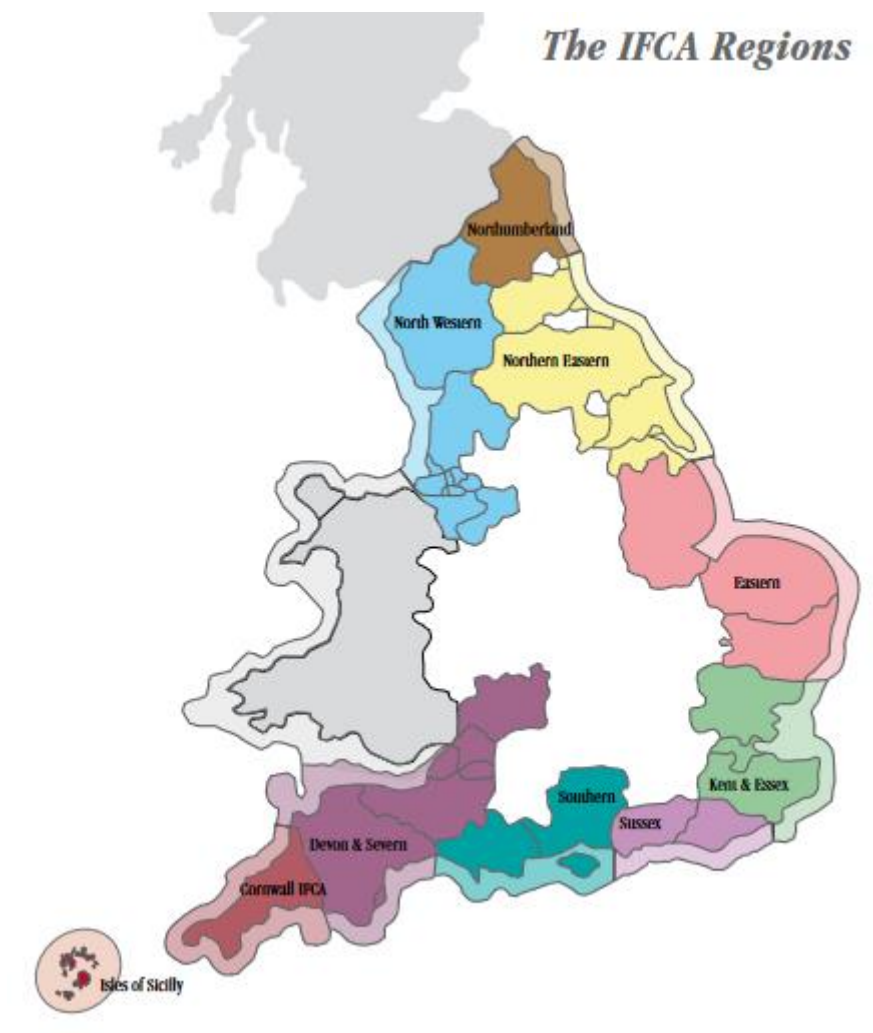


Figure 2 Overview of the ten IFCAs in place in England (source map: Association of IFCAs, (AIFCA, 2023)).

An exemplary case study of ABMTs identified by a Scottish marine management expert are the IFCAs (Inshore Fisheries Conservation Authorities) in place in England. IFCAs were set up in 2011 and are committees of local government responsible for sustainable fisheries management to up to six nautical miles. To understand how they operate, the practices of the Eastern IFCA were examined, including how their MPA Byelaw² facilitates the protection of the Wash and North Norfolk Coast SAC (Special Area of Conservation)

² Byelaws are laws applicable to a specified area, by a local council, enabled through an act requiring something to be done (<https://www.gov.uk/guidance/local-government-legislation-byelaws>). In the case of IFCAs, byelaws are enabled through sections 155-156 of the UK Marine and Coastal Access Act 2009 (<https://www.legislation.gov.uk/ukpga/2009/23/section/155>).



through fisheries restrictions. Another form of fisheries' measures is demonstrated with the protections in place to safeguard wreck sites in the Belgian part of the North Sea. Even though the main objective of these measures is to protect the wrecks themselves, the ban on fishing in these areas also alleviates trawling pressures from the seabed habitats. Alternative forms of measures are described in relation to the Vlaamse Banken MPA, including the carrying out of research to fill current knowledge gaps.

Finally, this study also gives an overview of protection measures in place in the Wadden Sea area, which include establishing protected areas, regulating fisheries and managing coastal development. The area is managed through the Trilateral Wadden Sea Cooperation, an agreement between the Netherlands, Germany and Denmark, and a single integrated management plan is in development, which will include a six-year plan for implementation of measures included in the plan.

3.2.3 Northeastern Atlantic

The Northeast Atlantic and the North Sea both belongs to the OSPAR area where five main regions can be identified (Figure 3). The Northeast Atlantic covers regions III, IV and V of the OSPAR area.

For this sea basin, two countries have been considered in the present study: metropolitan France (west coast) and Portugal. Compilation of area-based measures for these countries are reported in Annex 1 (Table 17, Table 18, Table 19, Table 20). In France, the selected MPAs for the fact sheets are located at the top part of OSPAR region IV, while for Portugal the MPAs and OECMs are in regions IV and V (Annex 2 – North-East Atlantic)). For the interests of clarity, the following part of this section focuses on the Bay of Biscay and the Iberian Coast (region IV), and the Wider Atlantic (region V).

The bathymetry of the Bay of Biscay and the Iberian Coast varies significantly from a sizeable continental shelf in the North to abyssal plains closer to the coastline in the South. This region supports highly diverse and productive marine and coastal ecosystems (seamounts, estuaries, rias, wetlands...), and is home to a large variety of migratory birds and marine mammal's species, both boreal and temperate (OSPAR Convention, 2023a). The principal human activities in this region are fishing, maritime transport, tourism, aquaculture, sand and gravel extraction, and the development of marine renewable energies.

The waters of the Wider Sea region are deep compared to other European maritime areas. For instance, the average depth of the Azores archipelago is approximately 3,000 meters (Amorim et al, 2017). Benthic communities are particularly rich in this region, and fragile deep-sea habitats (hydrothermal vents, carbonate mounds, cold-water coral reefs, coral gardens, sponge communities...) have recently been discovered (OSPAR



Convention, 2023b). Human population in this region is restricted to the Azores archipelago. The principal human activities are fishing, tourism, sand and gravel extraction (only around the Azores), maritime transport, submarine communication cables, and military activities.

The OSPAR Convention entered into force in 1998 with the objective to protect the marine environment of the North-East Atlantic. Contracting Parties can designate MPAs under the OSPAR Convention. OSPAR's work has contributed to the expansion of a regional network of MPAs and the designation of MPAs beyond national jurisdiction. Other regional organisations are present in this region: the North-East Atlantic Fisheries Commission (NEAFC), the North-Atlantic Salmon Conservation Organisation (NASCO), the North Atlantic Marine Mammal Commission (NAMMC), and the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS). These organisations as well as international ones should be taken into consideration when defining objectives and targets for biodiversity conservation.



Figure 3. The five main regions of OSPAR Convention: I) Arctic Waters, II) Greater North Sea, III) Celtic Seas, IV) Bay of Biscay and Iberian Coast, V) Wider Atlantic. Reprinted from The North-East Atlantic, by the OSPAR Commission, 2023, <https://www.ospar.org/convention/the-north-east-atlantic>. Copyright © 2015 - 2023 OSPAR Commission.



There are diverse MPA designations or types in this sea basin (marine reserve, marine park, OSPAR MPA, Natura 2000 network, nature reserve...), which are presented in Annex 1 - Table 17, Table 18, Table 19, Table 20 for both France (mainland) and Portugal. The objectives, level of protection, management authority, or size of an MPA vary according to their designation. In France, an important number of MPAs aims at supporting the conservation of species and habitats as well as the sustainable development of human activities at sea. Interviews conducted with MPA managers showed that this approach provides advantages and disadvantages. More details are available at the end of France's fact sheets (Annex 1 – North-East Atlantic).

Collecting information on these cases has revealed challenges and successes in terms of MPA governance. For instance, assessing the good ecological and conservation status of habitats and species can be difficult for sites' managers. This is due to several factors such as: the structure or function of a species (e.g., migration), an absence of benchmarks, or a lack of financial means to conduct the assessments. To conclude, the fact sheets for this sea basin provide a variety of successful practices and obstacles with regard to MPA management, biodiversity protection, and stakeholders integration. The fact sheets should be viewed independently from one another as they are significantly different.

More details on area-based protection measures are provided here below at country level.

France

In France, a majority of MPAs is designated under the Birds Directive and Habitats Directive (Natura 2000 sites). Indeed, there are 110 marine Natura 2000 sites in France, which covers 34 % of the exclusive economic zone (including overseas region) (OFB, n.d.). In comparison, there are 8 National Nature Reserves.

In French waters Fishing reserves elaborated and implemented by fishermen (cantonement de pêche) are present. The creation of a fishing reserve is typically done through a regulatory act, such as a ministerial or prefectural decree. This act determines the geographical boundaries of the fishing reserve, the fishing rules that apply within it, and the conservation or sustainable management objectives pursued. The decisions to designate fishing reserves are made in consultation with several stakeholders, which includes local fishers or fisheries committees, scientists, governmental bodies, and sometimes environmental protection associations³.

³ Ordonnance n° 2010-462 du 6 mai 2010 (Art.L. 922-2.).

<https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000022176680/>

Journal officiel de la République française. Lois et décrets n° 0137 du

13/06/1963. <https://www.legifrance.gouv.fr/download/securePrint?token=bDoLerM8ZJiu9vvhzHTQX>



With regard to other types of OECMs, the 2022 report of the IUCN French Committee (Comité français de l’UICN, 2022) elaborates recommendations for a possible application of OECMs in France. France is studying a strategy for national ABMT but some experiences of OECM exist like in the case of PSSAs.

The Western European waters, Belgium, France, Ireland Portugal, Spain and United Kingdom PSSA covers the western coasts of the United Kingdom, Ireland, Belgium, France, Spain, Portugal, from the Shetland Islands in the North to Cape S. Vicente in the South, and the English Channel and its approaches. The marine and shore environment is particularly vulnerable to the risks posed by the carriage of goods by sea. In the PSSA, IMO has adopted areas to be avoided, routing measures and imposed a mandatory ship reporting system which applies to all oil tankers over 600 gross tonnage.

In addition, the new PSSA for the North Western Mediterranean can be mentioned (see chapter 3.2.4 on the Mediterranean Sea).

The French fact sheets focus on two Natura 2000 sites on the Atlantic coast of France. One is a Special Protection Area (Birds Directive) and the second one is a Special Area of Conservation (Habitats Directive). One interview was conducted for each site. The four main criteria for selecting these MPAs were:

- 1) A clear declaration of MPA objectives;
- 2) A management plan that mentioned global prioritisation of ecosystems’ protection (species, processes, and/or habitats);
- 3) A publicly available management framework;
- 4) The possibility to conduct an interview to collect specific information.

Portugal

In Portugal, there are 3 sub-systems for Protected (and marine) Areas Classification coexisting (Figure 4): Mainland Portugal; Azores; and Madeira Autonomous Regions (Atlantic Archipelagos).

Zones de cantonnement de pêche aux crustacés dans le Finistère.
<https://geo.data.gouv.fr/fr/datasets/b1927aafde81dad67d7d79c653bc2b0cd7a4224>

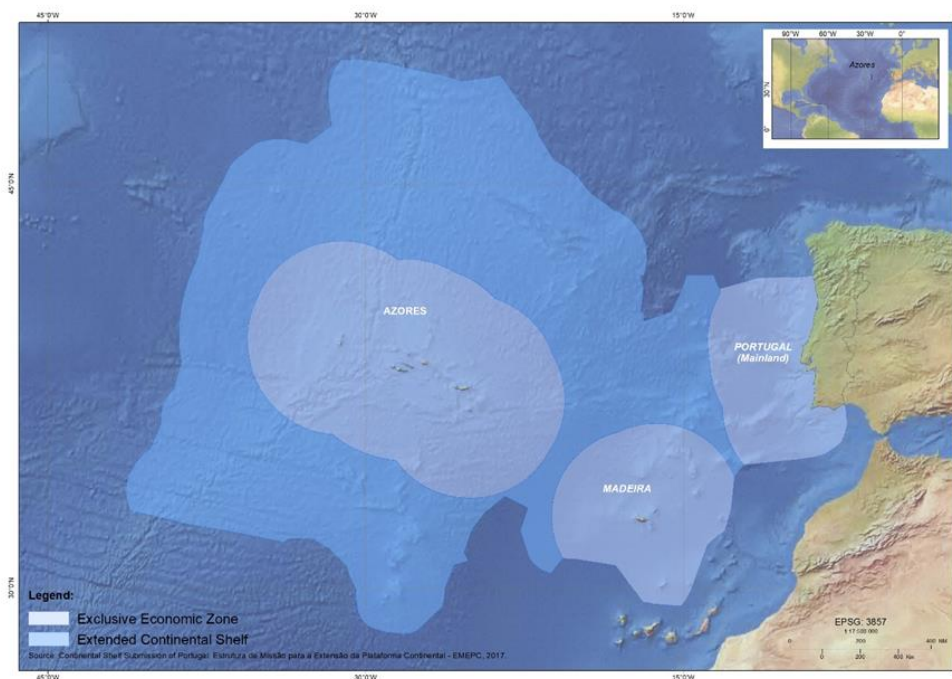


Figure 4 Mainland Portugal and Autonomous Regions (Azores, Madeira).

Mainland Portugal - National Classified Areas System

The National Classified Areas System (SNAC) was structured by the Legal Framework for Nature Conservation and Biodiversity, approved by Law Decree - 142/2008 of 24 July, amended and republished by Law Decree - 242/2015 of 15 October, and comprises the National Network of Protected Areas (NNAP). In addition, it includes the Natura 2000 Network, and other areas are classified under international commitments contracted by the Portuguese State (ICNF, n.d.).

In NNAP, land and inland water areas and marine areas are classified as protected areas where biodiversity or other natural occurrences have, due to their rarity, scientific, ecological, social or scenic value, a particular relevance that requires specific conservation and management measures, to promote the rational management of natural resources and the enhancement of natural and cultural heritage, regulating artificial interventions that may degrade them. Protected Areas may have national, regional, or local scope and also private status, being classified into the following typologies (Law Decree- no. 242/2015, of 15 October 2015):

- National Park;
- Natural Park;
- Nature Reserve;
- Protected Landscape



– Natural Monumeny

In 2022, in mainland Portugal, the National Protected Areas Network included 52 protected areas, of which 32 are national in scope, comprising 1 national park, 13 natural parks, 9 nature reserves, 2 protected landscapes and 7 natural monuments (ICNF).

The Natura 2000 network comprises the areas classified as Special Areas of Conservation (SAC) under the Habitats Directive and those classified as Special Protection Areas (SPA) under the Birds Directive. In these areas of Community importance for the conservation of specific natural habitats and species, which also cover the marine environment, human activities must be compatible with the preservation of these values, aiming at sustainable management from an ecological, economic and social point of view (ICNF, n.d.).

Finally, classified areas under international commitments include, among others, Biosphere Reserves, Ramsar Sites and Geoparks (APA, 2021).

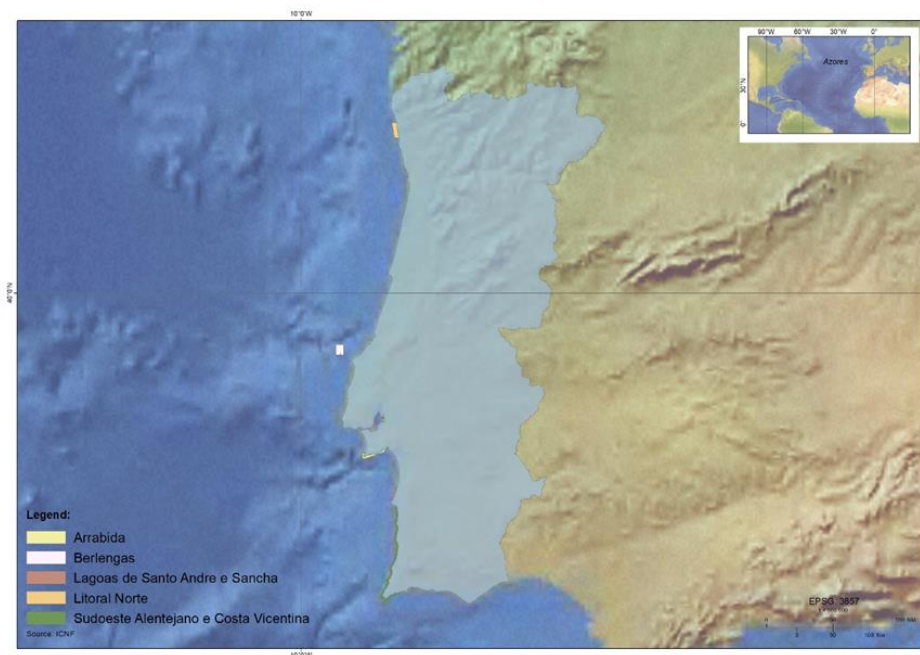


Figure 5 Coastal and marine protected Areas on Portugal (Mainland).

Regarding the marine subdivision of mainland Portugal, a list of sites has been prepared based on their designation through several sources such as PSOEM and ICNF. Table 18 in Annex 1 shows the categories of designations and the total number of sites. In total were found 88 sites in this subdivision. More specifically, 25 of them referred to the Natura 2000 Network and 63 of them refer to national protected areas like nature parks and nature reserve areas.



Azores Autonomous Region

The Protected Areas Network of the Azores was created according to the Regional Legislative Decree No. 15/2012/A of 2 April and integrates all the Protected Areas existing in the territory of the Autonomous Region of the Azores, defined according to the classification adopted by the International Union for Conservation of Nature (IUCN) (REEA, 2019):

- a) "Nature reserve", with the subcategories "integral nature reserve" (category Ia) and "partial nature reserve" (category Ib);
- b) "National park" (category II);
- c) "Natural monument" (category III);
- d) "Area protected for the management of habitats or species" (category IV);
- e) "Protected landscape (category V);
- f) "Protected resource management area (category VI).

The Azores Protected Areas Network integrates 3 types of management units: Island Natural Park (PNI), Azores Marine Park (PMA), and Protected Areas of Local Importance. In addition, the marine areas in the territorial sea adjacent to each archipelago island are included in the corresponding Island Natural Parks (REEA, 2019).

The 9 Island Natural Parks already created (which integrate the areas classified under the Natura 2000 Network as well as areas classified under international conventions), and with the Azores Marine Park, constitute the basic management unit of the Protected Areas Network of the Autonomous Region of the Azores (REEA, 2019).

The Natural Island Park (PNI) is the primary management unit of the Azores Protected Areas Network. Each island in the Azores archipelago has a natural island park. The natural island parks are created by regional legislative decree and consist of protected terrestrial areas and sites located in the territory of each island, and also include marine areas located up to the outer limit of the territorial sea (Regional Legislative Decree No. 15/2012/A, 2012) (Figure 6).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.

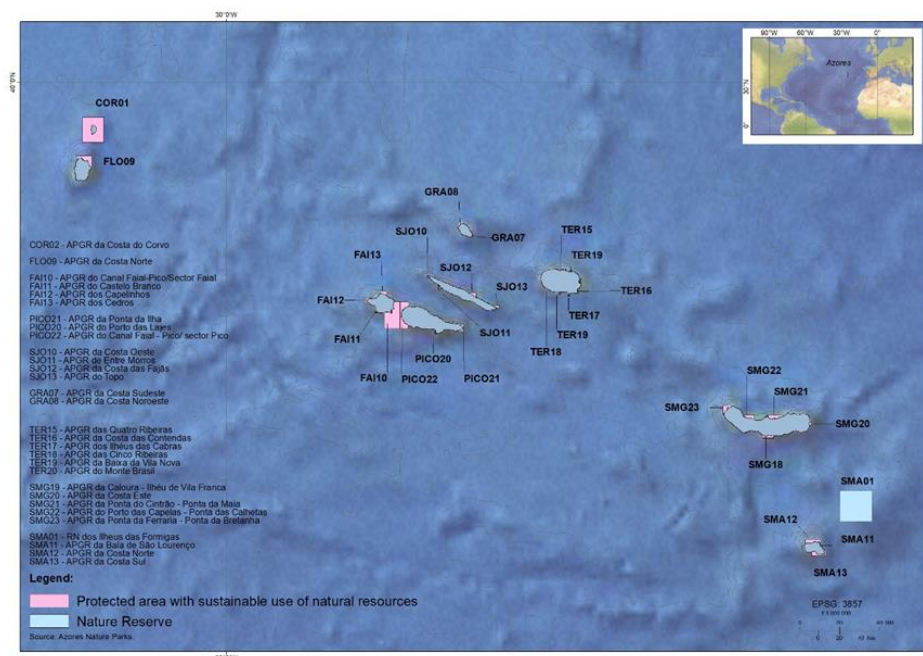


Figure 6 Coastal and marine protected Areas on Natural Island Parks in the Azores

The Azores Marine Park is made up of marine areas under the management of the Autonomous Region of the Azores located beyond the outer limit of the territorial sea, integrating a single management unit intended to enable the following: (a) adopt measures directed towards the protection of hydrothermal vents, mounds and other underwater structures, as well as sensitive marine resources, communities and habitats; (b) manage the hydrothermal vents, mounds and other classified underwater structures or others that come to be subject to classification in the Azores archipelago and surrounding regions (Regional Legislative Decree No. 15/2012/A, 2012).

Under the Island Natural Parks, 123 areas are protected (19 Natural Reserves, 10 Natural Monuments, 48 Protected Areas for the Management of Habitats or Species, 16 Protected Landscape Areas and 30 Protected Areas for the Management of Resources), which together total 180247 ha, of which 56066 ha is terrestrial area and 124181 ha marine area (Figure 7).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.

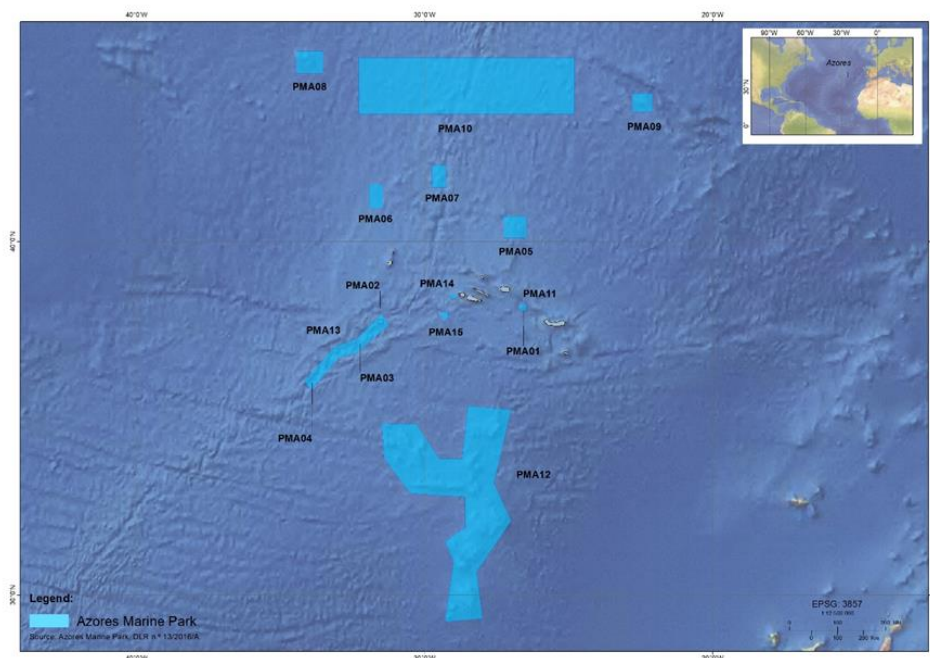


Figure 7 Azores Marine Park

In addition, with the Regional Legislative Decree No. 13/2016/A of 19 July, the Azores Marine Park was substantially increased by creating and classifying 4 new protected areas. Thus, since 2016, 15 marine areas have been protected within the Azores Marine Park, totalling 24,627,256 ha, more than double the area protected in 2011 (REAA, 2019).

In total 176 sites were found within the Azorean archipelago. More specifically, 24 of them referred to the Natura 2000 Network, 36 to cultural heritage sites, 69 of them are related to marine protected areas, 32 to Other Effective area-based Conservation Measures (OECM) and finally 15 of them referred to fisheries.

Madeira Autonomous Region

In Madeira there is a Natural Park (Parque Natural da Madeira), four Natural Reserves (R.N. das Ilhas Selvagens, R.N. das Ilhas Desertas, R.N. do Sítio da Rocha do Navio e R.N. parcial do Garajau), a Protected Area (Cabo Girão) and the Marine Protected Areas Network of Porto Santo.

The Cabo Girão Protected Area encompasses the Cabo Girão Marine Natural Park, the Cabo Girão Natural Monument and the Cabo Girão Protected Landscape.

The Madeira Natural Park, created in 1982, includes areas with different protection statuses, covering about two-thirds of the island of Madeira.



In addition, in 2018, a Marine Natural Park (PNM da Ponta do Pargo), a Natural Monument (MN da Ponta do Pargo) and a Protected Landscape (PP da Ponta do Pargo) were created.

In 2021, 13 more natural monuments were classified, which, together with the 2 already identified, constitute the network of Natural Monuments of the Autonomous Region of Madeira (APA, 2021).

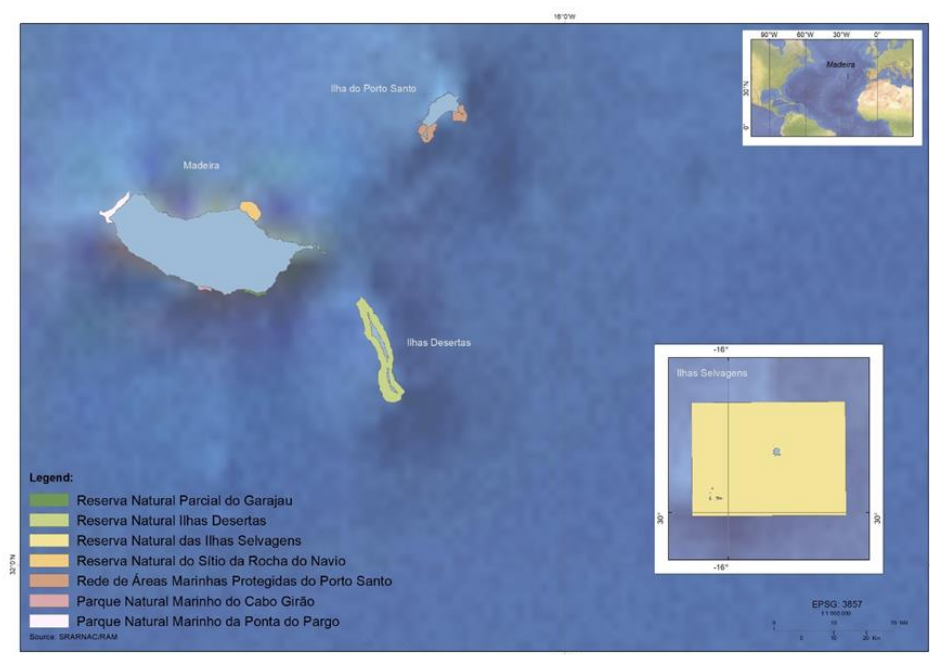


Figure 8 Coastal and marine protected Areas on Madeira region

In total were found 50 sites in Madeira. More specifically, 25 of them referred to the Natura 2000 Network (SPAs, SACs, and SCIs) and 17 of them refer to cultural heritage and 8 to national protected areas like nature parks and nature reserve areas (Double areas are not counted as separated sites).

OECMs in Portugal

The OECMs are generally based on the function of some specific activity, such as fishing or tourism. Some other initiatives focussed on biodiversity conservation, such as VMEs at thermal vents exist. Still, this recognition is hardly noted yet. Some new areas that function as Conservation sites as Underwater Cultural Heritage, are usually used for diving and fishing is not allowed. The central pressure on biodiversity in the Azores Sea is fishing, followed by whale watching and other tourism activities.



3.2.4 Mediterranean Sea

In the Mediterranean, a variety of spatial measures are in place for marine conservation: MPAs with a national statute, Natura 2000 sites established in the European Union member countries, Specially Protected Areas of Mediterranean Importance (SPAMIs) established under the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol), by the Contracting Parties to the Barcelona Convention, Ramsar sites designated under the Ramsar Convention, ("The Convention on Wetlands"), Biosphere Reserves nominated at national level under the provisions of UNESCO, as well as national and sub-national marine parks and other types of protected areas.

A relevant example of marine protection in the Mediterranean is provided by the Pelagos Sanctuary, a marine area of 87,500 sq. km subject to an agreement between Italy, Monaco and France for the protection of marine mammals.

In terms of international measures, relevant for environmental protection in general, it is worth noting that the International Maritime Organization's (IMO) Marine Environment Protection Committee ([MEPC 79](#)) adopted in December 2022 the Mediterranean Sea Emission Control Area for Sulphur Oxides and Particulate Matter (Med SOx ECA), to limit air pollution from ships, pursuant to Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL).

As far as fishery management is concerned, the General Fisheries Commission of the Mediterranean and the Black Sea (GFCM) has as its scope the conservation and sustainable use of marine living resources (as well as the development of sustainable aquaculture). The GFCM has been promoting the establishment of a series of spatial fisheries restrictions and regulations. To date, ten FRAs have been established, including on large deep-water FRA in which the use of towed dredges and trawl nets in all waters deeper than 1000 metres is banned to protect deep-sea benthic habitats (Figure 9). Fisheries restricted areas aim to protect Essential Fish Habitats (EFH) and/or sensitive habitats of high ecological value, such as Vulnerable Marine Ecosystems (VME), from any fishing activities. Spatial fishing restrictions addressing more coastal areas have also been implemented, often in conjunction with temporal ones, and included in multiannual management plans. FRAs are mentioned in the tables for Italy and Croatia. An example of such areas is provided with the fact sheet about the Jabuka / Pomo Pit shared between Italy and Croatia (Annex 2 – Mediterranean Sea – 5).

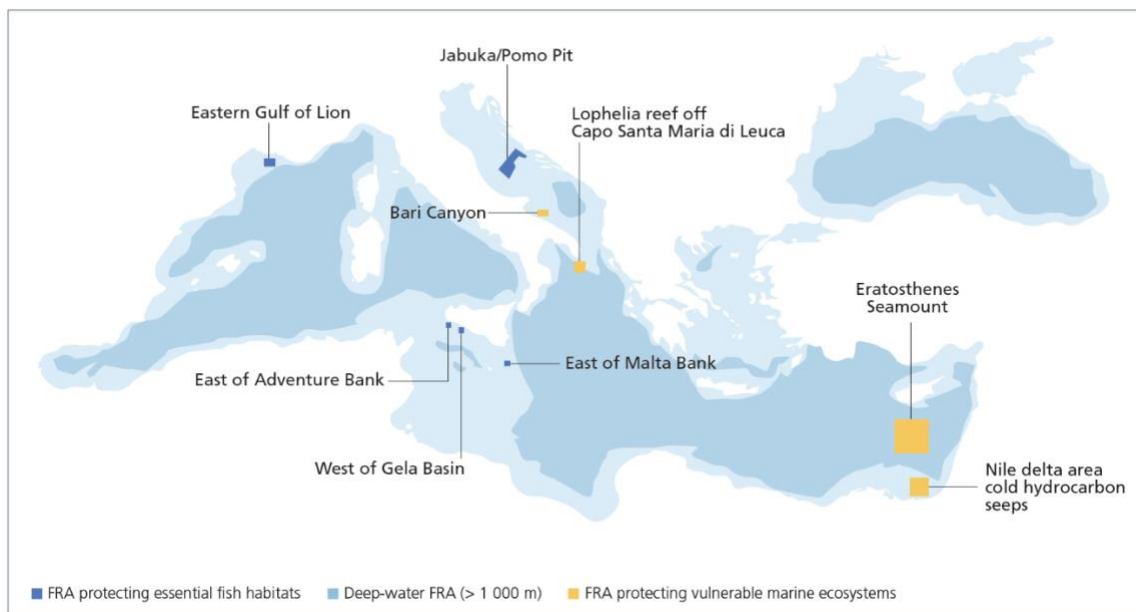


Figure 9 GFCM Fishery Restricted Areas (FAO, 2022).

Another example of OECMs established in the Mediterranean is given the Strait of Bonifacio (an international strait separating Sardinia from Corsica); designed as a Particularly Sensitive Sea Area (PSSA) under the International Maritime Organization (IMO), since 2011. A process is in place for the establishment of another PSSA in the Mediterranean, in a large area between Spain, France and Italy, the so-called Cetaceans' Corridor. This is documented in a dedicated fact-sheet (Annex 2 – Mediterranean Sea – 1).

In the region, particular attributions are given to some marine areas, which can provide the base for the identification of protected areas in the future. It is the case, for example, of the Ecologically or Biologically Significant marine Areas (EBSAs), identified at international level under the Convention of Biological Diversity, according to specific scientific criteria. These areas are identified as special areas in the ocean that serve important purposes, to support the healthy functioning of oceans and the many services that it provides (www.cbd.int). In the entire Mediterranean, 15 of these areas are identified. Important Marine Mammals areas are identified by the [Marine mammals protected areas task force](#). In the Mediterranean 26 such areas have been recognized (Marine mammals protected areas task force, 2017). Under the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic area (ACCOBAMS), Cetaceans Critical Habitats (CCH) are identified. These areas are identified by overlapping of IMMAs and mapping of anthropogenic threats.



The screening of spatial protection measures undertaken in the framework of this study considered the following countries of the Mediterranean: Spain, France, Italy, Slovenia, Croatia, Bosnia-Herzegovina, Montenegro, Albania, thus including EU Member State countries, as well as non-European coastal countries. The adjacent extraterritorial waters have been also considered for some of the measures.

In Annex 1, designations for each of the considered countries are reported in tables (Annex 1 - Table 21, Table 22, Table 23, Table 24, Table 25, Table 26, Table 27, Table 28, Table 29). Furthermore, a number of cases are illustrated in the factsheets of Annex 2, to highlight the variety of available area-based protection instruments. The Marine Protected area of Portofino (Annex 2 – Mediterranean Sea - 4) illustrates a typical example for the Mediterranean where the main threats to biodiversity conservation in a small-scale site are posed by tourism, which is a vital component for the economy of the area. The case of the Proposition for a North-Western Mediterranean Particularly Sensitive Sea Area (PSSA) (Annex 2 – Mediterranean Sea – 1) provides very updated details on a process, still in progress, of establishment of an OECM in the region. The case is characterized by the very large scale, the cooperation of three countries, and the fact that other area-based protection measures are comprised in its geographic scope. The Important Marine Mammal Area (IMMA) Western Ligurian Sea and Genoa Canyon (Annex 2 – Mediterranean Sea – 2) showcases the relevance of the science-based identification of critical areas for conservation of habitats and/or species in establishing / strengthen marine protection. The case of the Natural Marine Park of the Gulf of Lion (NMPGL) and the National Natural Marine Reserve Cerbère-Banyuls (Réserve Naturelle Nationale (RNN) Marine de Cerbère-Banyuls; RNMCB) (Annex 2 – Mediterranean Sea – 3) provides interesting perspective on the opportunities offered by different scale and levels of protection, providing a path for progressive extension of marine protection. The potential of science-based identification of areas for conservation is also highlighted in context where extension of marine protection is pursued. Finally, the Fishery Restricted Area of Jabuka/Pomo Pit (Annex 2 – Mediterranean Sea – 5) illustrates the challenges and success elements of proclaiming a spatial management measure for the crucial sector of fisheries in a cross-border context.

Patterns of similarity and differences emerge in the conservation efforts described in the factsheets of the Mediterranean basin. The main anthropogenic threats dealt with at a basin level result from fishing activity (both leisure and professional), disturbance of species and habitats by humans (e.g. whale watching, racing boats, recreational boats and/or shipping), tourism and the input of pollution, such as anthropogenic sound by various activities.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Protection measures have also led to additional, voluntary and desirable goodwill efforts to go above and beyond, such as in the case of Italian Navy's decision to forgo from running naval exercises in the Pelagos Sanctuary area that involved the use of ordnance or sonar and the decision by the Italian Ministry of the Environment to desist the discharge in the Sanctuary's waters of toxic mud dredged from harbours in the area. Increasing public awareness, creating and implementing a necessary management plan also remains a key focus in most Mediterranean case studies, in addition to conducting extensive scientific research. IMPACT-CET for example, explores incidental fishing captures and pollution, and the spatial and temporal characteristics and intensity of disturbances (including any cumulative effects) on cetaceans in sensitive areas (e.g., breeding and feeding sites). Notable are the protective measures for the Pelagos Sanctuary that extend beyond national jurisdiction which set a precedent of pelagic protected areas for the high seas.

Compromises between different stakeholder groups have also been pivotal in the progress of conservation measures, especially, and with additional challenges, in areas that are managed between several countries such as the Pelagos (France, Italy and Monaco) and the Jabuka/Pomo Pit (Italy and Croatia). Negotiation and management processes have understandably been longer when requiring collaboration amongst different countries,. However, the case studies shed light on how regular cooperation and communication amongst scientists from different authorities and countries, in addition to the involvement of key stakeholders such as fishermen, underpins the decision-making process of furthering conservation efforts.



3.2.5 Black Sea

The Black Sea is the largest semi-closed sea, bordered by Europe to the North, West and East, and Asia to the South. It is connected by the strait of Kerch to the shallow Azov Sea and to the Marmara Sea (Mediterranean Sea respectively) by the Bosphorus straight. The Black Sea lies between six countries: Bulgaria, Romania, Ukraine, Russia, Georgia and Turkey. It covers area of 421, 638 km², with coastal length of 4869 km. The Black Sea deep waters do not mix with the upper layers of water that receive oxygen from the atmosphere. As a result, over 90% of the deeper Black Sea volume is anoxic water. The Black Sea's circulation patterns are primarily controlled by basin topography and fluvial inputs, which result in a strongly stratified vertical structure. The number of MPAs (by countries) in Black Sea (<https://mpatlas.org>) is indicated here below.

Table 7. MPAs in the Black Sea

Country	Number of MPAs	Remarks
Bulgaria	44	Black Sea
Romania	14	Black Sea
Turkey	0	Black Sea
Georgia	2	Black Sea
Russia	5	Black Sea
Ukraine	45	Black Sea + Azov Sea

Area-based protection measures in Bulgaria

Environmental protection (Natura 2000 and nationally designated protected areas)

In 2007 Bulgaria presented to the European Commission a national list of potential Natura 2000 sites, which contains:

- 114 wild bird conservation areas covering 20.4% of the territory of Bulgaria.
- 228 protected areas for the protection of natural habitats, covering 29.5% of the territory of Bulgaria.

In the period 2008-2023, the national list of protected areas for the conservation of wild birds and for the protection of natural habitats was supplemented and expanded. The network of protected areas at the beginning of 2023 includes consist of:

- 120 protected areas for the conservation of wild birds, covering 23.1% of the territory of Bulgaria;
- 233 protected areas for the protection of natural habitats, covering 30.3% of the territory of Bulgaria.



According to the data published on the website of the Ministry of Environment and Water of Bulgaria (<https://www.moew.government.bg>), the total number of Natura 2000 protected areas in Bulgaria is 341, as 13 sites are protected under both Habitats and Bird Directives (Table 1). Of these, 234 areas have been designated under the Habitats Directive, with a total area of 36,118.6 km², of which 2,477.07 km² are marine part (Table 2). According to the Birds Directive, 120 zones have been defined, with a total area of 26,165.3 km², of which 544.89 km² are marine water areas. The total area of the Natura 2000 areas in Bulgaria is 41,560.6 km² (part of the areas dedicated by the two directives overlap), or 34.9% of the country's territory falls under the protection of Natura 2000. The marine part of the Natura 2000 areas occupies 2,821.35 km² (or 7.85 % of the country's maritime space). At the beginning of 2023 there no one Management Plan for the Natura 2000 MPA sites.

In Bulgaria, there are also 11 Ramsar sites with a total area of 352.73 km². Seven of the Ramsar sites are located on the Black Sea coast, with two of the sites in the study area.

Table 8. Protected areas in Bulgaria

	Number of zones	Area (km ²)	Territory [km ²]	Marine waters [km ²]%	% of the territory of Bulgaria	% of the Marine waters of Bulgaria
Habitats Directive protected areas	234	36,118.6	33,641.5	2,477.07	30.3%	6.88%
Protected Areas under the Wild Birds Directive	120	26,165.3	25,620.4	544.89	23.1%	1.51%
Total Protected Areas under Natura 2000	341	41,560.6	38,739.2	2,821.35	34.9%	7.84%

Under the national legislation (Protected Areas Act, 1998), according to CDDA data reported by Bulgarian authorities (<https://cdr.eionet.europa.eu/>), in Bulgaria in 2023 there are 1049 protected areas with a total area of 16,567.9 km². Out of all 1049 protected areas under national legislation, only 4 have a marine part. Only one of the protected areas is located entirely in the sea, while the rest three are predominantly located on land. One of the protected areas is a Reserve (IUCN category Ia), while the other three are IUCN categories VI. In total, under the protection of national legislation, only 11.94 km² fall into the marine part.



Areas at sea to be avoided

Other areas in the sea that fall under some form of protection. Such areas were pointed in Bulgarian MSP plan:

- Entry prohibited;
- Forbidden anchorage, demersal trawling, underwater and dredging works, bottom trawling and underwater explosions;
- Forbidden for sailing, sports, tourism, fishing, swimming, anchoring, diving operations and underwater explosions;
- Prohibited for navigation, fishing and diving works; Forbidden for sailing act. (MSP BG)

Traffic Separation Schemes.

In Bulgarian territorial waters, Traffic Separation Schemes cover the area of 1,141.2 km². In the MSP Plan is considered the option to change the Schemes. One of the main reasons for this is that the ship routes are in the shallow waters and in close distance from the coast.

- <https://www.moew.government.bg/bg/priroda/natura-2000/natura-2000-v-bulgariya/>
- https://cdr.eionet.europa.eu/bg/eea/cdda1/envxmpjmq/CDDA_Bulgaria_20200312.xls/manage_document
- https://mspbg.ncrdhp.bg/pic/documents/20/MSPRB_ZAPISKA_final_09_2021.pdf

Area-based protection measures in Romania

Environmental protection (NATURA 2000 and nationally designated protected areas)

At the beginning of 2007, approx. 8% of the country's was included in protected areas. The largest part of the area was the Danube Delta Biosphere Reserve (560,000 ha), in the 13 national parks (315,000 ha) and 14 natural parks (756,000 ha).

In 2007, the following are designated:

- Site of Community importance, according to the 79/409/CEE Birds Directive, directly nominated Special Protected Area - SPA - through GD no. 1284/2007 regarding the declaration of avifaunistic protected areas as an integrating part of the Natura 2000 European ecological network in Romania



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



- Sites of community importance (pSCI) through Ministerial Order no. 1964/2007 regarding the establishment of the protected natural area regime of sites of community importance as an integral part of the European Natura 2000 ecological network in Romania.

By designating proposed Sites of Community Interest (pSCI) and Special Protection Areas (SPA) the surface area of the protected areas increases significantly. Following its obligations as a member state of the European Union, Romania proposed in 2007 381 sites, representing 17.84% of the country's surface (108 SPAs and 273 SCIs representing 11.89% and respectively 13.21% from national territory).



4 Restoration measures

4.1 Marine restoration

Restoration, together with rehabilitation and remediation constitute a set of interconnected approaches, the “restorative continuum” for the recovery of ocean ecosystems, their functions, and their valuable services (Gann et al., 2019; Chazdon et al., 2021).

The importance of restoring degraded ecosystems has been recognized over the years, internationally and at European level, through different initiatives and agreements: the Convention on Biological Diversity (CBD) the EU Habitats Directive, the Marine Strategic Framework Directive. The recent CBD global biodiversity framework (CBD COP 15 2022) has identified quantitative targets for restoration. In 2019 The United Nations General Assembly declared the Decade on Ecosystem Restoration from 2021 to 2030) where marine ecosystems are considered as a fundamental component (Aronson et al., 2020).

In the context of the European Green Deal (COM(2019) 640 final), the EU framework for decarbonization and sustainable use of resources, the EU's 2030 Biodiversity Strategy (COM(2020) 380 final), put great emphasis on marine restoration, indicating among its key objective, the aim at restoring the good environmental status of marine ecosystems. The strategy recognises that marine ecosystems bring substantial health, social and economic benefits to coastal communities and the EU as a whole. Within the strategy, restoration and protection are proposed in combination, to benefit from mutual synergies. In addition to that, a legal framework for nature restoration has been proposed by the European Commission (COM(2022) 304 final), providing an opportunity to define targets and comprehensive and coordinated initiatives of ecosystem remediation including its implementation at large scale (Shumway et al., 2021; Cliquet et al., 2022).

In July 2023, the European Parliament approved the EU new Nature Restoration Law (NRL) which calls for binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters.

In terms of measures, active or passive restoration can be implemented. **Active or assisted restoration** includes human actions such as active remediation of abiotic and biotic conditions (Atkinson & Bonser, 2020). Establishing abiotic - substrate conditions (physical or chemical) includes habitat creation, reshaping of watercourses, reintroduction of environmental water flows, applying artificial disturbance to promote seed germination. Establishing biotic conditions includes e.g. invasive species management, reintroduction of species, augmenting or reinforcing depleted populations



of species (Atkinson & Bonser, 2020). Active restoration includes engineered replanting, shoreline or reef stabilization, pollution controls, species reintroductions, removal of non-native invasive species, and other deliberate actions by managers meant to either restore habitats that were previously present, or enhance degraded habitats to make them more resilient to human and climate change pressures. **Passive restoration** implies the natural or unassisted ecosystem recovery after removing a source of disturbance e.g. regulation and removal of pollution source (e.g. waste water treatment), remediation of contaminated sites (e.g. dredging of contaminated sediments), fisheries management measures (e.g. restrictions on bottom trawling and dredging) etc.

Despite many options are available to planners, choosing particular passive or active restoration measures requires a case-by-case cost-benefit analysis, considering the trade-offs of the two approaches and their direct and indirect costs (e.g. longer recovery time and vigilance costs in natural restoration strategies and material and labour costs in active restoration strategies; Zahawi et al., 2014).

4.2 Sea-basin overviews

4.2.1 Baltic Sea

Restoration measures play a critical role in addressing the ecological challenges faced by the Baltic Sea, one of the world's most vulnerable and fragile marine ecosystems. The Baltic Sea region has been struggling with numerous environmental issues, including eutrophication, habitat degradation, and biodiversity loss. To combat these problems and restore the health of the Baltic Sea, concerted efforts have been made to implement various restoration measures. These measures aim to improve water quality, restore degraded habitats, and enhance the resilience of the marine ecosystem.

Many marine coastal habitats within the Baltic Sea region hold potential for restoration efforts. While some of these habitats have previously undergone restoration measures, their success has varied. Often, the lack of simultaneous improvements in external conditions, such as water quality, has hindered the effectiveness of restoration initiatives. Recognizing these interlinkages, it becomes crucial to take a comprehensive approach that considers both physical measures targeted at the abiotic habitat and biological measures focused on the biological habitat and organisms. Additionally, potential water chemical measures (active remediation) should also be explored to ensure successful restoration outcomes.

A recent study, titled "Restoration measures for coastal habitats in the Baltic Sea: cost-efficiency and areas of highest significance and need," (HELCOM ACTION, 2021) sheds light on a comprehensive evaluation of restoration measures specifically tailored to coastal habitats in the Baltic Sea. This study conducted in the Baltic Sea region focuses



on the evaluation of 16 specific restoration measures categorized into three main groups. The first category comprises measures aimed at restoring or rehabilitating habitats or habitat-forming and other habitat key species. The second category centres on measures targeting the reduction of pressure levels, with a particular emphasis on nutrient loading. These measures aim to mitigate the predominant pressure on coastal habitats (passive restoration). The third category involves measures focused on a combination of passive and active measures such as habitat protection and the enhancement of functionally important species.

Table 9 provides a comprehensive summary of these measures and their potential impacts on coastal habitats in the Baltic Sea.

This study emphasizes several key points for effective restoration measures in the Baltic Sea's coastal habitats. Addressing the root causes of disturbance or loss is crucial. Successful restoration is typically observed at a localized scale, particularly in small or closed coastal systems, with some exceptions for measures enhancing predatory fish production. Active restoration tends to work better in sheltered areas, while open and exposed areas may benefit more from natural passive recovery. Protecting habitats for passive recovery can be more efficient and cost-effective. Prevention of coastal zone damage is more economical than subsequent restoration. Combining multiple measures in the same area boosts success rates due to cumulative pressures. Spatial planning should prioritize green infrastructure and ecological connectivity. Quantitative evaluation supports adaptive learning. Coastal wetland restoration and habitat protection are considered highly feasible and effective, while traditional restoration measures and physio-chemical interventions may be less favourable. Tailored approaches based on local conditions and pressures are advisable. The most impacted coastal areas, such as southern Finland, Estonia's northern coast, south Sweden, Polish Bay of Gdansk, and Danish/German regions, require significant restoration attention.

In Annex 3 – Baltic Sea - 1 an example of restoration is provided with reference to the Puck Bay and Hel Peninsula in Poland.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 9. Summary table of the restoration measures put in place for coastal habitats in the Baltic Sea (HELCOM ACTION 2021).

Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
Restoration of eelgrass	Sweden, Denmark, Estonia, and Åland Sea, Poland	Restructuring of seabed morphology, extraction of minerals, fish and shellfish harvesting, transport, tourism and leisure infrastructure and activities, among others	Restoration of eelgrass meadows, which can improve ecosystem structure and functions	Eelgrass, <i>Zostera marina</i>	Transplantation of vegetative eelgrass shoots	Habitat restoration
Restoration of soft bottom macrophytes (other than eelgrass)	Sweden, Poland, and Germany.	Canalisation, watercourse modifications, fish and shellfish harvesting, aquaculture, waste waters, and tourism and leisure activities.	Restoration of decreased distribution of macrophytes and charophytes on soft bottoms and of brown macroalgae on hard bottoms.	Improvement of ecosystem structure and several ecosystem functions, such as habitat formation, supporting biodiversity, fish nursery areas, CO2 sinks, coastal	Practical restoration method(s), which include transplantation, seeding, removal of local herbivores, use of artificial reefs, and more.	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
				protection, nutrient and organic matter sequestration, etc.		
Restoration of brown macroalgae, mainly <i>Fucus vesiculosus</i>	Sweden, Poland, and Germany.	Land claim, coastal defense and flood protection, restructuring of seabed morphology, extraction of minerals, fish and shellfish harvesting, aquaculture, agriculture, forestry, transportation, waste waters, and tourism and leisure infrastructure and activities.	Restoration of brown macroalgae, mainly <i>Fucus vesiculosus</i> , and improvement of ecosystem structure and functions.	Decreased distribution of perennial brown macroalgae on hard bottoms.	Practical restoration methods.	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
Restoration of blue mussel reefs	Halsefjord and Stigfjorden in western Sweden (in Skagerrak), Limfjorden in northern Denmark, and Nørrefjord in southern Denmark	Land claim, coastal defence and flood protection, restructuring of seabed morphology, extraction of minerals, renewable energy generation, fish and shellfish harvesting, aquaculture, transport (shipping and infrastructure), waste waters, and tourism and leisure activities	Decreased distribution of biogenic blue mussel reefs on hard bottoms	Blue mussel population (<i>Mytilus edulis/trossulus</i>) in areas where mussel abundances are decreasing	Restoration and revitalization of blue mussel reefs as a priority in areas where they have previously been destroyed or lost due to human activities, with the aim of re-establishing natural physical hard structures	Habitat restoration
Restoration of stony reefs in areas where these have previously been lost	Denmark and Sweden	Restructuring of seabed morphology, extraction of minerals, transport	Loss of hard surfaces through exploitation, stone fishing,	Stony/boulder habitats previously destroyed or lost due to human activities	Restoration and revitalization of stony/boulder habitats through reintroduction	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
		shipping infrastructure, canalisation and other watercourse modifications, fish and shellfish harvesting, and tourism and leisure activities.	and marine extraction		of natural or blasted rocks that can serve as underwater reefs	
Restoration of soft bottoms naturally free of vegetation	Åland islands and western Sweden	Canalisation, watercourse modifications, seabed restructuring, minerals extraction, transmission of electricity and communications, fish and shellfish harvesting, transport, and tourism and leisure activities	Restoration of damaged or disturbed bottoms naturally free of vegetation	Re-establishment of previous habitats and bottom substrates for bottom fauna as well as reproductive areas for fish	Covering of the seafloor with new bottom material or collection and removal of drifting macroalgae to re-establish bottoms naturally free from vegetation or natural (passive) re-sedimentation of previously dredged waterways	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
Restoration of coastal wetlands and fladas/lagoons	Sweden, Denmark and Finland	Land claim, canalisation, coastal defence and flood protection, fish and shellfish harvesting, and aquaculture	Restoration of shallow bay habitats, fladas/lagoons, coastal wetlands and flooding areas, and the spawning and recruitment habitats in coastal tributaries for coastal fish	Improvement of the recruitment and reproduction of fish species, such as pike and perch	Restoration of wetlands and tributaries to support spawning habitats of coastal fish	Habitat restoration
Invigorate piscivorous fish populations to rehabilitate coastal ecosystem function	The measure is being discussed and attempted in many areas in the Baltic Sea region	Land claim, canalisation, coastal defense and flood protection, seabed morphology restructuring, fish and shellfish harvesting, aquaculture, agriculture, and forestry	Decreased abundance and size of predatory fish and negative effects that are present at a Baltic Sea-wide scale	Achieve invigorated populations of predatory fish, with more big individuals, and the knock-on effects being less eutrophication symptoms through the re-establishment	Protection of shallow coastal environments by spatial or temporal closures, applying fishing gear and catch regulations, applying boating regulations, controlling	Fisheries management



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
				of trophic control	seals and cormorants, etc., in order to restore populations of predatory fish	
Reducing nutrient loading by farming and harvesting blue mussels	Kumlinge, Åland Islands, Finland; Sankt Anna, Southeastern Sweden; Kiel Bay, Germany; and Limfjorden, Denmark.	Excessive nutrient and organic material input causing increased eutrophication of coastal water bodies.	Reduction of nutrient loading.	Removal of nutrients and improvement of conditions for plant and macroalgal production, swimming, and recreation.	Farming and harvesting of blue mussels.	Habitat restoration
Rehabilitation of hypoxic areas by oxygen pumping	Sweden and Finland	Input of nitrogen and phosphorus	Decreased oxygen levels in sediments and bottom water	Food web dynamics, habitat, biodiversity, resilience, and regulation or eutrophication	Rehabilitation of hypoxic areas by oxygen pumping	Pollution control
Reducing internal phosphorus loads by metal binding	Sweden	Input of phosphorus	Eutrophication	Reduction of internal phosphorus loads	Metal binding	Pollution control



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
Investigative and trial biomanipulation by removing cyprinids and sticklebacks as a method for rehabilitating coastal ecosystems	Finland and Sweden.	Fish and shellfish processing, aquaculture, transport, industrial uses, waste waters, solid waste, tourism and leisure infrastructure, and tourism and leisure activities.	Decreased numbers of predatory fish and excessive nutrient levels.	Re-establishment or affecting of trophic structures in ecosystems where these have been altered due to overfishing of large predatory fish, eutrophication, or conditions otherwise becoming more beneficial for meso-predators.	Biomanipulation through fisheries targeting meso-predators such as cyprinids or sticklebacks.	Fisheries management
Rehabilitation of anoxic, nutrient rich or polluted sediments by removal or coverage	Harbour areas and a recipient outside forest industries in the Gulf of Bothnia.	Fish and shellfish processing, aquaculture, transport, industrial uses, waste waters, solid waste,	Dead or disturbed sediments due to hypoxia, nutrient enrichment or pollution.	Recolonization of plants and animals in the photic and aphotic zones.	Rehabilitation of anoxic, nutrient-rich, or polluted sediments by removal or coverage.	Pollution control



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
		tourism, and leisure activities.				
Establishment of artificial reefs	Germany, Poland, Russia, Estonia, and Finland	Restructuring of seabed morphology (dredging, beach replenishment, seabased deposit of dredged material); Extraction of minerals (rock, metal ores, gravel, sand, shell); Fish and shellfish harvesting (bottom-touching towed gears, professional, recreational); Fish and	Physical disturbance and loss to the seabed, changes to hydrological conditions, and loss of hard surfaces through exploitation, stone fishing, and marine extraction	Establishment of artificial reefs/substrates to allow for the colonization of hard bottom macroalgal and macrofaunal assemblages, including crustaceans, mussels, and fish	Establishment of artificial reefs/substrates	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
		shellfish harvesting (pelagic towed gears, stationary gears, professional, recreational); Aquaculture – marine, including infrastructure; Transport – shipping (incl. anchoring, mooring); Transport – shipping infrastructure (harbours, ports, shipbuilding); Urban uses (land use); Tourism and leisure infrastructure (piers, marinas); Tourism and leisure activities				



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measure	1. Which countries implemented this measure?	2. Which human activities are in place in the area where this measure implemented?	3. Type of impact that this measure targeted?	4. Ecological target for restoration?	5. Type of measure (a broad category for the measure)?	6. Broad restoration measure category
		(boating, beach use, water sports, etc.)				
Protection of habitats	All coastal nations of the Baltic Sea	Land claim, coastal defence and flood protection, fish and shellfish harvesting, transport, urban uses, tourism and leisure activities and infrastructure	Restoration of natural habitats that have been damaged due to past human activities	Safeguarding important habitats for the maintenance of biodiversity and provision of ecosystem services, for example the recruitment and production of fish	Habitat protection through the establishment of marine protected areas, protection of shallow coastal environments and shore protection, and applying fishing and boating regulations	Habitat protection



4.2.2 North Sea

Restoration measures included in this section include coastal sand dune restoration, saltmarsh restoration, seagrass restoration and oyster restoration (Table 10). Other committments in the North Sea include restoring the gravel beds and upgrading other reefs, such as tubeworm banks. However, the common measure that was found in all three countries included in this study is oyster banks restoration. Across Europe, oysters have become rare due to overfishing, the impact of trawling gear and pollution (Pogoda, 2019; NORA, 2023). For restoration of the European oyster *Ostrea edulis*, a European alliance has been set up in 2017 (NORA: Native Oyster Restoration Alliance) to bring together scientists, NGOs and producers of native oysters. The NORA Alliance has produced a document called the Berlin Oyster Declaration, which includes recommendations for restoration measures, as well as a code of conduct to avoid genetic pollution and disease (Pogoda et al., 2019, 2020; Lukic et al., 2020).

The different oyster restoration measures included here are at different phases of progression, include the involvement of differing sectors, and are located in diverse environments. The oyster restoration taking place in the Firth of Dornoch is a collaboration with a whiskey company and has already managed to restore 20,000 oysters (Annex 3 – North Sea - 1). The Firth of Dornoch is a sheltered estuary, whilst the second case study in Borkum, is in offshore waters, at greater depths. In the German EEZ, human activities damaging the seabed have been, to a large extent, excluded to protect oysters' beds and a restoration strategy is under development. Restoration experiments have been conducted in several pilot sites of the Borkum, in the framework of both the PROCEED and RESTORE projects (2016-2019) led by the Alfred Wegener Institute at the Helmholtz Centre for Polar and Marine Research (AWI) and the German Federal Agency for Nature Conservation (BfN) (Annex 3 – North Sea - 2).

The UNITED project has the aim of facilitating oyster restoration in a very dynamic North Sea environment, within a windfarm site, therefore collaboration with the wind energy sector is needed. Analysis is still ongoing as to the success of the restoration trials, which were informed by testing the infrastructure at a nearshore site before moving to the offshore windfarm site (Annex 3 – North Sea - 3).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 10 Overview of restoration measures in place in Scotland.

Type of restoration measure	Restoration Project	Year	Site	Existing protection measures in place?	Human activities happening in the area	Type of impact the measure targets	Ecological target for restoration	Specific target	Broad restoration measure category
Native oyster restoration	Dornoch Environmental Enhancement Project (DEEP)	Since 2013	Scotland, Dornoch Firth	Dornoch Firth and Morrich More OSPAR MPA; Dornoch Firth and Loch Fleet OSPAR MPA; Moray Firth SAC	Waste treatment and disposal, Transport, extraction of living resources and cultivation of living resources, production of energy, physical disturbance to the seafloor and underwater noise	Degraded ecosystems in eutrophicated and polluted coastal areas	Nursery grounds	4 millions oysters over 5 years	Habitat restoration
Seagrass restoration, European oyster restoration	Restoration Forth	Since 2022	Scotland, Firth of Forth	Firth of Forth Site of Special Scientific Interest (SSSI) and Firth of Forth OSPAR MPA; Forth Islands MPAs	Extraction of living resources, physical disturbance to seabed, input of litter, underwater noise, transport, production of energy	Degradated ecosystems in polluted coastal areas	Soft bottoms habitats	Plant 4 hectares of seagrass and 10,000 oysters per year by 2025	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Type of restoration measure	Restoration Project	Year	Site	Existing protection measures in place?	Human activities happening in the area	Type of impact the measure targets	Ecological target for restoration	Specific target	Broad restoration measure category
Saltmarshes	Green Shores Project	Since 1999	Scotland, Firth of Tay and Eden Estuary, Dornoch Firth	Firth of Tay and Eden Estuary SAC, Firth of Tay and Eden Estuary OSPAR MPA and Inner Tay Estuary Site of Special Scientific Interest	Transport, extraction of living resources and cultivation of living resources, production of energy, physical disturbance to the seafloor and underwater noise	Deterioration of intertidal coastal habitats due to human development (construction of golf links and an air base)	Soft bottoms habitats	Restore and enhance saltmarshes of the area by direct planting of native and locally provident saltmarsh species	Habitat restoration
	Nigg Bay Coastal Realignment Project	Since 2003	Scotland, Cromarty Firth	Cromarty Firth OSPAR MPA, Cromarty Firth SSSI, Nigg and Udale Bays Nature Reserve	Production of energy (non-renewable), input of waste and of waste water, inputs of nutrients and hazardous substances, physical disturbance of coastline and underwater noise	Degradation of intertidal coastal habitats	Coastal tidal habitats	Restore saltmarshes to prevent sea-level rise and flooding	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Type of restoration measure	Restoration Project	Year	Site	Existing protection measures in place?	Human activities happening in the area	Type of impact the measure targets	Ecological target for restoration	Specific target	Broad restoration measure category
Coastal Sand Dunes	West Sand Dunes Restoration Project	Since 2000	Scotland, Eden Estuary and Firth of Tay	Firth of Tay and Eden Estuary SAC, Firth of Tay and Eden Estuary OSPAR MPA and Inner Tay Estuary Site of Special Scientific Interest	Transport, extraction of living resources and cultivation of living resources, production of energy, physical disturbance to the seafloor and underwater noise	Degradation of coastal habitats	Coastal vegetation	Large-scale dune restoration to address coastal flooding and erosion risk	Habitat restoration
	Sand Dune Restoration Project	Since 2020	Scotland, Morrich More, Tain	Dornoch Firth and Morrich More OSPAR MPA; Dornoch Firth and Loch Fleet OSPAR MPA; Moray Firth SAC	Transport, extraction of living resources and cultivation of living resources, production of energy, physical disturbance to the seafloor and underwater noise	Degradation of coastal habitats (erosion and construction of golf link)	Coastal vegetation	Remove trees planted decades ago to prevent dune erosion, and create the conditions for dune vegetation to grow	Habitat restoration



4.2.3 Northeastern Atlantic

Different types of restoration measures (habitats, species, coastal, or at sea) were selected in this sea basin to highlight a range of possibilities. Six restoration measures on the Atlantic coast of France were identified, which includes artificial reefs' installation, fish habitats' reestablishment, dunes' restructuring, seagrasses' restoration, and oysters' recovery (Table 11). One measure on the recovery of the European flat oyster (*Ostrea edulis*) in Brittany was detailed in a fact sheet (Annex 3 – North-East Atlantic - 1). The main criteria for selecting this restoration case are: (i) availability of a complete and detailed restoration plan; (ii) plan easily retrieved online; (iii) testing, monitoring and evaluation of the restoration measure. This case study is interesting as it gives an example of a European collaborative network—the Native Oyster Restoration Alliance (NORA) — for the conservation, restoration and recovery of the European flat oyster. In the North Sea section of restoration measures. NORA is also described. A comparison of NORA projects in the United Kingdom (DEEP project) and France (FOREVER project) regarding the ecological targets, restoration methods, types of impacts, or outcomes could be done. One restoration measure's fact sheet was developed for Portugal on seagrass beds and fish stocks (Annex 3 – North-East Atlantic - 2).

In France, three main laws have been enacted: the law on nature protection in 1976, the law on Landscape Protection and Valorisation in 1993, and the law for the Recovery of Biodiversity, Nature, and Landscapes in 2016. In 2017, the National Strategy for the Sea and the Littoral was elaborated, which mentions the need to restore marine ecosystems. This strategy is a building block for the French maritime spatial plans. Although the list of restoration measures in Table 11 gives a few diverse examples of habitats and species restoration, these measures were not easily retrieved. No public database was found like MPA databases. In general, despite policy objectives, nature restoration measures are less referenced and framed with standards and norms.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 11. Examples (non-exhaustive list) of existing restoration measures for marine and coastal ecosystems in France.

Restoration measures	Site name	Organisation (authority, planner, manager...)	Year (start / end)	Type of area	Uses and human activities in place (Table 1)	Type of impact (list)	Ecological target for restoration (list)	Type of measure (list)	Sources
Artificial reefs	Récifs artificiels de Capbreton	Association Aquitaine Landes Récifs	1999 – ongoing	Offshore	Extraction of living resources (fishing activities); Tourism and leisure; Education and research	Degraded benthic community	Nursery grounds; Reproduction area; Refuge area	Installation of artificial substrates	<p>Castege, I., Milon, E., Fourneau, G. And Tauzia, A. (2016) 'First results of fauna community structure and dynamics on two artificial reefs in the south of the Bay of Biscay (France)', <i>Estuarine, Coastal and Shelf Science</i>, 179, pp.172-180.</p> <p>Mosnier, V. And Noël, F.-P. (2019) 'Landes : les récifs artificiels de Capbreton ont 20 ans', <i>Ici, Par France Bleu Et France 3</i> Available at: https://www.francebleu.fr/infos/sante-sciences/landes-20-ans-de-recifs-artificiels-a-capbreton-1561555912. (Accessed: 8 May 2023).</p> <p>Atlantique Landes Récifs. (2021) <i>Des Sites Remarquables</i>. Available at: https://atlantique-landes-recifs.org/des-sites-remarquables/. (Accessed: 8 May 2023).</p>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measures	Site name	Organisation (authority, planner, manager...)	Year (start / end)	Type of area	Uses and human activities in place (Table 1)	Type of impact (list)	Ecological target for restoration (list)	Type of measure (list)	Sources
Artificial reefs	Récifs artificiels de Mimizan	ADREMCA (association pour la défense, la recherche et les études de la côte aquitaine)	2021 – ongoing	Offshore	Extraction of living resources (fishing activities); Tourism and leisure; Education and research	Degraded benthic community	Nursery grounds; Reproduction area; Refuge area; Education and scientific research	Installation of artificial substrates	<p>Castege, I., Milon, E., Fourneau, G. And Tauzia, A. (2016) 'First results of fauna community structure and dynamics on two artificial reefs in the south of the Bay of Biscay (France)', <i>Estuarine, Coastal and Shelf Science</i>, 179, pp.172-180.</p> <p>Ministère Chargé de l'Environnement. (2021) <i>Demande d'examen au cas par cas préalable à la réalisation éventuelle d'une évaluation environnementale</i>.</p>
Migratory fish	Estuaire de la Gironde	Syndicat Mixte pour le Développement Durable de l'Estuaire de la Gironde (SMIDDEST)	2021 – 2027	Offshore (estuary)	Transport; Cultivation of living resources (aquaculture); Tourism and leisure; Extraction of living resources	Degraded water quality	Fish stocks; Hydrology; Good ecological status	Water treatment; Restoration of fish habitats; Enhance migratory fish passability in Gironde estuary;	<p>SMIDDEST. (2023) <i>La qualité des eaux superficielles et le bon état écologique des sous-bassins versants</i>. Available at: https://www.smiddest.fr/-la-qualite-des-eaux-superficielles-et-le-bon-etat-ecologique-des-sous-bassins-versants.html (Accessed: 10 May 2023).</p>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measures	Site name	Organisation (authority, planner, manager...)	Year (start / end)	Type of area	Uses and human activities in place (Table 1)	Type of impact (list)	Ecological target for restoration (list)	Type of measure (list)	Sources
					(fishing activities)			Reduce discharges of organic matter	
Dunes	Toul Gween, Pleumeur-Bodou (Brittany)	Commune de Pleumeur-Bodou; Lannion-Trégor Communauté; OFB project	2022 – 2023	Coastal	Tourism and leisure	Physical (morphology changes)	Restoration of dune habitats	Revegetation ; Restructuring	Lannion-Trégor Communauté. (2022) <i>Restauration des dunes à Toul Gween</i> . Available at: https://cotedegranitroseptiles.n2000.fr/actualites/restauration-des-dunes-toul-gween (Accessed: 10 May 2023).
Seagrass (zoostera)	Ile-de-Ré	Parc naturel marin Estuaire de la Gironde et de la mer des Pertuis and Seaboost. Project name: DYNAREST-noltei (funded at 70% by Life Marha)	2020 – ongoing	Coastal and offshore	Tourism and leisure; Physical restructuring of rivers, coastline or seabed (water management)	Input of wastewater ; Canalisation and other watercourse modifications; Disturbance of species due to human presence	Soft bottom habitats (organisms)	Not yet implemented	OFB. (2020) <i>Restauration de l'herbier de zostères sur l'île de Ré</i> . Available at: https://www.ofb.gouv.fr/actualites/restauration-de-lherbier-de-zosteres-sur-lile-de-re#:~:text=En%20septembre%202020%2C%20le%20Parc,environmental%20charge%20les%20premiers%20inventaires . (Accessed: 10 May 2023). Seaboost. (2020) <i>Etude de la restauration de l'herbier de zostères sur l'île de Ré</i> . Available at:



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Restoration measures	Site name	Organisation (authority, planner, manager...)	Year (start / end)	Type of area	Uses and human activities in place (Table 1)	Type of impact (list)	Ecological target for restoration (list)	Type of measure (list)	Sources
									https://www.seaboost.fr/actualites/etude-de-la-restauration-de-lherbier-de-zosteres-sur-lile-de-re/ (Accessed: 10 May 2023).
Oyster recovery	Baie de Quiberon, Brittany; Rade de Brest, Brittany	Responsible body: Comité Régional de la Conchyliculture (CRC); Scientific coordination: IFREMER; Project name: FOREVER (Flat Oyster REcoVERy), funded by FEAMP	Project study: 2018 – 2020; Operation: 2018 – ongoing	Offshore	Extraction of living resources (fishing activities); Cultivation of living resources (oyster farming)	Biological disturbance (parasites)	Hard bottom habitats (reefs); Soft bottom habitats (organisms)	Installation of artificial substrates for oyster management and restoration	Pouvreau, S., Juillet, E. and Gilante, H. (2021) 'Projet FOREVER (Flat Oyster Recovery): Restauration écologique de l'huître plate en Bretagne', <i>Génie écologique, Centre de ressources</i> . Available at: https://archimer.ifremer.fr/doc/00742/85402/ (Accessed: 12 May 2023).



4.2.4 Mediterranean Sea

Restoration measures in the Mediterranean take place in both protected and unprotected areas and as a response to climatic stressors and a variety of anthropogenic impacts stemming from but not limited to: tourism activities, the fishing industry, maritime traffic and land-based sources such as nutrient input. For most case studies listed, the focus is on the restoration of important habitat forming species such as seagrass meadows and reefs. In Croatia for example, eco-friendly buoys have been installed in the National Park Kornati as *Posidonia oceanica* meadows have been impacted in many coastal bays by the frequent anchoring of leisure boats. With the retreatment of meadows estimated to be greater than 50% in these areas, the buoys offer a viable alternative as their usage greatly reduces seabed and seagrass impact rates to a negligible level (Annex 3 – Mediterranean Sea - 2).

Other impacts are addressed through restoration and prevention initiatives in Italian, Spanish and Greek waters, such as the marine litter removal by the LIFE DREAM “Deep REef restoration And Marine litter removal” project. To conserve deep reefs, artificial reef structures are deployed. In addition, marine litter is removed from the seabed in order to eliminate its impact on deep reef communities (coralligenous, cold-water corals). The activities are implemented in submarine canyons: the Dohrn Canyon (Gulf of Naples) and Bari Canyon (Southern Adriatic Sea) (Annex 3 – Mediterranean Sea - 1).

In Italy, interventions for the restoration and protection of the seabed and marine habitats are foreseen in the framework of the Marine Ecosystem Restoration project (Italian Institute for Environmental Protection and Research, ISPRA). Some of the activities foreseen are the reconstruction of banks of the European flat oyster (*Ostrea edulis*). In addition to that, the restoration project involves the identification and recovery of at least 15 areas where there are abandoned fishing and/or aquaculture gear, preserving the local fauna and flora. Some examples of restoration projects undertaken in Italy are illustrated in Table 12. Such examples are not exhaustive of the several initiatives that have taken place in the last years. In addition to those listed, which have been selected on the basis of recovery of detailed information on the state of the art, other projects are in place at national and European level:

- AFRIMED (European Project on the restoration of the degraded macroalgal Cystoseira forest, funded by the Executive Agency for Small and Medium Enterprise (EASME) and European Maritime and Fisheries fund (EMFF) under grant agreement No 789059, January 2019-January 2023; <http://afrimed-project.eu/>)
- ABBaCo project (environmental restoration and bathing at Contaminated Site of National Interest (SIN) Bagnoli-Coroglio, Southern Tyrrhenian Sea) funded by



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



MIUR, the Italian Ministry of University and Research GU n.56 8.3.2017 and coordinated by the Stazione Zoologica A. Dohrn of Naples, March 2017-March 2020;
<https://www.szn.it/index.php/en/research/integrative-marine-ecology/research-projects-emi/abbaco>

- LIFE SeResto (LIFE12 NAT/IT/000331) aims to trigger a process of recolonization of aquatic seagrass meadows in the SCI IT3250031 "Laguna Superiore di Venezia", above all through the transplanting of *Zostera marina* and *Z. noltii*, <http://www.lifeseresto.eu/>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 12. Examples (non-exhaustive list) of restoration measures for marine and coastal ecosystems in Italy.

Type of restoration measure	Restoration Project	Year	Site	Existing protection measures in place?	Human activities happening in the area	Type of impact the measure targets	Ecological target for restoration	Specific target	Broad restoration measure category
Seagrass transplantation	MERCES	2019	Italy, Gabicce Mare (Central Mediterranean)	NO but bordering a Regional Park	High touristic pressure in pick season; presence and reallocation of a breakwater to protect the beach (reallocation has caused damages to seagrass meadows)	Direct and indirect burial (increased sediment resuspension) during breakwater reallocation works	Seagrass meadow (<i>Zostera marina</i> , <i>Zostera noltii</i> , <i>Cymodocea nodosa</i>)	None	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Type of restoration measure	Restoration Project	Year	Site	Existing protection measures in place?	Human activities happening in the area	Type of impact the measure targets	Ecological target for restoration	Specific target	Broad restoration measure category
Seagrass and reeds transplantation, hydro-morphological restoration	Lagoon REFRESH	2017-2021	Italy, Venice lagoon	Northern Venice Lagoon, SCI IT3250031; Venice Lagoon, SPA IT3250046	River input from the watershed into the lagoon has been reduced over the centuries. In the recent decades, due to environmental and climatic changes, the lack of freshwater has become an issue for the survival of Habitat 1150*	Hydro-morphological changes determining increase of water salinity and threats to Habitat 1150* - Coastal lagoons	Seagrass meadow (<i>Zostera marina</i> , <i>Zostera noltii</i> , <i>Ruppia cirrhosa</i>) and reed <i>Phragmites australis</i>	None	Habitat restoration
Implantation of recruits of the corallin algae <i>Cystoseira barbata</i>	POP-ROCK	2019	Italy, Portofino (Ligurian Sea), Cinque Terre (Ligurian Sea), Miramare (adriatic Sea)	Portofino MPA, Cinque Terre MPA, Miramare MPA	Coastal tourism, boating, urban development, fishing (outside the	Increase in turbidity, pollution, impact from fishing, overgrazing and outcompetition	Habitat 1170 Reefs (<i>Cystoseira</i>)	None	Habitat restoration



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Type of restoration measure	Restoration Project	Year	Site	Existing protection measures in place?	Human activities happening in the area	Type of impact the measure targets	Ecological target for restoration	Specific target	Broad restoration measure category
					protected areas)				
Passive and active restoration of the Deep Reefs	LIFE-DREAM	2023	Italy, Monopoli shelf and Bari Canyon (Apulian margin) in the South Adriatic Sea; Dohrn Canyon (Gulf of Naples) in the Tyrrhenian Sea	NO	Maritime traffic, fishing	Littering and fishing activity (mainly entangled longlines) on Monopoli shelf; dumping and macro-littering, as well as lost fishing gears (longlines) in the Dohrn Canyon	Deep rees		Habitat restoration



4.2.5 Black Sea

As of mid-2023, there is still lack of operational management plans put in place for marine protected areas in Bulgaria (both for Natura 2000 and nationally designated MPAs). Thus, there are no targeted measures for the restoration of MPAs. Indirectly, through the implementation of the COUNCIL DIRECTIVE of 21 May 1991, concerning urban wastewater treatment (91/271/EEC), and reducing the effect of the use of pesticides from agriculture, in recent years there has been a reduction in pressure and an improvement in the quality of coastal waters in some parts of coastal waters. There are observations of seagrass restoration in Sozopol and Burgas Bays.

For some of coastal lakes, EU funded projects (Life Programme) have been implemented. Such project was accomplished for instance for Atanasovsko Lake at the South Bulgarian Black Sea coast (Burgas Bay), which represents an example of restoration activities in Bulgaria.

Romania

There are no restoration measures in the marine sector in Romania at this moment. Some ecological reconstruction works related to the translocation of 2 species of bivalves (*Donax trunculus* and *Donacilla cornea*) and implanting of seagrass (*Zostera noltii*) and macroalgae (*Cystoseira* sp.) are considered in the context of coastal protection works.



5. Cross-cases considerations

Ecological criteria and anthropogenic pressures

The examples provided in Annex 2 showcase a diverse range of area-based measures aimed at conserving various wildlife species such as birds, marine mammals, and valuable fish habitats, along with different types of ecosystems including soft and hard bottom habitats, intertidal zones, and lagoons.

Across different sea basins and countries, there is a notable variation in the **ecological criteria** prioritized for conservation and management (Table 13). In the Baltic Sea, Finland's Signilskär-Märket Islands MPA stands out for its importance as a migration route, reproduction area, and high biodiversity region. Similarly, Poland's Vistula Lagoon and Vistula Spit MPA prioritizes the protection of species, migration routes, and natural biodiversity. Moving to the North Sea, the United Kingdom's North-western North Sea Sandeel Fishery Closure MPA focuses on safeguarding fish species and seabirds, while Belgium's Protected Shipwreck Sites and Vlaamse Banken MPAs protect diverse marine habitats. In the North-Eastern Atlantic, France's Archipel des Glénan MPA emphasizes the protection of bird species, and Portugal's Dori and Berlengas MPAs focus on fish, algae, invertebrates, and plant/algae protection. In the Mediterranean Sea, Italy's Western Ligurian Sea and Genoa Canyon IMMA protect marine mammals and their habitats, while France's Gulf of Lion Natural Marine Park and Cerbère-Banyuls National Natural Marine Reserve prioritize species and habitat protection. Italy's Portofino MPA conserves endangered species and Croatia/Italy's Jabuka/Pomo Pit MPA safeguards deep-sea habitats and fish species. Lastly, in the Black Sea, Bulgaria's Kaliakra Natural Reserve/Protected Area and Romania's Danube Delta marine area MPAs protect diverse species and coastal habitats.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 13. Summary of the examples of protected sites in different sea basins and countries, along with their ecological criteria and anthropogenic pressures

Sea Basin	Country	Site Name	Ecological Criteria	Anthropogenic Pressures
Baltic Sea	Finland	Signilskär-Märket Islands	Migration route, reproduction area, high biodiversity	Nutrient input, contaminant input, disturbance of species, physical disturbance to seabed
Baltic Sea	Poland	Vistula Lagoon and Vistula Spit	Species protection, migration routes, natural biodiversity	Non-indigenous species, loss/change to natural communities, disturbance of species, species extraction, physical disturbance to seabed, changes to hydrological conditions, litter input, anthropogenic sound
Baltic Sea	Poland	The Puck Bay and Hel Peninsula	Species protection, habitat protection, migration routes, reproduction area, natural biodiversity	Non-indigenous species, loss/change to natural communities, disturbance of species, species extraction, physical disturbance to seabed, changes to hydrological conditions, litter input, anthropogenic sound, water input
North Sea	UK (Scotland)	North-western North Sea Sandeel Fishery Closure	Fish species protection, seabird protection	Physical disturbance to seabed, extraction of wild species, changes to hydrological conditions
North Sea	UK (England)	The Wash and North Norfolk Coast	Bird species protection, mammal species protection, coastal habitat protection	Extraction of wild species, physical disturbance to seabed
North Sea	Belgium	Protected Shipwreck Sites	Mammal species protection, fish species protection, invertebrate species protection, pelagic habitat	Extraction of wild species, disturbance of species, physical loss, input of litter, input of other substances
North Sea	Belgium	Vlaamse Banken	Coastal hard bottom habitat protection, coastal	Species extraction, physical disturbance to seabed, physical loss



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sea Basin	Country	Site Name	Ecological Criteria	Anthropogenic Pressures
			soft bottom habitat protection	
North-East Atlantic	France	Archipel des Glénan	Bird species protection	Disturbance of species, extraction of wild species, input of pathogens, physical disturbance to seabed, physical loss, input of nutrients, input of substances, input of litter, input of anthropogenic sound
North-East Atlantic	France	Golfe du Morbihan, côte ouest de Rhuys	Bird species protection, plant/algae protection, mammal species protection, fish species protection	Disturbance of species, non-indigenous species, physical disturbance to seabed, physical loss, input of nutrients, input of litter, input of anthropogenic sound
North-East Atlantic	Portugal	Dori underwater archaeological park	Fish species protection, algae species protection, invertebrate species protection, pelagic habitat	Non-indigenous species, physical disturbance to seabed, input of anthropogenic sound
North-East Atlantic	Portugal	Berlengas	Bird species protection, mammal species protection, reptile species protection, fish species protection	Non-indigenous species, disturbance of species, extraction of wild species, physical disturbance to seabed, input of litter, input of anthropogenic sound
North-East Atlantic	Portugal	Lapas - Limpets (Áreas de Restrição de apanha)	Invertebrate species protection	Extraction of wild species
North-East Atlantic	Portugal	Parque Marinho Luís Saldanha	Species protection	Non-indigenous species, disturbance of species, extraction of wild species, physical disturbance to seabed
Mediterranean	France, Spain, Italy, Monaco	North-western Mediterranean PSSA	Mammal species protection	Extraction of wild species, input of substances, input of litter, input of anthropogenic sound



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sea Basin	Country	Site Name	Ecological Criteria	Anthropogenic Pressures
Mediterranean	Italy	IMMA Western Ligurian Sea and Genoa Canyon	Mammal species protection, canyon habitat protection	Fishing and shipping impacts, marine litter input
Mediterranean	France	Natural Marine Park of the Gulf of Lion	Species protection, habitat protection	Disturbance of species, invasive species, physical disturbance to seabed, inputs of nutrients and substances, hydrocarbons pollution, input of litter, input of anthropogenic sound
Mediterranean	Italy	Portofino Marine Protected Area	Endangered species protection, benthic species protection, marine turtle protection, marine mammal protection	Tourism, small-scale fishing activities
Mediterranean	Croatia/Italy	Jabuka/Pomo Pit	Deep-sea habitat protection, fish species protection	Disturbance of species, extraction of wild species, physical disturbance to seabed, input of anthropogenic sound
Black Sea	Bulgaria	Kaliakra Natural Reserve/Protected Area	Bird species protection, mammal species protection, fish species protection, coastal habitat protection	Nutrient input, contaminant input, disturbance of
Black Sea	Romania	Danube Delta marine area	Fish species protection, marine mammal protection, coastal soft bottom habitat protection, pelagic habitat	Nutrient input, contaminant input, disturbance of species, extraction of wild species, physical disturbance to seabed, changes to hydrological conditions



Further, this screening effort highlighted **anthropogenic pressures** in different conservation areas across various sea basins and countries (Table 13). In the Baltic Sea, examples like Signilskär-Märket Islands in Finland and Vistula Lagoon and Vistula Spit in Poland face challenges such as nutrient input, input of contaminants, disturbance of species, and physical disturbance to the seabed. Moving to the North Sea, sites like SSMO Closed Areas in the United Kingdom and The Wash and North Norfolk Coast Special Area of Conservation in England encounter pressures related to species extraction, physical disturbance to the seabed, and extraction or mortality of wild species. The Belgium sites of Protected shipwreck sites and Vlaamse Banken are also subject to pressures such as extraction of wild species, disturbance of species, physical loss, and input of litter. In the North-Eastern Atlantic, the French sites of Archipel des Glénan and Golfe du Morbihan, as well as the Portuguese sites of Dori, Berlengas, Parque Marinho Luís Saldanha, demonstrate pressures such as disturbance of species, extraction of wild species, input of microbial pathogens, physical disturbance to the seabed, and input of nutrients, substances, litter, and anthropogenic sound. Transitioning to the Mediterranean Sea, the proposed North-western Mediterranean Particularly Sensitive Sea Area (PSSA) and the Italian sites of Important Marine Mammal Area (IMMA) Western Ligurian Sea and Genoa Canyon, and Portofino Marine Protected Area face pressures including species extraction, input of substances, litter, and anthropogenic sound. Finally, in the Black Sea, Bulgaria's Kaliakra Natural Reserve/protected area and Romania's Danube Delta marine area encounter pressures such as nutrient input, contaminants, disturbance of species, extraction of wild species, physical disturbance to the seabed, and changes to hydrological conditions. Based on the frequency of given pressures in different case studies across various sea basins, the most important anthropogenic pressures identified were: nutrient input, contaminant input, disturbance of species, extraction of wild species, and physical disturbance to seabed. The examples provided illustrate the importance of conserving and restoring marine ecosystems in various sea basins, as they encompass a diverse range of ecological criteria. These examples also shed light on the different anthropogenic pressures that conservation areas face across countries and sea basins, underscoring the crucial need for conservation efforts to address and mitigate these pressures, ensuring the protection of marine ecosystems.

Trade-offs between marine conservation and human activities

When considering trade-offs between marine protection and human activities (Table 14), only few of the examples described in this deliverable report about the adoption of compromises between marine protection and human activities. This has been found only in the case of the Signilskär-Märket Islands MPA (FI) where fishing (both commercial and recreational) and hunting are still allowed and the National Natural Marine Reserve Cerbère-Banyuls where negotiations were undertaken for spatial allocation of protected



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



areas, fishing areas and areas where scuba diving and anchoring of boats are allowed. In the North-western North Sea Sandeel Fishery Closure case, negotiation was not needed because stakeholders, included fishers, have recognized the existence of impacts on ecosystems and natural resources and the need for protection. In other North Sea cases (SSMO Closed Areas and the Eastern IFCA and the Wash and North Norfolk Coast), early engagement leading to smooth acceptance of marine protection designation. Differently – and regrettably – in other cases, the lack of introduction of real protection measures, or their very limited spatial extent, or even the lack of control has been recognized as the reason for easy acceptance of new designations by stakeholders (e.g. Eastern IFCA and the Wash and North Norfolk Coast in UK, Vlaamse Banken in BE, Lapas - Limpets - Areas de Restrição de apanha in PT).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 14. Summary of the examples of protected sites in different sea basins and countries, along with the trade-offs applied and the challenges for implementation or the opportunities for strengthening the measures established.

Sea Basin	Country	Site Name	How trade-off with economic activities was reached	Challenges / Opportunities for strengthening of the measures
Baltic Sea	Finland	Signilskär-Märket Islands	Exemptions can be applied for e.g.: hunting, but within the constraints of the area's designation as a SPA area (N2000); dredging for the purposes of cables, but it requires the permissions; fishing (both recreational and commercial) and certain activities are allowed, although in restricted capacity, e.g. temporal restrictions.	-
Baltic Sea	Poland	Vistula Lagoon and Vistula Spit	-	-
Baltic Sea	Poland	The Puck Bay and Hel Peninsula	-	-
North Sea	UK (Scotland)	SSMO Closed Areas	Fishers have been readily available to collect and validate data on the whereabouts of the seagrass, horse mussel and maerl beds.	-



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sea Basin	Country	Site Name	How trade-off with economic activities was reached	Challenges / Opportunities for strengthening of the measures
North Sea	UK (Scotland)	North-western North Sea Sandeel Fishery Closure	A compromise was achieved without difficulties, as sandeel fishing industry was involved in the process from the beginning as well as local communities and environmental NGOs. All stakeholders were aware of the decline in threatened seabird populations and recognized the importance of sandeel in the food web and were in favour of a closure of sandeel fishing.	The technical measures in place only apply to benthic gear, leaving the water column unprotected. It would be good if all fishing gear susceptible to catch sandeel was prohibited in the closed area, in order to allow for full protection. It would also be important to consider connectivity aspects between the protected zones, namely between the fishery closure and the overlapping MPA.
North Sea	UK (England)	Eastern IFCA and the Wash and North Norfolk Coast	The involvement of key stakeholders from the decision-making stage allows for more acceptance of fishing regulations	Overall, only a very small portion of the SAC is covered by restricted areas, leaving the rest of the seafloor unprotected. Restricted areas are designated based on the Sac habitats they support (biogenic reefs, subtidal mixed sediments, subtidal mud, circalittoral rock and seagrass beds).
North Sea	Belgium	Protected Shipwreck Sites	The process of finding a compromise was not very challenging but it took a lot of time	The protection measures in place are clear but details on concrete enforcement are not clear.
North Sea	Belgium	Vlaamse Banken	No real conflicts arose due to the lack of restrictions imposed within the MPA for the fisheries sector and the shipping sector, which raises questions about the effectiveness of this MPA.	Since many of the proposed measures have not been implemented yet, especially in relation to beam trawling, the MPA is currently not meeting the protection objectives.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sea Basin	Country	Site Name	How trade-off with economic activities was reached	Challenges / Opportunities for strengthening of the measures
North-East Atlantic	France	Archipel des Glénan	The measures implemented have contributed to the reduction of pressures on protected birds. Successful management between human activities and protection measures. Different MPAs overlap in this area. Although there are more regulations and longer consultation processes, the MPAs are complementary, and the communication and coordination between stakeholders are enhanced.	Changes of certain socio-economic activities that compromise(d) birds' protection. The different stakeholders' perspectives in relation to conservation means, who are involved in the site's protection. Time in decision-making due to a relative high amount of consultations with all the stakeholders. Public visibility regarding the site's objectives and regulations due to the multiplicity of stakeholders and protection measures.
North-East Atlantic	France	Golfe du Morbihan, côte ouest de Rhuys	-	Difficulties in assessing the good ecological and conservation status of habitats Impact assessment: defining which human activity has the most direct impact and measuring the indirect impacts on marine habitats are both challenging. There is a significant diversification and an increase of human activities taking place in the area
North-East Atlantic	Portugal	Dori underwater archaeological park	No compensation measure was offered to fishermen	The constant visitation helps the control and possible monitoring of the area. But without a carrying capacity study, it can impact the cultural



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sea Basin	Country	Site Name	How trade-off with economic activities was reached	Challenges / Opportunities for strengthening of the measures
				heritage and disturbances to biodiversity.
North-East Atlantic	Portugal	Berlengas	No compensation measure was offered to fishermen or other restricted activity	-
North-East Atlantic	Portugal	Lapas - Limpets (Areas de Restrição de apanha)	No compensation measure was offered to fishermen or other restricted activity	There ia lack of resources to effectively control the respect of regulation
North-East Atlantic	Portugal	Parque Marinho Luís Saldanha	No compensation measure was offered to fishermen or other restricted activity	-But fisherman banned from the area are the only ones allowed to fish in the vicinity of the area
Mediterranean	France, Spain, Italy, Monaco	North-western Mediterranean PSSA	Potential shipping lane displacement or traffic report due to speed limitation measures. But still need to be evaluated in terms of economic impact. It hasn't been a strong question yet since proposed measures are on voluntary basis	When measures are to be applied under a voluntary base, the risk of inefficiency if high. However, IMO rarely imposes obligatory measures when defining a PSSA, except for very small areas.
Mediterranean	Italy	IMMA Western Ligurian Sea and Genoa Canyon	-	After the designation of the Pelagos, changes in the political climate and transitory decreases in public awareness of the predicaments faced by cetaceans caused long periods of inaction. Most management functions have been shouldered by the Meeting of the Parties and by the national and tri-national steering committees which are inefficient temporary solutions.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sea Basin	Country	Site Name	How trade-off with economic activities was reached	Challenges / Opportunities for strengthening of the measures
				moreover, no zoning measures were adopted.
Mediterranean	France	Natural Marine Park of the Gulf of Lion and National Natural Marine Reserve Cerbère-Banyuls	Some negotiations occurred between professional and recreational fishers to discuss the space and resource use in the area. In some areas a compromise, conflicts arose for the use of space between different activities and marine protection. A compromise was sought to anchor the boats in area where Posidonia would not be impacted. Colour codes buoys were introduced. Professional fishers were allowed to continue fishing in the area if they complied with good practices such as keeping their distance from the dive boats.	
Mediterranean	Italy	Portofino Marine Protected Area	-	-
Mediterranean	Croatia/Italy	Jabuka/Pomo Pit	Need to achieve a compromise between the two bordering countries and with their fishing sector	Following the success of Jabuka/Pomo Pit, other proposals for similar FRAs in the Mediterranean were prepared. In 2018, MedReAct project submitted a proposal to the GFCM's Subregional Committee for the Adriatic Sea for a Fishery Restricted Area named <i>Deep water essential fish habitats and sensitive</i>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sea Basin	Country	Site Name	How trade-off with economic activities was reached	Challenges / Opportunities for strengthening of the measures
				<i>habitats in the South Adriatic.</i> There are also some ideas to establish similar type of area in the north Adriatic.
Black Sea	Bulgaria	Kaliakra Natural Reserve/Protected Area	-	There are still no operational plans for the MPAs management, as the new operational programme "Environment" for the programme period 2021 - 2027 envisages the development of management plans for all protected areas of the Natura 2000 ecological network in Bulgaria.
Black Sea	Romania	Danube Delta marine area	-	-



Among the trade-offs, certain examples highlight the allowance of fisheries and hunting activities within protected sites, such as Signilskär-Märket Islands. At EU level concerns have been raised about the impacts of fishing on MPAs (European Environmental Agency, 2019). Perry et al. (2022) analysed the sites of the Natura 2000 network (which accounts on the whole for nearly 70% of the protected marine area in the EU and the United Kingdom) designated (solely or partially) for the protection of marine habitats, under the EU Habitats Directive. The authors have assessed that, during 2018, a total of more than one million hours of high-risk fishing occurred inside such sites. These fishing activities took place in the waters of all 23 countries within the Natura 2000 MPA network (Figure 10). Of the MPAs assessed, 510 (26%) were subject to high-risk fishing. These sites represented 86% of the 384,000 km² of total area designated for habitat protection.

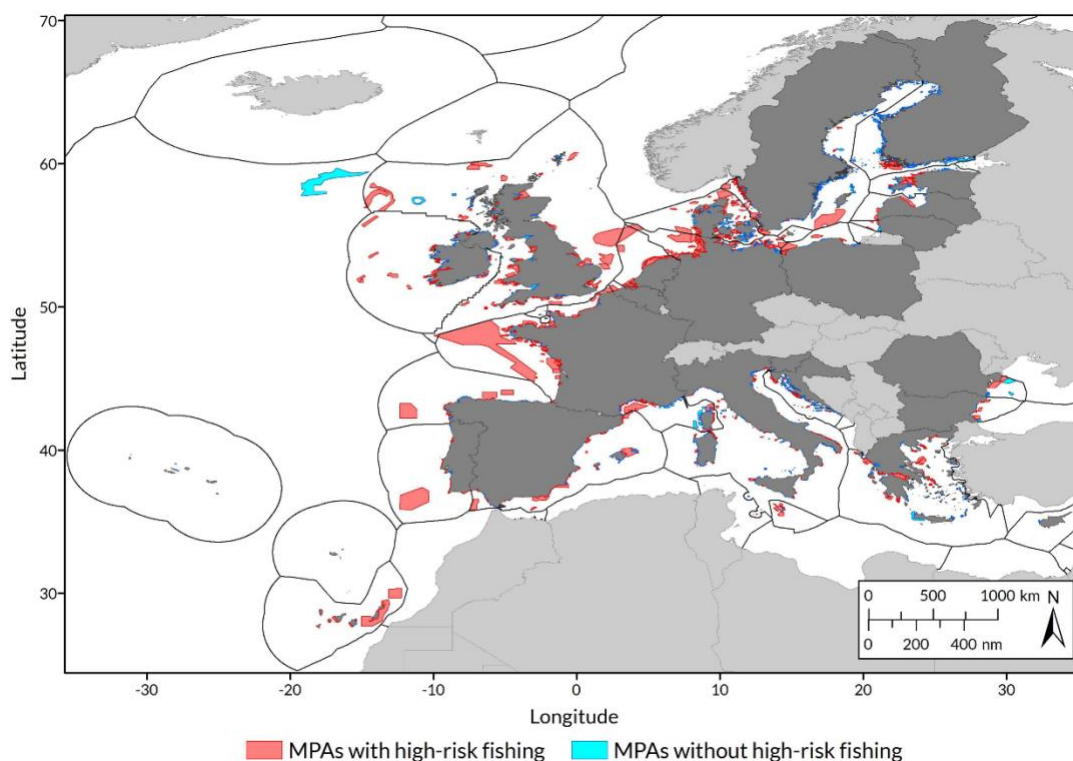


Figure 10 Overview of Occurrence of high-risk fishing within marine protected areas (MPAs) designated for habitat protection under the EU Habitats Directive. Countries whose waters were included in the analysis (marine EU Member States and the United Kingdom) are shaded dark grey. Source: Perry et al. (2022).

On the other hand, some of the examples presented in this study, highlight the opportunity offered to marine conservation by fishing managed areas (e.g. the SSMO Closed Areas, the Sandeel Fishery Closure, the Jabuka-Pomo Pit fishery restricted area). As highlighted by the Scottish cases, bottom-up approach (i.e. when the initiative for the closed areas came from fisheries organization) have demonstrated to be able to deliver good results,



in comparison with the top-down (e.g. to designate highly protected MPAs, or the development of wide fisheries measures). Being part of the decision making of designation processes is key for fishermen representatives.

However, for areas of transboundary relevance, such as the Pelagos Sanctuary of Cetaceans (France, Italy and Monaco) and the Fishery Restricted area of Jabuka-Pomo Pit between Croatia and Italy under GFCM, negotiation processes have understandably been longer when requiring collaboration amongst different countries, however the case studies shed light on how regular cooperation and communication amongst scientists from different authorities and countries, in addition to the involvement of key stakeholders such as fishermen, underpins the decision-making process of furthering conservation efforts

More in general, Grorud-Colvert et al. (2021) highlight the governance practices MPAs can largely benefit from stakeholder participation in order to be effective. Inclusivity, transparency, and accountability, increase legitimacy, ownership, support, and overall effectiveness of conservation are strictly related (Guidetti and Caudette, 2020; Bennet et al., 2019). These practices give voice to those who often disproportionately bear the costs of degradation or conservation and identify livelihood support or other strategies to help mitigate impacts and increase benefits.

A combination of top-down and bottom-up approach in establishment of area-based protection measures can also be successful: for example, while the Marine Reserve Cerbère-Banyuls (France) has been designated with a top-down approach at national level, the National marine park of the Gulf of Lion (again France) only had a perimeter set in place and restrictions have and continue to be subsequently and progressively added through the management board. With two separately managed management bodies, the cooperation and communication between the NMPGL and the RNMCB has improved and been streamlined to a much greater extent leading to common monitoring and planification.

Combining the protection of ecological and cultural values

Among the examples described in this study, some deal with protection of Underwater Cultural Heritage elements: the protected shipwreck sites in the Belgian sea, the Dori underwater archaeological park in the Azores, the Kaliakra Natural Reserve/protected area in Bulgaria). In fact, the measures in place in these sites, addressing fishing and prohibiting trawling, exert a double effect on the conservation of both natural and cultural values. Person and Thompson (2023) highlight how the presence of sustainable fishing regulations can offer *de facto* protection for UCH. In fact, highly impacting fishing activities such as bottom-trawling can cause damage to UCH-both its physical form and its cultural



integrity. This is especially true for shipwrecks “in deep waters that are below the reach of divers and the impact of storms, but within reach of fishing activities”. Fisheries management and wreck management should be increasingly integrated, to drive collaborative management that can mitigate conflicts between the fishing industry and maritime archaeologists. The authors indicate a number of approaches offering further opportunities for the co-occurrence of UCH and marine biodiversity to support sustainable tourism and livelihoods: artificial reef wrecks (vessels “sunk intentionally as a recreational resource”, innovative technologies, such as ‘virtual dive trails’, which can increase visitation from non-divers; Knowledge Awareness Centers can also be used to inform visitors of the importance of both marine biodiversity and UCH.

Integration of different area-based marine protection tools

Marine parks, such as the Pelagos Agreement or OECMs like PSSAs as kind of loose protection measures, can be an opportunity to pave the way for more specific area-based measures. For example, within a PSSA, more restrictive measures to mitigate shipping pressures on clearly identified important habitats could be established e.g., through Areas-To-Be-Avoided, Traffic Separation Schemes, areas with mandatory speed limits. Riparian states of the PSSA could also decide to apply obligatory measures for their national fleets. Therefore, such instruments seem to be important to introduce some degree of protection, particularly in large marine areas, with the ultimate objective to facilitate and speed-up the introduction of more restrictive and effective measures. On the other way, PSSA designation can strengthen MPA designations, as States usually cannot impose restrictions to navigation by international shipping without IMO's involvement. Therefore, PSSAs can complement and contribute to the conservation objectives of MPAs and MPA networks and integrated oceans management (Diz et al., 2018).

Overlapping of different type of protection measures, when well-coordinated, can provide synergies and mutual reinforcement. This is the case for example of the Parque Marinho Luís Saldanha PT, the Natural Marine Park of the Gulf of Lion + the National Natural Marine Reserve Cerbère-Banyuls (FR), the Kaliakra Natural Reserve/protected area (BG) and the Danube Delta protected area (RO).

Restoration measures

We are witnessing a proliferation of active and passive restoration projects, as promising approach to counteract habitat loss in coastal areas. Restoration measures are still primarily aimed at rebuilding one habitat type across relatively small geographical scales (Fraschetti et al., 2021; Fabbrizzi et al., 2023) tending to be opportunistic rather than being a strategic part of geographically large, integrated marine plans. The science



behind restoration needs more robust approaches leading to the development of best practices (e.g. protocols, monitoring of the effects, reasons for failure) to be applied at wider spatial and temporal scales so as to answer to present and future environmental challenges.

Despite far to be exhaustive, the examples of restoration cases provided in Annex 3 showcase the diversity of actions undertaken across EU to restore marine ecosystem and biodiversity. Both examples of active (e.g. seagrass transplantation, installation of artificial substrates, sowing oyster spat) and passive restoration (e.g. wastewater treatment, dredging of contaminated sediments, no-access or regulated access, fisheries management measures, anchoring regulation or installation of eco-friendly buoys) are provided. In some of the cases, active and passive restoration are applied in combination, like e.g. in the Puck Bay and Hel Peninsula (PL), in the Firth of Dornoch (UK, Scotland), in the Parque Marinho Luís Saldanha (PT), LIFE DREAM “Deep REef restoration And Marine litter removal” (GR, IT, SP). In addition to the application of already consolidated practices, e.g. installation of artificial substrates, some examples of innovative techniques are illustrated like the case of the Flat Oyster Recovery (FOREVER project), Brittany (FR) where oysters’ shell debris are recycled and mixed with a specific cement to provide a high affinity substrate. Restoration measures are likely to be implemented in coastal waters (generally more degraded but also more easily to be accessed by these type of interventions). Nevertheless, oysters’ beds are being restored also in offshore waters (Borkum Reefground (BRG) Biogenic reef restoration (DE), Flat Oyster Recovery (FOREVER project), Brittany (FR)). Notably, the LIFE DREAM “Deep REef restoration And Marine litter removal” (GR, IT, SP) is experimenting restoration of deep-sea habitats, targeting recovery of Vulnerable Marine Ecosystems (VME) such as the cold-water corals, located on the continental shelf. Finally, it is worth noting that, in half of the cases described, restoration is implemented within protected areas.

From our non-exhaustive analysis, several considerations of some key aspects can be drawn.

Restoration targets: In the Baltic restoration measures have identified several targets such as priority habitats or habitat-forming and other key species. Nutrient input and other pressure reduction and a combination of passive and active measures have been applied, such as habitat protection and the enhancement of functionally important species, respectively. In the North Sea oyster reefs and mussel beds are main target of restoration, while in the North Atlantic the focus is on artificial reefs’ installation, fish habitats’ reestablishment, dunes’ restructuring, seagrasses’ restoration, and oysters’ recovery. Finally, in the Mediterranean Sea studies are increasing; especially those focused on seagrasses and saltmarshes. The recovery of deep-sea projects are rare because of several constraints, mainly costs and need to improve the development of technologies for active restoration and for monitoring restoration outcomes in these areas.



Restoration trajectories: In the Baltic cases active restoration has proved to be successful at a local scale, particularly in small or closed coastal systems, and sheltered areas, while open and exposed areas may benefit more from natural passive recovery. Protecting habitats for passive recovery in the form of prevention or banning can be more efficient and cost-effective; however, in many cases a combination of the two approach is suggested. Moreover, the Baltic restoration initiatives analysis underlined the importance to take a comprehensive approach that considers both physical measures, targeting abiotic habitat conditions, and biological measures, focused on biological habitat conditions and organisms. Again, the combination of active and passive approach can be the solution. A general example is provided by large-scale restoration cases, as for example the one reported by Collins (2022), where active restoration of oyster reefs is coupled to passive restoration provided by restrictions on bottom trawling and dredging, along with restoration of riparian habitats that result in improved water quality in estuarine / nearshore waters.

Many of the cases across the sea basins are affected by multiple pressures and by cumulative impacts in the same area: multiple measures are therefore required to boost the success of restoration. In fact, it is suggested that the best approach is to monitor and consider all the present sources of pressures in a multi-use context, identifying cumulative impacts and main degradation trajectory (Teichert et al., 2016).

Spatial and temporal scales and global change: In the Mediterranean Sea the MERCES project pointed to the lack of non-standardized methodology and short time of projects which hinder the real recovery of environments and the assessment of successful methodologies and rationale. Short project duration (one-two years), small restoration areas (< 1 ha), lack of controls and knowledge of baselines are still a limit for deriving generalities (Guarnieri et al 2019).

Much of restoration plans implemented at small scale limits in taking connectivity into account. As connectivity underpin several ecosystem functions, restoration should be directed in areas are more critical for maintaining connectivity I respect to others because they differ in their functions as food subsidies, refuges from weather or predators, accessibility to dispersal pathways, and in numerous other ecological properties that help to gain the full functioning of ecosystems (Fraschetti et al 2021). Moreover, maintaining the links between diverse habitats across wide seascapes is critical for the population dynamic of many mobile species (McMahon et al., 2012).

Finally, restorations rarely consider future challenges linked to global change, thus impairing long-term success. Considering climate change impacts, the key strategies might include vulnerability assessments as priority for restoration, supporting ecosystem resilience, protecting and restoring climate refugia etc (Wilson et al., 2020). In this sense, restoration strategies should be directed to enhance blue carbon sequestration, lowered



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



coastal vulnerability, eliminate cumulative pressures in climate refugia, etc (see also Manea et al. in press).

Toward a restoration focused ecosystem-based management – MSP framework

Restoration and conservation strategies are synergic, and must draw on their complementary strengths to achieve their goals (Wiens & Hobbs, 2015). As such, ecological restoration is nowadays recognized as one of the main pillars of ocean management in aiming to reverse degradation trajectories of nature (Coleman et al., 2020). A possibility of incorporating restoration into large management framework such as marine spatial planning (MSP) is anchored to the ecosystem-based management (EBM) principles. Manea et al. (in press) suggested a frame termed EB-MSP, for maximizing the recovery of ocean ecosystems, their functions, and their valuable services. Benefits of incorporating active and passive restoration measure within an EB-MSP framework include: a scaling up of restoration effectiveness, a greater guarantee that sustainability and conservation goals will be met, and improvements in MSP as an integrated planning tool with the potential to address climate change.



6. Conclusive remarks

The common aim of protection and restoration is to enable the ecosystem and its components to develop naturally and return as much as possible to their original conditions. In this sense, protection and restoration measures are complementary tools and should be applied as much as possible in combination, to maximize their synergistic effects. The combination of two tools increases the possibility to reach the objectives of the respective protection and restoration measures in comparison with the application of one type of measure in isolation. On the other hand, marine ecosystems are dynamic and, due to climate change and other drivers, returning to 'original condition' is perhaps not (fully) possible. Therefore, one additional aim of protection and restoration should be to enhance their resilience.

Spatial and temporal scales are both key elements to be considered in order to achieve the objectives of protection and restoration measures. The full potential of measures can be secured only if they are implemented at the ecologically appropriate scale. MPA location and size, as well as enlargement on MPAs should be always based on scientific knowledge. Appropriateness of position and dimension is a prerequisite to ensure obtaining the benefits for ecosystem but also to return investment of resources. Protection and restoration activities needs a long-term perspective to obtain their results: they need to be included in strategic planning and implementation needs to account for future changes both in the socio-economic and in environmental context.

OECSs seems a promising tool to extend marine protection but criteria should be clearly defined for the different typologies.

Restoration measures should be incorporated as much as possible in MSP, for the sake of biodiversity conservation, preservation of good environmental quality and sustainable use of marine resources.



7. References

General

Aronson, James; Goodwin, Neva; Orlando, Laura; Eisenberg, Cristina; Cross, Adam T. (2020). A World of Possibilities: Six Restoration Strategies to support the United Nation's Decade on Ecosystem Restoration. *Restoration Ecology*, (), –. doi:10.1111/rec.13170

Atkinson, J., & Bonser, S.P. (2020). “Active” and “passive” ecological restoration strategies in meta-analysis. *Restoration Ecology*, 28(5), 1032-1035. <https://doi.org/10.1111/rec.13229>

Bennett N. J., Bennett, A. Di Franco, A. Calò, E. Nethery, F. Niccolini, M. Milazzo, P. Guidetti, (2019). Local support for conservation is associated with perceptions of good governance, social impacts, and ecological effectiveness. *Conserv. Lett.* 12, e12640

CBD (2018) ‘Protected areas and other effective area-based conservation measures (Decision 14/8)’. Available at: <https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-08-en.pdf>.

Chazdon, R.L., Falk, D. A., Banin, L.F., Wagner, M., Wilson, S.J., Grabowski, R.C., & Suding, K.N. (2021). The intervention continuum in restoration ecology: rethinking the active–passive dichotomy. *Restoration Ecology*, e13535. <https://doi.org/10.1111/rec.13535>

Cliquet, A., Telesetsky, A., Akhtar-Khavari, A., & Decleer, K. (2022). Upscaling ecological restoration: toward a new legal principle and protocol on ecological restoration in international law. *Restoration Ecology*, 30(4), e13560. <https://doi.org/10.1111/rec.13560>

Coleman, M.A., Wood, G., Filbee-Dexter, K., Minne, A.J., Goold, H.D., Verges, A., et al. (2020). Restore or redefine: future trajectories for restoration. *Frontiers in Marine Science*, 7: 237. <https://doi.org/10.3389/fmars.2020.00237>

European Environment Agency (2019). *Marine Messages II: Navigating the Course Towards Clean, Healthy and Productive Seas Through Implementation of an Ecosystem-Based Approach*. EEA Report 17/2019. Luxembourg: Publications Office of the European Union, 82. doi: 10.2800/71245

FAO. 2022. A handbook for identifying, evaluating and reporting other effective area-based conservation measures in marine fisheries. Rome. <https://doi.org/10.4060/cc3307en>

Fraschetti, S., McOwen, C., Papa, L., Papadopoulou, N., Bilan, M., Boström, C., et al. (2021). Where is more important than how in coastal and marine ecosystems restoration. *Frontiers in Marine Science*, 8: 626843. <https://doi.org/10.3389/fmars.2021.626843>



Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., et al. (2019). International principles and standards for the practice of ecological restoration. Second edition. *Restoration Ecology*, 27: S1-S46. <https://doi.org/10.1111/rec.13035>

Gissi, E. et al. (2022) 'Contributions of marine area-based management tools to the UN sustainable development goals', *Journal of Cleaner Production*, 330(July 2021), p. 129910. Available at: <https://doi.org/10.1016/j.jclepro.2021.129910>.

Grorud-Colvert K. et al. (2021). The MPA Guide: A framework to achieve global goals for the ocean. *Science* 373, eabf0861 .DOI:10.1126/science.abf0861

Guarnieri, G.; Mcowen, C.; Papa, L.; Papadopoulou, N.; Bilan, M.; Boström, C.; Capdevila, P.; Carugati, Laura; Cebrian, E.; Dailianis, T.; Danovaro, R.; Leo, F. D.; Fiorentino, D.; Gagnon, K.; Gambi, C.; Garrabou, J.; Gerovasileiou, V.; Hereu, B.; Kipson, S.; Kotta, J.; Ledoux, J.; Linares, C.; Martin, J.; Medrano, A.; Montero-Serra, I.; Morato, T.; Pusceddu, A.; Sevastou, K.; Smith, Christopher J.; Verdura, J.; Fraschetti, S. (2019), Active restoration across marine coastal habitats: focus on the Mediterranean Sea. 3rd Mediterranean Symposium on the conservation of Coralligenous & other Calcareous Bio-Concretions, pp. 57-62. Antalya, Turkey, 15-16 January 2019

Guidetti P., J. Claudet, Comanagement practices enhance fisheries in marine protected areas. *Conserv. Biol.* 24, 312–318 (2010).

IUCN (2008). IUCN Guidelines for Applying Protected Area Management Categories, Published 2 October 2008

IUCN (2016) 'A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0'. IUCN. Available at: <https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf>.

IUCN-WCPA (2008) Establishing resilient marine protected area networks--making it happen. Washington, D.C.: IUCN-WCPA: National Oceanic and Atmospheric Association : The Nature Conservancy. Available at: https://www.iucn.org/sites/default/files/import/downloads/mpanetworksmakingithappen_en.pdf.

Manea E, Agardy T, Bongiorno L Link marine restoration to marine spatial planning through ecosystem-based management to maximize ocean regeneration. *Aquatic Conservation, Marine and Freshwater Ecosystems*, in press

McMahon, K.W., Berumen, M.L. & Thorrold, S.R. (2012). Linking habitat mosaics and connectivity in a coral reef seascape. *Proceedings of the National Academy of Sciences, U.S.A.*, 109: 15372-15376. <https://doi.org/10.1073/pnas.1206378109>



Pearson N., Benjamin S. Thompson (2023). Saving two fish with one wreck: Maximizing synergies in marine biodiversity conservation and underwater cultural heritage protection. Marine Policy, Volume 152. <https://doi.org/10.1016/j.marpol.2023.105613>.

Perry Allison L., Blanco Jorge, García Silvia, Fournier Nicolas (2022). Extensive Use of Habitat-Damaging Fishing Gears Inside Habitat-Protecting Marine Protected Areas. Frontiers in Marine Science 9. DOI=10.3389/fmars.2022.811926

Prior, S., Chircop, A. and Roberts, J. (2010) 'Area-based Management on the High Seas: Possible Application of the IMO's Particularly Sensitive Sea Area Concept', The International Journal of Marine and Coastal Law, 25(4), pp. 483–522. Available at: <https://doi.org/10.1163/157180810X525403>.

UNGA (2007) Report of the Secretary-General of the United Nations General Assembly on Oceans and the Law of the Sea, pp. 122–161. Available at: https://www.gc.noaa.gov/documents/2007_UN_area_based_tools.pdf (Accessed: 12 June 2023).

Vilas D., M. Coll, X. Corrales, J. Steenbeek, C. Piroddi, D. Macias, A. Ligas, P. Sartor, J. Claudet (2020), Current and potential contributions of the Gulf of Lion Fisheries Restricted Area to fisheries sustainability in the NW Mediterranean Sea. Mar. Policy 123, 104296 .

Wiens J.A. & Hobbs R.J. (2015). Integrating conservation and restoration in a changing world. BioScience, 65(3), 302-313. <https://doi.org/10.1093/biosci/biu235>

Zahawi, R.A., Reid, J.L., & Holl, K.D. (2014). Hidden costs of passive restoration. Restoration Ecology, 22(3), 284-287. <https://doi.org/10.1111/rec.12098>

Baltic Sea

HELCOM ACTION (2021) Restoration measures for coastal habitats in the Baltic Sea: cost-efficiency and areas of highest significance and need.

[Word Maritime University \(2014\). PSSA in the Baltic Sea: protection on paper or progresses?](#)

North Sea

AIFCA (2023). Available at: <https://association-ifca.org.uk/> (Accessed: 17 May 2023).

Afdeling Kust - Vlaamse Hydrografie. Wrecks database, [<https://wrakkendatabank.afdelingkust.be/>]

Agentschap Onroerend Erfgoed. Maritime archaeology database, [<https://www.maritieme-archeologie.be/>]



Baretta, M. (2004) 'Marine Protected Areas in the Dutch sector of the North Sea', in. Proceedings of the International Expert Workshop on Marine Protected Areas and Fisheries, p. 116.

Belgische Staat (2018a) Actualisatie van de initiële beoordeling voor de Belgische mariene wateren Kaderrichtlijn Mariene Strategie – Art 8 lid 1a & 1b. Available at: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/initiele_beoordeling_msfd_2018.pdf (Accessed: 14 September 2022).

Belgische Staat (2018b) Beheerplannen voor Natura 2000 in het Belgische deel van de Noordzee - Habitat- en Vogelrichtlijn. Brussel, België: Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu, DG Leefmilieu, pp. 1-60 pp. Available at: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/beheerplannen_natura_2000_noordzee_2018-2023.pdf (Accessed: 23 August 2022).

Belgische Staat (2019) Koninklijk besluit tot vaststelling van het marien ruimtelijk plan voor de periode van 2020 tot 2026 in de Belgische zeegebieden. Available at: https://www.ejustice.just.fgov.be/mopdf/2019/07/02_2.pdf#page=2 (Accessed: 2 September 2020).

Belgische Staat (2022) Actualisatie van de maatregelen voor de Belgische mariene wateren: Natura 2000 en Kaderrichtlijn Mariene Strategie - Art 13. Available at: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/maatregelenprogramma_2de_cyclus_2022.pdf (Accessed: 14 September 2022).

Demerre, I.; Van Haelst, S.; Sandra, M. (2020). Inventory 100-year old shipwrecks in the Belgian part of the North Sea. Vlaams Instituut voor de Zee (VLIZ). Oostende. 363 pp. [<https://www.vliz.be/en/catalogue?module=ref&refid=341019>]

Degraer, S. et al. (2009) Studie betreffende het opstellen van een lijst van potentiële Habitatrichtlijngebieden in het Belgische deel van de Noordzee. Eindrapport in opdracht van de Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu, Directoraat-generaal Leefmilieu. Brussel, België, p. 93 pp. Available at: https://purews.inbo.be/ws/portalfiles/portal/669495/Degraer_etal_StudieBetreffendeOpstellenLijstPotentiëleHabitatrichtlijngebiedenBelgischeDeelNoordzee.pdf.

European MSP Platform (2022) North Sea, The European Maritime Spatial Planning Platform. Available at: <https://maritime-spatial-planning.ec.europa.eu/sea-basins/north-sea-0> (Accessed: 16 May 2023).

FOD Volksgezondheid (2016) Habitats Directive Areas in the Belgian part of the North Sea, FPS Public Health. Available at: <https://www.health.belgium.be/en/habitats-directive-areas-belgian-part-north-sea> (Accessed: 4 May 2023).



FPS Public Health (2023). Inventory 100-year old shipwrecks in the Belgian part of the North Sea. [<https://www.health.belgium.be/en/inventory-100-year-old-shipwrecks-belgian-part-north-sea>]

Kustportaal (2023). [<https://www.kustportaal.be/nl/statische-kaarten>]

Law of 23 April 2021. Wet tot implementatie van het UNESCO-verdrag van 2 november 2001 ter bescherming van het cultureel erfgoed onder water en de bescherming van waardevolle wrakken. 2021-04-23/10 [https://etaamb.openjustice.be/nl/wet-van-23-april-2021_n2021041529.html]

Leloup, E. (1970) 'Recherches sur l'ostreiculture dans le bassin de chasse d'Ostende en 1968', Bull. Inst. r. Sci. nat. Belg., 46(6), pp. 1–22.

Lindeboom, H.J., van Kessel, J.G. and Berkenbosch, L. (2005) Gebieden met bijzondere ecologische waarden op het Nederlands Continentaal Plat. RIKZ/Alterra.

Lukic, I. et al. (2020) Revision of the current environmental assessment and status of pilots (Deliverable 4.1, WP4 Environmental gain of multi-use of marine space and infrastructure).

Mallefet, J.; Zintzen, V.; Massin, C.; Norro, A.; Vincx, M.; De Maerschalck, V.; Steyaert, M.; Degraer, S.; Cattrijsse, A.; Vanden Berghe, E. (2008). Belgian shipwreck: hotspots for marine biodiversity BEWREMABI: final report. Brussels. 151 pp. [<https://www.vliz.be/nl/imis?module=ref&refid=126030>]

MD of 6 April 2018. Ministerieel besluit betreffende de erkenning van 3 scheepswrakken als cultureel erfgoed onder water. 2018-04-06/01. [https://etaamb.openjustice.be/nl/ministerieel-besluit-van-06-april-2018_n2018011377.html]

NatureScot (2023) OSPAR Marine Protected Areas, NatureScot. Available at: <https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/marine-protected-areas/ospar-marine-protected-areas> (Accessed: 16 May 2023).

NORA (2023) 'Native Oyster – NORA'. Available at: <https://nora-europe.eu/native-oyster/> (Accessed: 17 May 2023).

Pecceu, E. et al. (2021) Scientific background report in preparation of fisheries measures to protect the bottom integrity and the different habitats within the Belgian part of the North Sea, p. 199.

Pecceu, E., Hostens, K. and Maes, F. (2016) 'Governance analysis of MPAs in the Belgian part of the North Sea', Marine Policy, 71, pp. 265–274. Available at: <https://doi.org/10.1016/j.marpol.2015.12.017>.



Pogoda, B. (2019) 'Current Status of European Oyster Decline and Restoration in Germany', *Humanities*, 8(1), p. 9. Available at: <https://doi.org/10.3390/h8010009>.

Pogoda, B. et al. (2019) 'The Native Oyster Restoration Alliance (NORA) and the Berlin Oyster Recommendation: bringing back a key ecosystem engineer by developing and supporting best practice in Europe', *Aquatic Living Resources*, 32, p. 13. Available at: <https://doi.org/10.1051/alr/2019012>.

Pogoda, B. et al. (2020) 'NORA moving forward: Developing an oyster restoration network in Europe to support the Berlin Oyster Recommendation', *Aquatic Conservation: Marine and Freshwater Ecosystems*, 30(11), pp. 2031–2037. Available at: <https://doi.org/10.1002/aqc.3447>.

Pieters, M.; Van Dijck, M.; Missiaen, T.; Van Haelst, S.; Pirlet, H.; Devriese, L. (2022). Maritime and coastal heritage, in: Dauwe, S. *Knowledge Guide Coast and Sea 2022 - Compendium for Coast and Sea*. pp. 153-163.

Rabaut, M. et al. (2008) 'Experimental beam-trawling in *Lanice conchilega* reefs: Impact on the associated fauna', *Fisheries Research*, 90(1), pp. 209–216. Available at: <https://doi.org/10.1016/j.fishres.2007.10.009>.

Rabaut, M., Vincx, M. and Degraer, S. (2009) 'Do *Lanice conchilega* (sandmason) aggregations classify as reefs? Quantifying habitat modifying effects', *Helgoland Marine Research*, 63(1), pp. 37–46. Available at: <https://doi.org/10.1007/s10152-008-0137-4>.

Reubens, J. (2013). The ecology of benthopelagic fish at offshore wind farms: Towards an integrated management approach = De ecologie van benthopelagische vis bij offshore windmolens: Naar een geïntegreerd beheer van de zee. PhD Thesis. Ghent University: Gent. 237 + Addenda pp.

RD of 22 May 2019. Koninklijk besluit tot vaststelling van het marien ruimtelijk plan voor de periode 2020 tot 2026 in de Belgische zeegebieden. 2019-05-22/23 [https://etaamb.openjustice.be/nl/koninklijk-besluit-van-22-mei-2019_n2019013159.html]

RD of 30 July 2021. Koninklijk besluit tot uitvoering van de wet van 23 april 2021 tot implementatie van het UNESCO verdrag van 2 november 2001 ter bescherming van het cultureel erfgoed onder water en de bescherming van waardevolle wrakken. 2021-07-30/17. [https://etaamb.openjustice.be/nl/koninklijk-besluit-van-30-juli-2021_n2021042757.html]

RD of 21 September 2016. Koninklijk besluit betreffende de reglementaire maatregelen ter bescherming van het cultureel erfgoed onder water. 2016-09-21/12 [https://etaamb.openjustice.be/nl/koninklijk-besluit-van-21-september-2016_n2016014315.html]



Searle, K.R. et al. (2023) 'Effects of a fishery closure and prey abundance on seabird diet and breeding success: Implications for strategic fisheries management and seabird conservation', *Biological Conservation*, 281, p. 109990. Available at: <https://doi.org/10.1016/j.biocon.2023.109990>.

Termote, T.; Termote, D. (2009). *Schatten en scheepswrakken: Boeiende onderwaterarcheologie in de Noordzee*. Davidsfonds: Leuven. ISBN 978-90-5826-609-5. pp.

North-East Atlantic

Amorim, P., Perán, A.D., Pham, C.K., Juliano, M., Cardigos, F., Tempera, F. and Morato, T., 2017. Overview of the ocean climatology and its variability in the Azores region of the North Atlantic including environmental characteristics at the seabed. *Frontiers in Marine Science*, 4, p.56.

Comité français de l'UICN (2022). Aires conservées françaises. Recommandations pour une future déclinaison du concept d'AMCEZ (Autre Mesure de Conservation Efficace par Zone) en France. Montreuil, France. 154 pages.

OFB. (n.d.) Le réseau Natura 2000. Available at: <https://www.ofb.gouv.fr/le-reseau-natura2000#:~:text=Le%20r%C3%A9seau%20Natura%202000%20est,1%20753%20sites%20Natura%202000> (Accessed: 12 June 2023).

OSPAR Convention. (2023a). *Region IV: Bay of Biscay and Iberian Coast*. <https://www.ospar.org/convention/the-north-east-atlantic/iv>

OSPAR Convention. (2023b). *Region V: Wider Atlantic*. <https://www.ospar.org/convention/the-north-east-atlantic/v>

Mediterranean

FAO. 2022. The State of Mediterranean and Black Sea Fisheries 2022. General Fisheries Commission for the Mediterranean. Rome. <https://doi.org/10.4060/cc3370en>

Marine Mammal Protected Areas Task Force, 2017. First IMMA Regional Workshop for the Mediterranean. Chania, Greece, 24-28 October 2016.



Appendix – Template used to collect information from interviewees

Sea- basin
Country
Site name
Site map
Designation type
Designation level: subnational, national, regional, European or international level
Type of area: coastal, offshore, deep sea
Brief general description of geographic, morphological and environmental features
Uses and human activities in place in the area (the most relevant): in the description please make referenced to the ones identified under the MSFD, see Table 1
Anthropogenic pressures in marine environment (the most relevant): in the description please make referenced to the ones identified under MSFD, see Table 2. To each pressure, a score will be assigned to assess its relevance
Ecological criteria: to be selected from a closed list, as in Table 3, include also a narrative description
Management measures: availability of a management plan for the area will be checked. In case of a plan available typology of measures will be identified based on a closed list of options as in Table 4 and then described in more detail
<p>FROM INTERVIEWS: Trade-offs between sea uses and marine protection: discuss challenges and achievements (info to be collected from interview and expert knowledge).</p> <p>In a scale 1-5 how challenging was to achieve a compromise.</p> <p>In a scale 1-5 how much you think the solution found meets optimal protection objectives?</p>
<p>FROM INTERVIEWS: Coexistence and multi-use of the sea: present good practices (info to be collected from interviews and/or desk analysis)</p>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



FROM INTERVIEWS: For OECMs:
- Policy context in which the measure has been established
- Main sector(s) involved in the OECMs
- Main environmental impacts targeted
- Direct and indirect implications for biodiversity and ecosystem protection of the OECM
- Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring:
- Opportunities for establishing this type of OECMs in other areas of the sea-basins
- Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation
- Potential for strengthening of protection measures



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Annex 1 – Designations at country level



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Baltic Sea

Table 15 Spatial coverage of HELCOM MPAs and Natura2000 areas in the Baltic Sea countries.

Country	Designation level	Type	Designation type	Size (km2)
Denmark	Regional	HELCOM MPA	Total	11222.95
			Designated	625.46508
			Designated and managed	10597.485
	European	Natura 2000	Total	16538.58
			Special Protection Area (Birds Directive)	9382.87
			Special Areas of Conservation (Habitats Directive)	7127
			Both	28.72
Estonia	Regional	HELCOM MPA	Total	7238.0018
			Designated	1150.76
			Designated and managed	6087.2418
	European	Natura 2000	Total	13111.56
			Special Protection Area (Birds Directive)	6448.46
			Special Areas of Conservation (Habitats Directive)	4150.33
			Both	2512.77
Finland	Regional	HELCOM MPA	Total	7788.4998
			Designated	5322.2225
			Designated and managed	2307.4343
			Designated and partly managed	158.843
	European	Natura 2000	Total	11031.62
			Special Protection Area (Birds Directive)	2207.27
			Special Areas of Conservation (Habitats Directive)	3212.8
Germany	Regional		Both	5611.55
		HELCOM MPA	Total	8155.3935
			Designated	3303.153



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Country	Designation level	Type	Designation type	Size (km2)
Latvia	European		Designated and managed	2383.0251
			Designated and partly managed	2469.2154
		Natura 2000	Total	16538.58
			Special Protection Area (Birds Directive)	9382.87
			Special Areas of Conservation (Habitats Directive)	7127
			Both	28.72
		HELCOM MPA	Total	4365.2263
	Regional		Designated	4365.2263
			Designated and managed	
	European	Natura 2000	Total	5818.04
			Special Protection Area (Birds Directive)	1738.47
			Special Areas of Conservation (Habitats Directive)	219.86
			Both	3859.71
		HELCOM MPA	Total	1961.5537
Regional		Designated	1029.505	
		Designated and managed	932.04869	
Lithuania	European	Natura 2000	Total	2789.27
			Special Protection Area (Birds Directive)	1427.85
			Special Areas of Conservation (Habitats Directive)	1361.42
			Both	
		HELCOM MPA	Total	8073.7754
	Regional		Designated	6918.6464
			Designated and managed	1155.129
Poland	European	Natura 2000	Total	16996.52
			Special Protection Area (Birds Directive)	10596.97
			Special Areas of Conservation (Habitats Directive)	5598.38
			Both	801.17
		HELCOM MPA	Total	9088.0597



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Country	Designation level	Type	Designation type	Size (km2)
Russia	European	Natura 2000	Designated	1882.6438
			Designated and managed	6425.0663
			Designated and partly managed	780.34959
			Total	21103.98
			Special Protection Area (Birds Directive)	793.42
			Special Areas of Conservation (Habitats Directive)	5784.76
			Both	14525.79
	Regional	HELCOM MPA	Total	1338.8293
			Designated	34.000301
			Designated and managed	1304.829
			HELCOM MPA Total	59232.29
			Designated and managed	30037.13
			Designated and partly managed	4563.537
			Designated	24631.622
Total	European	Natura 2000	Special Areas of Conservation (Habitats Directive)	34581.55
			Special Protection Area (Birds Directive)	41978.18
			Both	27368.43



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



North Sea

Table 16 Spatial coverage per designation type for North Sea wide designations and for the Belgian, Danish, German and Scottish part of the North Sea. Some of the Natura 2000 designations are split up into types B or C, where B = designated under the Habitats Directive, and C = designated under the Birds and Habitats Directive.

Area of application	Designation level	Designation type	Area total designated (km ²)	Area total implemented (km ²)	Area total highly protected (km ²)
North Sea - wide	International	MARPOL Emission Control Area Sox	-	-	-
		MARPOL Special Area	-	-	-
Belgian part of the North Sea	International	MARPOL PSSA	3,454.00	3,454.00	0.00
		Ramsar Site	19.00	19.00	0.00
	European	Special Areas of Conservation (Habitats Directive), type B	1,477.17	1,414.17	0.00
		Special Protection Area (Birds Directive)	314.29	314.29	0.00
	Regional	OSPAR Marine Protected Area	1,239.00	1,239.00	0.00
	National	Protected shipwrecks	1.29	1.29	1.28 ⁴
Danish part of the North Sea	International	MARPOL PSSA	not found	not found	not found
	European	Marine Strategy Framework Directive Area	589.10	0.00	0.00
		Sites of Community Importance (Habitats Directive), type B	12,361.00	not found	0.00

⁴ Line fishing, fishing with trawling nets, anchoring and dredging prohibited



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Area of application	Designation level	Designation type	Area total designated (km ²)	Area total implemented (km ²)	Area total highly protected (km ²)
		Sites of Community Importance (Habitats Directive), type C	1,342.70	1,342.70	0.00
		Special Areas of Conservation (Habitats Directive), type B	18,691.32	5.90	not found
		Special Areas of Conservation (Habitats Directive, type C	2,623.10	2,623.10	not found
		Special Protection Area (Birds Directive)	16,558.73	16,558.73	not found
		Special Protection Area (Birds Directive), type C	3,965.80	42.50	not found
	Regional	OSPAR Marine Protected Area	22,445.81	22,445.81	0.00
	National	Marine Strategy Area	589.80	589.80	0.00
		Protected by conservation order (Fredet ved afgørelse, excl. Kirkeomgivelser)	298.54	298.54	0.00
German part of the North Sea	International	MARPOL PSSA	not found	not found	not found
	European	Site of Community Importance (Habitat Directive)	21,905.80	0.00	0.00
		Special Protection Area (Birds Directive)	not found	not found	not found
	Regional	OSPAR Marine Protected Area	not found	not found	not found
	National	Landscape Protection Area	80.80	80.80	0.00
		National Parks	3,403.90	3,403.90	0.00
		Nature reserve	9,769.10	9,769.10	9,769.10
		Nature Reserves Owned By Professional Nature Management Organizations	552.50	552.50	552.50



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Area of application	Designation level	Designation type	Area total designated (km ²)	Area total implemented (km ²)	Area total highly protected (km ²)
Scottish part of the North Sea	International	Council of Europe Diploma Site	0.03	0.03	0.00
		Ramsar Site	219.91	219.91	0.00
		MARPOL PSSA	not found	not found	not found
	European	Council of Europe Biogenetic Reserve	2.14	0.00	0.00
		Site of Community Importance (Habitats Directive)	0.00	0.00	0.00
		Special Areas of Conservation (Habitats Directive)	3,516.90	3,516.90	0.00
		Special Protection Area (Birds Directive)	6,590.27	6,590.27	0.00
	Regional	OSPAR Marine Protected Area	9,377.10	9,377.10	0.00
	National	Demonstration and Research Marine Protected Area (Scottish)	155.30	155.30	0.00
		Local Nature Reserve (UK)	27.60	27.60	0.00
		Marine Consultation Area (Scottish)	47.54	0.00	0.00
		National Nature Reserve (UK)	16.91	16.91	0.00
		Nature Conservation Marine Protected Area (Scottish)	8,260.43	2,421.90	0.00
		Nature Reserve (unspecified)	6.17	6.17	0.00
		Site of Special Scientific Interest (UK)	257.61	257.61	0.00



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



North-East Atlantic

Table 17 Protected areas designation in metropolitan France.

Site designation	TOTAL VALUE PER COUNTRY				
	Zone marine area (km2)	Zone total area (km2)	Fully / highly protected area (km2)	Implemented protected area (km2)	Designated protected area (km2)
Biotope Protection Order (Arrêté de protection de biotope)	22.94	31.29	0.00	22.94	22.94
Corsican Nature Reserve (Réserve naturelle de Corse)	796.71	813.50	0.00	796.71	796.71
Marine Nature Park (Parc naturel marin)	30 365.00	30 506.75	0.00	30 365.00	30 365.00
Marine Protected Area (Others)	1 755.40	1 757.51	0.00	0.00	0.00
Marine Protected Area (OSPAR)	29 201.20	29 950.35	0.00	29 201.20	29 201.20
National Nature Reserve (Réserve Naturelle Nationale)	217.45	301.59	0.62	217.45	217.45
National Park	2 685.90	2 958.70	45.20	2 685.90	2 685.90
Ramsar Site, Wetland of International Importance	246.89	1025.38	0.00	246.89	246.89
Regional Nature Park (Parc naturel régional)	36.21	5765.80	0.00	36.21	36.21
Regional Nature Reserve (Réserve naturelle régionale)	1.96	3.33	0.00	1.96	1.96



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Site designation	TOTAL VALUE PER COUNTRY				
	Zone marine area (km2)	Zone total area (km2)	Fully / highly protected area (km2)	Implemented protected area (km2)	Designated protected area (km2)
Sites of Community Importance (Habitats Directive)	78 396.70	78 368.72	0.00	5 984.80	78 396.70
Special Areas of Conservation (Habitats Directive) - Natura 2000	27 359.86	31223.60	0.00	34.16	27359.86
Special Protection Area (Birds Directive) - Natura 2000	107 370.87	111 446.79	0.00	107 370.87	107 370.87
Specially Protected Areas of Mediterranean Importance (Barcelona Convention)	1 005.10	1 028.70	0.00	1 005.10	1 005.10

Notes: Data was collected from the Marine Protection Atlas (MPAtlas) database. data may differ depending on the database (e.g. MAIA network, INPN - MNHN...) used. However for coherence and harmomisation between all partners, the MPAtlas was preferred.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 18 Number and types of conservation measures in the subdivision mainland Portugal

	Site Designations	Number of site names	Total (km2)*	Marine Area (km2)
Natura 2000 Network	Special Protection Area (SPA)	11	7515,28	6279,71
	Sites of Community Importance (SCI)	14	32446,97	29849,23
National Protected Areas	Nature Park	17	7306,91	N/A
	Regional Nature Park	1	247,69	N/A
	National Park	1	695,92	N/A
	Natural Monument	10	12,84	N/A
	Local Natural Monument	1	3,16	N/A
	Nature Reserve	12	898,44	N/A
	Local Nature Reserve	2	1,19	N/A
	Protected Landscape	7	141,8	N/A
	Local Protected Landscape	5	34	N/A
	Regional Protected Landscape	3	168,6	N/A
	Private Protected Area	4	8,15	N/A

* The Portuguese system is based on nested areas therefore total values are accounted duplicated sometimes.

Methodological notes and weaknesses

In some cases, insufficient information is provided about the size of the sites.

References

- Law Decree- No. 242/2015, of 15 October, Diário da República No. 202/2015, Series I of 2015-10-15. Which proceeds with the first amendment and republication of Decree-Law No. 142/2008, of 24 July, which approves the legal regime for nature conservation and biodiversity.
- ICNF (n.d). The National Classified Areas System (SNAC). Available at <https://www.icnf.pt/biodiversidade/sistemanacionaldeareasclassificadas>
- Portuguese Environment Agency (2022). Soil and Biodiversity. National Classified Areas System. Available at: <https://rea.apambiente.pt/content/sistema-nacional-de-%C3%A1reas-classificadas?language=pt-pt>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 19 Number and types of conservation measures in the Autonomous Region of the Azores

	Site Designations	Number of site names	Total (km2)*	Marine Area (km2)
Natura 2000 Network	Special Areas of Conservation (SAC)	15	144,05	66,91
	Special Protection Area (SPA)	7	6,1	0,219
	Sites of Community Importance (SCI)	2	286,49	285,3
Cultural Heritage	Underwater Archaeological Parks	7	N/A	1,65
	Archaeological Findings	4	N/A	N/A
	Shipwreck	22	N/A	N/A
	Sunked for anthropogenic purposes	2	N/A	N/A
	Set of heritage occurrences	1	N/A	N/A
Marine Protected Areas	Marine Protected Area (OSPAR)	7	5677,78	5674,2
	Azores Marine Park	15	N/A	246290,3
	Resource Management Protected Area	30	N/A	1045,48
	Nature Reserve	5	527,66	526,96
	Habitats or Species Management	12	14,562	1,469
OECMs	Reserve areas for the capture of limpets	5	N/A	N/A
	Important Areas for Seabirds	11	9332	N/A
	Sand Extraction Areas	16	N/A	N/A
Fishery	Prohibition of commercial and recreational fishing	3	N/A	N/A
	Regulated Area for Fishing	4	69,3	N/A
	Regulated Areas for Fishing in the Maritime Zone of Faial and Pico Islands	7	7,88	N/A
	Restricted Area for Fishing	1	41,68	N/A

* The Portuguese system is based on nested areas therefore total values are accounted duplicated sometimes.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Methodological notes and weaknesses

For some sites no information about their size is provided. One of the main sources used is MPAtlas, which can provide a weakness in terms of area size, zones may contribute less than their total area if they are covered by zones with higher levels of protection. This may have happened in some sites, as some websites that provided information on the extent of areas noticed that the number for the area was rounded off as well.

References:

- Regional Legislative Decree no. 28/2011/A, of 11 November, which structures the Azores Marine Park; altered and republished by the Regional Legislative Decree no. 13/2016/A, of 19 July.
- Regional Legislative Decree no. 15/2012/A, of 2 April - Establishes the legal regime for nature conservation and biodiversity;
- REAA(2019). Report on the State of the Environment of the Azores. Available online at: <http://rea.azores.gov.pt/store/REAA-2019.pdf>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 20 Number and types of conservation measures in Madeira.

	Site Designations	Number of site names	Total (km2)	Marine Area (km2)
Natura 2000 Network	Special Protection Areas (SPAs)	5	N/A	N/A
	Special Areas of Conservation (SAC)	11	N/A	N/A
	Sites of Community Importance (SCI)	9	N/A	N/A
Cultural Heritage	Natural Monument	15	N/A	N/A
	Shipwrecks	2	N/A	N/A
National Protected Areas	Natural Reserve	5	N/A	222,567
	Natural Park	3	N/A	N/A

Methodological notes and weaknesses

In the context of Madeira, there are sites included that are not only marine. These sites have no data for the marine area. In addition, many sites that have been found in the IFCN (Instituto das Florestas e da Conservação da Natureza, IP-RAM) do not have sufficient information on their extent. Moreover, in the case of Madeira, some sites are presented twice, because the information on the total and marine area as well as the legislative framework were collected from different sources, and this shows the inability of some websites to provide sufficient information. It can be concluded that PSOEM provides more information than IFCN, regarding the double areas.

References

Portuguese Environment Agency (2022). Soil and Biodiversity. National Classified Areas System. Available at: <https://rea.apambiente.pt/content/sistema-nacional-de-%C3%A1reas-classificadas?language=pt-pt>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Mediterranean Sea

Table 21. Designations in Albania

	TOTAL VALUES PER COUNTRY				
Site Designations	Marine Area (km ²)	Total Area (km ²)	Top Level Fully / Highly Protected Area (km ²)	Top Level Implemented Protected Area (km ²)	Top Level Designated Protected Area (km ²)
Special Protected Areas of Mediterranean Importance (SPAMI)	116.3	124.2		116.3	116.3
National Park (category II IUCN)	128.7	218.5		128.7	128.7
Protected Landscape (category V IUCN)	2.1	197.3		2.1	2.1
Nature Monument (Category III IUCN)	0.5	15.0		0.5	0.5

NOTE: Input data are based on MPAtlas. The total of **134 km²** of marine area is protected which corresponds to the **1.1% of total marine area**. Protected planet.net enlists additional protected areas belonging to following categories: Ramsar Site, Wetland of International Importance (Karavasta Lagoon); Managed Nature Reserve (category IV IUCN) (Patok-Fushekuqe-Ishem); National Park (category II) (Divjake Karavasta); and Nature Monument (Category III IUCN) (Kordoni litoral i Bregut të Ri; Ishulli i Cabakut; Pylli i Zvernecit; Ishujt e Ksamili and Ishulli i Pelikanit). For the given reason, according to the Protected Planet database, the total of **318 km²** of marine area is protected which corresponds to the **2.84% of total marine area**. However, additional areas appearing in the PP database could not be added to the above calculations since the information on the coverage of marine area was not available there.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 22. Designations in Bosnia and Herzegovina

Site Designations	TOTAL VALUES PER COUNTRY				
	Marine Area (km ²)	Total Area (km ²)	Top Level Fully / Highly Protected Area (km ²)	Top Level Implemented Protected Area (km ²)	Top Level Designated Protected Area (km ²)
Special Reserve	0.19			0.19	0.19
Sites of Community Importance (Habitats Directive) (B)	0.19			0.19	0.19

NOTE: This is an area of Bay of Mali Ston (Malostonski Zaljev), the transboundary area, majority of which belongs to Croatia (total marine area protected, covering both countries, is 55 km² as a Special Reserve, i.e. 54.4 km² as Site of Community Importance; and the total protected area of 149 km² as a Special Reserve, i.e. 57.2 km² as Site of Community Importance).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 23. Designations in Croatia

	TOTAL VALUES PER COUNTRY				
Site Designations	Marine Area (km ²)	Total Area (km ²)	Top Level Fully / Highly Protected Area (km ²)	Top Level Implemented Protected Area (km ²)	Top Level Designated Protected Area (km ²)
Sites of Community Importance (Habitats Directive)	4727.7	5200.8	0.0	0.0	4727.7
Special Areas of Conservation (Habitats Directive)	186.8	286.3	0.0	0.0	186.9
Special Protection Area (Birds Directive)	982.7	3484.5	0.0	982.7	982.7
Special Reserve	112.1	243.5	0.0	112.0	112.0
Forest park	0.1	2.9	0.0	0.1	0.1
National park	205.9	302.6	0.0	205.9	205.9
Natural monument	0.0	0.1	0.0	0.0	0.0
Nature park	184.2	2301.2	0.0	184.2	184.2
Significant landscape	107.8	191.9	0.0	107.8	107.8

NOTE: Input data are based on MPAtlas. The total of **5,115 km²** of marine area is protected which corresponds to the **9.2% of total marine area**. According to the Protected Planet database, the total of **4,985 km²** of marine area is protected which corresponds to the **9% of total marine area**. Percentual differences between two databases are minor, especially keeping the mind the size of protected areas' coverage.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 24. Designations in Italy

Designation	TOTAL VALUE PER COUNTRY				
	Marine Area (km ²)	Total Area (km ²)	Top Level Fully / Highly Protected Area (km ²)	Top Level Implemented Protected Area (km ²)	Top Level Designated Protected Area (km ²)
Landscape Park (krajinski park)	1.5	3.4	0.0	1.5	1.5
National Park (Parco Nazionale)	705.7	1,733.6	0.0	705.7	705.7
Natural Marine Reserve and Natural Protected Marine Areas (Riserva Naturale Marina e Aree Naturali Marine Protette)	2,263.8	2,290.1	8.7	2,306.9	2,306.9
Other Protected Natural Regional Areas (Altre Aree Naturali Protette Regionali)	0.6	0.8	0.0	0.6	0.6
Others (Altri)	1.9	2.2	0.0	1.9	1.9
Ramsar Site, Wetland of International Importance	10.9	116.8	0.0	10.9	10.9
Regional/Provincial Nature Park (Parco naturale regionale/provinciale)	43.3	298.2	0.0	43.3	43.3
Regional/Provincial Nature Reserve (Riserva naturale regionale/provinciale)	43.6	80.4	0.0	43.6	43.6
Sites of Community Importance (Habitats Directive) (B)	5,466.8	5,614.8	0.0	5,050.0	5,466.8
Sites of Community Importance (Habitats Directive) (C)	2,868.2	2,921.6	0.0	2,868.2	2,868.2
Special Areas of Conservation (Habitats Directive) (B)	5,706.4	6,848.0	0.0	7.1	5,706.4
Special Areas of Conservation (Habitats Directive) (C)	1,626.4	2,112.9	0.0	1,626.4	1,626.4
Special Protection Area (Birds Directive)	9,768.8	11,582.5	0.0	9,768.8	9,768.8
Special Protection Area (Birds Directive) (C)	4,494.7	5,035.6	0.0	2,034.7	4,494.7
Specially Protected Areas of Mediterranean Importance (Barcelona Convention)	1,546.3	1,561.0	0.0	1,546.3	1,546.3
State Nature Reserve (Riserva Naturale Statale)	2.4	32.1	0.0	2.4	2.4
Total	34,551.2	40,233.9	8.7	26,018.2	34,594.3



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Designation	TOTAL VALUE PER COUNTRY				
	Marine Area (km ²)	Total Area (km ²)	Top Level Fully / Highly Protected Area (km ²)	Top Level Implemented Protected Area (km ²)	Top Level Designated Protected Area (km ²)
Fishery managed areas					
Areas of biological protection (Zone di Tutela Biologica, ZTB)	1,257	-	-	-	-
Coastal areas where trawling is forbidden (within 3nm or at a depth<50m)	26,700	-	-	-	-
Fishery Restricted Areas (GFCM)	6,276	-	-	-	-
OECD					
Bonifacio Strait PSSA					

NOTE: Input data are based on MPAtlas, data from draft national MSP Plans



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 25. Designations in Montenegro

Site Designations	TOTAL VALUES PER COUNTRY				
	Marine Area (km ²)	Total Area (km ²)	Top Level Fully / Highly Protected Area (km ²)	Top Level Implemented Protected Area (km ²)	Top Level Designated Protected Area (km ²)
Nature Park	38.0	47.6		38.0	38.0
Special Nature Reserve	0.4	1.4		0.4	0.4
Ramsar area	0.4	1.4		0.4	0.4

NOTE: Input data are based on MPAtlas. The total of **38.4 km²** of marine area is protected which corresponds to the **0.6 % of total marine area**. Protected planet.net enlists additional protected areas belonging to categories: Natural monument (Beach Topolica and Velika Plaža next to Ulcinj) and Landscape with special features (Ratac peninsula with Zukotrljica and Stari Ulcinj island and beach). These “additional” areas are not big in size so, according to the Protected Planet database, the total marine area protected does not increase much – 43 km² which corresponds to the 0.58 % of total marine area (relatively similar to the MPAtlas). Four additional areas from the PP database could not be added to the above calculations since the information on the coverage of marine area was not available there.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 26. Designations in Spain

Designation	TOTAL VALUE PER COUNTRY				
	Marine Area (km2)	Total Area (km2)	Top Level Fully / Highly Protected Area (km2)	Top Level Implemented Protected Area (km2)	Top Level Designated Protected Area (km2)
Marine Protected Area	56,693.50	57,041.25	0.00	49,025.20	49,025.20
Marine Protected Area (OSPAR)	26,860.30	26,886.85	0.00	26,860.30	26,860.30
Marine Conservation Zone	10.07	10.24	0.00	10.07	10.07
Marine Reserve	1,249.30	1,262.87	0.00	1,249.30	1,249.30
Marine Natural Park	4,008.00	4,009.19	0.00	4,008.00	4,008.00
National Park	2,196.50	2,507.95	0.00	1,208.40	1,208.40
Natural Monument	2.67	8.25	0.00	2.67	2.67
Natural Park	951.83	2,241.96	0.00	945.63	945.63
Natural Place (Paraje Natural)	297.52	356.13	0.00	297.52	297.52
Nature Reserve (Integral) (Reserva Natural Integral)	0.31	7.81	0.00	0.31	0.31
Nature Reserve (Parcial) (Reserva Natural Parcial)	19.19	59.30	0.00	19.19	19.19
Nature Reserve (Reserva Natural)	50.91	68.08	0.00	50.91	50.91
Nature Reserve (Special) (Reserva Natural Especial)	0.81	39.55	0.00	0.81	0.81

NOTE: The data refer to the total values for the country, thus considering both the North Eastern Atlantic and the Mediterranean designations. Input data are based on MPAtlas.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 27. Designations in Slovenia

Site Designations	TOTAL VALUES PER COUNTRY				
	Marine Area (km ²)	Total Area (km ²)	Top Level Fully / Highly Protected Area (km ²)	Top Level Implemented Protected Area (km ²)	Top Level Designated Protected Area (km ²)
Special area of conservation (Habitat Directive)	3.8	4.9	0.0	0.0	3.8
Special protection area (Birds directive)	10.6	11.7	0.0	10.6	10.6
Specially protected area	11.1	12.6	0.0	11.1	11.1
Landscape park	2.9	7.7	0.0	2.9	2.9
Natural monument	0.3	0.4	0.0	0.3	0.3
Natural reserve	0.7	1.2	0.0	0.7	0.7
Ramsar area	3.6	7.9	0.0	3.6	3.6

NOTE: Input data are based on MPAtlas. The total of **11.7 km²** of marine area is protected which corresponds to the **5.5% of total marine area**. However, according to the Protected Planet database, the total of **4 km²** of marine area is protected which corresponds to the **2.32% of total marine area**. The reason is that the Protected planet.net database omits certain protected areas such as Žusterna, Med Strunjanom in Fieso, Piranski klif, Strunjanske soline s Stjužo. On the other hand, MPAtlas does not consider Škocjanski zatok, which is protected as a Ramsar site. To have consistency with the calculations in other countries, MPAtlas was used since the coverage of protected marine areas is given there in greater detail.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Black Sea

Table 28. Designations in Bulgaria

Site Designations	TOTAL VALUES PER SEA COUNTRY				
	Marine Area (km2)	Total Area (km2)	Top Level Fully / Highly Protected Area (km2)	Top Level Implemented Protected Area (km2)	Top Level Designated Protected Area (km2)
Examples:					
Landscape Parks	0	1902,26	NA	NA	NA
Marine Parks	NA	NA	NA	NA	NA
Marine Protected Area	2821,35	2821,35	3,84	3,84	3,84
Other sub-national Natural Protected Areas	5,48	6465,35	3,84	3,84	3,84
Site of Community Importance (Habitat Directive)	2476,87	NA	NA	NA	NA
Special Protected Areas (Bird Directive)	544,89	NA	NA	NA	NA
Special Protected Areas of Mediterranean Importance	NA	NA	NA	NA	NA
State Natural Reserve	3,84		3,84		



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



TOTAL VALUES PER SEA COUNTRY					
Site Designations	Marine Area (km2)	Total Area (km2)	Top Level Fully / Highly Protected Area (km2)	Top Level Implemented Protected Area (km2)	Top Level Designated Protected Area (km2)
Regional/Provincial Natural Reserve	NA	NA	NA	NA	NA
Particularly Sensitive Sea Areas	NA	NA	NA	NA	NA
Areas To Be Avoided	749,51	749,51	NA	NA	NA
Traffic Separation Schemes	1141,2	1141,2	0	0	0



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Table 29. Designations in Romania

Site Designations	TOTAL VALUES PER SEA COUNTRY				
	Marine Area (km2)	Total Area (km2)	Top Level Fully / Highly Protected Area (km2)	Top Level Implemented Protected Area (km2)	Top Level Designated Protected Area (km2)
Examples:					
Marine Protected Area (National Natural Reserve)	73,172	73,172	31,5		
Site of Community Importance (Habitat Directive)	6056	6056,00	NA	NA	NA
Special Protected Areas (Bird Directive)	1491	1491,00	NA	NA	NA
Marine Park (Biosphere Reserve)	1280	5764,22	NA	NA	NA
Wetlands of International Importance (Ramsar Sites)	1280	5764,22	NA	NA	NA
World Heritage Site	70	3119,16			
OECD (fishing prohibition zones)	273				



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.

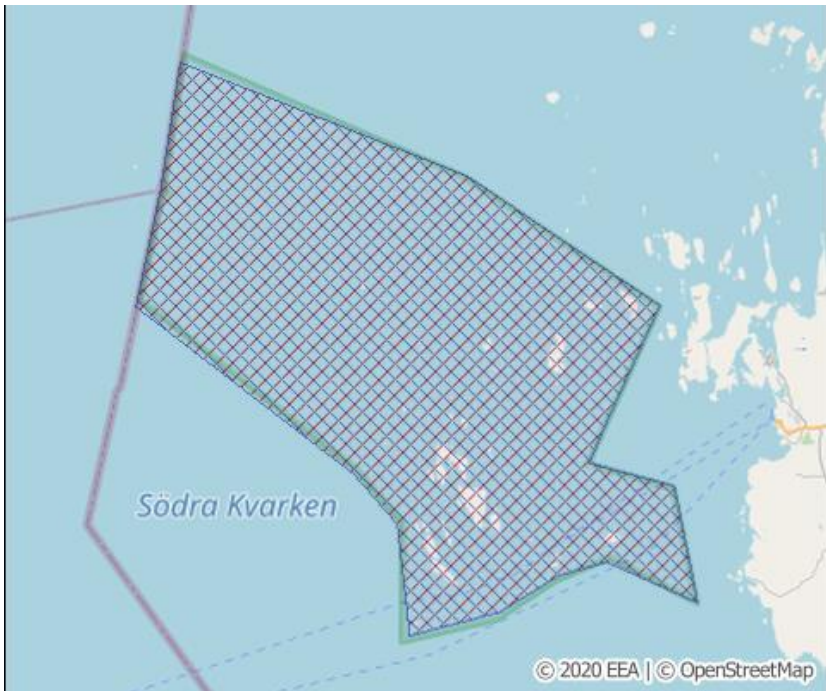




Annex 2 – Examples of area-based protection measures

Baltic Sea

1. Protected area of Signilskär- Märket Islands (FI)

Sea- basin: Baltic Sea
Country: Finland
Site name: Signilskär- Märket Islands
<p>Site map:</p> 
Designation type: NATURA 2000, HELCOM MPA, Ramsar - Designated and managed
Designation level: Subnational
Type of area: Coastal (Territorial waters)
<p>Brief general description of geographic, morphological and environmental features:</p> <p>Signilskär and its archipelago encompass approximately 50 islands and islets of varying sizes and various characteristics. The group of islands is internationally recognized for its rich birdlife. Birds are found to nest, migrate and overwinter in the area. A bird species worthy of protection is found in the area throughout the year. Sometimes during autumn when migration of birds of prey migration is most intensive, as many as 600 sparrow hawks have been observed per day</p>



in the area. Northern Europe's oldest bird-banding station, which was founded in 1927, is situated on the main island. The area also has significant cultural-historical value. Among the islands there are many valuable bird nesting islands. The vegetation on the islands is also noteworthy. The state border between Finland and Sweden is situated on Märket's lighthouse island. The Märket area consists of scattered low reefs and this region is the core area for the grey seal in the Northern Baltic Sea.

Uses and human activities in place in the area (the most relevant):

- Semi-permanent restructuring of seabed morphology
- Transport infrastructure
- Ports and other coastal constructions
- Cables & pipelines
- Extraction of sand and gravel
- Renewable energy generation (wind, wave & tidal power)
- Fish & shellfish harvesting (professional, recreational)
- Hunting and collecting (for non-food purposes)
- Aquaculture
- Forestry
- Transport - shipping
- Tourism, recreation and sports
- Research and survey
- Waste and material disposal
- Wastewater discharge

Anthropogenic pressures in marine environment (the most relevant):

- Input of nutrients and organic matter (Low)
- Input of contaminants (synthetic substances, non-synthetic substances, radionuclides)
- diffuse sources, point sources, acute events (Low)
- Disturbance of species (Low)

Ecological criteria:

- Important migration route and resting area for species
- Important reproduction area for species
- Area with high natural biodiversity
- Keystone species
- Because of biological values
- Because of marine values
- Because of terrestrial value

Scientific name	English name	Species group	Species status	Does the species justify the site's designation as an MPA?



<i>Branta leucopsis</i>	Barnacle goose	Birds	not reported	No
<i>Charadrius hiaticula hiaticula</i>	Ringed plover	Birds	not reported	No
<i>Halichoerus grypus</i>	Grey seal	Mammals	resident	Yes
<i>Sterna hirundo</i>	Common tern	Birds	not reported	No
<i>Sterna paradisaea</i>	Arctic tern	Birds	not reported	No

Management measures:

<https://www.regeringen.ax/sites/default/files/attachments/protocol/nr46-2018-enskild-s4.pdf>

https://www.regeringen.ax/sites/default/files/attachments/page/maijs-signil_ny_afs2018_nr54.pdf

Regulated activity	Regulation type	Regulation frequency
Semi-permanent restructuring of seabed morphology	prohibited	permanent
Transport infrastructure	regulated	permanent
Ports and other coastal constructions	partially regulated	permanent
Cables & pipelines	regulated	permanent
Extraction of sand and gravel	prohibited	permanent
Renewable energy generation (wind, wave & tidal power)	partially regulated	permanent
Fish & shellfish harvesting (professional, recreational)	partially regulated	periodic
Hunting and collecting (for non-food purposes)	partially regulated	permanent
Aquaculture	prohibited	permanent
Forestry	prohibited	permanent
Transport - shipping	regulated	permanent
Tourism, recreation and sports	regulated	periodic
Research and survey	regulated	permanent
Waste and material disposal	prohibited	permanent




Wastewater discharge	prohibited	permanent
<ul style="list-style-type: none"> • Zoning (designating different areas for different uses, such as no-take zones, recreation areas, and commercial fishing areas) • Fishing quotas (setting limits on the quantities of fish that can be caught to maintain healthy populations) • Gear restrictions (limiting the types of fishing gear that can be used to reduce unintended bycatch and damage to the seafloor) • Enforcement measures (monitoring and enforcing regulations to ensure compliance and deter illegal fishing activities) • Education and outreach (providing information to stakeholders and the public about the benefits of MPAs and how to comply with regulations) • Habitat protection (protecting sensitive areas and habitats, such as coral reefs and seagrass beds, from damage and disturbance) • Monitoring and evaluation (tracking changes in the MPA over time and adjusting management measures as needed based on scientific data) 		
<p>Trade-offs between sea uses and marine protection:</p> <p>Exemptions can be applied for e.g.:</p> <ul style="list-style-type: none"> • hunting, but within the constraints of the area's designation as a SPA area (N2000); • dredging for the purposes of cables, but it requires the permissions. This would require an environmental impact assessment by the Provincial Government of Åland; • fishing (both recreational and commercial) <p>And certain activities are allowed, although in restricted capacity, e.g. temporal restrictions.</p>		
<p>Coexistence and multi-use of the sea: E.g., fishing (both recreational and commercial) is allowed on the permission of the provincial government of Åland.</p>		



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



2. Marine Protected Area of the Vistula Lagoon and Vistula Spit (PL)

Sea- basin: Baltic Sea
Country: Poland
Designation type: Special Areas of Conservation (SAC) / MPA
Site name (original - PL): Zalew Wislany i Mierzeja Wislana, PLH220007
Site name (translation - EN): Vistula Lagoon and Vistula Spit, PLH220007
Site map: 
Designation status: Designated and managed
Designation level: national
Type of area: Coastal (Internal Sea Waters)
Brief general description of geographic, morphological and environmental features: <p>The Vistula Lagoon, shared by two countries Poland and Russia, is a shallow, brackish water area, important from the point of view of migratory and nesting water birds as well as the brackish and sea fish species, having their spawning there. On Polish side of the Lagoon two Natura 2000 areas (birds and habitats) are established, covering entirely the Lagoon and only the plan for the SAC is adopted. The maritime spatial planning process is in place right now – the MSP should be adopted by June 2023.</p>



Uses and human activities in place in the area (the most relevant):

- Land claim
- Canalisation and other watercourse modifications
- Coastal defence and flood protection
- Restructuring of seabed morphology, including dredging and depositing of materials
- Non-renewable energy generation Transmission of electricity and communications (cables)
- Fish and shellfish harvesting (professional, recreational)
- Transport infrastructure
- Transport — shipping
- Urban uses
- Waste treatment and disposal
- Tourism and leisure infrastructure
- Tourism and leisure activities
- Military operations
- Research, survey and educational activities

Anthropogenic pressures in marine environment (the most relevant):

- Input or spread of non-indigenous species
- Loss of, or change to, natural biological communities due to cultivation of animal or plant species
- Disturbance of species (e.g. where they breed, rest and feed) due to human presence
- Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)
- Physical disturbance to seabed (temporary or reversible)
- Physical loss (due to permanent change of seabed substrate or morphology and to extraction of seabed substrate)
- Changes to hydrological conditions
- Input of nutrients — diffuse sources, point sources, atmospheric deposition
- Input of litter (solid waste matter, including micro-sized litter)
- Input of anthropogenic sound (impulsive, continuous).

Ecological criteria:

- Protection of species (bird)
- Protection of species (mammal)
- Protection of species (fish)
- Protection of species (plant/algae)
- Important migration route and resting area for species
- Important reproduction area for species
- Area with high natural biodiversity
- Because of biological values



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



<u>Scientific name</u>	<u>English name</u>	<u>Species group</u>	<u>Species status</u> N.R. = not reported	<u>Does the species justify the site's designation as an MPA?</u>
<i>Actitis hypoleucos</i>	Common sandpiper	Birds	N.R.	No
<i>Alosa fallax</i>	Twaite shad	Fish and lamprey species	N.R.	Yes
<i>Anas clypeata</i>	Shoveler	Birds	N.R.	Yes
<i>Anas strepera</i>	Gadwall	Birds	N.R.	No
<i>Anser anser</i>	Greylag goose	Birds	N.R.	Yes
<i>Anser fabalis fabalis</i>	Taiga bean goose	Birds	N.R.	Yes
<i>Aythya fuligula</i>	Tufted duck	Birds	N.R.	Yes
<i>Aythya marila</i>	Greater scaup	Birds	N.R.	No
<i>Bucephala clangula</i>	Goldeneye	Birds	N.R.	Yes
<i>Cobitis taenia</i>	Spined loach	Fish and lamprey species	N.R.	No
<i>Cygnus olor</i>	Mute swan	Birds	N.R.	Yes
<i>Haliaeetus albicilla</i>	White-tailed sea-eagle	Birds	N.R.	Yes
<i>Halichoerus grypus</i>	Grey seal	Mammals	N.R.	Yes
<i>Hydrocoloeus minutus</i>	Little gull	Birds	N.R.	Yes
<i>Lampetra fluviatilis</i>	River lamprey	Fish and lamprey species	N.R.	Yes
<i>Larus argentatus</i>	Herring gull	Birds	N.R.	Yes
<i>Larus canus</i>	Mew gull	Birds	N.R.	No
<i>Larus marinus</i>	Greater black-backed gull	Birds	N.R.	No



<i>Larus melanocephalus</i>	Mediterranean gull	Birds	N.R.	No
<i>Lutra lutra</i>	Eurasian otter	Mammals	N.R.	No
<i>Pelecus cultratus</i>	Razor-fish	Fish and lamprey species	N.R.	Yes
<i>Petromyzon marinus</i>	Sea lamprey	Fish and lamprey species	N.R.	Yes
<i>Phalacrocorax carbo sinensis</i>	Long-tailed cormorant	Birds	N.R.	Yes
<i>Philomachus pugnax</i>	Ruff	Birds	N.R.	No
<i>Podiceps cristatus</i>	Great-crested grebe	Birds	N.R.	No
<i>Podiceps grisegena</i>	Red-necked grebe	Birds	N.R.	No
<i>Rhodeus sericeus/Rhodeus amarus</i>	Bitterling (european)	Fish and lamprey species	N.R.	No
<i>Sterna hirundo</i>	Common tern	Birds	N.R.	No
<i>Sterna paradisaea</i>	Arctic tern	Birds	N.R.	No
<i>Tadorna tadorna</i>	Common shelduck	Birds	N.R.	Yes
<i>Tringa totanus</i>	Common redshank	Birds	N.R.	No

(data source: http://mpas.helcom.fi/apex/f?p=103:12:::NO::P12_ID:83)

Habitats/ Biotope complexes which justify the site's designation as an MPA

Code	Habitat/ Biotope complex name
1130	Estuaries
1150	Coastal lagoons
2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")
2180	Wooded dunes of the Atlantic, Continental and Boreal region

Management measures:

The legal act on the establishment of the protection plan for the Vistula Lagoon and Vistula Spit (PLH280007) is a regulation issued by the Minister of Climate and Environment. This



important legislation, enacted on December 7, 2022, and officially announced on December 21, 2022, has been in effect since January 5, 2023.

The protection plan for the Vistula Lagoon and Vistula Spit, a special area of habitat protection under Natura 2000, encompasses several key components to ensure the proper conservation and management of the area. These components include:

- **Definition of boundaries:** The plan provides a clear description of the area's boundaries and includes a map of the Natura 2000 Area. This helps to establish the scope of the protected zone.
- **Identification of threats:** The plan identifies both existing and potential threats to the preservation of natural habitats, species of plants and animals, and their respective habitats within the protected area. This understanding is crucial for effective conservation efforts.
- **Conservation status conditions:** The plan determines the necessary conditions for maintaining or restoring the proper conservation status of the protected objects within the Natura 2000 Area. It aims to preserve the integrity of the area and ensure coherence within the broader network of Natura 2000 sites.
- **Spatial development adjustments:** The plan provides recommendations for changes in existing studies and local spatial development plans to mitigate or eliminate internal and external threats to the protected area. This involves aligning development activities with the goal of nature conservation.
- **Protective measures and responsible entities:** The plan specifies protective measures required to maintain or restore the proper conservation status of the protected objects within the Natura 2000 Area. Additionally, it identifies the entities responsible for implementing these measures, ensuring accountability and efficient management.
- **Indicators of favourable conservation status:** The plan establishes indicators to assess and monitor the favourable conservation status of natural habitats, species of plants and animals, and their respective habitats within the protected area. These indicators serve as benchmarks for evaluating the success of conservation efforts.
- **Implementation monitoring:** The plan defines methods for monitoring the implementation of protective measures and their effectiveness. This monitoring process helps ensure that the intended conservation actions are being carried out as planned.
- **Conservation status monitoring:** The plan outlines methods for monitoring the conservation status of natural habitats, species of plants and animals, and their respective habitats within the protected area. This ongoing monitoring provides valuable data for assessing the overall health and effectiveness of conservation measures.

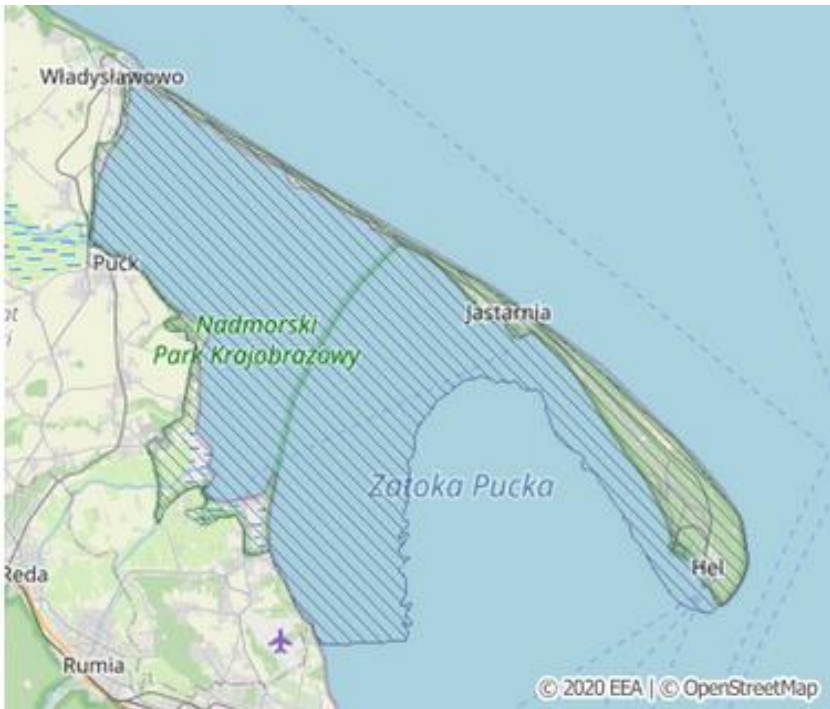
By incorporating these essential elements, the protection plan for the Vistula Lagoon and Vistula Spit aims to effectively manage and safeguard the ecological integrity of the protected area under the Natura 2000 framework.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



3. Protected area of the Puck Bay and Hel Peninsula (PL)

Sea-basin: Baltic Sea
Country: Poland
Designation type: Special Areas of Conservation (SAC)
Site name (original - PL): Zatoka Pucka i Półwysep Helski, PLH220032
Site name (translation - EN): The Puck Bay and Hel Peninsula, PLH220032
Site map: 
Designation status: Designated
Designation level: national
Type of area: Coastal (Internal Sea Waters)
Brief general description of geographic, morphological and environmental features: <p>The Puck Bay, located next to Tricity district, is a shallow, brackish water area, important from the point of view of migratory and nesting water birds as well as the brackish and sea fish species, having their spawning there. Two Natura 2000 areas (birds and habitats) are established here, covering entirely the Bay. The plans of managements for both of Natura areas were prepared and proposed but not adopted. The maritime spatial planning process is in place right now – the MSP should be adopted in near future.</p>
Uses and human activities in place in the area (the most relevant):



- Land claim
- Canalisation and other watercourse modifications
- Coastal defence and flood protection
- Restructuring of seabed morphology, including dredging and depositing of materials
- Non-renewable energy generation Transmission of electricity and communications (cables)
- Fish and shellfish harvesting (professional, recreational)
- Fish and shellfish processing
- Agriculture Forestry
- Transport infrastructure
- Transport — shipping
- Transport — land
- Urban uses
- Industrial uses
- Waste treatment and disposal
- Tourism and leisure infrastructure
- Tourism and leisure activities
- Military operations (subject to Article 2(2))
- Research, survey and educational activities.

Anthropogenic pressures in marine environment (the most relevant):

- Input or spread of non-indigenous species
- Loss of, or change to, natural biological communities due to cultivation of animal or plant species
- Disturbance of species (e.g. where they breed, rest and feed) due to human presence
- Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)
- Physical disturbance to seabed (temporary or reversible)
- Physical loss (due to permanent change of seabed substrate or morphology and to extraction of seabed substrate)
- Changes to hydrological conditions
- Input of nutrients — diffuse sources, point sources, atmospheric deposition
- Input of litter (solid waste matter, including micro-sized litter)
- Input of anthropogenic sound (impulsive, continuous)
- Input of water — point sources (e.g. brin

Ecological criteria:

- Protection of species (bird)
- Protection of species (mammal)
- Protection of species (fish)
- Protection of species (plant/algae)
- Protection of habitat (coastal - soft bottom)
- Important migration route and resting area for species
- Important reproduction area for species (fish, birds)
- Area with high natural biodiversity
- Because of biological values



<u>Scientific name</u>	<u>English name</u>	<u>Species group</u>	<u>Species status</u> N.R. = not reported	<u>Does the species justify the site's designation as an MPA?</u>
<i>Alosa fallax</i>	Twaite shad	Fish and lamprey species	N.R.	Yes
<i>Anser fabalis fabalis</i>	Taiga bean goose	Birds	N.R.	No
<i>Arenaria interpres</i>	Ruddy turnstone	Birds	N.R.	No
<i>Aspius aspius</i>	Asp	Fish and lamprey species	N.R.	No
<i>Aythya fuligula</i>	Tufted duck	Birds	N.R.	Yes
<i>Aythya marila</i>	Greater scaup	Birds	N.R.	Yes
<i>Branta leucopsis</i>	Barnacle goose	Birds	N.R.	No
<i>Bucephala clangula</i>	Goldeneye	Birds	N.R.	Yes
<i>Calidris alpina alpina</i>	Dunlin	Birds	N.R.	Yes
<i>Charadrius alexandrinus</i>	Kentish plover	Birds	N.R.	No
<i>Charadrius hiaticula hiaticula</i>	Ringed plover	Birds	N.R.	Yes
<i>Clangula hyemalis</i>	Long-tailed duck	Birds	N.R.	No
<i>Cygnus olor</i>	Mute swan	Birds	N.R.	Yes
<i>Gavia arctica</i>	Black-throated diver	Birds	N.R.	No
<i>Gavia stellata</i>	Red-throated diver	Birds	N.R.	No
<i>Haematopus ostralegus</i>	Eurasian oystercatcher	Birds	N.R.	No
<i>Haliaeetus albicilla</i>	White-tailed sea-eagle	Birds	N.R.	No



<i>Halichoerus grypus</i>	Grey seal	Mammals	N.R.	Yes
<i>Hydrocoloeus minutus</i>	Little gull	Birds	N.R.	No
<i>Hydroprogne caspia</i>	Caspian tern	Birds	N.R.	No
<i>Lampetra fluviatilis</i>	River lamprey	Fish and lamprey species	N.R.	Yes
<i>Larus argentatus</i>	Herring gull	Birds	N.R.	Yes
<i>Larus melanocephalus</i>	Mediterranean gull	Birds	N.R.	No
<i>Lutra lutra</i>	Eurasian otter	Mammals	N.R.	No
<i>Melanitta fusca</i>	Velvet scoter	Birds	N.R.	Yes
<i>Mergus merganser</i>	Common merganser	Birds	N.R.	Yes
<i>Mergus serrator</i>	Red-breasted merganser	Birds	N.R.	Yes
<i>Misgurnus fossilis</i>	Weatherfish	Fish and lamprey species	N.R.	No
<i>Phalacrocorax carbo sinensis</i>	Long-tailed cormorant	Birds	N.R.	Yes
<i>Philomachus pugnax</i>	Ruff	Birds	N.R.	No
<i>Phocoena phocoena</i> (Baltic Sea subpop)	Harbour porpoise	Mammals	N.R.	Yes
<i>Podiceps auritus</i>	Horned grebe	Birds	N.R.	No
<i>Podiceps cristatus</i>	Great-crested grebe	Birds	N.R.	No
<i>Recurvirostra avosetta</i>	Pied avocet	Birds	N.R.	No
<i>Salmo salar</i>	Atlantic salmon	Fish and lamprey species	N.R.	No
<i>Sterna hirundo</i>	Common tern	Birds	N.R.	Yes
<i>Sterna paradisaea</i>	Arctic tern	Birds	N.R.	No



<i>Sterna sandvicensis</i>	Sandwich tern	Birds	N.R.	Yes
<i>Sternula albifrons</i>	Little tern	Birds	N.R.	Yes
<i>Tadorna tadorna</i>	Common shelduck	Birds	N.R.	Yes
<i>Tringa totanus</i>	Common redshank	Birds	N.R.	No
<i>Xenus cinereus</i>	Terek sandpiper	Birds	N.R.	No

(datasource: http://mpas.helcom.fi/apex/f?p=103:12:::NO::P12_ID:84)

Habitats/ Biotope complexes which justify the site's designation as an MPA

Code	Habitat/ Biotope complex name
1130	Estuaries
1160	Large shallow inlets and bays
1210	Annual vegetation of drift lines
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")
2170	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)
2180	Wooded dunes of the Atlantic, Continental and Boreal region

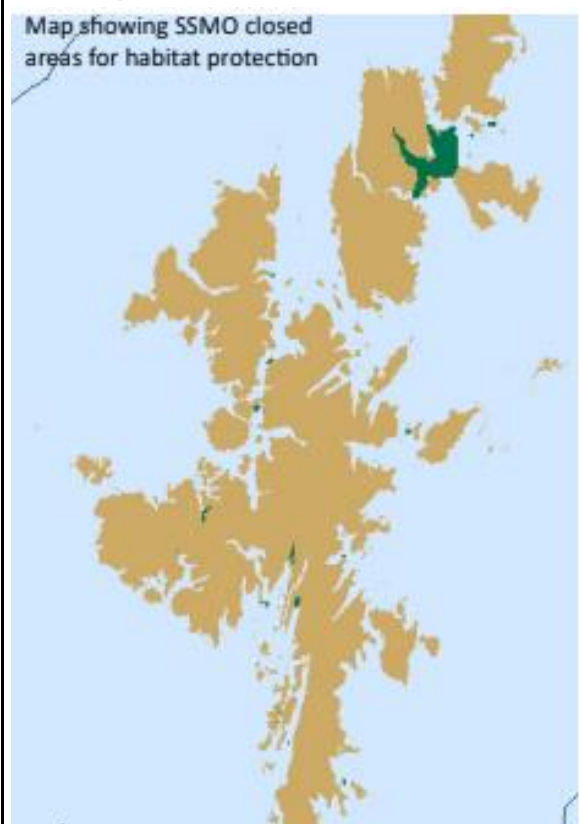


North Sea

1. SSMO Closed Areas (UK, Scotland)

Site name: SSMO Closed Areas (SSMO = Shetland Shellfish Management Organisation)

Site map:



Locations of the SSMO closed areas indicated in green. Source: SIRMP, 2022).

Designation type: Statutory closed areas volunteered by SSMO

Also closed for all licensed activities (not just scallop dredging), so for example the area is closed for aquaculture and renewables but not for creelers

Designation level: Subnational

Type of area: Coastal

Brief general description of geographic, morphological and environmental features:

The Shetland Islands is an archipelago found 160km from the Scottish mainland, and 320km west of Norway. The archipelago consists of over 100 islands, 16 of which are inhabited. The North Sea is found to the east of Shetland, and the Atlantic Ocean to the west. The SSMO



closed areas are all found within six nautical miles of Shetland's coastline, which is complex and varied, and hosts important natural heritage (Shetland Islands Marine Planning Partnership, 2021)

Uses and human activities in place in the area:

Fish and shellfish harvesting (professional)

Shetland's coastal waters host a variety of fisheries targeting demersal fish and shellfish with passive gear as well as trawling gear. Out to six nautical miles, fisheries targeting shellfish are managed by the SSMO.

Anthropogenic pressures in marine environment:

Physical disturbance to the seabed

Ecological criteria:

Protection of habitat (coastal – soft bottom)

Presence of maerl beds, horse mussel (*Modiolus modiolus*) beds and seagrass beds (all three included in the OSPAR List of Threatened and/or Declining Species and Habitats (OSPAR, 2023)) which are at least 25m² in size (threshold aligns with specifications OSPAR (OSPAR, 2008)). These ecological features are also PMFs (Priority Marine Features) as defined in 2014 by the Scottish Government (Wilding, C. *et al.*, 2016)

Management measures:

Measures correspond to "No take zone" for scallop fishing through SSMO's management plan and "Regulated access" for other licensed activities through the marine planning policy MPA4 of the SIRMP (Shetland Islands Regional Marine Plan).

Scallop fishing is prohibited in these areas, which is enforced through the management plan referred to in SSMO Regulation 7 (SSMO, 2022). Bottom-trawling methods harmful for habitats are prohibited in the closed areas. The closed areas include the protected features along with a buffer of around 50m around the habitats, depending on sea depth, to allow the beds to have room to grow.

SSMO closed areas are also prohibited for all licensed activities through **Policy MP MPA4** of the Shetland Islands Regional Marine Plan (Shetland Islands Marine Planning Partnership, 2021). Restrictions are in place for those closed areas, along with Shetland-wide conservation measures.

Trade-offs between sea uses and marine protection: challenges and achievements:

Scale interpretation: 1=easiest, 5 is hardest

How challenging was it to achieve a compromise?

Answer = 2/5

For the establishment of the closed areas, a compromise was achieved: there was the willingness of the fishers to provide data, and there was back and forth communication between the research institute (UHI Shetland) and the fishers to collect and validate data on the whereabouts of the seagrass, horse mussel and maerl beds.

How much do you think the solution found meets optimal protection objectives?

Answer = 3/5



This score was given because the protection objectives are met as how they were defined, but to get a higher score more information on genetic connectivity would be needed and the closed areas should be combined with wider seas measures

Coexistence and multi-use of the sea: good practices:

The closing of the areas was a bottom-up approach where the initiative for the closed areas came from the shellfish management organisation, which allows to have agency over the planning, designation and management of the closed areas. Conversations around the areas to be designated were inclusive, fishers participated in the decisions around what the buffer size around the features should be. The proposal of the fishers to define reefs/beds instead of locations of individual organisms, aligned with OSPAR specifications (that define 25m² as the minimum threshold for a reef/bed).

Voluntarily closing areas for fishing allowed them to be ahead of the ‘conservation creep’ experienced by them. ‘Conservation creep’ refers to the top-down plans to close areas for fisheries, e.g. to designate highly protected MPAs in Scottish waters, or the development of Scotland-wide fisheries measures to protect Priority Marine Features (PMFs). The top-down approach for these Scotland-wide initiatives make the fishing organisation feel they don’t have agency, that they are not part of the decision making of this designation process, and by voluntarily closing areas themselves they can be empowered to be part of the process, they have agency.

A benefit to this bottom-up approach was that the process went ahead at the pace suited to the involved fishers and their representatives, which is trickier with processes that have government-imposed deadlines, that might not account for times of the year fishers will have less time to dedicate to the setting up of measures, as they may be out fishing more often.

As well as that, compromises were made more readily with this bottom-up approach. For example, when the scallop fishers were sceptical of the outdated locations of the ecological features at the beginning of the process, they implemented a voluntary closure until the locations were verified.

The locations of the features to be protected were validated by data collection, as well as the locations of areas where these features were not found (so data is available on both presence and absence of the features). This means there was no need to take a precautionary approach in the areas where the features are known not to occur.

Looking forward, the challenge to keeping the positive perception by fishers is the extent to which they will be asked to give up more of their fishing grounds, especially when this comes from top-down initiatives. Another challenge is the way in which other activities are managed in comparison to fisheries – if measures are only imposed for fishing activities and not for other activities such as aquaculture and cable trenching, they would feel disadvantaged.

Policy context in which the OECM has been established

The closed areas are implemented through *The Shetland Islands Regulated Fishery (Scotland) Order, 2012*, which regulates all shellfish fishing out to 6 nm from the Shetland coastline (excluding *Nephrops* fishing which is regulated by ICES).

The implementation of the closed areas happened around the same time as the setting up of the marine plan, so there was a stocktake of what pressures are affecting the marine



environment. This included feature mapping and pressure mapping, and conversations were happening on how to address pressures per sector.

The marine plan provided data to SSMO on features vulnerable to fisheries, and the fishing industry was sceptical, and asked for ground-truthing (and they were right to be sceptical in the end, historic data was inaccurate).

It also happened around the same time of an MSC accreditation opportunity, for which the closed areas could help demonstrate sustainable practice (*Shetland Crab and Scallop: Shetland's Sustainable Shellfish*, no date)

So the following important factors set the scene for the closed areas:

Regulating order

MSC accreditation

Development of marine planning (the plan was in development: there was a policy framework, voluntary policies, and a lot of mapping going on, since 2006)

Desire fishing industry to take control and better understand pressures and habitats themselves (instead of waiting for a top-down approach)

Their voluntary closed areas allowed them to be more involved in the conversation to meet biodiversity objectives, to have a stronger say in the process (more agency)

In summary, the fishing organisation wanted procedural justice, to be more engaged, so they can ensure equitable outcomes that also take their perspective into account.

Main sector(s) involved in the OECM:

Scallop fishing

Main environmental impacts targeted:

Physical disturbance to the seabed

Direct and indirect implications for biodiversity and ecosystem protection of the OECM:

Direct: protection of biogenic habitat from physical disturbance

Indirect: habitats themselves provide wider ecosystem functions (nursery function, carbon sequestration, improved water quality)

Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring:

Monitoring of ecological features

Not monitored, nor are any of the MPAs in the UK

SACs in Shetland: last monitoring was 15 years ago

Approach Scotland: there is no need for monitoring if pressure has been removed (so there is no consideration of monitoring to check compliance)

There is potential to use acoustics for monitoring (could be cheaper than diving teams) by UHI Shetland if financial and human resources would be more available

Compliance measures

For compliance, according to a report by FCI, VMS data are used to verify compliance to the closed areas, and no vessels have been recorded within them (FCI, 2014)



Opportunities for establishing this type of OECMs in other areas of the sea-basins:

The bottom-up approach increased trust and buy-in, the concerns by the fishers around the data were validated through new data collection, their voices were heard, and action was taken. This bottom-up approach was made possible through the Regulating Order (RO), which gives control of an area to vested stakeholders in the region. This bottom-up approach is definitely recommended for other places. Also, the achieved buy-in leads to better adherence to the compliance of the closed area measure. It also allowed them to get MSC accreditation, which provides economic benefits.

The consideration of procedural justice led to acceptance of the measures.

A challenge was that the historic data on the location of the sensitive features was inaccurate, which meant new data collection was needed which was expensive and time consuming.

Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation:

Strength: physical disturbance on the sensitive habitats is removed.

Now the process was perceived positively by the fishing industry, but there is a risk this perception will change if new features to be protected will be found, as that would mean more closed areas would need to be designated.

Weakness: feature-based, doesn't consider pollution, it's a measure that's independent of the management of the wider environment (but in the Shetland context pollution is less of an issue)

Potential for strengthening of protection measures:

A weakness to the measure was that it only applied to the shellfishing sector. To strengthen the measures, the closed areas were also applied to other sectors through the SIRMP (Shetland Islands Marine Planning Partnership, 2021). This posed a challenge as it meant other sectors had to agree to adhere to closed areas suggested by another sector. The designated areas as of 2019 were included in the marine plan, but if more features to be protected (seagrass/horse mussel/maerl) are identified in the future, the delineation of closed areas will be consulted on with other sectors before being designated.

Further improvements to the closed areas would be a consideration of connectivity between the protected habitats. More information is needed on genetic connectivity for this, e.g. maerl connectivity, as different beds might be separate species, which would mean beds smaller than 25m² (which is the threshold) might also be important to protect (if they are separate species)



Sources

FCI (2014) Off Site Surveillance Visit - Report for SSMO Shetland Inshore Brown and Velvet Crab and Scallop Fishery.

OSPAR (2008) Descriptions of habitats on the OSPAR List of threatened and/or declining species and habitats (OSPAR Agreement: 2008-07). Available at: <https://www.ospar.org/documents?v=32797> (Accessed: 29 March 2023).

OSPAR (2023) List of Threatened and/or Declining Species & Habitats, OSPAR Commission. Available at: <https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats/habitats> (Accessed: 29 March 2023).

Shetland Crab and Scallop: Shetland's Sustainable Shellfish (no date). Available at: <https://stories.msc.org/uk/shetland-crab-scallop> (Accessed: 29 March 2023).

Shetland Islands Marine Planning Partnership (2021) Shetland Islands Regional Marine Plan. NAFC Marine Centre UHI, p. 158.

SIRMP (2022) 'Shetland Marine Planning Partnership Newsletter'. Available at: <https://www.shetland.uhi.ac.uk/t4-media/one-web/shetland/research/document/marine-spatial-planning/newsletters/Issue-3-winter-22-23.pdf> (Accessed: 16 May 2023).

SSMO (2022) 'Shetland Shellfish Management Organisation (SSMO) Regulations'. Available at: https://www.ssmo.co.uk/site/assets/files/1/ssmo_regulations_-_sept_2022-1.pdf (Accessed: 29 March 2023).

'The Shetland Islands Regulated Fishery (Scotland) Order' (2012).

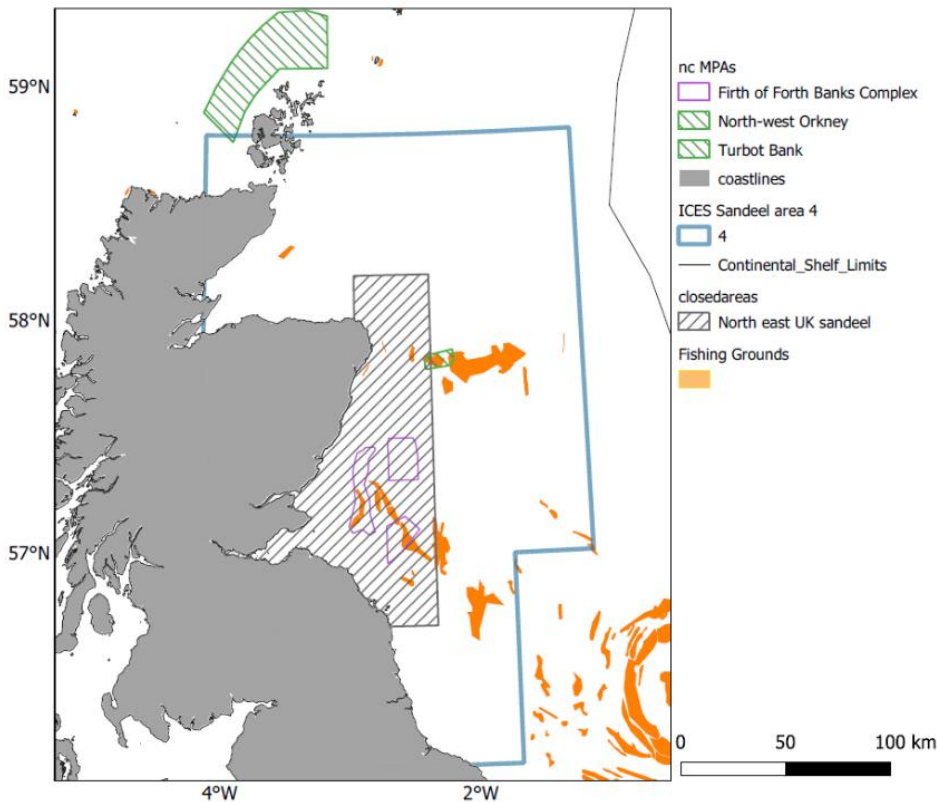
Wilding, C. et al. (2016) 'Descriptions of Scottish Priority Marine Features (PMFs)'. Available at: https://www.nature.scot/sites/default/files/Publication_2016_-_SNH_Commissioned_Report_406_-_Descriptions_of_Scottish_Priority_Marine_Features_%28PMFs%29.pdf.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



2. North-western North Sea Sandeel Fishery Closure (UK, Scotland)

Sea- basin: North Sea
Country: UK (Scotland)
Site name: North-western North Sea Sandeel Fishery Closure
Site map: 
<i>Location of the sandeel fishery closure (source map: ICES 2021).</i>
Designation type: Precautionary fisheries closure
Designation level: European, then national after Brexit.
Type of area: Coastal, offshore
Brief general description of geographic, morphological and environmental features: <p>The area covered by the fishery closure is of about 20,000km² west of 1°W (see map above), from the sea area alongside Fraserburgh in the north of the area, down to Newcastle in the south (overlap with both English and Scottish EEZ). The fishery closure is now exclusively in UK waters following Brexit and is an important area for several marine species and seabirds. It also overlaps with several important Scottish marine protected areas.</p>



Uses and human activities in place in the area:

Fish and shellfish harvesting (professional)

Sandeel fisheries in the North Sea are mainly done by Danish vessels, followed by Norway. Main fishing grounds for sandeel are in the Dogger Banks, between the EEZs of the UK, The Netherlands and Germany (mainly in the UK EEZ), and fisheries run typically between April and July. Other important fisheries in the area target horse mackerel, haddock and herring.

Renewable energy generation (wind, wave, tidal power) including infrastructure.

In the area, the Scottish government granted permits for several large-scale offshore renewable energy projects off the Firth of Forth and the coast of Aberdeen. Some are already operational (e.g. Kincardine Floating Offshore Wind Farm, Aberdeen Bay offshore wind test pilot), and some are undergoing construction (e.g. Moray West Offshore Wind Farm, Neart Na Goithe Offshore Wind Farm Limited). Others are still in earlier stages and have started environmental studies (e.g. Berwick Bank Wind Farm).

Anthropogenic pressures in marine environment:

- Physical disturbance to seabed (temporary)
- Extraction of wild species (by commercial fishing)
- Changes to hydrological conditions (due to climate change)

Ecological criteria:

Protection of species (fish), protection of species (seabird)

The Firth of Forth, off the east coast of Scotland, is an important breeding ground for several seabird and marine species. The Forth Islands, ranging from Bass Rock to Haystack are colonies to Atlantic puffins, gulls, and gannets, with some colonies gathering more than 200,000 individuals (Marine Scotland, 2020). Several of those seabird colonies (mainly kittiwake, puffin, gannets, shags, guillemots, and razorbills) are included in the OSPAR threatened list of species.

The area also hosts the largest distribution of sandeels, with important grounds throughout the area (Wee Bakie, Marr and Berwick Banks). The seabed of the north-western coast of Scotland is mainly composed of subtidal sands and gravel, a suitable environment for sandeels. Further offshore, the seabed is, for an important part of the fishery closure, composed by deep sea muds. Both are Priority Marine Features for the Scottish government. Sandeel are important prey species for several seabird species, that rely on it for survival.

Management measures:

Management corresponds to a “regulated gear measure” by the European Council.

Fishing for sandeel using a towed gear with a mesh size of less than 32 mm within the closed area is prohibited in the fishery closure. Fisheries for scientific investigation, however, are allowed but only for the purpose of monitoring sandeel stocks. (EU Regulation 2019/1241).

Trade-offs between sea uses and marine protection: challenges and achievements:

Scale interpretation: 1 = easiest, 5 = hardest.

How challenging was it to achieve a compromise?

Answer = 2/5.



A compromise achieved without difficulties, as sandeel fishing industry was involved in the process from the beginning as well as local communities and environmental NGOs. All stakeholders were aware of the decline in threatened seabird populations and recognized the importance of sandeel in the food web and were in favour of a closure of sandeel fishing.

How much do you think the solution found meets optimal protection objectives?

Answer = 4/5.

Following the closure, sandeel abundance increased, particularly in age 1+ individuals, which had an impact on several seabird species and particularly kittiwakes. Protecting this crucial prey species meant a positive impact on a diversity of other marine species. However, environmental conditions play an essential role in sandeel distribution, with climate change and associated sea temperature rise have an important adverse effect. Sandeel fisheries also continue around the closed area.

Coexistence and multi-use of the sea: present good practices (info to be collected from interviews and/or desk analysis):

The sandeel fishery closure shows a good practice of clear and well-established objectives. Relevant stakeholders were involved from the beginning (sandeel fishery, coastal communities, and environmental NGOs). It shows the adoption of a precautionary approach by both the EU and the UK government, that acted on ICES recommendations.

Policy context in which the OECM has been established:

In the 1990s, a sandeel fishery developed in ICES Area 4, with landings peaking at over 100,000 tons in 1993 (ICES, 2021), thus affecting seabird colonies along the coast. In 1999, the UK requested a moratorium on sandeel fishery to preserve seabird colonies, and the EU requested advice from ICES.

ICES noted the 1990s' fishery coincided with a low breeding success of seabirds, and particularly kittiwakes, and called for a precautionary closure. The EU then advised the area to be closed to sandeel fishing for three years, starting in 2000, through first EC Regulation No 850/09, then through EC No 2000/1298. The EU Commission was requested to produce annual reports to the Council regarding the effects of the closure; based on such reports, the closure was maintained for another three years. The closure was then passed under UK legislation following Brexit.

Main sector(s) involved in the OECMs:

UK government, sandeel fishery and ICES

Main environmental impacts targeted:

The main environmental impact targeted is the depletion of sandeel stocks and the associated depletion of seabird colonies relying on sandeel for subsistence.

Direct and indirect implications for biodiversity and ecosystem protection of the OECM

Direct: protection of sandeel populations.

Indirect: food availability for seabird species, some species of commercial fish and some marine mammals. Breeding success of kittiwake has been higher since the closure, but this is not the case for all sandeel-reliant seabird species.



Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring:

The fishery closure was assessed in 2000 and 2001, and then in 2007. The fishery closure is monitored through the UK Seabird Monitoring Programme lead by JNCC, as well as by specific monitoring programmes around the Isle of May.

However, understanding the effect of the sandeel fishery on sandeel-reliant seabird species is highly complex and assessment is lacking. *“This fishery closure has now been in place for over two decades, yet no comprehensive assessment of the long-term impact of closure on breeding success of kittiwakes and other seabirds breeding in the region has been made since the initial studies”* (Searle et al, 2023, p.3)

Opportunities for establishing this type of OECMs in other areas of the sea-basins:

This fishery closure has been established after a strong decline of seabird species relying on sandeel was noticed, in an area that hosts large seabird colonies. There are several factors that allowed for a relatively efficient fishery closure. First, the Royal Society for the Protection of Birds (RSPB), an important UK NGO strongly advocated for closing areas to sandeel fishing to protect seabird colonies. Secondly, the closure has been relatively effective also because sandeel are largely resident species, that rarely disperse more than 30km from their native grounds, allowing for population increase once fishing pressure is removed. Single fisheries closures for other migrating species might not prove to be as efficient.

Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation:

Strengths

All stakeholders were included from the beginning and authorities acted based on ICES knowledge, thus the closure was rather well accepted. Protecting a species at the basis of the food web allows for protection of several other species feeding on sandeel.

Weaknesses

The EU Commission did not accept to use breeding success of kittiwake as an index for reopening the fishery closure, and no alternative criteria has been put in place to do so. Therefore, there is no formal way of assessing whether the fishing closure effectively contribute to the conservation of seabird species, and to what extent. This goes together with a general lack of scientific knowledge on sandeel stock. Moreover, the fishing closure was adopted as a response to an existing problem (decline of seabirds), when such area-based tools should be used before such problem arise (precautionary approach). Also, since Brexit there is a risk that the following government will not maintain the fishing closure.

Potential for strengthening of protection measures:

The technical measures in place only apply to benthic gear, leaving the water column unprotected. It would be good if all fishing gear susceptible to catch sandeel was prohibited in the closed area, in order to allow for full protection. It would also be important to consider connectivity aspects between the protected zones, namely between the fishery closure and the overlapping MPA.

Sources



- Daunt, F., Wanless, S., Greenstreet, S., Jensen, H., Hamer, K., Harris, M. 2008. The impact of the sandeel fishery closure on seabird food consumption, distribution, and productivity in the northwestern North Sea. *Canadian Journal of Fisheries and Aquatic Sciences*, vol 65. Doi 10.1139/f07-164
- Dunn, E.. 2021. Revive our Seas: The case for stronger regulation of sandeel fisheries in UK waters. RSPB report.
https://www.rspb.org.uk/globalassets/downloads/documents/campaigning-for-nature/rspb2021_the-case-for-stronger-regulation-of-sandeel-fisheries-in-uk-waters.pdf
- European Commission, 2007. Commission Staff Working Document – Evaluation of Closed Area Schemes (SGMOS-07-03). Subgroup on management of stocks (SGMOS) of the Scientific, Technical and Economic Committee for Fisheries (STECF).
https://stecf.jrc.ec.europa.eu/documents/43805/44876/07-09_SG-MOS+07-03+-+Evaluation+of+closed+areas+II.pdf
- Greenstreet, S., Fraser, H., Amrstrong, E., Gibb, I. 2014. Monitoring the Consequences of the Northwestern North Sea Sandeel Fishery Closure. Scottish Marine and Freshwater Science Reports. <https://data.marine.gov.scot/dataset/monitoring-consequences-northwestern-north-sea-sandeel-fishery-closure>
- ICES. 2021. ICES/IUCN-CEM FEG Workshop on Testing OECM Practices and Strategies (WKTOPS). ICES Scientific Reports. 3:42. 195 pp. <https://doi.org/10.17895/ices.pub.8135>
- Marine Scotland Assessment, 2020. *Case Study: Sandeels in Scottish Waters*.
<https://marine.gov.scot/sma/assessment/case-study-sandeels-scottish-waters>.
- OSPAR. 2008. Descriptions of habitats on the OSPAR List of threatened and/or declining species and habitats (OSPAR Agreement: 2008-07).
<https://www.ospar.org/documents?v=32797>
- OSPAR. 2023. List of Threatened and/or Declining Species & Habitats. OSPAR Commission.
<https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats/habitats>
- Searle, K.R., Regan C.E, Perrow, M.R., Butler, A., Rindorf, A. Harris, M.P., Newell, M.A., Wanless, S., Daunt F. Effects of a fishery closure and prey abundance on seabird diet and breeding success: Implications for strategic fisheries management and seabird conservation. *Biological Conservation*, Volume 281, 2023. <https://doi.org/10.1016/j.biocon.2023.109990>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



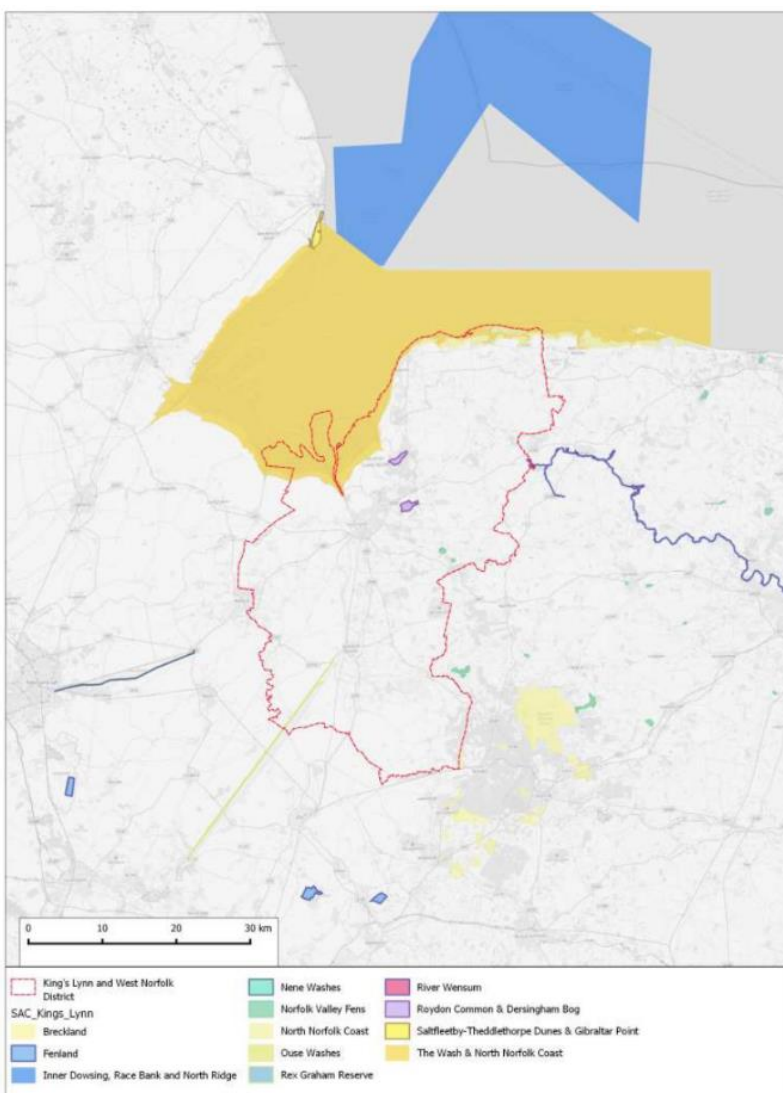
3. Eastern IFCA and the Wash and North Norfolk Coast SAC (UK, England)

Sea- basin: North Sea

Country: UK (England)

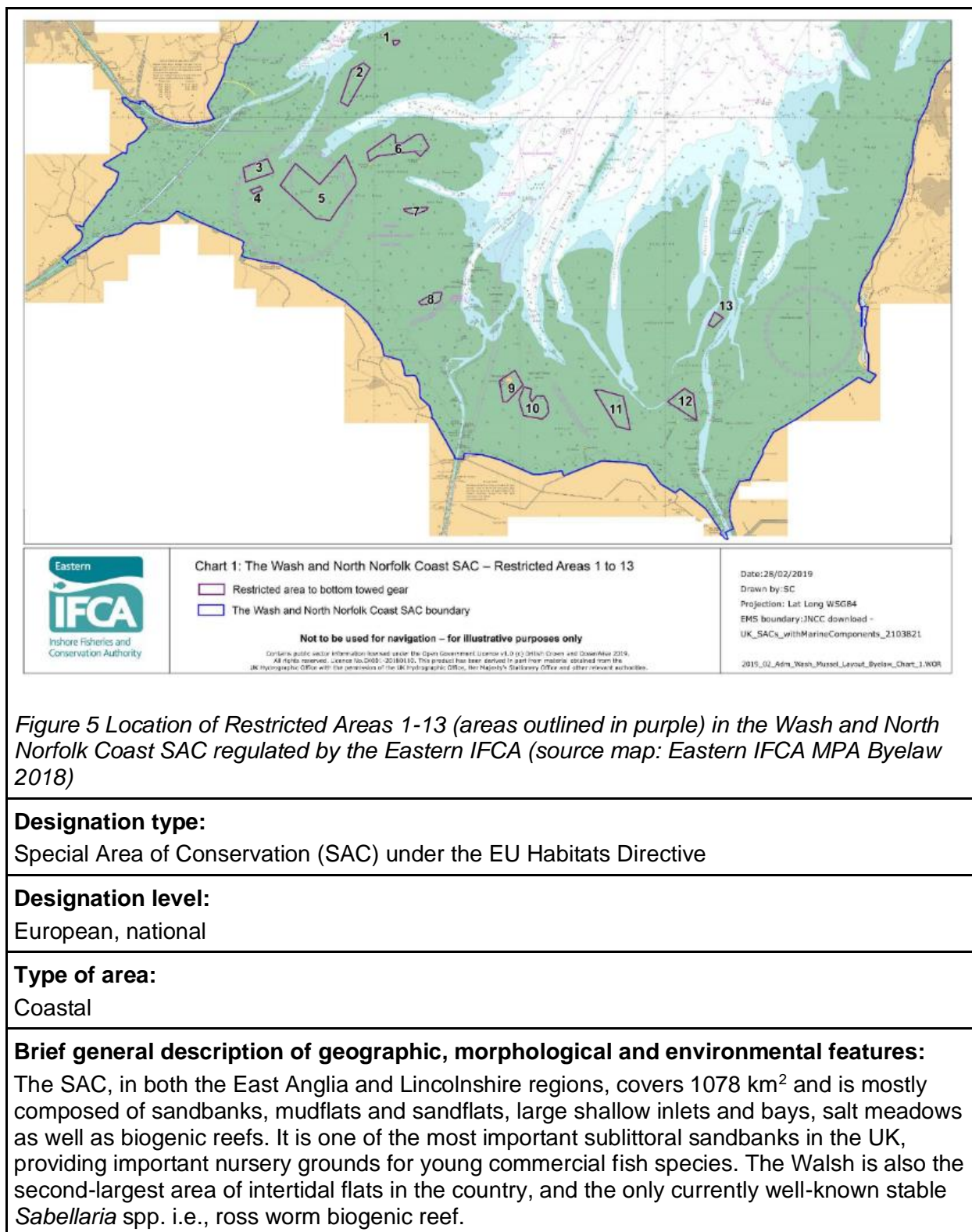
Site name: The Wash and North Norfolk Coast Special Area of Conservation

Site map



© Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right 2020. Contains map data © OpenStreetMap contributors. Terms: www.openstreetmap.org/copyright

Figure 4 Location of The Wash and North Norfolk SAC indicated in yellow (source map: Liley et al., 2020)



**Uses and human activities in place in the area:**

Transport – shipping, including infrastructure

Renewable energy generation including infrastructure

Fish and shellfish harvesting (professional and recreational)

The main fisheries that take place in the Wash and North Norfolk Coast are hand-raking for cockles, hand-raking for dredging of mussels, twin-beam trawling for brown shrimp, and potting for whelks and crabs.

Anthropogenic pressures in marine environment:

Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)

Physical disturbance to seabed (temporary or reversible)

The main pressures on the marine environment arising from fishing are abrasion of seabed habitats due to bottom-towed gear, removal of target species (mainly brown shrimp, cockle, mussel, whelk, crab and lobster), removal of non-target species and visual disturbance to waders and wildfowls on intertidal flats and potentially to Harbour seals.

Ecological criteria:

Protection of species (bird)

Protection of species (mammals)

Protection of habitat (coastal - hard bottom)

Protection of habitat (coastal - soft bottom)

The area is ecologically important for the reproduction and wintering of a range of seabird species, namely *Gavia stellata*, *Larus minutus*, *Melanitta nigra*, *Sterna albifrons*, *Sterna hirundo* and *Sterna sandvicensis*.

It also shows important seagrass and mussels' beds and hosts an important population of Harbour seal *Phoca vitulina* (7% of the country's population).

Management measures:

Natural England is the governmental body responsible for the management of the area, but to date no management plan is in place. The Eastern IFCA (Inshore Fisheries Conservation Authority) regulates fishing in the area.

EIFCA's regulations include:

Effort limits:

Licensing system

Daily and Annual quota for cockle and mussel fisheries, determined from stock surveys, and fishing on specified tides only

Total allowable effort for shrimp fishery, to limit impact on SAC seabed habitats

Application of a bird-food model, to ensure sufficient cockle stocks remain to support dependent oystercatchers (SPA species)

Pot limitation in whelk fishery



Minimum landing sizes for mussel, crab, lobster and whelk

Minimum mussel bed density before fishing is allowed

Closure of intertidal fisheries during prolonged severe weather periods to prevent disturbance to SPA species when they are most vulnerable.

Spatial restrictions:

Closed areas for towed demersal fisheries (dredge and trawl) to protect most sensitive SAC features (biogenic reef, circalittoral rock, subtidal mixed sediments, subtidal mud)

Closed areas for cockle and mussel fisheries to protect juvenile stocks (varies annually)

Closed areas for cockle and mussel fisheries to prevent disturbance to haul-out Harbour seals (SAC species) during pupping / breeding season and to prevent disturbance to waders (SPA species) in "core bird areas" (varies annually)

Gear restrictions:

Limits on number and size of fishing devices that may be used, to minimise physical impact on seabed habitats

Use of selectivity device to minimise bycatch in shrimp fishery.

Importantly, EIFCA has set a prohibition of fishing with bottom trawl gear in restricted areas 1 to 13 unless with permit; and a total prohibition of bottom trawling in restricted areas 14 to 35. When transiting through a restricted area, bottom towed gears on vessels must be secured and stowed unless for a few exceptions under para 5. of Schedule 1. In total, restricted areas cover 11 342,7ha, so approximatively 11% of the total surface of the SAC.

The use of dredges is prohibited without the authorisation of the Eastern IFCA (Byelaw 3 on molluscan shellfish methods of fishing), and dredging activities anywhere in the districts are allowed only after going through an environmental impact assessment. The EIFCA needs to approve such EIAs. EIFCA also sets minimum catch sizes for fish and shellfish.

Trade-offs between sea uses and marine protection: challenges and achievements:

Scale interpretation: 1 = easiest, 5 = hardest.

How challenging was it to achieve a compromise? Answer: 1/5

England's IFCA's fishing regulations are generally well-accepted by the public, as IFCA are composed of local authorities' members as well as general members, meaning members with specific expertise in marine environmental matters or familiar with fishing communities concerns. IFCA's member work on a voluntarily basis. This involvement of key stakeholders from the decision-making stage allows for the more acceptance of fishing regulations. Fishers, notably, were involved in developing the regulations and understand why such regulations are needed. EIFCA consults widely with stakeholders when developing regulations (e.g., annual consultations on the Wash cockle and mussel fisheries).

How much do you think the solution found meets optimal protection objectives?

Answer: 3/5

Overall, only a very small portion of the SAC is covered by restricted areas, leaving the rest of the seafloor unprotected. Restricted areas are designated based on the Sac habitats they support (biogenic reefs, subtidal mixed sediments, subtidal mud, circalittoral rock and seagrass beds).

**Coexistence and multi-use of the sea: good practices:**

See strength and weaknesses section below

Policy context in which the measure has been established:

The Eastern IFCA was established in 2011 under the 2009 Marine and Coastal Access Act, replacing the North-Eastern Sea Fisheries Committee. It has full competence to manage fisheries in its regulatory area (from the shoreline to 6 nautical miles).

The SAC was established in 2005 under the EU Habitats Directive, and under UK legislation Regulations 15 and 17-19 of The Conservation of Habitats and Species Regulations 2017 and Regulations 12, 19 and 20 of The Conservation of Offshore Marine Habitats and Species Regulations 2017.

It also partly overlaps with the Greater Wash SPA, established in 2018 under the Birds Directive to protect several species of seabirds and which covers a larger area (353577.86ha)

The EIFCA passed the Marine Protected Area Byelaw in 2018, that sets restrictions for the Wash and North Norfolk Coast SAC. The byelaw creates 35 restricted areas where stronger regulations are in place. EIFCA's other general regulations also apply to the SAC (catch limits, licences, gear restrictions...)

Main sector(s) involved in the OECMs:

Fishery sector

Main environmental impacts targeted:

Impacts from bottom trawling on vulnerable seabed ecosystems

Direct and indirect implications for biodiversity and ecosystem protection of the OECM:

Sabellaria reefs, as well as seagrass beds are important habitats for several species, allowing for both taxonomic richness and seabed diversity. By protecting them from bottom trawling, EIFCA protects the biological diversity of the site.

Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring:

Fishing activities within the restricted areas are monitored by both EIFCA and the Marine Management Organisation. Vessel monitoring systems are used on fishing vessels of more than 12m length, and EIFCA also conducts patrols at sea and from shore. The frequency of monitoring depends on the perceived risk of non-compliance.

Natural England is responsible for monitoring the health of the habitats protected within the SAC. It monitors specific habitats one by one (saltmarshes, biogenic reefs...) but so far we could not find comprehensive studies of the health of the entire marine environment.

EIFCA also regularly assess its fisheries, through a Habitat Regulation Assessment (for cockle and mussel fisheries, as well as for shrimp fisheries). Natural England agrees or not with EIFCA's Habitat Regulation Assessment and decides whether or not the fishery has an adverse effect on the integrity of the site.

Opportunities for establishing this type of OECMs in other areas of the sea-basins:



There are 10 IFCA's in total in England, and the specific regulations within marine protected areas for fishing could be applied in other IFCA's. Several IFCA's already efficiently protect existing marine protected areas from fishing through strict regulations, e.g. the North-Eastern IFCA sets a total prohibition on bottom trawling in its regulatory area (North-Eastern IFCA – Trawling: Prohibition: Exception Byelaws III 2003).

Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation:

EIFCA succeeds in engaging with key stakeholders, particularly fishers for biodiversity conservation. By working together with them on the development of regulations, EIFCA increases acceptance, and thus efficiency of such regulations. Key habitats are protected by strict measures and compliance is regularly monitored. However, it should be noted that only a small percentage of the total SAC is covered by EIFCA's restricted areas, leaving large areas unprotected. There is no overall protection of the marine environment within the SAC.

Potential for strengthening of protection measures:

Restricted areas could be extended to cover the totality of the SAC, allowing for more holistic protection of marine ecosystems. Pelagic fishing gear could also be subject to more regulations.

Sources

Eastern IFCA. *MPA byelaw 2018*. <https://www.eastern-ifca.gov.uk/wp-content/uploads/2020/05/EIFCA-MPA-Byelaw-2018.pdf>

Liley, D., Saunders, P., and Caals, Z., 2020. Habitats Regulations Assessment of the King's Lynn and West Norfolk Local Plan Review at pre-submission. Unpublished report by Footprint Ecology (URL: <https://www.footprint-ecology.co.uk/reports/Liley%20et%20al.%20-%202021%20-%20Habitats%20Regulations%20Assessment%20of%20the%20King%27s%20Lynn.pdf>)

Natural England, 2014. European Site Conservation Objectives for The Wash & North Norfolk Coast SAC (UK0017075). <https://publications.naturalengland.org.uk/publication/5950176598425600>

Ranger S., Kenter, Bryce, J.O., Cumming, G., Dapling, T., Lawes, E., Richardson, P.B. 2016. Forming shared values in conservation management: An interpretive-deliberative-democratic approach to including community voices. *Ecosystem Services*. Volume 21, Part B, Pages 344-357. <https://doi.org/10.1016/j.ecoser.2016.09.016>

Solandt, J-L., Mullier, T., Elliott, S., Sheehan, C. In 2020, Marine Protected Areas. Humphreys, J., Robert W.E. Clark. Elsevier. Pages 157-181, <https://doi.org/10.1016/B978-0-08-102698-4.00009-5> .



4. Fisheries restriction measures around protected wreck sites (BE)

Sea- basin: North Sea
Country: Belgium
Site name: Protected shipwreck sites
<p>Site map:</p> <p>Shipwreck sites in the Belgian Part of the North Sea (BPNS) [1]</p>
<p>Designation type:</p> <p>Restrictive measures related to fisheries, anchorage and construction works in the context of the protection of shipwreck sites.</p> <p>This case can be regarded as OECM.</p>
<p>Designation level:</p> <p>National</p>
Type of area:



Coastal and offshore

Brief general description of geographic, morphological and environmental features:

More than 300 (ship)wrecks lay in the Belgian part of the North Sea (BNS) ^[2-4]. They have great ecological value, because they are important hiding places and nurseries for different types of fauna ^[5-7].

Respect of underwater cultural heritage in the BNS is an important objective in the new marine spatial plan 2020-2026 ^[8], whereby:

- The most valuable cultural heritage under water is protected in situ according to a legal procedure
- The areas with protection measures for the recognised shipwreck sites are included
- Appropriate mitigating measures are adopted if cultural heritage would be threatened by human activities
- Wrecks are enabled in the context of **nature preservation**.

The Law of 23 April 2021 for the protection of underwater cultural heritage and the protection of valuable wrecks ^[9] ensures that any shipwreck that has been underwater for at least 100 years will automatically be given the status of underwater cultural heritage. In this respect, 55 wrecks have been studied detailing technical information, historical background and current state including biodiversity recordings ^[10, 11]. Effective *in situ* protection of these wreck sites is decided on a case-by-case basis based on these research reports. The Royal Decree (RD) implementing this law ^[12] imposes general restrictions on activities on and in the near vicinity of the in situ protected wrecks:

- Any dive to *in situ* protected heritage must be reported by the diver to the administration via an electronic form at least 4 hours in advance.
- In the vicinity around the *in situ* protected heritage and on the in situ protected heritage itself, no activities or works may be carried out that may alter the in situ protected heritage. All activities in the vicinity of the in situ protected heritage must make every effort not to damage the in situ protected heritage.
- No object may be removed from the in situ protected heritage, or from the immediate surroundings related to this in situ protected heritage, without permission from the minister.

Since 2014, several RDs have been adopted imposing individual measures regarding in situ protected underwater heritage followed by several Ministerial Decrees (MD) for the protection of underwater cultural heritage ^[8, 13, 14]. As a result, individual measures are in place for the *insitu* protection of 27 out of the 29 recognised protected wreck sites in the Belgian North Sea. In situ protection measures are lacking for two wreck sites that are positioned in the (harbour) channel and thus assumed to be indirectly protected due to their position.

The imposing measures occur in an area of generally 150m of radius around the middle position of the wreck. The radius can be smaller depending on the size and location of the wreck and on the timing that the imposing measures were set.

Uses and human activities in place in the area:

- Extraction of living resources
Pressure: Fish and shellfish harvesting (professional, recreational)



- Transport
Pressure: Transport - shipping
- Tourism and leisure
Pressure: Tourism and leisure activities
- Education and research
Pressure: Research, survey and educational activities

- Anthropogenic pressures in marine environment:
- Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)
- Disturbance of species (e.g. where they breed, rest and feed) due to human presence
- Divers are generally trained to not disturb biological communities
- Physical loss (due to permanent change of seabed substrate or morphology and to extraction of seabed substrate)
- Input of litter (solid waste matter, including micro-sized litter)
In 2021, the protected wreck sites Westhinder and the Kilmore were cleaned from litter (fishing nets, fishing lead, fishing baskets, dredge anchors from divers, ...). From an ecological point of view, this may have resulted in changes in biodiversity in and near the wrecks and in the seabed. Cleaning activities avoid entanglement of fish and mammals, but it also removes substrate which can be used for organisms to settle. The risks of cleaning activities must also be taken into account. Fishing nets provide natural protection for the wreck site by partially covering it and capturing vegetation and sediment. When the covering material is removed, the wreck site is again exposed to natural degradation processes. The site is also once again less sheltered from illegal fishing and more accessible to unreported diving activities. This risk is compounded by the enforcement problem and the extra publicity a protected (and therefore valuable) wreck receives.
- Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides) — diffuse sources, point sources, atmospheric deposition, acute events
- In some cases, there is still ammunition present at the wreck sites which may become exposed and affect the natural environment and safety for divers.

Ecological criteria:

The protection of exact ecological features depends on the specific wreck site and can be consulted in the research reports recordings ^[10, 11]. The most frequently occurring ecological features protected at the wreck sites are:

- Protection of species (mammal)
--> not identified
- Protection of species (fish)
-> most common ones: *Scophthalmus rhombus*, *Trachurus trachurus*, *Gadus morhua*, *Echiichthys vipera*, *Scomber scombrus*, *Pleuronectes platessa*, *Pollachius pollachius*, *Chelidonichthys lucerna*, *Limanda limanda*, *Trisopterus luscus*, *Solea solea*, *Merlangius merlangus*, *Dicentrarchus labrax*



- Protection of species (invertebrates)
-> see list in annex 2
- Protection of species (plant/algae)
-> not identified
- Protection of habitat (pelagic)
- -> pelagic habitat
-> artificial hard substrate

Management measures:

In general, management measures at wreck sites correspond to

- No access zone for fishing activities/ regulated fishing gears
- Anchoring regulation
- Dredging regulation
- Construction works
- Diving regulation

Individual protection measures for the 27 recognised shipwreck sites are listed in annex 1 below with reference to the legal documents in which the management plan is anchored. Following individual protection measures are included:

- No access zone for fishing activities/ regulated fishing gears:
- Line fishing prohibited
- Fishing with trawling nets prohibited
- Anchoring regulation:
- Anchoring prohibited
- Diving related anchoring can be allowed under strict circumstances and if electronic notifications are taking place
- Dredging regulation:
- dredging prohibited
- Construction works:
- no activities or works may be carried out that may alter the in situ protected heritage
- Diving regulation:
- Any dive to in situ protected heritage must be reported by the diver to the administration via an electronic form at least 4 hours in advance.

Trade-offs between sea uses and marine protection:

Scale interpretation: 1=easiest, 5 is hardest

How challenging was it to achieve a compromise? Answer = 1/5

An inventory of a selection of 55 identified shipwrecks that have been underwater for at least 100 years in the Belgian part of the North Sea was carried out in 2019 by VLIZ and Flanders Heritage Agency (Onroerend Erfgoed) [10, 11]. Based on this inventory with technical information, historical background, current state including biodiversity recordings and the



recommendations for protection, a consultation round was organised with members of following institutes:

- Marine Environment Service, FPS Health
- FPS Mobility and transport
- Flemisch Hydrography (MOW)
- Flanders Heritage Agency (Onroerend Erfgoed)
- Flemish service of the governor
- Flanders Marine Institute (VLIZ)

These institutes also represent other sectors with potential conflicting interests. The recommendations from the research reports were checked with the expert panel based on the feasibility and ability for enforcement.

The process of finding a compromise was not very challenging. However, it took a lot of time as the first shipwreck sites were protected in 2014 and it took many years to have individual protection measures for (at this moment) 29 shipwreck sites, whereas many more are still protected under the Royal Decree (RD) implementing the UNESCO law.

How much do you think the solution found meets optimal protection objectives? Answer =3/5

The protection measures in place are clear but details on concrete enforcement are not clear. For line fishing, recreational fishers can use an interactive module on the 'Recreatieve Zeevisserij' website to check the regulations in place relating to the specific recreational fishing activities, including line fishing at wreck sites. However, recent dive surveys suggest that there is an enforcement problem for recreational fisheries. At certain wreck sites (the recently revamped Westhinder and Kilmore), recent fishing lead is noted indicating that the fishing ban is not being enforced.

Enforcement of diving activities is officially carried out by MDK. FOD mobiliteit announces the protection measures of the wreck sites and hosts the page with the notification form for divers. However, the information in this form is outdated (only including 11 wreck sites and referring to the outdated RD of 2016), suggesting that enforcement of diving activities is not a reality.

Coexistence and multi-use of the sea: present good practices

Recreational diving and protection of maritime archaeological heritage can go hand in hand.

An example is the initiative taken on two protected wreck sites Westhinder and the Kilmore. In 2021, they were cleaned from litter (fishing nets, fishing lead, fishing baskets, dredge anchors from divers, ...) by recreational divers. An important trade-off must be noted. Removing marine litter may be beneficial for the natural fauna and flora, at the same time, it may make the wreck more susceptible to degradation.

Recreational diving and research activities also go hand in hand.

An example is the provision of underwater footage by recreational divers, providing information for biodiversity research on and near the wrecks, to be used for recommendations on protection measures by experts.

General research of the wrecks can also be done by collaborations with recreational divers.

Policy context in which the measure has been established



See above
Main sector(s) involved in the OECMs <ul style="list-style-type: none"> • Maritime archaeological heritage • Fisheries • Transport • Recreational diving • Environmental protection • Research and innovation
Main environmental impacts targeted <ul style="list-style-type: none"> • Extraction of wild species • Physical disturbance to the seabed • Marine litter
Direct and indirect implications for biodiversity and ecosystem protection of the OECM Direct implications: protection of biogenic habitat from physical disturbance and protection of extraction of living resources. Indirect implications: habitats themselves provide wider ecosystem functions (nursery function, refugee function, etc.)
Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring: Different institutes are involved in several monitoring aspects in and near the wreck sites.
Opportunities for establishing this type of OECMs in other areas of the sea-basins: Protecting shipwreck sites is very relevant for most of the countries in the North East Atlantic and other sea basins. However, there are no cross-regional agreements and different countries have different sets of protections measures in place. This is also dependent on the type of use, the location of the wreck etc. This could be subject to a more elaborate study on uniformization the protection measures of wreck sites based on different categories.
Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation: Strength: Physical disturbance/extraction on the sensitive habitats and the extraction of the living resources is removed. Weakness: Compliance to regulations is weak.
Potential for strengthening of protection measures: <ul style="list-style-type: none"> • The development of clear protection objectives to be linked to the protection measures could be interesting to be able to monitor the effectiveness of the protection measures. • The currently set perimeters for the shipwrecks that were in situ protected in 2014, 2016 and 2018 amount to only tens of meters, making them difficult to maintain and control



at sea, especially when taking into account navigating vessels in tidal currents, waves and wind ^[10]. Perimeter around the central coordinate of the wreck should be raised to 150 metres. This uniformisation of protection measures will make any monitoring and enforcement easier.

- The 11 wreck sites protected in 2014, 2016, and 2018 are subject to the new RD but should also be reviewed regarding the 150m perimeter within which a ban on fishing, trawling, anchoring and dredging should apply. Currently, only vague guidelines apply here that no activities or works may be carried out 'in the vicinity' that 'may alter' the in situ protected heritage (see above).
- In the current situation, it is not obvious for a seafarer to find out which protection measures specifically apply to which particular protected wreck. Switching to concrete unambiguous protection measures that apply to all protected wrecks would be preferable ^[10].
- All protected wrecks are marked on the official nautical chart with the text "Historic Wreck (see note)". A footnote will then be provided on the chart with the following text in Dutch and English, including a reference to 'Notices to Mariners No. 1' where additional explanation is given regarding the Act on the Protection of Underwater Cultural Heritage, find reporting obligation, ban on intentionally bringing up finds, protected wrecks and protection measures.
- Wreck sites within the fairway are also worth protecting. The diving ban in the fairway is not necessarily a guarantee that sites will remain protected via this route. Wakeful and UB29, for example, have not received additional protection measures.
- A diving report by recreational divers could become compulsory in order to receive information on the wreck site, including its condition, the presence of fishing lead, litter, etc.
- Collaboration with other North Sea countries to agree on common protection measures and exchange of good practices on more effective enforcement.

Sources:

- [1] Kustportaal (2023). [\[https://www.kustportaal.be/nl/statische-kaarten\]](https://www.kustportaal.be/nl/statische-kaarten)
- [2] Pieters, M.; Van Dijck, M.; Missiaen, T.; Van Haelst, S.; Pirlet, H.; Devriese, L. (2022). Maritime and coastal heritage, *in*: Dauwe, S. *Knowledge Guide Coast and Sea 2022 - Compendium for Coast and Sea*. pp. 153-163.
- [3] Afdeling Kust - Vlaamse Hydrografie. Wrecks database, [\[https://wrakkendatabank.afdelingkust.be/\]](https://wrakkendatabank.afdelingkust.be/)
- [4] Agentschap Onroerend Erfgoed. Maritime archaeology database, [\[https://www.maritieme-archeologie.be/\]](https://www.maritieme-archeologie.be/)
- [5] Mallefet, J.; Zintzen, V.; Massin, C.; Norro, A.; Vincx, M.; De Maerschalck, V.; Steyaert, M.; Degraer, S.; Cattrijsse, A.; Vanden Berghe, E. (2008). Belgian shipwreck: hotspots for marine biodiversity BEWREMA: final report. Brussels. 151 pp. [\[https://www.vliz.be/nl/imis?module=ref&refid=126030\]](https://www.vliz.be/nl/imis?module=ref&refid=126030)
- [6] Reubens, J. (2013). The ecology of benthopelagic fish at offshore wind farms: Towards an integrated management approach = De ecologie van benthopelagische vis bij



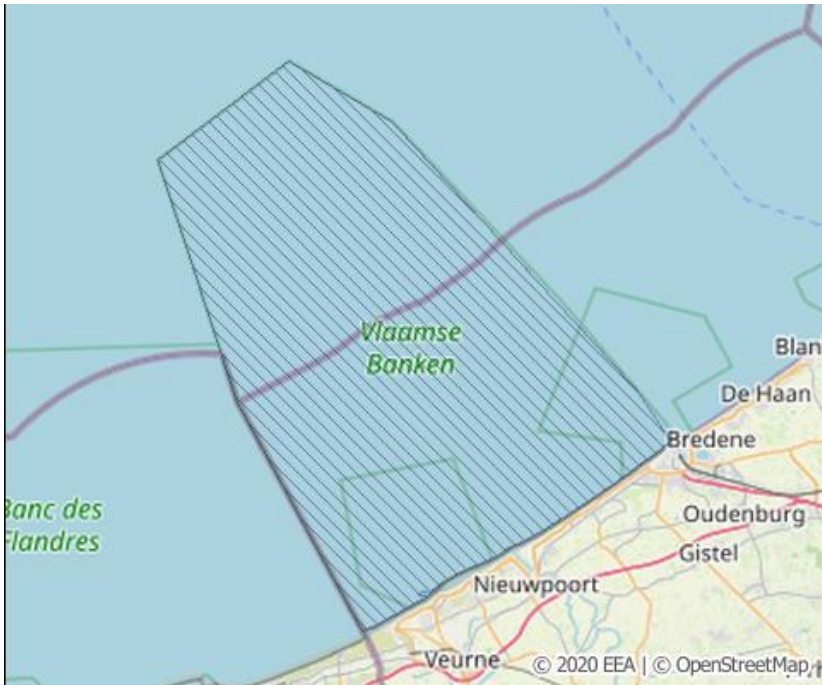
- offshore windmolens: Naar een geïntegreerd beheer van de zee. PhD Thesis. Ghent University: Gent. 237 + Addenda pp.
- [7] Termote, T.; Termote, D. (2009). Schatten en scheepswrakken: Boeiende onderwaterarcheologie in de Noordzee. Davidsfonds: Leuven. ISBN 978-90-5826-609-5. pp.
- [8] RD of 22 May 2019. Koninklijk besluit tot vaststelling van het marien ruimtelijk plan voor de periode 2020 tot 2026 in de Belgische zeegebieden. 2019-05-22/23 [https://etaamb.openjustice.be/nl/koninklijk-besluit-van-22-mei-2019_n2019013159.html]
- [9] Law of 23 April 2021. Wet tot implementatie van het UNESCO-verdrag van 2 november 2001 ter bescherming van het cultureel erfgoed onder water en de bescherming van waardevolle wrakken. 2021-04-23/10 [https://etaamb.openjustice.be/nl/wet-van-23-april-2021_n2021041529.html]
- [10] Demerre, I.; Van Haelst, S.; Sandra, M. (2020). Inventory 100-year old shipwrecks in the Belgian part of the North Sea. Vlaams Instituut voor de Zee (VLIZ). Oostende. 363 pp. [<https://www.vliz.be/en/catalogue?module=ref&refid=341019>]
- [11] FPS Public Health (2023). Inventory 100-year old shipwrecks in the Belgian part of the North Sea. [<https://www.health.belgium.be/en/inventory-100-year-old-shipwrecks-belgian-part-north-sea>]
- [12] RD of 30 July 2021. Koninklijk besluit tot uitvoering van de wet van 23 april 2021 tot implementatie van het UNESCO verdrag van 2 november 2001 ter bescherming van het cultureel erfgoed onder water en de bescherming van waardevolle wrakken. 2021-07-30/17. [https://etaamb.openjustice.be/nl/koninklijk-besluit-van-30-juli-2021_n2021042757.html]
- [13] MD of 6 April 2018. Ministerieel besluit betreffende de erkenning van 3 scheepswrakken als cultureel erfgoed onder water. 2018-04-06/01. [https://etaamb.openjustice.be/nl/ministerieel-besluit-van-06-april-2018_n2018011377.html]
- [14] RD of 21 September 2016. Koninklijk besluit betreffende de reglementaire maatregelen ter bescherming van het cultureel erfgoed onder water. 2016-09-21/12 [https://etaamb.openjustice.be/nl/koninklijk-besluit-van-21-september-2016_n2016014315.html]



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



5. Vlaamse Banken SAC (BE)

Sea- basin: North Sea
Country: Belgium
Site name: Vlaamse Banken
Site map: 
Source map: https://eunis.eea.europa.eu/sites/BEMNZ0001
Designation type: Special Area of Conservation (Habitats Directive)
Designation level: European
Type of area: coastal, offshore
Brief general description of geographic, morphological and environmental features: <u>Geographic</u> The “Vlaamse Banken” MPA is 1099.39 km ² in size and extends to ±45 km out to sea, so it covers parts of both the territorial sea and the EEZ. It borders the French “Bancs de Flandres” MPA designated under the Birds and Habitats Directive. <u>Morphological & Environmental</u> The area comprises of a complex system of sandbanks and gullies. This sandbank system hosts four different macrobenthic communities.



Uses and human activities in place in the area:

Extraction of living resources – Fish and shellfish harvesting (professional)

Beam trawling

Extraction of non-living resources – Extraction of minerals (gravel, sand)

Aggregate extraction

Physical restructuring of seabed – dredging and depositing of materials

Dredging

Dumping of dredged material

Production of energy – Renewable energy generation (wind), including infrastructure

Construction of offshore windfarms

Anthropogenic pressures in marine environment:

Biological – extraction of species

For the *L. conchilega* habitat, beam trawling is considered the predominant threat – fauna associated with the habitat is wiped out after one pass of the beam trawl. For the gravel beds, the beam trawl fishery is regarded as the main reason for the disappearance of the European oyster in the Belgian part of the North Sea (BPNS).

As well as the extraction of commercial species, beam trawling also leads to mortality of non-target species such as invertebrates and non-commercial fish species as a result of bycatch. Beam trawling has been found to change the composition of macrobenthic communities associated with gravel beds

Aggregate extraction and dredging also lead to the removal of benthic species.

Physical disturbance to seabed

Beam trawling leads to the physical disturbance of the seabed, including the upwelling of sediments and a change in the seabed morphology. It also causes the turning around of stones, which affects the gravel bed physical structure.

Aggregate extraction leads to an increase in the average grain size of sediment, and it changes the seabed morphology. Dumping of dredging material leads to the original seabed being covered with sediment from a different source.

Physical loss (removal of gravel, sand, rocks)

Aggregate extraction leads to the removal of gravel and sand. Beam trawling activities have also led to the removal of rocks from the gravel bed areas (to make fishing practices safer)

Ecological criteria:

Protection of habitat (coastal – hard bottom)

The deep section of the MPA hosts gravel beds, which have an important function as spawning and nursery grounds. In the shallow section closer to the coast, *Lanice conchilega* aggregations can be found, which are important for structuring habitats. Both gravel beds and *Lanice conchilega* aggregations are a protected habitat under Habitat type code 1170 (“Reefs”).

Protection of habitat (coastal – soft bottom)

Sandbanks are a protected habitat type under the Habitats Directive (Habitat type code 1110: “sandbanks permanently covered with seawater”).



Management measures:

There is a management plan available, it was revised in 2022. The measures are linked with the conservation objectives to demonstrate how the conservation objectives will be achieved through the management measures. The additional measures are categorised into 'knowledge', 'policy' or 'action' measures. The measures listed below are sourced from Tables 3a-c from the report "Beheerplannen voor Natura 2000 in het Belgische deel van de Noordzee - Habitat- en Vogelrichtlijn" (Belgische Staat, 2022)

No access zone

Currently, there are not any 'no access' zones in place, but options are being explored for the allocation of a marine reserve, which would exclude all anthropogenic pressures (policy)

Regulated access

The delineation and designation of fishing gear restrictions is ongoing, and will be implemented within the search zones defined in the 2020-2026 MSP (policy)

Existing measure: Terms for sand extraction and dumping of dredging material

Existing measure: Measures specified in the MSP regarding cables, sand extraction and bottom-contact fisheries (e.g. recreational fisheries with beam trawlers is forbidden in the whole MPA)

Restoration

Once fishing gear restrictions are in place, there are plans to monitor the natural recovery of biogenic reefs. In case the state of the habitats are not recovering, it will be evaluated whether extra measures are necessary (action)

Active restoration of gravel beds (action)

Research

Mapping of the most important functional habitats for commercial and non-commercial fish species, keeping in mind the expansion of knowledge on their spawning, nursery and foraging grounds (knowledge)

Mapping of gravel beds within the BPNS (knowledge)

Research on the impact of electromagnetic fields on gravel beds and associated fauna (knowledge)

Research on reducing turbidity during dredging/sand extraction (knowledge)

Non-native species

Existing measures: ban on introduction of non-native species through ballastwater

Implementation of IMO biofouling guidelines: cleaning of hulls before entering the BPNS (policy)

Classification system non-native species (classify species according to level of threat) (knowledge)

Implementation ballast water agreement (policy)

Planning measures

Avoid gravel beds during cable routing for new offshore wind farm zone (policy)

Nature inclusive design in/nearby offshore construction (action)

Analysis for a 'decommissioning strategy' for retiring windfarms/offshore installations (policy)



Trade-offs between sea uses and marine protection: challenges and achievements:

In terms of trade-offs between sea uses and marine protection, a paper was published on the designation of this MPA (Pecceu et al., 2016). The Vlaamse Banken MPA was established through a Royal Decree in 2012. The authors indicated the success factors of a successful designation to be the appointment of a minister of the North Sea, awareness of the need for conservation through the different EU Directives and the level of engagement and transparency during the process. However, it was indicated that no real conflicts arose due to the lack of restrictions imposed within the MPA for the fisheries sector and the shipping sector, which raises questions about the effectiveness of this MPA.

In a scale 1-5 how much you think the solution found meets optimal protection objectives?

Answer: 4/5 (1 is best, 5 is worst)

Since many of the proposed measures have not been implemented yet, especially in relation to beam trawling, the MPA is currently not meeting the protection objectives. A report from 2018 about achieving Good Environmental Status (GES) as defined by the MSFD concluded that benthic habitats are still disturbed by beam trawling, and gravel beds in the MPA are still under threat.

Coexistence and multi-use of the sea: good practices:

A potential good practice associated with this MPA is the development of fishing gear restrictions for defined subzones within the MPA. These measures are currently in the process of being approved by the EU, so that they will also apply to vessels from other member states. The identification of gear restriction zones was informed by a combination of data on ecological features and fisheries data, which was fed into a Marxan model to identify suitable options. However, nothing can be said yet about the implementation of these measures because they have been approved yet, but the preliminary analysis for zone identification demonstrates the use of a trade-off tool (Marxan) in practice.



Sources

- Belgische Staat (2018a) Actualisatie van de initiële beoordeling voor de Belgische mariene wateren Kaderrichtlijn Mariene Strategie – Art 8 lid 1a & 1b. Available at: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/initiele_beoordeling_msfd_2018.pdf (Accessed: 14 September 2022).
- Belgische Staat (2018b) Beheerplannen voor Natura 2000 in het Belgische deel van de Noordzee - Habitat- en Vogelrichtlijn. Brussel, België: Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu, DG Leefmilieu, pp. 1-60 pp. Available at: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/beheerplannen_natura_2000_noordzee_2018-2023.pdf (Accessed: 23 August 2022).
- Belgische Staat (2019) Koninklijk besluit tot vaststelling van het marien ruimtelijk plan voor de periode van 2020 tot 2026 in de Belgische zeegebieden. Available at: https://www.ejustice.just.fgov.be/mopdf/2019/07/02_2.pdf#page=2 (Accessed: 2 September 2020).
- Belgische Staat (2022) Actualisatie van de maatregelen voor de Belgische mariene wateren: Natura 2000 en Kaderrichtlijn Mariene Strategie - Art 13. Available at: https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/maatregel_enprogramma_2de_cyclus_2022.pdf (Accessed: 14 September 2022).
- Degraer, S. et al. (2009) Studie betreffende het opstellen van een lijst van potentiële Habitatrichtlijngebieden in het Belgische deel van de Noordzee. Eindrapport in opdracht van de Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu, Directoraat-generaal Leefmilieu. Brussel, België, p. 93 pp. Available at: https://purews.inbo.be/ws/portalfiles/portal/669495/Degraer_et_al_StudieBetreffendeOpstellenLijstPotentielleHabitatrichtlijngebiedenBelgischeDeelNoordzee.pdf.
- FOD Volksgezondheid (2016) Habitats Directive Areas in the Belgian part of the North Sea, FPS Public Health. Available at: <https://www.health.belgium.be/en/habitats-directive-areas-belgian-part-north-sea> (Accessed: 4 May 2023).
- Leloup, E. (1970) 'Recherches sur l'ostreiculture dans le bassin de chasse d'Ostende en 1968', Bull. Inst. r. Sci. nat. Belg., 46(6), pp. 1–22.
- Lindeboom, H.J., van Kessel, J.G. and Berkenbosch, L. (2005) Gebieden met bijzondere ecologische waarden op het Nederlands Continentaal Plat. RIKZ/Alterra.
- Pecceu, E. et al. (2021) Scientific background report in preparation of fisheries measures to protect the bottom integrity and the different habitats within the Belgian part of the North Sea, p. 199.
- Pecceu, E., Hostens, K. and Maes, F. (2016) 'Governance analysis of MPAs in the Belgian part of the North Sea', Marine Policy, 71, pp. 265–274. Available at: <https://doi.org/10.1016/j.marpol.2015.12.017>.
- Rabaut, M. et al. (2008) 'Experimental beam-trawling in Lanice conchilega reefs: Impact on the associated fauna', Fisheries Research, 90(1), pp. 209–216. Available at: <https://doi.org/10.1016/j.fishres.2007.10.009>.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Rabaut, M., Vincx, M. and Degraer, S. (2009) 'Do *Lanice conchilega* (sandmason) aggregations classify as reefs? Quantifying habitat modifying effects', *Helgoland Marine Research*, 63(1), pp. 37–46. Available at: <https://doi.org/10.1007/s10152-008-0137-4>.



6. Wadden Sea protection measures in place (NE, DE, DK)

The Wadden Sea is the largest tidal flats system in the world, extending along the coasts of the Netherlands, Germany, and Denmark. It is a unique ecosystem of shallow waters, tidal flats, salt marshes, and dunes, and it supports a rich and diverse array of plant and animal species. Due to its ecological importance, the Wadden Sea has been designated as a UNESCO World Heritage Site and a Marine Protected Area.

The Wadden Sea is home to more than 10,000 species of plants and animals, including a large number of migratory birds and fish, out of which about 2,700 species are of marine origin. The area serves as an important breeding, feeding, and resting ground for many bird species, including oystercatchers, sandpipers, and red knots. It is also a crucial feeding ground for millions of migratory birds that travel from the Arctic to Africa and back each year. The Wadden Sea is also a vital nursery area for several fish species, including flounder, herring, and cod. Indigenous species of marine mammals in the Wadden Sea are the common harbour seal, grey seal and harbour porpoise.

The Wadden Sea's ecological importance also extends to its role in regulating the climate. The area's salt marshes and tidal flats absorb carbon dioxide from the atmosphere and store it in the soil, helping to mitigate the impacts of climate change. The Wadden Sea also acts as a natural buffer against storm surges and sea-level rise, protecting the surrounding areas from flooding and erosion.

To protect the Wadden Sea's ecological and cultural values, the area has been designated as a Marine Protected Area. The Wadden Sea is managed by a trilateral partnership between the Netherlands, Germany, and Denmark, known as the Trilateral Wadden Sea Cooperation which has managed and protected this valuable ecosystem since 1978. The management system is a combination of the national management systems and the trilateral single integrated management plan (SIMP) and Wadden Sea Plan (WSP) implemented by the responsible authorities. The partnership aims to ensure the long-term conservation of the Wadden Sea ecosystem while also promoting sustainable economic and recreational activities in the area.

The management of the Wadden Sea involves a range of measures to protect its unique ecology. These measures include the establishment of protected areas, the regulation of fisheries, and the management of coastal development, to improvement of the resilience of the Wadden Sea ecosystem to climate change, and promotion of sustainable economic and recreational activities. The Wadden Sea Cooperation also works to reduce pollution in the area, including plastic waste and chemical contaminants.

Despite the efforts to protect the Wadden Sea, the area still faces several threats. One of the biggest threats to the Wadden Sea's ecology is climate change. Rising sea levels, increased storm surges, and changes in temperature and precipitation patterns can all



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



have significant impacts on the Wadden Sea ecosystem. Other threats to the area include pollution, overfishing, and coastal development.

Continued efforts are needed to protect the Wadden Sea's ecology and cultural values for future generations. The SIMP is a key element of the management of the Wadden Sea. It is a comprehensive management plan that aims to ensure the sustainable use and conservation of the Wadden Sea ecosystem and will be designed to balance the conservation of the Wadden Sea's unique ecology with the needs of the local communities and economies that depend on the area. It involves a wide range of stakeholders, including scientists, conservationists, local communities, and industry representatives. The plan is currently in its development phase, with the intention to be adopted in 2023, and will provide a roadmap for the management of the area for the next six years.

Source: Wadden Sea Secretariat (2023) Wadden Sea. Available at: <https://www.waddensea-worldheritage.org/> (Accessed: 17 May 2023).

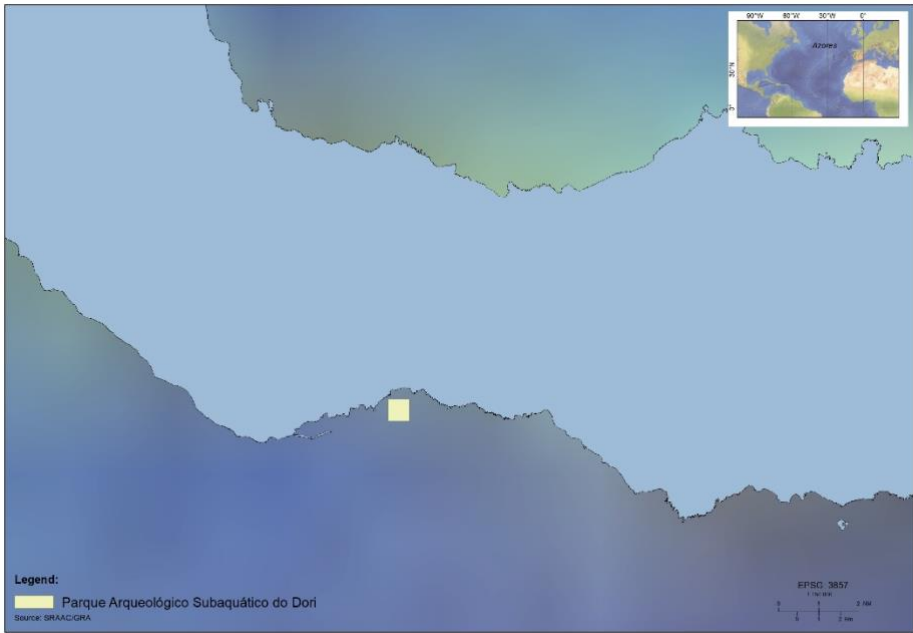


This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Northeastern Atlantic

1. Dori underwater archaeological park (PT)

Sea- basin: North-Atlantic
Country: Portugal
Site name: Dori
<p>Site map: The underwater archaeological park of Dori, with the centre at coordinates 37°44.602'N. and 025°37.695'W., in the WGS84 reference ellipsoid, off the south coast of São Miguel island, to the south-south-east of Ponta de Rosto de Cão, opposite São Roque. This boundary's geographical coordinates (WGS84) are to the north by the parallel 37°44,820'N., to the south by the parallel 37°44,390'N., to the west by the meridian 025°37,960'W. and to the east by the meridian 025°37,420'W.</p> 
Designation type: Underwater Archaeological Park
Designation level: subnational
Type of area: coastal
<p>Brief general description of geographic, morphological and environmental features</p> <p>The protection of the sunken remains of the Dori allows the conservation of biodiversity and the safeguarding of the marine resources existing in that area, from the point of view of biodiversity and nature conservation. Dori is a submerged structure that provides substrate for the colonisation of various organisms, creating an artificial environment similar to the natural</p>



coastal reefs of the Azores Sea, in which various marine species of ecological and economic importance are sheltered.
Uses and human activities in place in the area (the most relevant): <ul style="list-style-type: none"> • Tourism and leisure activities • Tourism and leisure infrastructure • Research, survey and educational activities
Anthropogenic pressures in marine environment (the most relevant): Input or spread of non-indigenous species; Physical disturbance to seabed (temporary or reversible); Input of anthropogenic sound (impulsive, discontinuous noise).
Ecological criteria: Protection of species (fish, algae, invertebrate); Protection of habitat (pelagic)
Management measures: Amateur diving is permitted at the Dori Underwater Archaeological Park, provided that the legal and regulatory norms that regulate that activity are complied with.
Trade-offs between sea uses and marine protection: discuss challenges and achievements (info to be collected from interview and expert knowledge). In a scale 1-5 how challenging was to achieve a compromise. In a scale 1-5 how much you think the solution found meets optimal protection objectives? No compensation measure was offered to fishermen.4 on a protection scale
Coexistence and multi-use of the sea: The Dori shipwreck presents characteristics that allow controlled visits by divers without significantly impacting the conservation of the archaeological and natural assets. This archaeological testimony is well identified and is already a privileged site for divers to visit, containing a high potential for promoting tourism and culture in the Azores, and could be transformed into an underwater museum.
For OECM: Protecting cultural heritage with the possibility of becoming a focus for biodiversity enhancement.
- Policy context in which the measure has been established: Regional Regulatory Decree no. 12/2012/A/A
- Main sector(s) involved in the OECMs: diving sector and tourism (dive)
- Main environmental impacts targeted: fish biodiversity
- Direct and indirect implications for biodiversity and ecosystem protection of the OECM: by restricting fishing in the area, local biodiversity is protected, and the animals seek the wreck as a refuge and place to reproduce. Besides the preservation of the cultural heritage.
- Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions




<p>involved in monitoring: usually dive operators are responsible for monitoring the site. There is no institutionalised continuous monitoring operation.</p>
<ul style="list-style-type: none"> - Opportunities for establishing this type of OECMs in other areas of the sea-basins: conservation of cultural heritage such as shipwrecks can result in good practice for the restoration of local biodiversity
<ul style="list-style-type: none"> - Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation: the constant visitation helps the control and possible monitoring of the area. But without a carrying capacity study, it can impact the cultural heritage and disturbances to biodiversity.
<ul style="list-style-type: none"> - Potential for strengthening of protection measures: constant monitoring and surveillance.
<ul style="list-style-type: none"> - Economic sector involvement and potential for strengthening of protection measures: dive centres and the possibility of developing collaborative monitoring in the area.
<ul style="list-style-type: none"> - Sources: https://dre.tretas.org/dre/300192/decreto-regulamentar-regional-12-2012-A-de-8-de-maio#:~:text=No%20Parque%20Arqueol%C3%B3gico%20Subaqu%C3%A1tico%20do,regulamentares%20que%20regulam%20aquela%20atividade.&text=1%20%2D%20O%20ponto%20central%20do,por%20boia%20de%20sinaliza%C3%A7%C3%A3o%20adequada.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



2. The Nature Reserve Berlengas (PT)

Sea- basin: North-Atlantic
Country: Portugal
Site name: Berlengas
<p>Site map: It is located on the Continental Shelf of the western front of the Iberian Peninsula, about 6 miles west of Cape Carvoeiro, off the city of Peniche. (39° 24' 52" N / 9° 30' 38" W)</p> 
Designation type: Nature Reserve
Designation level: national
Type of area: coastal
<p>Brief general description of geographic, morphological and environmental features</p> <p>Comprises the entire land area of the islands and islets of the archipelago and a vast area of marine reserve located in its surroundings. An oceanic archipelago composed of numerous islands and rocks of irregular outline, with steep slopes, arranged in three groups, namely Berlenga, Estelas and Farilhões-Forçadas.</p>
<p>Uses and human activities in place in the area (the most relevant): in the description, please make referenced to the ones identified under the MSFD, see Table 1</p> <ul style="list-style-type: none"> • Tourism and leisure activities • Tourism and leisure infrastructure • Fish and shellfish harvesting (professional, recreational) • Transport — shipping



Anthropogenic pressures in marine environment (the most relevant):

Input or spread of non-indigenous species, Disturbance of species (e.g. where they breed, rest and feed) due to human presence, Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities), Physical disturbance to seabed (temporary or reversible);

Input of litter (solid waste matter, including micro-sized litter); Input of anthropogenic sound (impulsive, discontinuous noise)

Ecological criteria:

Protection of species (bird, mammal, reptile, fish, invertebrates, plant/algae)

- Protection of habitat (coastal - hard bottom, coastal - soft bottom, deep sea)

Management measures:

Areas to be avoid:

Portaria n.º 1366/2006, de 5 de dezembro: <https://dre.pt/dre/detalhe/portaria/1366-2006-545448>

Establishes the limits of the traffic separation schemes (TSS) of Cape Roca and Cape São Vicente and the limits of the Berlengas avoidance area.

ANNEX II

1 - Avoid Area of the Berlenga Islands

Description of the area [coordinates are referred to European Datum (ED-50)]

The Berlenga avoidance area consists of an area bounded to the north by latitude 39° 30',00 N, to the south by latitude 39° 20',00 N, to the west by a line joining geographical positions 39° 20',00 N 009° 42',20 W and 39° 30',00 N 009° 42',20 W and to the east by the Portuguese coastline.

Trade-offs between sea uses and marine protection: discuss challenges and achievements (info to be collected from interview and expert knowledge). In a scale 1-5 how challenging was to achieve a compromise. In a scale 1-5 how much you think the solution found meets optimal protection objectives?

No compensation measure was offered to fishermen or other restricted activity. 4 on a protection scale.

Coexistence and multi-use of the sea:

Since the Anzol+ project, fishermen have begun collaborating with data to assess bycatch. As a result, there was a greater understanding of the activity and its impacts, and the fishing association called for stricter class rules in the revision plan.

For OECMs (examples of topics that can be included in the description):

Not applicable

- **Policy context in which the measure has been established:** Decree Law n.º 264/81, September 3. Creates the Berlenga Natural Reserve.



- Main sector(s) involved in the OECMs: not applicable
- Main environmental impacts targeted: to preserve as an island ecosystem, the biological value of the surrounding marine area, the high botanical interest, the role of the island in terms of marine birdlife and the presence of interesting underwater archaeological heritage.
- Direct and indirect implications for biodiversity and ecosystem protection of the OECM: it was the first co-managed example on the Portuguese coast. Active fishermen are helping to legislate in your fishing gear, including more restrictive measures. Shellfish gatherers requested a moratorium to prohibit the harvest of the "percebe" during the reproduction season.
- Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring: there are some monitoring projects in the area. A harvest ordinance was created that delimits the fishing season and the number of 40 fishermen. The law also determines the licensing rules, including a harvest manifest report that must be submitted by each fisherman at the end of the season (a condition for license renewal).
- Opportunities for establishing this type of OECMs in other areas of the sea-basins: the co-management model with community engagement, regular meetings and a participative process should be adopted in other OECMs.
- Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation: the local stakeholders engaged in the MPA management contributed to building legislation more adapted to conservation goals. The carrying capacity numbers support local resilience.
- Potential for strengthening of protection measures: the local community engaged and requested more restrictive measures.
- Economic sector involvement and potential for strengthening of protection measures: access to the island of Berlenga depends on prior registration on the Berlengapass platform and payment of the respective fee.
- Sources: https://www.icnf.pt/conservacao/reservasnaturais/rnberlengas - https://natural.pt/protected-areas/reserva-natural-berlengas?locale=pt

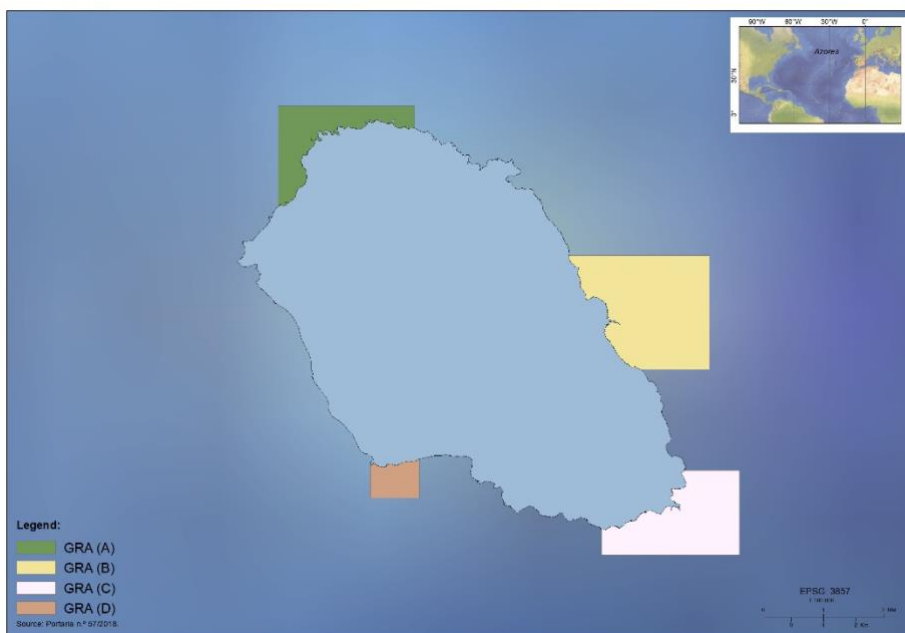


3. Limpets catches – seasonal restricted areas (PT)

Sea- basin: North-Atlantic
Country: Portugal
Site name: Limpets catches – seasonal restricted areas
<p>Site map: It applies to all the islands of the Azores, specifically the following areas:</p> <p>Santa Maria - Natural Reserves of the Bays of Praia, São Lourenço and Maia; 2) Formigas Islets; 3) São Miguel - Natural Reserve of the Ilhéu de Vila Franca, Caloura (from Ponta de Água to Vila Franca), Ilhéus dos Mosteiros, Porto Formoso to Baía da Maia and Nordeste (Ponta do Arnel to Ponta da Madrugada); 4) Terceira - Ilhéus das Cabras, Ilhéus dos Fradinhos, Monte Brasil, Vila Nova to Ponta dos Carneiros, including the North Islet; 5) Graciosa - from Baixa do Redondo to Ponta dos Fenais, including Praia islet, from Carapacho Bay to Ponta do Feliciano, including small islets, Ponta Branca and islet (Baixa de Afonso Correia to Ponta Branca) and Vitória Bay to Diagaves Bay, including small islets (Ponta da Barca to Barro Vermelho islets); 6) São Jorge - Natural Reserve from Ilhéu do Topo, Morros das Velas (Morro de Lemos and Morro Grande), from Fajã dos Cúberes to Fajã de Santo Cristo and Ponta dos Rosais; 7) Pico - from Pé do Monte to Porto do Cachorro including the Madalena islets, Lajes do Pico Bay to Ponta da Queimada, Ponta dos Mistérios and Baía das Canas to Prainha lighthouse; 8) Faial - surrounding coast of the Capelinhos Volcano, Castelo Branco hill, Feteira to the breakwater of the Port of Horta (including the Protected Landscape of Monte da Guia) and from Ponta dos Cedros to Ponta do Salão; 9) Flores - Ponta Ruiva to Santa Cruz, including the islets, Ponta dos Bredos to Ponta Lopo Vaz and Baixa da Rosa to Ponta Delgada, including the islets; 10) Corvo - Pão de Açúcar, Portinho da Areia to Ponta Negra, Ponta do Marco to Ponta dos Torrais and Pedra do Atlas to Canto do Carneiro.</p>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Graciosa Island and respective Limpets catches – seasonal restricted areas

Designation type: Integral Reserve Areas for catching limpets

Designation level: subnational

Type of area: coastal

Brief general description of geographic, morphological and environmental features:
univalve mollusks, commonly known as limpets

Uses and human activities in place in the area (the most relevant):

- Fish and shellfish harvesting (professional, recreational)
- Hunting and collecting for other purposes
- Research, survey and educational activities

Anthropogenic pressures in marine environment (the most relevant):

Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)

Ecological criteria:

Protection of species (invertebrates)

Management measures:

Conditional Operating Zones - relating to locations and time;

- Closed season - no harvest between October 1st and May 31st,
- Minimum sizes and catch limits



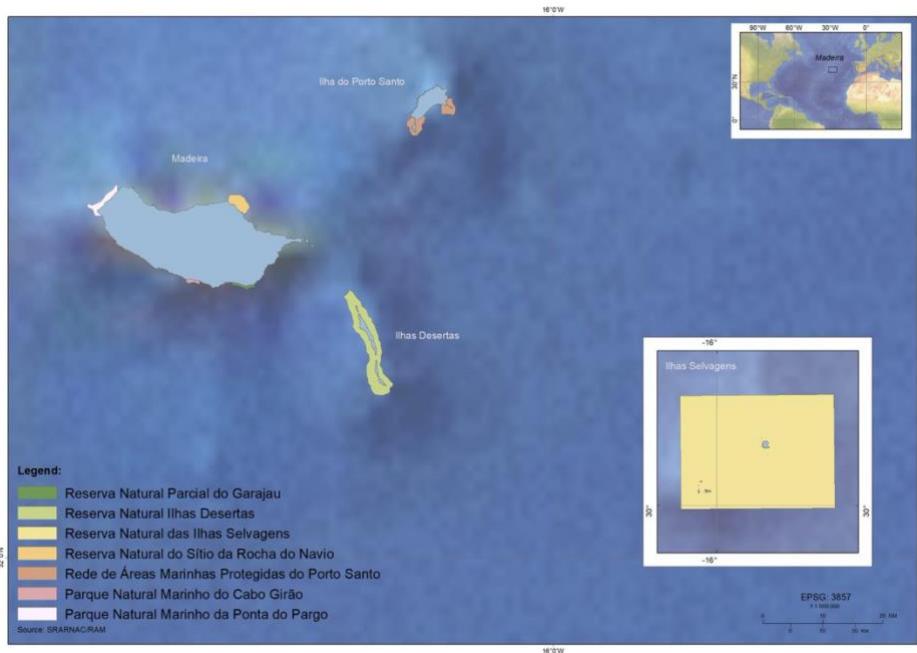
<ul style="list-style-type: none"> • Underwater harvesting - can only be carried out in snorkelling • Authorization and licensing regime for harvesting and commercialization.
<p>Trade-offs between sea uses and marine protection: discuss challenges and achievements (info to be collected from interview and expert knowledge). In a scale 1-5 how challenging was to achieve a compromise. In a scale 1-5 how much you think the solution found meets optimal protection objectives?</p> <p>No compensation measure was offered to fishermen or other restricted activity. The activity is not controlled. 3 on a protection scale</p>
<p>Coexistence and multi-use of the sea: Exceptions to all the provisions of the regulation are crops that are proven to be made for scientific purposes.</p>
<p>For OECMs (examples of topics that can be included in the description):</p>
<ul style="list-style-type: none"> - Policy context in which the measure has been established: Article 4(5) of Regional Regulatory Decree 14/93/A, of 31 July - Approves the regulation for harvesting limpets.
<ul style="list-style-type: none"> - Main sector(s) involved in the OECMs: shellfishermen
<ul style="list-style-type: none"> - Main environmental impacts targeted: regulation of harvesting, both for own consumption and for commercial purposes and the respective commercialization to guarantee the conservation and management of the populations of limpets, in order to avoid future ruptures in the respective stocks.
<ul style="list-style-type: none"> - Direct and indirect implications for biodiversity and ecosystem protection of the OECM: conservation of the stock of limpets, continuing to be a source of income and food for the population.
<ul style="list-style-type: none"> - Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring: Not found. The inspection of compliance with the provisions of this regulation is the responsibility of the maritime authority, the Tax Guard, and the Economic Inspection Services of the Regional Secretariat for Youth, Employment, Commerce, Industry, and Energy.
<ul style="list-style-type: none"> - Opportunities for establishing this type of OECMs in other areas of the sea-basins: opportunity to legislate about specific fishing gear or upon a particular specie
<ul style="list-style-type: none"> - Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation: the strong point is the conservation of stocks if achieved as planned; the weak point is the difficulty to control if the rules are being followed.
<ul style="list-style-type: none"> - Potential for strengthening of protection measures: there must be constant on-site monitoring and updating of the data and licenses of the shellfishermen.
<ul style="list-style-type: none"> - Economic sector involvement and potential for strengthening of protection measures: guarantee of continuity of the commercial activity of collection, serving as a source of income and food
<ul style="list-style-type: none"> - Sources: Regional Legislative Decree no. 45/2008/A



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



4. Ilhas Selvagens (PT)

Sea- basin: North-Atlantic
Country: Portugal
Site name: Ilhas Selvagens
<p>Site map: Are the southernmost part of the Portuguese territory, situated in the North Atlantic Ocean between latitudes 30°01'35 "N and 30°09'10 "N and longitudes 15°52'15 "W 16°03'15"W, they are 163 nautical miles southeast of Madeira Island.</p> 
Designation type: Natural Reserve (overlaps the SAC classified area) and included in the SPA classified area.
Designation level: Subnational
Type of area: offshore
<p>Brief general description of geographic, morphological and environmental features</p> <p>They are of volcanic origin and consist of two islands: Selvagem Grande, where the main support station for the protected area is located, and Selvagem Pequena, by a series of islets, the main one being Ilhéu de Fora, and by all the adjacent marine area.</p>
Uses and human activities in place in the area (the most relevant): in the description, please make referenced to the ones identified under the MSFD, see Table 1



<ul style="list-style-type: none">- Tourism and leisure activities- Tourism and leisure infrastructure- Transport — shipping- Research, survey and educational activities
<p>Anthropogenic pressures in marine environment (the most relevant): in the description, please make referenced to the ones identified under MSFD, see Table 2. To each pressure, a score will be assigned to assess its relevance</p> <p>Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities).</p>
<p>Ecological criteria: to be selected from a closed list, as in Table 3, include also a narrative description</p> <p>Protection of species (bird, mammal, reptile, fish, invertebrates, plant/algae) Protection of habitat (coastal - hard bottom, coastal - soft bottom, deep sea)</p>
<p>Management measures: availability of a management plan for the area will be checked. In case of a plan available typology of measures will be identified based on a closed list of options as in Table 4 and then described in more detail</p>
<p>Trade-offs between sea uses and marine protection:</p> <p>It has the status of an Integral Reserve, in which the ecosystems of the entire land area (Selvagem Grande, Selvagem Pequena, Ilhéu de Fora, and adjacent islets), and of the entire adjacent marine area are protected up to 12 nautical miles.</p> <p>The access of people to the land area, diving, interpretive visits, bird watching and listening, and overnight stays are allowed in the context of awareness and educational activities with the authorization of the Institute of Forests and Nature Conservation; The exercise of any fishing activities is forbidden in this entire area.</p> <p>Decree-Law n.º 8/2022/M, of 3 May, that approves the new juridical regime of the Natural Reserve of the Selvagens Islands.</p>
<p>Coexistence and multi-use of the sea: present good practices (info to be collected from interviews and/or desk analysis)</p>
<p>- Sources:</p> <p>https://ifcn.madeira.gov.pt/areas-protegidas/ilhas-desertas/gestao-e-protecao.html</p>



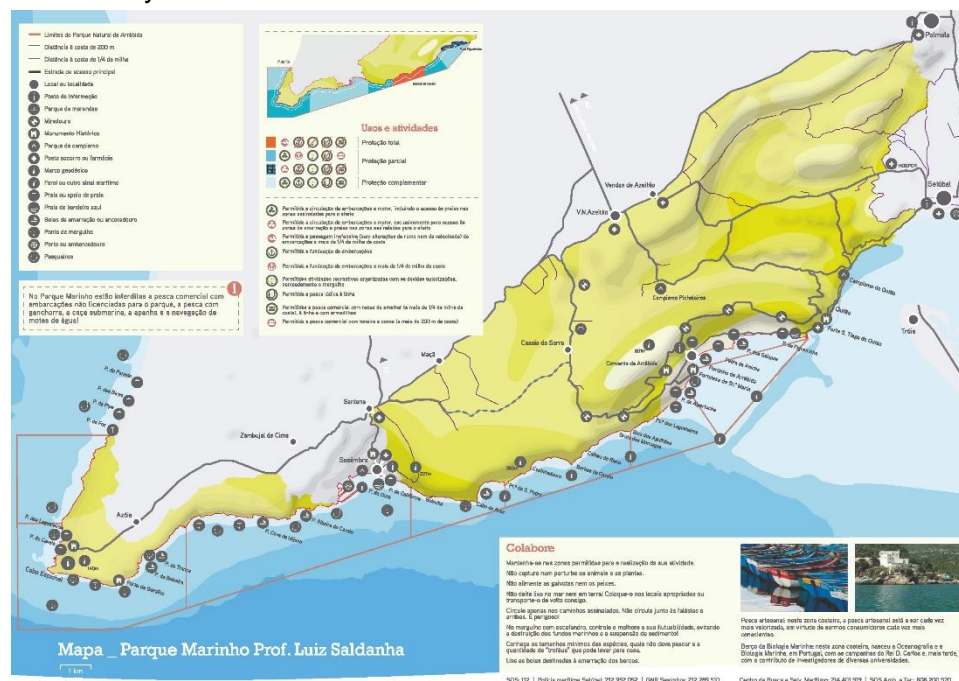
5. Marine Park Professor Luis Saldanha / Arrabida Natural Park (PT)

Sea- basin: North-Atlantic

Country: Portugal

Site name: Marine Park Professor Luis Saldanha / Arrabida Natural Park

Site map: The waters off the Arrábida-Espichel coast are protected by the Marine Park Professor Luiz Saldanha, created in 1998 with the main objective of protecting and restoring biodiversity.



Designation type: Nature Park. The entire Marine Park area is part of the Arrábida Natural Park, managed by the Institute for Nature Conservation and Forests (ICNF), and is integrated into the European network of conservation areas - Natura 2000 Network.

Designation level: national

Type of area: coastal

Brief general description of geographic, morphological and environmental features

In only 53 km² more than 2000 marine species have been found, highlighting the unique character of these waters. The environmental and geographical conditions of the Marine Park allow for the existence of different types of habitats, some of which are preferred sites for the reproduction, feeding and refuge of many species. Species of high commercial value spend important stages of their life cycle here, so the biodiversity of the Marine Park is also a source of livelihood for fisheries, marking the identity of local communities. In 2011, they defined a way to successfully transplant 11 m² of the species *Zostera marina*, which persisted and expanded.



This area, in 2014, had already increased about 5 times its initial size. However, the interviews showed that part of this recovery is not in place anymore. This is a regular MPA with good examples of restoration measures. Implementing OECMs with restoration measures is possible if we perform long-term compromises in conservation projects and co-management structures.

Uses and human activities in place in the area (the most relevant):

- Marine plant harvesting
- Tourism and leisure activities
- Fish and shellfish harvesting (professional and recreational)
- Research, survey and educational activities

Anthropogenic pressures in marine environment (the most relevant):

- Input or spread of non-indigenous species,
- Disturbance of species (e.g. where they breed, rest and feed) due to human presence,
- Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities),
- Physical disturbance to seabed (temporary or reversible)

Ecological criteria:

Protection of species (bird, fish, underwater grasslands)

Management measures:

- No access zone
- Regulated access
- Speed regulation
- Anchoring regulation
- Only allowed uses
- No take zone
- Regulated gears
- restoring the seagrass meadows

Trade-offs between sea uses and marine protection: No compensation measure was offered to fishermen or other restricted activity.³ on a protection scale.

Coexistence and multi-use of the sea:

However, inside the zoning scheme of the Spatial Management Plan outside the no take area, only local small scale traditional fisheries can operate.

- **Policy context in which the measure has been established:**
- The Council of Ministers Resolution nº 142/1997 of 28th August approves the Arrábida/Espichel Natura 2000 Network site
- The Regulating Decree nº 23/98 of 14th October creates the Marine Park Professor Luiz Saldanha
- The Council of Ministers Resolution nº 86/2003, of 25 June approves the Sintra-Sado Coastal Zone Management Plan (POOC)
- The Council of Ministers Resolution nº 141/2005, of 23 August 2005 approves the Arrábida Natural Park Management Plan (POPNA)



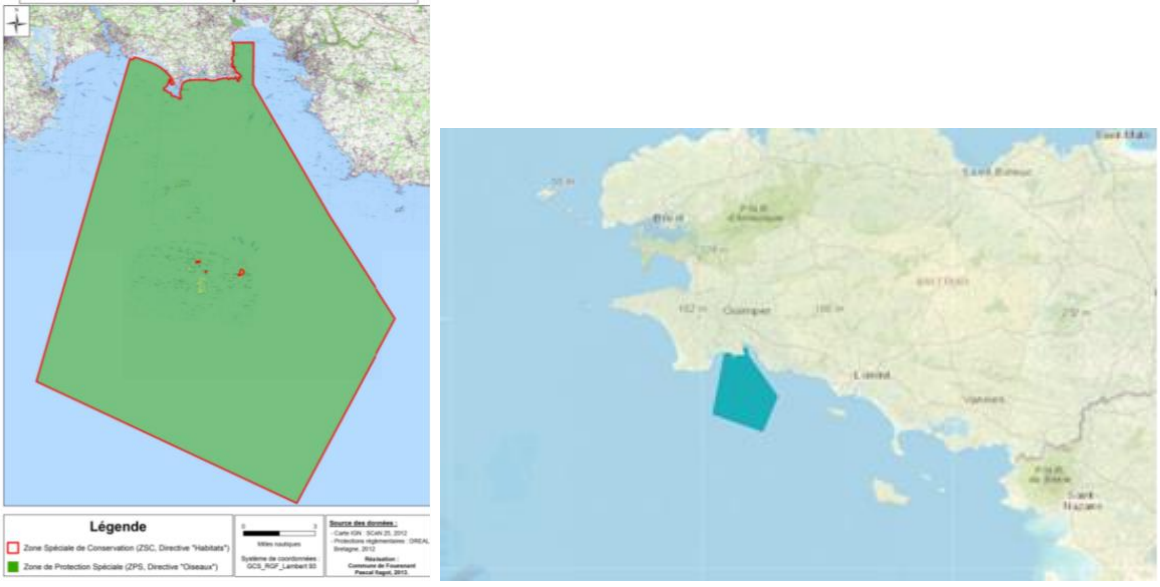
- Main sector(s) involved in the measure: not applicable
- Main environmental impacts targeted: restoration of Algae and grassland
- Direct and indirect implications for biodiversity and ecosystem: In 2011, they defined a way to successfully transplant 11 m2 of the species <i>Zostera marina</i> , which persisted and expanded. This area, in 2014, had already increased about 5 times its initial size. However, the interviews showed that part of this recovery is not in place anymore.
- Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring: Yes, there are some initiatives, mostly from the University of the Algarve. (https://arrabidaparquemarinho.ualg.pt/ciencia-e-conservacao)
- Opportunities for establishing this type of measure: this is a regular MPA with good examples of restoration measures. Implementing OECMs with restoration measures is possible if we perform long-term compromises in conservation projects and co-management structures.
- Strengths and weaknesses of this measure: the MPA are highly dependent on conservation projects (max five years). Still do not have a policy framework for the steering committee and other co-management initiatives (more explanation in the interview)
- Potential for strengthening of protection measures: constant monitoring



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



6. A Special Protection Area in Glenan Islands (FR)

Sea-basin: North-Eastern Atlantic
Country: France
Site name: Archipel des Glénan (Glenan Islands)
Site map: 
Designation type: <u>Special Protection Area (SPA)</u> - Natura 2000 (Birds Directive). In France: type A (ZPS)
Designation level: national (code de l'environnement, Article L. 414-1) and European (Directive 2009/147/EC)
Type of area: coastal & offshore
<p>Brief general description of geographic, morphological and environmental features: Legally designated in 2019 as a special protection area (SPA), the surface of this marine protected area (MPA) is 58,790 ha. The area is located in the region of Brittany and is administratively attached to the municipality of Fouesnant. The Archipel des Glénan (Glenan archipelago) is composed of eight main islands and about ten islets with multiple reefs bordering it.</p> <p>This archipelago constitutes a very rich ecological system, both on land and at sea, with very fine balances between the islands, the lochs, the islets, the reefs, and the vegetation. The major ornithological interest of the site is essentially based on its role in the reproduction of several species of seabirds, which concerns approximately 140 species of birds.</p>
Uses and human activities in place in the area (the most relevant): in the description, please make referenced to the ones identified under the MSFD, see Table 1.



The principal human activities in the MPA, from high (H) to medium (H) importance in terms of pressures, are:

- Tourism and leisure: infrastructure and activities (H)
- Extraction of living resources: fish and shellfish harvesting (professional, recreational) (M)
- Transport: infrastructures, passengers, shipping (M)
- Physical restructuring of seabed: dredging and bottom trawling (?)

Anthropogenic pressures in marine environment (the most relevant): in the description, please make referenced to the ones identified under MSFD, see Table 2. To each pressure, a score will be assigned to assess its relevance

- Biological:
 - Disturbance of species due to human presence
 - Extraction of, or mortality/injury to, wild species
 - Input of microbial pathogens
- Physical:
 - Physical disturbance to seabed
 - Physical loss
- Substances, litter and energy:
 - Input of nutrients (eutrophication)
 - Input of other substances: synthetic substances (e.g. microplastics, chemicals from sunscreens...)
 - Input of litter
 - Input of anthropogenic sound

Ecological criteria:

- Protection of species (birds)

The archipelago plays an important role in the **conservation and reproduction of seabirds, and concerns about 140 species of birds on a regular basis**. The avifauna of Glénan includes a total of 33 breeding species, among which 32 are also present in winter or frequent the area during the migration period, while 105 other species are only migratory or wintering. This brings to 137 the number of species for which the Glénan archipelago hosts populations during the inter-nuptial period. The low number of breeding species is characteristic of island systems. This phenomenon is compensated by the presence of several species with high heritage value. This is also a significant breeding area for terns.

Seabirds present on the site and subject to evaluation:

Sterna sandvicensis, Sterna dougallii, Sterna hirundo, Sterna albifrons, Chlidonias niger, Uria aalge, Alca torda, Asio flammeus, Puffinus puffinus mauretanicus, Gavia stellata, Gavia arctica, Gavia immer, Podiceps cristatus, Podiceps auritus, Podiceps nigricollis, Puffinus puffinus, Hydrobates pelagicus, Morus bassanus, Morus bassanus, Phalacrocorax carbo, Phalacrocorax carbo, Phalacrocorax aristotelis, Branta bernicla, Somateria mollissima, Melanitta nigra, Mergus serrator, Pernis apivorus, Falco peregrinus, Fulica atra, Haematopus ostralegus, Haematopus ostralegus, Charadrius hiaticula, Charadrius hiaticula, Charadrius alexandrinus, Pluvialis squatarola, Calidris alba, Calidris ferruginea, Calidris maritima, Calidris alpina, Philomachus pugnax, Philomachus pugnax, Limosa lapponica, Numenius arquata,



Tringa totanus, Arenaria interpres, Arenaria interpres, Stercorarius parasiticus, Catharacta skua, Larus minutus, Larus fuscus, Larus argentatus, Larus marinus.

Management measures:

Presence of a management plan, but typology of measures not quite defined.

Explicit actions:

- No access zone and regulated access: access is forbidden to certain islands during the reproduction period to protect seabirds.

And less defined actions include:

- Evaluation of impacts on seagrass and definition of protection zones.
- Experimentation of “ecological” moorings.
- General awareness raising and diffusion of good practices.
- Natura 2000 Charter

Trade-offs between sea uses and marine protection (*The following information was collected from an interview*)

Birds protection

Challenges: the MPA is home to numerous migratory birds, which are subject to significant external pressures and impacts. For instance, the recent avian flu has decimated a large part of the protected terns (*Sterna*) and northern gannet (*Morus bassanus*). Therefore, it is often hard to meet the Natura 2000's objectives in terms of conservation status. Moreover, site managers may face challenges in assessing the conservation status of bird species and the efficiency of protection measures.

Achievements: several measures have been put into place for the protection of birds, such as a strictly protected zone on the Ile aux Moutons with public restriction from April to August (during the nesting and reproduction period). These measures are regularly monitored, reviewed, and analysed.

Trade-offs between human activities and birds' protection (*For context purposes, it is a highly frequented area with many human activities and overlapping MPAs*).

Challenges:

- ⊘ Changes of certain socio-economic activities that compromise(d) birds' protection.
- ⊘ The different stakeholders' perspectives in relation to conservation means, who are involved in the site's protection.
- ⊘ Time in decision-making due to a relative high number of consultations with all the stakeholders.
- ⊘ Public visibility regarding the site's objectives and regulations due to the multiplicity of stakeholders and protection measures.

Achievements:

- ⊘ The measures implemented have contributed to the reduction of pressures on protected birds.
- ⊘ Successful management between human activities and protection measures.
- ⊘ Different MPAs overlap in this area. Although there are more regulations and longer consultation processes, the MPAs are complementary, and the communication and coordination between stakeholders are enhanced.



In a scale from 1 to 5, 1 being “**no** effective management measures between bird protection and human activities” and 5 being “**high** effective management measures between birds' protection and human activities”, how would you rate the management measures in the SPA?
4/5

Coexistence and multi-use of the sea: *(the following information was collected from an interview):*

The Community of Communes Pays Fouesnantais (CCFP) is not in charge of the management of human activities at sea. That is the role of either the “Direction Interrégionale de la Mer” or the maritime prefecture. The CCFP only intervenes if some human activities have an impact on bird species protected by the site.


For information, the present SPA management plan should be updated in 2025 or 2026. The update will depend on the future conservation objectives in the geographic zone (change or addition of MPAs, coordination between all the different MPA management plans...).

Sources:

- Museum national d'Histoire naturelle. (2023). *FR5310057 - Archipel de Glénan*. <https://inpn.mnhn.fr/docs/natura2000/fsdpdf/FR5310057.pdf>
- Ragot, P. (2014). *Document d'objectifs Natura 2000 – Archipel des Glénan, tome II : Diagnostic du site et mesures de gestion*. DREAL Bretagne / Commune de Fouesnant-les-Glénan. http://natura2000.mnhn.fr/uploads/doc/PRODBIOTOP/1498_DOCOB_GLENAN_TOME_2.pdf
- Inventaire National du Patrimoine Naturel. (2022). *FR5310057 - Archipel de Glénan*. <https://inpn.mnhn.fr/site/natura2000/FR5310057>



7. A Special Area of Conservation in the Gulf of Morbihan (FR)

Sea-basin: North-Eastern Atlantic
Country: France
Site name: Golfe du Morbihan, côte ouest de Rhuys (Gulf of Morbihan)
Site map: 
Designation type: Special Area of Conservation (SAC) , first adopted as a site of community importance (SCI) - Natura 2000 (Habitats Directive). In France: type B (pSIC/SIC/ZSC)
Designation level: national (code de l'environnement, Articles L. 414-1, R. 414-1, R. 414-3, R. 414-4 and R. 414-7; and European (Directive 92/43/CEE)
Type of area: coastal, offshore, and onshore
Brief general description of geographic, morphological and environmental features: <p>A site of community importance (SCI) was adopted in 2004 in the Gulf of Morbihan, in which a special area of conservation (SAC) was legally designated in 2007. The surface of this marine protected area (MPA) is 9 502 ha (91 % is marine surface).</p> <p>The Gulf of Morbihan is located in Brittany and encompasses 17 municipalities. This area is characterised by a vast sandy-muddy expanse bordered by salt and coastal marshes. There are multiple indentations, dotted with islands and islets, and separated from the sea by a narrow inlet crossed by violent tidal currents.</p> <p>The gulf is the second-largest group of eelgrass beds in France, especially for <i>Zostera noltii</i> (muddy flats of community interest). The seagrass bed plays a significant role for the wintering and migration of water birds (Ramsar site hosting between 60,000 and 130,000 birds in winter). The rocky seabed is home to a remarkable diversity of fauna and flora. In general, there is a vast range of habitats (sea, estuaries, rivers, meadows, salt marshes, sand dunes...) in the Gulf of Morbihan.</p>
Uses and human activities in place in the area (the most relevant): in the description, please make referenced to the ones identified under the MSFD, see Table 1



The principal human activities in the gulf, from high (H) to medium (H) importance in terms of pressures, are:

- Extraction of living resources: fish and shellfish harvesting (professional, recreational) (M)
- Tourism and leisure: infrastructure and activities (?)
- Physical restructuring of seabed: dredging and bottom trawling (?)

Anthropogenic pressures in marine environment (the most relevant):

- Biological:
 - Disturbance of species due to human presence
 - Input or spread of non-indigenous species (invasive species)
- Physical:
 - Physical disturbance to seabed
 - Physical loss
- Substances, litter and energy:
 - Input of nutrients (eutrophication)
 - Input of litter
 - Input of anthropogenic sound

Ecological criteria:

- Protection of species (birds, plants/algae, mammals, fishes, invertebrates)
- Protection of habitat (coastal, soft bottom, hard bottom)

On the site, habitats of European interest (marine and terrestrial) cover 15,009 ha. Marine habitats of community interest cover approximately 13,773 ha and terrestrial habitats of community interest occupy 1,236 ha out of 6,117 ha of mapped terrestrial habitats (excluding paths, roads and urbanized areas). Some of these habitats, rare and threatened on a European scale, are classified as priority community interest.

Here is a non-exhaustive list of the habitats:

Sandbanks, bay mud, intertidal zones, lagoon, coves, dunes, meadows, reefs, moorlands, reed beds.

Species present on the site and subject to evaluation:

Myotis myotis, *Tursiops truncatus*, *Lutra lutra*, *Halichoerus grypus*, *Phoca vitulina*, *Vandenboschia speciosa*, *Rumex rupestris*, *Euplagia quadripunctaria*, *Eryngium viviparum*, *Luronium natans*, *Oxygastra curtisii*, *Coenagrion mercuriale*, *Euphydryas aurinia*, *Lucanus cervus*, *Cerambyx cerdo*, *Petromyzon marinus*, *Alosa alosa*, *Alosa fallax*, *Salmo salar*, *Rhinolophus hipposideros*, *Rhinolophus ferrumequinum*, *Barbastella barbastellus*, *Myotis emarginatus*, *Myotis bechsteinii*, *Pelodytes punctatus*, *Bufo calamita*, *Hyla arborea*, *Rana dalmatina*, *Streptopelia turtur*, *Asphodelus arrondeaui*, *Coeloglossum viride*, *Erodium botrys*, *Parentucellia latifolia*, *Peucedanum officinale*, *Ranunculus ophioglossifolius*, *Zostera marina*, *Zostera noltii*, *Aster linosyris* subsp. *armoricanus*, *Cytisus scoparius* subsp. *maritimus*, *Daucus carota* subsp. *gadecaei*, *Dianthus hyssopifolius* subsp. *gallicus*, *Galium mollugo* subsp. *Neglectum*, *Limonium ovalifolium* subsp. *gallicum*, *Lupinus angustifolius* subsp. *reticulatus*.

Management measures:

Presence of an **objective report** (DOCOB, in French), which is quite complete and include: an inventory of habitats, species and geological features; protection objectives and measures;



and a plan for the evaluation and reporting of scientific work, consultation process, and legal protection.

The Gulf of Morbihan is subject to a **set of very complex regulations and regulatory mechanisms**, of scope and of different influence.

Regulations in the gulf (and in the MPA) include, but are not limited to:

- No access zone
- Regulated access
- Speed regulation
- Anchoring regulation
- Only allowed uses
- Regulated gears

Trade-offs between sea uses and marine protection: *(the following information was collected from an interview):*

Created in 2014, the Regional Nature Park (RNP) of the Gulf of Morbihan is the public body in charge of the SAC. Although RNPs are land areas of national interests, some RNPs in France—like the Gulf of Morbihan—have marine zones.

Several protection and management measures are in place, and sometimes overlap, in the Gulf of Morbihan, such as:

- 2 Natura 2000 sites (SAC and SPA) → managed by the RNP of the Gulf of Morbihan and the French Office for Biodiversity;
- 1 national hunting and wildlife reserve → managed by the French Office for Biodiversity;
- 1 national nature reserve → managed by the *Réserve Naturelle de Séné*;
- 1 biotope decree → signed by the minister in charge of environment.

Challenges for the SAC:

- Difficulties in **assessing the good ecological and conservation status of habitats**. For instance, what were their initial good ecological health to set a benchmark?
- **Impact assessment:** defining which human activity has the most direct impact and measuring the indirect impacts on marine habitats are both challenging. As an example, there is still no fishing risk analysis in the area. As another example, since a few years, the presence of green algae on the seabed has increased, which affects marine habitats. While green algae blooms are caused by poor water quality, it is hard to identify the source of water quality degradation.
- In the Gulf of Morbihan, there is a **significant diversification of the types of human activities at sea or on the coastline** (e.g. wing foil, coastal walks...), as well as an **augmentation of people participating in these activities**.
- High biodiversity protection measures can only be implemented by the competent governing body. The RNP of the Gulf of Morbihan can spatially or quantitatively limit human activities at sea with the government services' approval.
- The MPA governance can be challenging, because it is sometimes based on political perspectives, rather than technical and scientific discussions. From an environmental point of view, strategies adopted are not always adequate.

Achievements for the SAC:



- **Awareness-raising measures and prevention campaigns with sea users** have been fruitful. Every year, the RNP team trains maritime professionals and educates tourists to share and promote environmentally sustainable practices. Feedback shows that most sea users would adapt their activities to reduce their impacts on marine habitats.
- There are **human and financial means** to enhance the natural and cultural heritage of the park, **although not enough to effectively manage the MPA**.
- The PNR, hence the MPAs (including the SAC), are involved in several national and regional projects such as Life Marha (to improve the conservation status of marine habitats) and VALMER (to enhance effective maritime planning through a better assessment of marine ecosystem services). Being part of these projects allows information sharing and best practices exchange to meet sustainable development objectives.
- There is an **efficient collaboration** between environmental policing, the RNP, and governing bodies.

In a scale from 1 to 5, 1 being “**no** effective management measures between habitats protection and human activities” and 5 being “**high** effective management measures between habitats protection and human activities”, how would you rate the management measures in the SAC?

3/5.

Coexistence and multi-use of the sea: *(the following information was collected from an interview):*

In 2006, a **local maritime planning tool** (*Schéma de mise en valeur de la mer*) was implemented in the Gulf of Morbihan. This has led to an efficient multi-use of the sea and marine protection management. Despite an update of the plan in 2020 and successful outcomes in terms of co-existence of activities in the past, consultations with stakeholders to implement the strategies have been in hold.

Sources

- € Inventaire National du Patrimoine Naturel. (2022) *FR5300029 -Golfe du Morbihan, côte ouest de Rhuys*. Available at: <https://inpn.mnhn.fr/site/natura2000/FR5300029> (Accessed: 29 April 2023).
- € Museum national d'Histoire naturelle. (2023) *FR5300029 - Golfe du Morbihan, côte ouest de Rhuys*. Available at: <https://inpn.mnhn.fr/docs/natura2000/fsdpdf/FR5300029.pdf> (Accessed: 29 April 2023).
- € La direction départementale des Territoires et de la Mer du Morbihan. (2021) *Schéma de mise en valeur de la mer Golfe du Morbihan*. Available at: https://www.morbihan.gouv.fr/contenu/telechargement/56651/400186/file/2021_05_31%20SMVM%20r%C3%A9vis%C3%A9%20et%20modifi%C3%A9%20version%20compress%C3%A9e.pdf (Accessed: 29 April 2023).
- € SIAGM et ONCFS, (Coord.) Cosson T., Mézac A. (SIAGM) et Picard L (ONCFS). (2013) ‘Document d'objectifs des sites Natura 2000 ZSC « Golfe du Morbihan – côte ouest de Rhuys » (FR 53 000 89) et ZPS « Golfe du Morbihan » (FR 53 100 86)’, *Syndicat Intercommunal d'Aménagement du Golfe du Morbihan et Office National de la Chasse et de la Faune Sauvage*. Available at:



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



http://natura2000.mnhn.fr/uploads/doc/PRODBIOTOP/79_N2_02102013_PG_Docob_GOLFE56_app.pdf (Accessed: 30 April 2023).



Mediterranean Sea

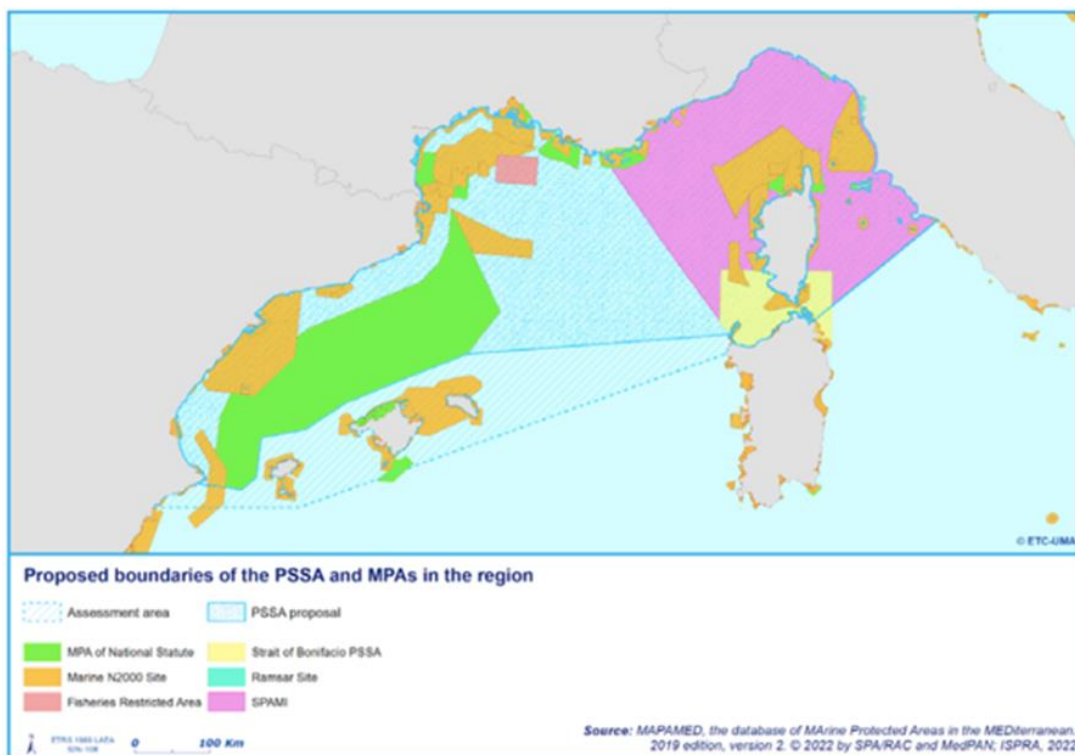
1. Proposition for a North-Western Mediterranean Particularly Sensitive Sea Area (PSSA) (FR, IT, MO, SP)

Sea- basin: North-western Mediterranean Sea

Country: France, Spain, Italy, Monaco

Site name: Proposition for a North-western Mediterranean Particularly Sensitive Sea Area (PSSA)

Site map



Designation type: Particularly Sensitive Sea Area (PSSA)

Designation level: international

France, Italy, Monaco and Spain have jointly submitted a proposal for a new Particularly Sensitive Sea Area (PSSA) to be established to the International Maritime Organization, in order to protect cetaceans. In December 2022, the Marine Environment Protection Committee (MEPC) of IMO agreed to the designation of the North-Western Mediterranean Sea as a PSSA. Proponents submitted their request to the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) and to the Maritime Safety Committee in May 2023. The MEPC



agreed with the designation of the new NW Med PSSA at the MEPC 80 meeting held from 3 - 7 July 2023. Entry into force is expected by the beginning of 2024.

Type of area: coastal, offshore, deep sea

Coastal, offshore.

Brief general description of geographic, morphological and environmental features

The proposed PSSA encompasses the whole Pelagos Sanctuary and the Spanish cetacean corridor, which are already designated as Special Protected Areas of Mediterranean Importance (SPAMIs) under the Barcelona Convention and the UN Mediterranean Action Plan dedicated to the conservation of cetaceans.

The north-western portion of the Mediterranean basin is characterized by the rapid plunge of the coast towards the deep sea (up to 2,000 metres) in proximity of the main islands (Corsica and Sardinia) and off the Ligurian coasts and most of the Provence-Alpes-Côte d'Azur's and Catalonia's coast. The seabed shows one of the highest densities of canyons globally and submarine valleys between 300 and 600 metres deep (IMO, 2022). The area is characterized by a high rate of endemism. The majority of biological populations are composed of Mediterranean subpopulations, different from the Atlantic populations. The overall area has a set of geomorphological and oceanographic features that favour productivity levels of biological and ecological importance for the region. In particular, the area hosts important habitats for endangered cetacean species, i.e., Mediterranean fin whales (*Balaenoptera physalus*), the sperm whales (*Physeter macrocephalus*), the Cuvier's beaked whales (*Ziphius cavirostris*), the bottlenose dolphins (*Tursiops truncatus*) and the Risso's dolphins (*Grampus griseus*).

Uses and human activities in place in the area (the most relevant): in the description please make referenced to the ones identified under the MSFD, see Table 1

1. Transport — shipping

In the north-western Mediterranean area, the shipping activity constitutes the main environmental hazard to the marine environment in open-sea areas. The proximity to large and tourist islands and coastal areas, and the important port infrastructures promotes intense economic trades, seasonal passenger traffic as well as widespread recreational boating. Such activities have had a gradual increasing over the years as well as the size and speed of the vessels (IMO, 2022; Fortuna et al., 2022).

Anthropogenic pressures in marine environment (the most relevant):

Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities): this is linked to ship strikes

2. Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides) — diffuse sources, point sources, atmospheric deposition, acute events
3. Input of litter (solid waste matter, including micro-sized litter)
4. Input of anthropogenic sound (impulsive, continuous)

Among maritime uses that produce pressures on the marine environment, international shipping traffic has been identified as a threat to the conservation of cetaceans, particularly in terms of accidental mortality and serious injuries to large cetaceans, such as the fin whale and the sperm whale, due to collision, as well as chemical and acoustic threats. Pollution is determined by accidental or intentional discharges of a wide variety of substances, either directly into the marine environment or indirectly through the atmosphere. This includes



releases of oil and oily mixtures, noxious liquid substances, sewage, garbage, noxious solid substances, anti-fouling systems, harmful aquatic organisms and pathogens, and noise.

Collision between ships and large cetaceans is internationally recognized as an important threat to cetaceans, especially as shipping traffic, vessel size and speed continue to increase. Collisions involve a wide variety of vessels, with the risk of collision increasing with vessel speed, as does the severity of injury to the animal (Leaper, 2019). Accidents generally take place offshore and are rarely noticed by seafarers. The two species that are mainly concerned in this area are the fin whale and the sperm whale. The latter spends long periods of rest floating at the surface between deep dives, making it very vulnerable to ship strikes (UNEP/MAP-RAC/PSA, 2016). Different scientific studies highlight that collision is the main human cause of death for fin whales in the western Mediterranean and the majority of injured fin whales when struck by ships had not yet reached the reproductive stage (Peltier et al., 2019).

Furthermore, the shipping traffic alters also the health status of cetaceans, influencing their behavioural responses and moving to less favourable habitats, altering the normal course of functions such as foraging, social functioning, reproduction, suckling, resting or migration (IMO, 2022).

The underwater noise generated by human activities (e.g., commercial shipping) is another pressure identified and it is mainly due to the merchant ship through the engine propeller. The noise level increases with the shape of the propeller, the state of wear of the ship, its size, speed and loading. The anthropogenic noise level has steadily increased over the years as shipping traffic has increased. Such noises have the effect of reducing the communication range of cetaceans, making difficult for them to find mates or establish social relationships, as well as foraging, orientation and increase the risk of decompression illness (IMO, 2022).

Ecological criteria:

- Protection of species (mammals)

The proposed PSSA is frequented by several species of cetaceans, eight of which (fin, sperm, Cuvier's beaked and long-finned pilot whales, Risso's, bottlenose, striped and common dolphins) are regularly present all year round.

The estimated abundance of fin whale within the proposed PSSA represents about the 67% of the whole Mediterranean population (ACCOBAMS 2021). Concerning the sperm whale, compared to the total Mediterranean the estimate in half of the proposed PSSA (Laran et al. 2017) was between 300 and 600 individuals.

Management measures:

The designation of a Particular Sensitive Sea Area in the North-Western Mediterranean Sea has been proposed to protect cetaceans from collision risk, ship-generated pollution and to increase awareness on a critically important area for the fin whale and the sperm whale. The following Associated Protective Measures (APMs) have been proposed – each of those have to be implemented on voluntary basis:

(1) recommendation to seafarers/ship operators to navigate with particular caution within the NW Med PSSA, when and where large and medium cetaceans are present, and to limit their speed to between 10 and 13 knots as voluntary speed reduction; (2) recommendation to ships to keep an appropriate safety distance or speed reduction measure from any large and medium cetaceans observed or detected in close quarter situation; (3) recommendation to ships to broadcast by VHF or other suitable means on the area the position of medium and large



cetaceans observed or detected and to transmit the information and the position to a designed coastal Authority; (4) Mariners should report any collision with cetaceans to a designated coastal Authority(ies), which should forward this information to the International Whaling Commission (IWC) global cetacean ship strikes database...

Beyond the above-mentioned measures, coastal and local authorities have taken specific and more strictly protection actions by creating various marine protected areas (almost 145,000 km² of the study area has a special status). Overall, the measures and recommendations already implemented are: traffic management measures (permanent or seasonal), recommendation for specific routes, prohibited areas, reduction in the speed of ships and in the propeller cavitation (permanent or seasonal), and mandatory ship notification systems to trigger anti-collision manoeuvres. Beyond these international agreed actions, bilateral measures have been undertaken by France, Italy, Monaco and Spain governments through specific regulations and laws (IMO, 2022).

A way to implement voluntary measures is to work on labels such as Green Marine Europe for sustainable shipping (operated in the PSSA context by Surfrider foundation) or “Charte Croisière Durable Méditerranée” (sustainable cruising strategy) in the French context.

Trade-offs between sea uses and marine protection:

Potential shipping lane displacement or traffic report due to speed limitation measures. But still need to be evaluated in terms of economic impact. It hasn't been a strong question yet since proposed measures are on voluntary basis.

Coexistence and multi-use of the sea: present good practices (info to be collected from interviews and/or desk analysis)

Does not apply.

Additional information:

- **Policy context in which the measure has been established:** International Maritime Organization
- **Main sector(s) involved in the OECMs:** maritime transport
- **Main environmental impacts targeted:** cetaceans' mortality due to collisions
- **Direct and indirect implications for biodiversity and ecosystem protection of the OECM:**
- **Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring:**
- **Opportunities for establishing this type of OECMs in other areas of the sea-basins:** PSSAs are established under IMO and so this type of measure is transferable in all European seas. This type of measure is suitable for hot spot areas where maritime traffic density is particularly high. The measures have potential to reduce impacts on the mobile marine megafauna, as well as risk of acute pollution in relation with accidents. Reduced speed also determines reduced CO₂ and other pollutant emissions.



- **Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation:** PSSAs are established under IMO so the measures established apply to all world fleets. Establishment of a PSSAs can pave the way for the establishment of more restrictive measures and/or of other type of protection. When measures are expressed only in terms of recommendations, to be applied under a voluntary base, the risk of inefficiency is high. However, it has to be noted that IMO rarely imposes obligatory measures when defining a PSSA, except for very small areas. The PSSA application would have probably not been accepted if obligatory measures were proposed. The designation process took about 2 years which is quite short, but following the designation of the PSSA, the proponents might consider proposing relevant ship's routing measures for the Sub-Committee's consideration in the future as APMs, after further analysis and study. This process is about to last longer than the designation one itself.

The very large scale of the proposed PSSA is a challenge to design and implement regulation measures. The complexity of IMO decision process is also a challenge to achieve PSSA designation.
 - On the other hand, the PSSA application process is an opportunity to align existing managing initiatives such as Pelagos sanctuary, Barcelona convention or ACCOBAMS initiative.

The governance of the PSSA has not been defined yet and is under reflection, but the objective is to make it as light and flexible as possible and to rely on existing cross-border agreements. It thus represents an opportunity to strengthen cooperation among neighbouring countries on cetacean conservation but also on other environmental issues such as cross border N2000 management or fishing regulation.
 - Another strength of such measure is to contribute to palliating the lack of tools and data regarding big cetaceans' localization. Tools are being under development that will allow real-time detections of these marine mammals.
-
- **Potential for strengthening of protection measures:** within PSSA additional measures for traffic control may be established. More restrictive measures to mitigate shipping pressures on clearly identified important habitats could be established within the PSSA (e.g., through Areas To Be Avoided, Traffic Separation Schemes, areas with mandatory speed limits). Riparian states of the PSSA could also decide to apply obligatory measures for their national fleets in the area, which account for 75% of the ships.

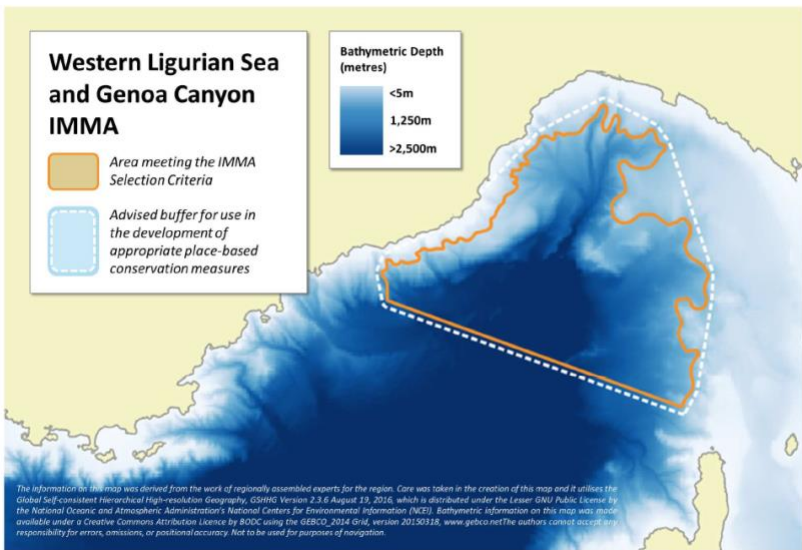
The ongoing development of dynamic monitoring tools of cetacean presence and collision risk could help to implement more targeted and dynamic measures. Real time monitoring systems are being (passive acoustic sensors on buoy or onboard cetacean detection devices).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



2. Important Marine Mammal Area (IMMA) Western Ligurian Sea and Genoa Canyon (IT)

Sea- basin: Western Ligurian Sea, Mediterranean Sea
Country: Italy
Site name: Important Marine Mammal Area (IMMA) Western Ligurian Sea and Genoa Canyon
<p>Site map Area Size of IMMA: 8,526 km²</p>  <p>The information in this map was derived from the work of regionally assembled experts for the region. Care was taken in the creation of this map and it utilizes the Global Self-consistent Hierarchical High-resolution Geography, GSHHG Version 2.3.6 August 19, 2016, which is distributed under the Lesser GNU Public License by the National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NCEI). Bathymetric information on this map was made available under a Creative Commons Attribution License by GEBCO using the GEBCO_2014 Grid, version 20130318, www.gebco.net. The authors cannot accept any responsibility for errors, omissions, or positional accuracy. Not to be used for purposes of navigation.</p>
Designation type: IMMA (IUCN Task Force)
<p>Designation level: no designation</p> <p>Important Marine Mammal Areas (IMMAs) are defined as discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation. IMMAs consist of areas that may merit place-based protection and/or monitoring. Therefore, this area is not designed as protected area yet. It is considered a good example of opportunities to strengthen marine protection within the area of the proposed PSSA of the North-Western Mediterranean presented before. The IMMA is also contained within International Pelagos Sanctuary MPA / SPAMI (Italy, France, Monaco).</p>
Type of area: Coastal, offshore, deep sea.
<p>Brief general description of geographic, morphological and environmental features</p> <p>The Ligurian Sea is found in the northernmost section of the western Mediterranean (Enrichetti et al., 2020). Being one of the colder parts of the Mediterranean Sea, its biota rather differs from the rest of the basin with higher abundances of temperate boreal species (Bianchi et al., 2019). Amongst the most dynamic areas of the Mediterranean, the Ligurian Sea plays a key role in the energy balance of the entire basin (Vietti et al., 2010). It is characterized by a strong</p>



anticlockwise circulation supplemented by the Tyrrhenian and western Mediterranean currents, causing upwelling of deep waters. For the western Mediterranean, this underpins a higher-than-average level of spring primary production and triggers the growth of substantial phytoplankton and zooplankton assemblages (Vietti et al., 2010). In turn, primary consumers such as krill (*Meganyctiphanes norvegica*) have a crucial role in the trophic food webs of the region, feeding large pelagic fauna such as the flagship species fin whale (*Balaenoptera physalus*) that reproduces in the Ligurian Sea (Vietti et al., 2010).

Located north of Corsica Island, the Ligurian Sea contains the Genoa Canyon which originates from the northeast to southwest off the coast of the city of Genoa, Italy (Giorli, G., Neuheimer, A., and Au, W., 2016). The sea is amongst the highest urbanized regions on the Mediterranean coastline, with a particular importance for the traffic of commercial vessels (Vietti et al., 2010). Canyons like the Genoa Canyon exert an effect on the oceanographic features of an area whilst serving as an at-depth aggregation zone for demersal and pelagic animals taking advantage of upwellings induced by coastal currents' interaction with bathymetry, blockages of downwards descending zooplankton and counter-upwelling depth retention (Lavoie et al., 2000, cited in Giorli, G., Neuheimer, A., and Au, W., 2016).

Uses and human activities in place in the area (the most relevant):

MSFD Activities of particular relevance:

- Extraction of living resources – Fish and shellfish harvesting
- Cultivation of living resources – Aquaculture – Marine
- Tourism and leisure – Tourism and leisure infrastructure
- Tourism and leisure activities
- Transport – shipping
- Security/defence – Military operations

Education and research – Research, survey and educational activities (whale watching and scientific research)

The Ligurian Sea is one of the most anthropized sections of the Mediterranean Sea, with extensive urban, industrial and touristic development, harbour activities and construction works, such as the coastal road projects, railways, dumping and drainages, professional and recreational fisheries, and beach nourishments (Bianchi et al., 2019). 63 major towns, and around 43 harbour structures are located along the Ligurian coastline, with Genoa, La Spezia and Vado Liguria having the largest commercial ports and recreational activities include fishing with more than 220,000 currently active licenses (Enrichetti et al., 2020). Fishing pressure in the western Mediterranean is currently the greatest threat to the conservation of benthic habitats in the long-term (Enrichetti et al., 2019). Although the biggest urban towns have sewage systems, black water discharges have occasionally been observed. Yachting is a frequent activity in the Ligurian Sea, where some of the touristic spots are located in the vicinity of five Marine Protected Areas (Enrichetti et al., 2020). Military exercises, oil-gas exploration and seismic prospecting also occur in the Pelagos Sanctuary (Fossi et al., 2013).

The Management Plan of the Pelagos Sanctuary lists the following human activities/threats:

- Fishing/Aquaculture activities
- Maritime traffic and coastal navigation
- Pleasure and sports vessels
- Whale watching



- Sound pollution
- Marine pollutions
- Risks due to scientific research activities at sea

Anthropogenic pressures in marine environment (the most relevant):

The Ligurian sea is subjected to anthropogenic pressures and threats due to the fishing and shipping industries. Marine litter input also occurs extensively from densely populated coastal areas (Enrichetti et al., 2020). Mean density of marine litter has been recorded at levels of two orders of magnitude higher than the Gulf of Lions and the French Ligurian coast and amongst the highest ever recorded in Europe. In addition, submarine canyons act as conduits which can transport the litter into deep-sea environments (Enrichetti et al., 2020).

Canyons such as the Bergeggi and Bordighera canyons located near the coast in the Western Ligurian Sea, often host vulnerable marine ecosystems (VMEs) and habitat forming species (e.g., cold-water corals). They are strongly affected due to the removal by fishing, but also marine litter, principally Derelict Fishing Gears (DFGs) such as nets and ropes (85% of litter compared to 15% general urban litter) which originate from the activities of local small-scale trawling fisheries (Giusti et al., 2019). DFGs, through reducing seabed coral cover, can lead to a reduction of biodiversity with benthic organisms being suffocated, destruction of erect species and thus bring about an over-simplification of community structure in addition to the long-term effect of ghost fishing (Ponti et al., 2014; Fernandez-Arcaya et al., 2017). Trawling also applies a considerable pressure on canyons by modifying seabed sedimentation and morphology (Giusti et al., 2019).

Relevant Annex III MSFD pressures:

Biological:

- Disturbance of species due to human presence
- Extraction of, or mortality/injury to wild species by commercial and recreational fishing and other activities

Substances, litter and energy:

- Input of litter
- Input of anthropogenic sound

Ecological criteria:

- Protection of species (mammals)
- Protection of habitat (canyon).

Special protection of the Genoa Canyon IMMA due to its importance for cetaceans was proposed by the Marine Mammal Protected Areas Task Force (MMPATF) (IUCN, joint SSC/WCPA) at the 2016 IMMA Regional Expert Workshop held in Chania, Crete, for the Identification of IMMAs in the Mediterranean Sea (IUCN-MMPATF., 2017).

Although the proposed IMMA does not yet specifically hold a protective designation, it lies within the much greater area of the Pelagos Sanctuary, an international MPA encompassing 87500 km² and established by France, Italy and the Principality of Monaco in 1999 and that came into force in 2002.

Protective measures for the Pelagos Sanctuary extend beyond national jurisdiction setting precedent of pelagic protected areas for the high seas (Notarbartolo-di-Sciara et al., 2008). The Pelagos Sanctuary strives to protect key marine mammal breeding and foraging grounds in the



Ligurian Sea whilst also providing an ‘umbrella’ protection to other marine predators in the area (Notarbartolo-di-Sciara et al., 2008).

It aims to also empower other conservation measures, such as the Specially Protected Areas Protocol of the Barcelona Convention and the wider goals of the Agreement on the Conservation of Cetaceans of the Black and Mediterranean Seas (ACCOBAMS). In 2001, the Parties to the Barcelona Convention adopted the decision of adding the Pelagos Sanctuary in the List of the Specially Protected Areas of Mediterranean Importance (SPAMIs) (Notarbartolo-di-Sciara et al., 2008). The marine mammal species of the area are also listed under the EU Habitats Directive’s Annex IV (IUCN-MMPATF., 2017).

The proposed IMMA area of the Western Ligurian Sea and Genoa Canyon holds, for the Mediterranean Sea, the highest density of Cuvier’s beaked whale (Cañadas, 2016). The Ligurian Sea is known to be of an important breeding ground for the species with both juveniles and calves being observed (Moulins et al., 2008). Beaked whales are deep diving and have been recorded foraging in the mesopelagic to bathypelagic waters (613-1297 m) of the Ligurian Sea (Tyack et al., 2006). In addition, other cetacean species have been reported in the area; the sperm whale, Risso’s dolphin, the fin whale, pilot whale and striped dolphin. For these reasons, the area is recognised as an IMMA under criterion B, C and D of the MMPATF (IUCN-MMPATF., 2017).

Management measures

Most suitable Management measures - Regulated access, speed regulation (In the presence of cetaceans).

The Pelagos Sanctuary adopted a management plan in 2004, which considers issues: from a functional perspective (i.e., help organizations to collaborate), dynamically (continuous evaluations and result-based modifications) and in terms of the ecosystem (variables relation to the natural environment and the socio-economic context) (Pelagos Sanctuary, n.d.). The plan also considers actions implemented under ACCOBAMS, RAMOGE and UNEP/MAP (1975 Barcelona Convention). Nevertheless, it was deemed in 2013 to have partially failed until date to fulfil the goal of considerably improving the conservation status of the cetacean populations present in the area, even considering the joint effort of the EU and the Barcelona Convention to establish an MPA network in the high seas of the Mediterranean (Fossi et al., 2013).

Thonaille fishing (a type of driftnet fishing) was used by the French fleet even after the EU’s ban on driftnet fishing. It was limited to a small group of fishermen and required a special fishing permit. A charter was formed to regulate this activity, including requiring the use of ‘pingers’ (acoustic warning devices), the reduction of net lengths, allowing on-board observers and interrupting fishing in the Sanctuary from August 15th to September 15th each year. It is currently banned but appeals have been made to reintroduce it (Pelagos Sanctuary, n.d.).

Whale watching

The Pelagos Sanctuary and partners created a code of good conduct for whale watching. Regarding the French waters of the Sanctuary, the Ministerial Decree of July 1st, 2011, makes the intentional disturbance of marine mammals (approaching < 100 m from individuals) in French territorial waters (and in all French Mediterranean waters since July 6th, 2021) a punishable offense. Within the designated viewing area (100-300 m from cetaceans) all human activity is strictly regulated (Pelagos Sanctuary, n.d.). This includes aborting approaches when animals show signs of disturbance, not positioning vessels in front of animals/approaching from behind, limiting boat speed to 5 knots (and zero when reaching the edge of the no-go area



(<100 m) and having only one boat within a viewing area for a maximum of 15 minutes if other vessels are waiting (Pelagos Sanctuary, n.d.). These rules apply in and beyond the Sanctuary and to other users of the marine environment such as fishermen and pleasure boaters. Whale watching should generally not take place within 5 nautical miles of the coast, with some exemptions for Corsica and 'fishing tourism'. A label, as a voluntary participatory approach, is being developed to identify ecologically responsible operators and would require whale watching organisations to undergo training, respect the code of good conduct, take part in research programs, working groups (e.g., limiting acoustic impact) and education initiatives to clients (Pelagos Sanctuary, n.d.).

Marine Traffic Disturbances

To improve risk management, the research program IMPACT-CET explores the spatial and temporal characteristics and intensity of disturbances, including cumulative effects, in sensitive areas (e.g., breeding and feeding sites) (Ecoocéan Institut, n.d.). The program also investigates aspects such as incidental fishing captures and pollution (noise and macro-waste). With regards to sports races, since 2001 high-speed vehicle competitions are prohibited in Italian territorial waters of the Sanctuary, although they still occur in the French waters (Pelagos Sanctuary, n.d.).

Trade-offs between sea uses and marine protection

The French Powerboat Federation is assessing how the organisation of French boating races can conform to the Sanctuary's requirements of protecting cetaceans. Future races are planned to take place, where possible, outside of the Sanctuary (Pelagos Sanctuary, n.d.).

Despite the considerable challenge of protecting cetaceans in a greatly exploited and large area, the Pelagos Sanctuary's initiatives have resulted in some noteworthy achievements: increasing public awareness, creating and implementing a necessary management plan (rare for the region), activating three governments' measures to cut down environmental impacts, using 'umbrella' species to protect entire ecological communities and serving as a model for large scale, high-seas MPAs that seek to implement ecosystem-based management and adopt regional seas agreements (Notarbartolo-di-Sciara, Hyrenback and Agardy., 2008). Financial resources have been made available for marine conservation as substantial funds have been allocated to promote the goals of the Pelagos Sanctuary Agreement, with Italy alone having provided half a million euros per year. Soon after the signing of the treaty for the creation of the Sanctuary, some institutions provided acts of goodwill in the spirit of the Agreement that went beyond legal requirements, such as the Italian Navy's decision to forgo from running naval exercises in the Sanctuary area that involved the use of ordnance or sonar and the decision by the Italian Ministry of the Environment to desist the discharge in the Sanctuary's waters of toxic mud dredged from harbors in the area (Notarbartolo-di-Sciara, Hyrenback and Agardy., 2008).

On the other hand, changes in the political climate and transitory decreases in public awareness of the predicaments faced by cetaceans in the Ligurian Sea have caused long periods of inaction. Most management functions have been shouldered by the Meeting of the Parties and by the national and tri-national steering committees, which are inefficient temporary solutions to tackle the arduous tasks brought on by such an expansive and complex marine protected area (Notarbartolo-di-Sciara, Hyrenback and Agardy., 2008). Lastly, the Parties of the Agreement have asserted that no zoning measures be added in the management plan. Spatially defining activities would help the successful management of the area and aid in



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



conflict resolution. At a minimum it could be trialled with activities that cause the least conflict, such as whale watching (Notarbartolo-di-Sciara, Hyrenback and Agardy., 2008).

Coexistence and multi-use of the sea

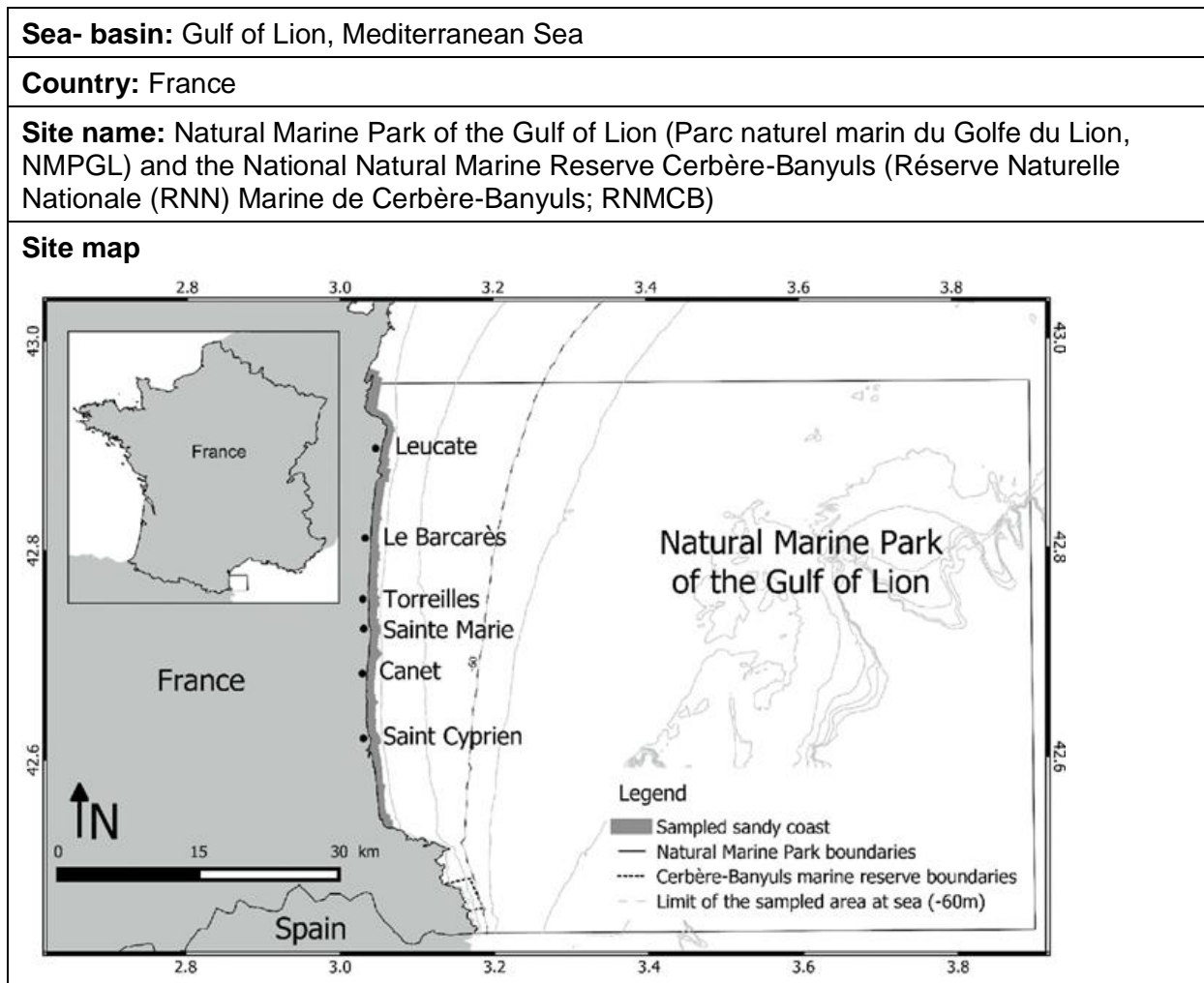
Whale watching and practiced in the area

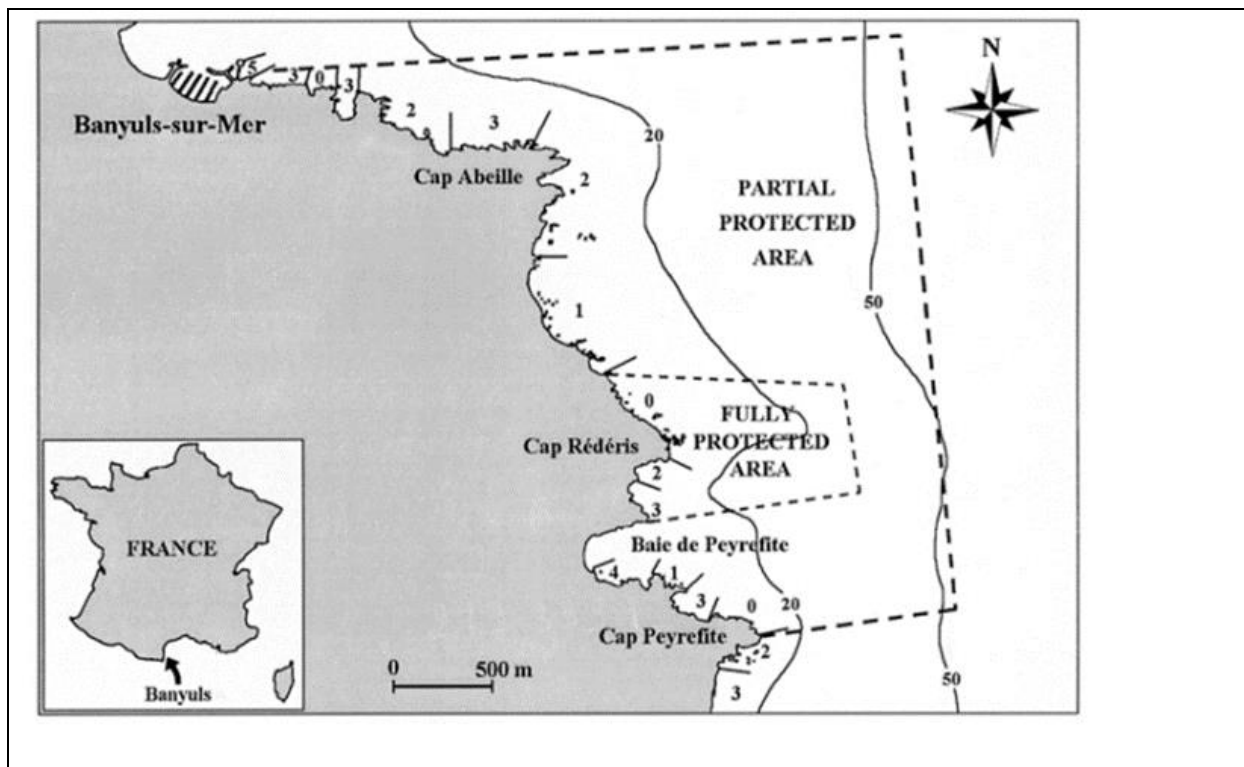


This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



3. Natural Marine Park of the Gulf of Lion and the National Natural Marine Reserve Cerbère-Banyuls (FR)





Designation type: Marine Protected Area, Marine Natural Park, Marine Reserve (RNMCB)

Designation level

NMPGL: National

RNMCB: Subnational & National

Highlights of note: The RNMCB is currently enlisted for a period of 5 years in the IUCN green list of Marine Protected Areas (MPA) – a management quality labelling system and governance of protected areas, based on globally defined criteria by the IUCN. Selected as one of ten MPAs worldwide that celebrates excellence in marine conservation, it is the only MPA in French waters to have been given the GLORES 2018 prize from the Marine Conservation Institute, with the distinction of being a “Blue MPA”. Considered too small today, the RNMCB is currently being extended. The new perimeter implementation is expected between 2025 and 2026 and further details are described in the following sections.

Type of area

Natural Marine Park (NMPGL): Deep Sea, coastal (total area of 4,010 km²).

Marine Reserve (RNMCB): Coastal (5.10 km² total marine area niched in the NMPGL).

Brief general description of geographic, morphological and environmental features

The overall Gulf of Lion area, where the NMPGL is established in the southwestern part, is a prograding continental margin extending from Cap de Creus in Spain to Toulon in France. It is characterized by a broad continental shelf, unusual for the Mediterranean basin, reaching up to 72 km lengths in its widest locations. The shelf break comprises a complex network of submarine canyons, reaching depths of almost 2000 m. Due to differences in shelf width along



the continental margin, some of the canyons can be found relatively close to the shore, just a few kilometres from land (e.g., Cap de Creus), while others appear relatively offshore (e.g., Grand and Petit Rhône). Submarine canyons in the Natural Marine Park of the Gulf of Lion contain unique biodiversity for which much remains unknown. These submarine canyons constitute remarkable habitats, in particular for the presence of deep cold-water coral colonies. One of these, the Lacaze-Duthiers Canyon, is completely unique in the Mediterranean for its abundance and richness of white corals and offers refuge to numerous species: fish, decapods and cetaceans, amongst others.

The depositional system of the Gulf of Lion is mainly determined by topography, sediment supply and water circulation. The low sediment inputs irregularly discharged over the years due to the Mediterranean climatic conditions has influenced the geological features of the shelf and slope. The Rhône river discharges fine-grained sediment and supplies most of the terrigenous sediment in the Gulf of Lion. The fluvial system is characterized by a strong inter-annual variability, with the highest river discharge periods mainly in spring and autumn. The dominant current system on the Gulf of Lion flows towards the southwest and the associated freshwater produced by the Rhône river sediment discharge tends to get deflected south-westward by the general water-mass movement, moving sediments along the coastline. Multiple benthic communities dwell from the circalittoral zone to the deep-sea region, which vary according to the type of substrate (i.e., hard beds and rocks, muds, sand). The sea waters are also inhabited by sea turtles, seabirds, cetaceans and fishing species with an economic value.

The Cerbère-Banyuls natural marine reserve (RNMCB) declared in 1974, is an MPA in the North-Western Mediterranean Sea and in the extreme southern part of the NMPGL, near the border with Spain. Covering 6.5 km of coastline and extending into the sea by 1.5 nautical miles, its total area of 650 hectares is niched since 2011 within the 4,010 km² (401,000 ha) area designated as the marine park. The protected area of RNMCB encompasses a great diversity of habitats, including rock and boulder bottoms, coralligenous outcrops, and seagrass meadows such as *Posidonia oceanica*. *Posidonia oceanica* is an endemic species of the Mediterranean basin and provides a nursery ground for numerous species such as octopuses, seahorses and sea breams. The rocky reefs meanwhile act as a home to many fish, crustacean and mollusc species, whilst coralligenous assemblages host > 500 species of invertebrates. In total, the various habitats allow for outstanding levels of biodiversity with 1,239 species of fauna and 497 species of flora having been identified inhabiting the reserve including the endangered dusky grouper (*Epinephelus marginatus*). Amongst this rich biodiversity, 49 species are protected under either national, European or international regulations such as the red coral (*Corallium*), whereas other species with devastated populations such as lobsters and groupers have repopulated the boulders of the reserve. Moreover, the open water is characterised by frequent transits of large pelagic predators including amberjacks (*Seriola*), bonitos (*Sarda*) and barracudas (*Sphyraena*).

Uses and human activities in place in the area (the most relevant):

NMPGL:

The NMPGL is managed under French Mediterranean law with some specificities for fishing such as a seasonal closure for octopuses (*Octopus vulgaris*). It supports fisheries, including bottom and pelagic trawls, and gill nets, but principally trawling. Specifically, bottom fishing activities have a direct physical interaction with the seabed and its biota, causing re-suspension of sediment, modifying the fluxes of nutrients, reducing the structural complexity of benthic



communities and leading, eventually, to their complete elimination. Further impacts of human activities are the underwater noise, generated by the marine traffic, construction of coastal and offshore infrastructures, and the marine litter (macro and micro waste).

Therefore, extraction of living resources, transport (infrastructure, shipping, pleasure craft, fishing), tourism and leisure are the main marine uses of the area, causing pressures that affect the Gulf of Lion.

RNMCB:

Within the Fully Protected Area (also called *No-Take Zone*, NTZ) of 65 hectares near Cap R  d  ris, the sole permitted activities are recreational navigation, surface swimming, and scientific diving. For the Partially Protected Area (PPA), located in the surrounding zone (585 hectares), more extensive human activities are allowed albeit under regulation and even license detention for part of them. These include boat circulation, fishing and diving. Fishing activities can be conducted in this partial protection buffer area between the no-take area and the outer boundary of the marine reserve; however, these are subjected to restrictions.

For professional fishing, only 5 fishing vessels are authorized inside the area. They must respect several measures such as a minimum mesh size, minimum catch sizes, a maximum length of gillnets and seasonal closures during the reproductive period for some species such as the *Octopus vulgaris*.

For recreational fishing, 1000 licenses are attributed each year and restrictions on the type of gear, as well as species-specific minimum catch sizes and maximum bag limits are also implemented. As with the marine park, the extraction of living resources, transport (pleasure craft, fishing), tourism and leisure are the main marine uses of the area which can cause pressures to biodiversity.

Anthropogenic pressures in marine environment (the most relevant):

- The key anthropogenic activities occurring in the area cause the following pressures to the marine ecosystem. Particularly impacting the NMPGL are the fishing activity and the bottom trawling disturbance as well as the mooring of the boats which have a direct effect on seagrass meadows. For the reserve, tourism (e.g., scuba-divers) and fishing related pressures are most relevant, although some invasive species, coral mass mortality and pollution events have also occurred in recent years in the RNMCB.
- Disturbance of species due to human presence
- Invasive species and filamentous algae in RNMCB (Invasive algae from Australia (*Caulerpa cylindracea*, *C. taxifolia* and *C. racemosa*)) and mass mortality events (white gorgonians (*Eunicella singularis*) in 2017 and currently, the noble pen shell (*Pinna nobilis*)).
- Extraction of, or mortality/injury to, wild species (professional and recreational fishing and other activities)
- Physical disturbance to seabed by divers or anchors
- Inputs of nutrients and other substances, mainly due to the coastal and offshore human activities (fishing, economic activities, touristic leisure)
- Hydrocarbons pollution in RNMCB (Notable event in November 2018, requiring beach clean-ups)
- Input of litter
- Input of anthropogenic sound (Jet skis, boats)



Ecological criteria:

- Protection of species
- Protection of habitat

The National Marine Park of the Gulf of Lion (under the Office français de la biodiversité since 2020, i.e., French office of Biodiversity) is part of Natura2000, the Barcelona Convention, the Ramsar Convention and other instruments that per se establish conservation and protection actions. The actions establish the protection of the marine environment, specifically of fishes, habitats (coastal-hard bottom and soft bottom, pelagic, deep sea). Regulations have been established for the fishing activity, specifically for the use of dredges, trawls and seines which are prohibited in areas with phanerogams, coralligenous and maerl habitats. The RNMCB is managed by the Departmental Council of the Pyrénées-Orientales, France (*Département des Pyrénées-Orientales*), with regulations of activities such as fishing and tourism that are in general stricter than the marine park.

Management measures

Most relevant management measures:

- Regulated access/Only allowed uses (applicable in specific areas, e.g., Buoys in Cap Béar)
- Anchoring regulations (specific areas, e.g., Buoys in Cap Béar)
- Speed regulations
- No-take zone (part of the reserve)
- Regulations for fishing gears (e.g., number of hooks)

Created in 2011, the NMPGL is a young MPA implementing its own management measures. Management measures have been set up in the NMPGL to protect the ecosystems and natural habitat. Particularly vulnerable habitats are the seagrasses meadows, the coralligenous and maerl concretions, for which areas for mooring and light equipment have been set up. They are considered areas in which anchoring is prohibited, the speed is regulated, and the buoys installed in the rocky substrate to allow for mooring can only be used for few hours. Furthermore, specific projects have been established within the area to better manage, protect and promote the natural and cultural marine heritage. These projects regulate the navigation allowances in the area, the fishing activity and the touristic presences.

The RNMCB has an advisory committee appointed for 3-year durations. It comprises of state and local authorities, scientists, users, conservationists and socio-professionals. An annual meeting with the committee is chaired by the prefect of the department or his/her representative and involves examining the budget and report of activities in the MPA. Plans are currently underway to extend the RNMCB. In addition to safeguarding biodiversity and preserving the Mediterranean for future generations, this is to achieve the national objectives which aim to increase from 0.2% to 5% of Zones of Strong Protection (*Zones de Protection Fortes*, ZPF) by 2027 in the Mediterranean Sea. This would mean an additional 68 ha of no-take area/fully protected area (i.e., equivalent to the current area near Cap Rédéris) and 600 ha of partially protected area. The RNMCB accommodates over 100,000 visitors each year, more than 30,000 of which comprised scuba-divers in the last few years. This has made the reserve a strong contributor to the region's community atmosphere and socio-economic growth. When fishing in the reserve, anglers on the shore are limited to using two lines with a maximum of 6 hooks and 12 when on a boat. Similar gear restrictions are applicable in the park. Other constraints in the



reserve include minimum catch sizes specific to species and maximum bag restrictions, whilst spearfishing is prohibited. Between 2005-2014 for example, 4 to 15 artisanal fishing vessels were registered to conduct commercial fishing in the partial protection zone of the reserve.

With two separately managed management bodies, the cooperation and communication between the NMPGL and the RNMCB has improved and been streamlined to a much greater extent leading to common monitoring and planification. For example, the park and reserve has some overlap, such as organising scuba dives from the same boats, sharing the use of equipment and representatives attending meetings of both the reserve and park. The park staff has been strongly involved in the extension process of the RNMCB, notably by attending the round tables where the extension is discussed and planned. Facilitators have also been trained both for the park and reserve. As the extension is in a zone that is part of the park, NMPGL staff will be part of the surveillance team considering that they are already currently monitoring these areas.

Protection provisions included in the MPA management plan (uses, activities allowed in a spatial-temporal view)

In the RNMCB, control of monitoring measures is conducted by the marine reserve personnel itself and by other French administrations such as the police. 6 staff oversee controls during the year of which 4 are commissioned (having had a formation and being judge-approved).

For the NMPGL, there are 17 members of the park personnel among which 8 are accredited individuals enforcing measures. Individuals comprising of the Gendarmerie Maritime (Maritime Police), Customs department and the Brigades nautiques (part of the state department) also offer a hand in controlling the park. As a result, the control of measures remains limited as it is a substantially larger area, with additional challenges of monitoring at night-time. A notable issue is poaching occurring between a lagoon and the marine park, where there are walkways. The park has authority over the marine environment, but the lagoon is under the jurisdiction of another authority, so the area between the two does not fully fall within the authority of one or another.

Whilst the marine reserve functions with a top-down approach of legislation being written and the reserve then adapting to it, the marine park only had a perimeter set in 2011 and arrangements are gradually made through the management board ("Conseil de gestion"). The board comprises of 60 individuals that represent different stakeholders and vote on decisions. New proposals for regulations are then communicated from the board to state departments that decide whether a new regulation goes ahead. When a measure is accepted, the measure is then implemented as a law and the park is responsible of its application. The park authority does this by working directly with the different stakeholders, such as conducting research or building awareness on the issue in question (e.g., the cleaning of boats during a drought). The marine park authority is also asked to give their view on important decisions in the perimeter of its jurisdiction, such as the decision to build offshore wind farm in the marine park.

In general, specific fishing limitations exist for both professional and recreational fishers but are stricter in the reserve. Fishing gear limitations are different for the park vs. the reserve, such as the number and types of hooks allowed, the electric reel used and that the fishing net length is only limited in the reserve. Minimum catch size limits are applicable to numerous species and must be abided by both professional and recreational fishers and although not official yet (it remains to be sent to the prefecture), both the minimum catch size will increase (in size) and



the implementation of no-fishing periods. The catch size limit for professional and recreational fisheries are not homogenized and each activity group follows its own regulation.

For the marine park, current fishing limitations are largely due to the national regulations, but they also evolve rapidly to consider new developments. Temporal limitations exist both for the park and reserve, for example in the case of octopus (*Octopus vulgaris*) fishing, which in the last two years includes seasonal catch restrictions and a limit on the number of fishing vessels. Historically for octopus fishing, conflicts occurred between professional and recreational fishers as different ports in the park allowed different periods of activity and quantity of fishing gear. Studies by IFREMER showed that the fishing effort was too high and that the reproduction periods for the species had to be considered to ensure sustainability. The marine park brought together representatives of professional fishers to harmonise the decision of when to establish a temporary closure of fishing for Octopus, finalised as mid-July to mid-September. This subsequently applied to recreational fishers as well. Other temporal restrictions apply in the RNMCB for the fishing of species such as European Seabass and Sea Bream. It is expected that once approval is given by the national authority, legislation for recreational fishing of four species in the park will consider their respective reproduction periods and lead to temporal limitations.

Tourism (recreational fishers, divers, etc): control of numbers and access to areas.

For tourism, there are no controls of numbers either for the park or reserve even if the areas are highly touristic. For example, the NMPGL hosts almost 2 000 000 visitors each year. Access for recreational fishers in the reserve is controlled, with a required permit and a limit of 1000 licenses given. In reality, there are usually 300-600 active anglers. Some people also miss the timeframe (December-January) to apply for fishing access in the reserve. There is no restrictive license in the NMPGL, but the implementation of a compulsory declarative licence is being researched and should be established in the coming years. This would not be restricting the number of fishers but would simply to track the number of individuals. The need for fishers to register has been pushed by the EU, which has asked to have a better understanding and inclusion of marine recreational fishing in the marine policies. It is currently under discussion in France and around the Mediterranean.

RNMCB limits for scuba divers: 20 professional structures/diving centres, 20 association dive groups and 500 individuals authorised. 10 permits are given for professional fishers with small boats. Interestingly, many locals do not know that the reserve is nested in the marine park (the reserve is well known but not the NMPGL for the moment) whilst individuals coming from further away in France are more likely to be aware of this.

During the summer, most beaches in the NMPGL are closed to fishing during the day. Priority is given to the swimmers, with the municipalities doing so to avoid problems with fishing gear/hooks causing injuries.

Trade-offs between sea uses and marine protection:

NMPGL:

Some sea uses are easy to design into protective areas as changes are not too constraining for stakeholders. This has not been the case for professional fishers, as such many discussions have been focused to this group. Even though greatly affected, fishers in the region remain generally quite open to discussing the regulations of the marine reserve. The second most affected group are recreational fishers, specifically those operating at Cap Cerbère and Cap Béar. Some negotiations occurred between professional and recreational fishers to discuss the



space and resource use in the area. It is however not yet clear how the planned reserve extension will affect this situation and the relationships among users, as it could give an advantage solely to the local fishers over the tourists (or vice-versa), who also remain an important contributor to the area's economy. Discussions have likewise occurred regarding the possibility of having fishing tournaments in the marine park. Some tournaments have been allowed on the condition that participants sign a chart of adhering to best practice regulations and that a representative of the marine park takes part in the event. Other recent developments include fishing from kayaks - a new phenomenon that will likely be discussed in future meetings.

A notable example of a trade-off and a main challenge for negotiations in the marine park, has taken place in a bay just south of Cap Béar, near the marine reserve. This is an area of great importance both for fishers, as it represents a large portion of their catches, and for tourism, as it is protected from the wind, used for anchoring recreational boats and is an area visited by numerous divers. Although an important economic contributor, divers can have a high ecological impact in both the marine reserve and in Cap Béar, especially in the summer when many visitors come to the area. This is because divers tend to be inexperienced and can be a risk to the habitats or species, for example by damaging gorgonians that are close to the water surface. Cap Béar also has Posidonia meadows, so during the negotiations with the different groups, a compromise was sought to anchor the boats in areas where Posidonia would not be impacted. Divers wanted their own area of activity and buoys, recreational boats wanted access to all areas and larger passenger boats wanted to access caves but were too large to anchor at the regular buoys. This resulted in colour coding the buoys, with red ones giving priority to divers and white ones for recreational boaters. As for the professional fishers, they were allowed to continue fishing in the area if they complied with good practices such as keeping their distance from the dive boats. This is due to conflicts in the past, with diving accidents involving fishing gear. The park financed the installing of buoys and an educational outreach programme, where park interns kayak around the area in the summer to visit boats and explain the requirements and good practice guidelines. Other conflicts have been spatial, and resource based as well, such as between jet ski users and the other users. Currently there are studies that are investigating the impact of acoustic/sound pollution in the reserve (speed of boats, number of boats etc), but speed is already limited and difficult to further limit.

RNMCB and its planned extension within the park:

In 2017 work began regarding the possibility of creating an RNMCB extension, a process called "Carte sur table" following which a series of round tables called and including different stakeholders such as professional and recreational fishers, divers, jet ski users and scientists. The consultation phase for the expansion then began in January 2022 and will end in June 2023. Scientific results have pushed for the extension of the reserve and helped to persuade the groups affected. 5 subgroups have been worked with: divers, professional fishers, leisure fishers/spear fishers, kayaks, leisure boats associations and associations for the conservation of nature. The extended zone will benefit from more regulations, such as catch size limits, but some additional activities will be allowed such as spearfishing and the professional fishing of octopus. There will be two more reinforced reserves in the extension zone. The northern reinforced reserve is limited spatially by anchoring areas both to the north and south which is why a second reinforced reserve will be done at Cap Cerbère. 51 buoys are also planned to be installed in the Baie de Paulilles (slightly north of the current reserve perimeter) and 1,200 hours of surveillance is conducted in the reserve, with more than half during July and August so the monitoring of measures is quite extensive.



For tourism, specifically for scuba diving activities, the new reserve at the south will impact mainly one diving centre. Some professional fishers, state that they are impacted but accept the situation. There have not been too many difficulties with leisure fishers, but negotiations with spear fishers have been more challenging as the extension considerably reduces the allowable zones. The new reserve in the south is proposed due to the connectivity with Catalonia. Some scientific evidence on connectivity has been discussed for the extension (e.g., Guizien et al., 2014). Research has shown that the marine park currently only includes sink populations of the larval dispersal of soft-bottom species. If protection measures were taken in the centre of the Gulf of Lion where source sites are largely located (outside the current park boundaries), this would benefit populations throughout the region (Guizien et al., 2014).

Nevertheless, scientific results in general have been the driving force for the extension of the reserve and connectivity is a consideration when spacing protected areas to not be too far apart to benefit from the connectivity aspects of species such as for gorgonians. The protection with regards to connectivity is expected to be discussed soon with regards to three zones of the park; sandy substrates, plateaus and the offshore canyons. For the canyons, it is expected to be more complicated as Spanish trawlers can also be found fishing in the area.

Overall scores: Scale interpretation: 1 = easiest/best, 5 = hardest/worst.

RNMCB (1st Interviewee): Score of 3 for the trade-off between protection and sea uses and a score of 2 for how solutions meet the optimal protection objectives as there is always room for improvement, but compromises have been made between all stakeholders to benefit the maximum number of groups and ensuring marine protection. Notable achievements include the accepting of fishing limitations, catch sizes etc, by professional and leisure fishers. People are accustomed to the reserve as it has been established nearly 50 years ago and many efforts have been made to include different users in the running of the reserve. Enlarging brings about certain advantages compared to when creating of a new marine reserve or protected area from the beginning, especially when initiatives to increase stakeholder engagement have taken place early in the process.

RNMCB (2nd Interviewee): Solutions are not clear yet as we still ignore lots of ecological and human processes but if the enlargement process to Cap Béar goes ahead, this would also give a score of 3. The initial proposal of the extension of the reserve was better to meet optimal protection objectives but was not feasible with the trade-off between sea use and protected areas. Work is nevertheless being done to better understand the connectivity of the reserve with other marine protected areas, not solely to see the reserve as a single entity.

NMPGL: Score of 3 for the level of difficulty in finding compromises regarding fishing activities (usually more difficult with professional fishers compared to recreational ones), with a score of 2 for solutions found regarding the challenges of conservation in the area. In theory the regulations in the reserve are stricter than those in the park, but due to recent efforts made by the park authority (including new management measures currently awaiting approval by the prefecture), this means that regulations are increasingly resembling those applied in the reserve. This is a positive advancement, supported by and indicative of the goodwill and work of the park managers and users, as well as the role of the reserve in being a driving force for local conservation management in the region.

Coexistence and multi-use of the sea: present good practices (info to be collected from interviews and/or desk analysis)



Pescatourism occurs both in the reserve and in the marine park of the Gulf of Lion. Some professional fishers or their close family members provide camping opportunities for tourists which helps to boost their income. Pescatourism operators also have agreements with the authorities to present and educate visitors about the attributes of the reserve, but only a few guides operate in the reserve.

The reserve brings tangible benefits also to fishers, with some travelling long distances to fish next to the limit of the no-take area, due to the belief of spillover effects. Lastly, fishers have guidelines with the species that can be caught and best practices, including flashcards with the regulations in place in the area. There is also a national guideline for fishing as well, provided by the French office of Biodiversity, which is applicable to both the marine park and reserve.

For the marine park, fishing guides are included in the discussions such as for the creation of new marine reserves and they train fishers to follow best practice guidelines which allows them to market themselves as such. Professional fishers also create cooperatives for pescatourism, but the administration remains quite challenging for this process.

A lot of activity (Navivoile) in the marine park is linked to the observing of cetaceans. The marine reserve and the NMPGL are involved with all activities even though they don't specifically offer the guided whale watching tours. Meetings discussing activities include representatives of all users, so that they are all simultaneously made aware of regulations (e.g., for boat races, where best practice guidelines and authorisation for each race had to be given). In the case of Navivoile, the park authority has an agreement with whale watchers to present and talk about the marine reserve or the park and park staff conducts numerous activities to promote awareness in the area.

Other good practices carried out in the reserve are communicated through outreach initiatives. A member of staff of the reserve oversees all activities that take place in the area. Communications are in general targeted to the different groups involved, such as fishers and divers, in order to solve and prevent precise concerns and problems. In addition, there are educational initiatives focused on school children.

However, communication can have its limitations in the field. For divers, it is feasible to give talks to dive associations or on dive boats, but it is more complicated to ensure that the ecological information provided, and the good practice guidelines, are then correctly applied by individual divers in the water due to the high number of participants.

BIBLIOGRAPHY

Arnau, P., Liqueste, C., Canals, M., 2004. River mouth plume events and their dispersal in the Northwestern Mediterranean Sea. *Oceanography* 17: 22–31.

Ballesta, L., Pergent, G., Pasqualini, V. and Pergent-Martini, C., 2000. Distribution and dynamics of *Posidonia oceanica* beds along the Albères coastline. *Comptes Rendus de l'Académie des Sciences-Series III-Sciences de la Vie*, 323(4), pp.407-414.

Brazo, A., Marques, R., Zimmermann, M., Aspillaga, E., Hereu, B., Saragoni, G., Mercière, A., Crec'hriou, R., Mercader, M., Verdoit-Jarraya, M. and Cadène, F., 2021. Seasonal influence on the bathymetric distribution of an endangered fish within a marine protected area. *Scientific Reports*, 11(1), p.13342.

Cambra, E., Bello, A., Kayal, M., Lenfant, P., Vasseur, L., Verdoit-Jarraya, M., 2021. Holistic investigation of shore angler profiles to support marine protected areas management. *Journal of Environmental Management* 285, 112089. <https://doi.org/10.1016/j.jenvman.2021.112089>



- Canals Artigas, M., Casamor Bermúdez, J.L., Lastras Membrive, G., Monaco, A., Acosta, J., Berné, S., Loubrieu, B., Weaver, P.P.E., Greham, A. and Dennielou, B., 2004. The Role of Canyons in Strata Formation. *Oceanography*, 2004, vol. 17, num. 4, p. 80-91.
- Dalleau, C., Bliard, F., Quemmerais-Amice, F., Murciano, C., Cervera-Núñez, C., Campillos-Llanos, M., Lloret, A., Punzón, P., Grassa, J.M., GómezBallesteros, M., Gimard, A., Alloncle, N. (2018). Mapping exposure risk of marine megafauna to cumulative pressures. EU Project Grant No.: EASME/EMFF/2015/1.2.1.3/02/SI2.742101. Supporting Implementation of Maritime Spatial Planning in the Western Mediterranean region (SIMWESTMED). 60pp. DOI: 10.5281/zenodo.2599697
- Golfe du Lion, 2022. *Concilier préservation des habitats sous-marins et activités nautiques: mise en place de zones de mouillages et d'équipements légers (ZMEL)*. Available at: https://parc-marin-golfe-lion.fr/documentation?field_pnm_date_documentation_value=&term_node_tid_depth=All&term_node_tid_depth_2=All&page=1
- Golfe du Lion, 2020. *Programme d'actions*. Available at: https://parc-marin-golfe-lion.fr/documentation?field_pnm_date_documentation_value=&term_node_tid_depth=All&term_node_tid_depth_2=All&page=1
- Guizien, K., Belharet, M., Moritz, C. and Guarini, J.M., 2014. Vulnerability of marine benthic metapopulations: implications of spatially structured connectivity for conservation practice in the Gulf of Lions (NW Mediterranean Sea). *Diversity and Distributions*, 20 (12), pp.1392-1402.
- Hinz, H., Prieto, V., Kaiser, M.J. 2009. Trawl disturbance on benthic communities: chronic effects and experimental predictions. *Ecol Appl* 19:761–773.
- Kayal, M., Cigala, M., Cambra, E., Soulat, N., Mercader, M., Lebras, A., Ivanoff, P., Sébés, L., Lassus-Debat, A., Hartmann, V., Bradtke, M., Lenfant, P., Jabouin, C., Dubreuil, J., Pelletier, D., Joguet, M., Mellionec, S.L., Brichet, M., Binche, J.-L., Payrot, J., Saragoni, G., Crec'hriou, R., Verdoit-Jarraya, M., 2020. Marine reserve benefits and recreational fishing yields: The winners and the losers. *PLOS ONE* 15, e0237685. <https://doi.org/10.1371/journal.pone.0237685>
- Marine Conservation Institute, 2020. *Réserve Naturelle Marine de Cerbère-Banyuls*. Available at : <https://marine-conservation.org/blueparks/awardees/cerbere-banyuls/>
- Marine Protection Atlas, 2023. *Cerbère-Banyuls-Partially Protected Zone*. Available at: <https://mpatlas.org/zones/414/>
- MedPan, 2019. *Golfe du Lion*. <https://medpan.org/fr/annuaire-des-amp/golfe-du-lion>
- Parc Naturel Marin Golfe du Lion, 2019. *Les canyons profonds*. Available at: <https://parc-marin-golfe-lion.fr/editorial/les-canyons-profonds>
- Parc Naturel Marin Golfe du Lion, 2021. *De cap à cap | Le dossier du Parc naturel marin du golfe du Lion N°7*. Available at : <https://www.calameo.com/ofbiodiversite/read/00350294836b5ddaddc91?view=book&page=1>
- Parc Naturel Marin Golfe du Lion, 2021. *Plan de Gestion*. Available at : <https://parc-marin-golfe-lion.fr/documentation/plan-de-gestion>
- Pyrénées Orientales Le Département, 2019. *L'Ecrin Blue Bulletin d'Information de la Réserve Naturelle Marine de Cerbère-Banyuls*. Lettre n°16. Available at :



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



https://www.ledepartement66.fr/wp-content/uploads/2019/04/37068_117_EcrinBleu-16-bassedef.pdf

Pyrénées Orientales Le Département, 2022. Qu'est-ce que la réserve marine ? Available at : <https://www.ledepartement66.fr/quest-ce-que-la-reserve-marine/>

Pyrénées Orientales Le Département, 2023. *Projet d'extension de la Réserve Marine*. Available at: <https://www.ledepartement66.fr/projet-dextension-de-la-reserve-marine-cerbere-banyuls/>

Pyrénées Orientales Le Département, 2022. *Réserve Naturelle Marine de Cerbère-Banyuls RAPPORT D'ACTIVITÉ DE L'ANNÉE 2022*. Available at : https://www.ledepartement66.fr/wp-content/uploads/2023/02/Rapport-dactivite-complet-RM-2022_compressed.pdf

Ulses, C., Estournel, C., Puig, P., Durrieu de Madron, X., Marsaleix, P. 2008. Dense shelf water cascading in the northwestern Mediterranean during the cold winter 2005: Quantification of the export through the Gulf of Lion and the Catalan margin. *Geophysical Research Letters* 35, L07610, doi:10.1029/2008GL033257

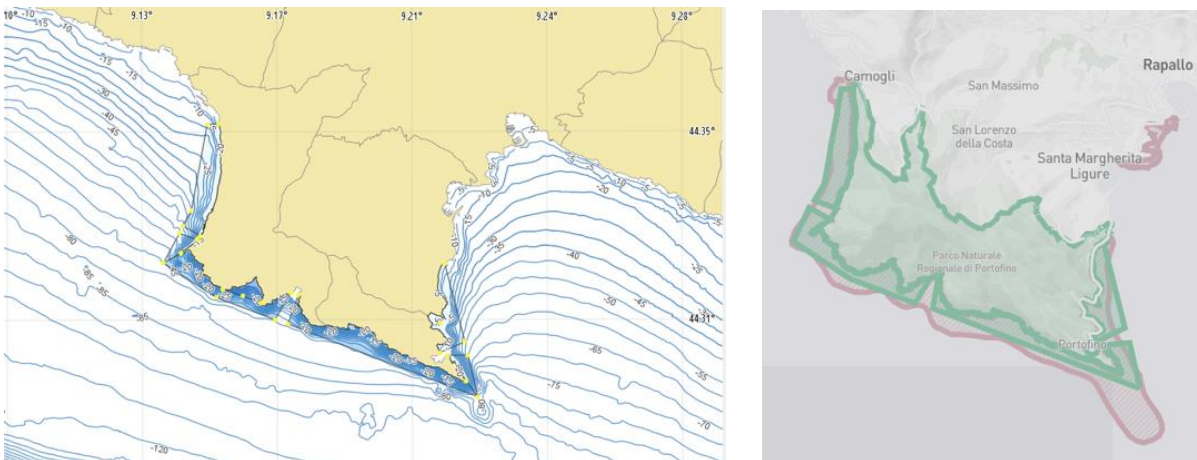
UNEP-MAP-RAC/SPA. 2013. *Description of the ecology of the Gulf of Lions shelf and slope area and identification of the areas that may deserve to be protected*. By Sardà, J.M.G. and Domínguez-Carrió, C. Ed. RAC/SPA, Tunis. 64pp.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



4. Portofino Marine Protected Area (IT)

Sea- basin: Ligurian Sea, Mediterranean
Country: Italy
Site name: Portofino Marine Protected Area.
Site map 
Designation type: Marine Protected Area, differentiation in zones A, B and C and Natura 2000 site
Designation level: National, European
Type of area: Coastal
Brief general description of geographic, morphological and environmental features <p>The MPA of Portofino is located in the Ligurian sea, extending among the municipalities of Camogli, Portofino and Santa Margherita Ligure, for an overall area of 346 ha and presenting a roughly quadrangular shape. The MPA is also a Natura 2000 site and a Regional Natural Reserve.</p> <p>The MPA is characterized by both shallow seabed, close to the coastline, and hard seabed made up of coralligenous concretions. Seagrasses meadows, especially <i>Posidonia oceanica</i>, coralligenous concretions, bivalves and fauna characterize the seabed. In this regard, the MPA of Portofino represents one of the most important marine sites of the Mediterranean for the abundance of coral red populations and the luxuriant coralligenous community. This community flourishes on the submerged cliff and on the rocks, while coralligenous platforms develop off the rocky bottoms, at a depth of 60 to 100 m. on the other hand, small <i>Posidonia</i> meadows fringe most of the eastern and western coastlines and within creeks and coves, but along the south coast they do not cover an important extension (Portofino report, 2005; Sbrocca et al., 2021).</p> <p>The geomorphological features of the area have determined an underwater environment very rich in crevices, roofs and small caves favoring the development of a rich and diversified benthic flora and fauna. The southern coast is dominated by submerged cliffs rapidly reaching the 40-50 meters of depth and made of calcareous clasts. On the contrary, the sides towards Camogli and Rapallo are characterized by stratified sedimentary rocks.</p> <p>The stretch of sea between Punta del Faro and Santa Margherita Ligure present a muddy seabed for the high sedimentation levels given by the fluvial deposits brough by the stream Boate (in Rapallo) and by the river Entella (Portofino report, 2005, Sbrocca et al., 2021).</p>



The sea currents, presenting an average speed of 25 cm/sec and generally in the direction E-W, ensure a good change of water, preventing the formation of polluted backwater near the coast and preventing most marine human activities for long periods of the year. This has allowed a greater conservation of both fish fauna and the community of artisanal fishermen (Girepam project, 2020). the southern cliffs, exposed to strong scirocco and libeccio winds, are characterized by a strong hydrodynamism (Portofino report, 2005).

Moreover, in the area are present many rare or interesting termophylic species (e.g., *Centrostephanus longispinus*, *Ophidiaster ophidianus*, *Gerardia savaglia*) and rich in fish population, many of which having an economic value (e.g., *Dentex dentex*, *Seriola dumerili*, *Sphyræna sphyræna*, *Epinephelus marginatus*).

Uses and human activities in place in the area (the most relevant)

- Tourism and leisure: bathing, recreational diving, boating
- Extraction of living resources: fishing harvesting (recreational and artisanal)

The main pressures arise from boating/yachting and recreational diving activities, which are damaging coralligenous concretions, seagrass meadows and, in small extent, biocenosis. Particularly, boating is affecting the seabed through the anchoring, which decimates coralligenous concretions and damages the *Posidonia oceanica* limiting its growth and expansion. Further impacts of the recreational boating concern the chemical pollution due to the loss of oil, wastewaters, antifouling, etc., and the acoustic noise made by the boat engine (Marittimo project report).

Anthropogenic pressures in marine environment (the most relevant)

The main activities taking place in the MPA is tourism and small professional fishing activities. Specifically, yachting, scuba diving, hotels, and tourism facilities have the largest socio-economic and conservation impact in the area, while in lesser extent is the impact of small-scale fishing activities, since it is reserved to the fisherman living in the municipalities of Camogli, Portofino and Santa Margherita Ligure, hence a limited amount of people work in this sector. Moreover, fishing is forbidden in zone A, while it is allowed in zones B and C with some restrictions.

The main physical impacts arising from the fishing activity is the physical disturbance to seabed.

The main biological impacts due to the tourism and fishing activities concern the disturbance of species due to human presence, and extraction of, or mortality/injury to, wild species by commercial and recreational fishing and other activities.

Finally, the economic activities are affecting the MPA by providing nutrients and by anthropogenic sound.

Overall, the main dangers come from mass tourism and the related activities.

Indirect damages come from also the activities taking place around the site, for example light urban pollution is present in front of Camogli and Santa Margherita, dumping activities of earth material in the North-East are affecting *Posidonia* beds that unlikely will recover in a short time (Portofino report, 2005).

Ecological criteria

In the MPA of Portofino a list of species is endangered, for which protection actions are required (Portofino report, 2005), including benthic species, marine turtles and marine mammals: *Spongia agaricina* for mass mortalities, *Spongia officinalis* for mass mortalities, *Spongia zimocca* for mass mortalities, *Gerardia savaglia*, *Corallium rubrum* for mass mortalities and illegal fishing, *Antipathes* sp. plur. *Ranella olearia*, *Charonia lampas*, *Erosaria spurca*, *Pinna nobilis* for fishing, *Homarus gammarus* for fishing, *Palinurus elephas* for fishing, *Centrostephanus longispinus*, *Ophidiaster ophidianus*, *Hacelia attenuate*, *Epinephelus marginatus* for fishing, *Caretta caretta*, *Eretmochelys imbricate*, *Tursiops truncatus*.

Management measures



The MPA was established with the aim of safeguarding marine biodiversity and biological resources, and promoting and enhancing local economic activities that must be compatible with the importance of the naturalistic aspects and landscape of the area. In particular, the MPA fosters the preservation of natural equilibrium and of biological and ecological values, to avoid loss or introduction of organisms, substances or manufactured structures that can alter natural equilibria, restoration and protection of intensely exploited fish stock, control and analysis of environmental quality, promotion of a sustainable use of natural resources, to stimulate the correct use on of the marine and coastal environment (recreation and tourism), to favour environmental education and promote eco-compatible tourism and to seek agreement between local communities and MPA authority.

The MPA of Portofino is divided into three zones with a different environmental protection level (MPAtlas, 2023):

- Zone A of integral natural reserve (3.4 ha), in which all activities that might affect the marine environment are prohibited. In particular, trawling drift nets are forbidden as well as professional fishing.
- Zone B of general natural reserve (41.73 ha), in which the activities taking place in the area and that do not affect the environmental protection are regulated. In particular, only small scale traditional professional fishing is permitted and specific equipment and methods must be followed (e.g., fixed net set perpendicular to the coastline). It is forbidden to discharge into the sea water that has not been purified coming from ships' bilges or from other equipment of the vessel and any toxic or polluting substance including solid or liquid refuse.
- Zone C of partial natural reserve (169.9 ha), in which the activities with a low environmental impact are allowed and regulated. In particular, only small scale traditional professional fishing is permitted and specific equipment and methods must be followed (e.g., fixed net). It is forbidden to discharge into the sea water that has not been purified coming from ships' bilges or from other equipment of the vessel and any toxic or polluting substance including solid or liquid refuse.

The competent authority has also defined a management plan to undertake in case of emergency due to incidents (e.g., oil spill, fire), which might severely affect the protection of the natural environment and people along the coast.

Furthermore, to better protect the MPA and to understand the dynamics on the state of the environment, a network of scientific cooperation at international level has been created, named Network for Ecological Research in the long term (LTER). The purpose of the network is to study the effects of air, water pollution, the climate change impacts on the biodiversity, forests, seas, lakes and lagoons. The MPA is also a Natura2000 site and is part of a network with other national and neighbouring protected areas (e.g., MPA of the French coastline).

Trade-offs between sea uses and marine protection

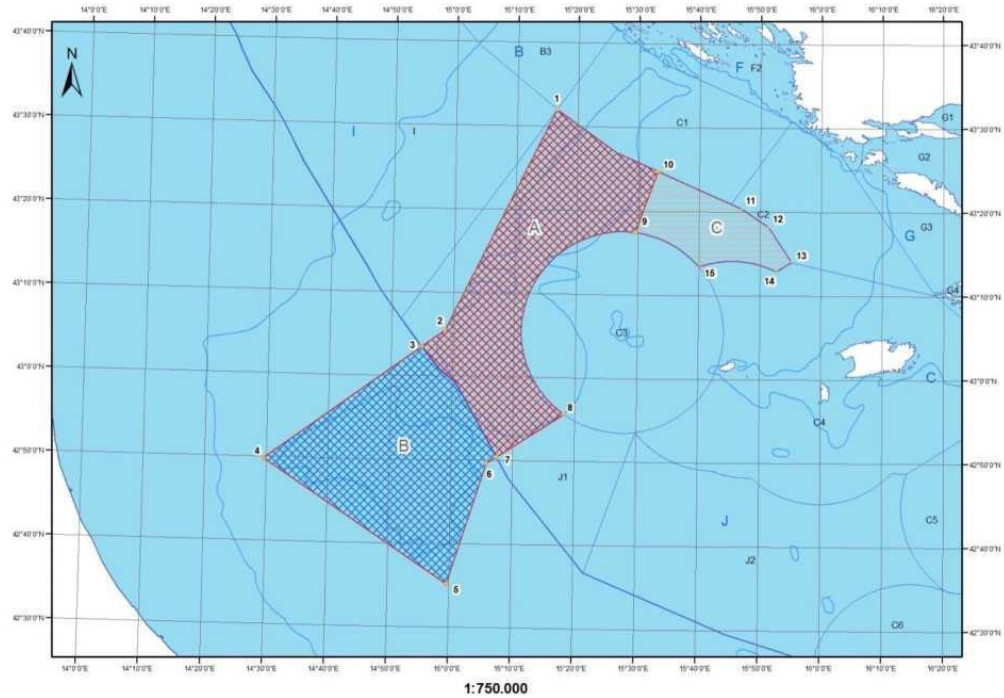
Coexistence and multi-use of the sea:



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



5. Jabuka /Pomo Pit Fishery Restricted Area (HR, IT)

Sea- basin - Mediterranean
Country – Croatia/Italy
Site name – Jabuka /Pomo Pit
Site map 
<i>Recommendation GFCM/44/2021/2</i>
Designation type – Fisheries Restricted Area (FRA), under the General Fisheries Commission for the Mediterranean
Designation level: International level
Type of area: Deep sea
Brief general description of geographic, morphological and environmental features <p>Jabuka/Pomo Pit is a marine area characterised by three depressions limited by the 100 m isobath and reaching a maximum depth of 273 m. It is situated in the central part of the Adriatic Sea, between Croatia and Italy (GSA 17⁵). It is named after the volcanic rock of Jabuka and broadly stretches in diameter of 130km from the island of Žirje (Croatia) towards Ortona at the mouth of Pescara (Italy). The area covers almost 10% of the Adriatic surface (see figure below). It is characterized with the cold-water flow, rich in nutrients, arriving from the northern</p>

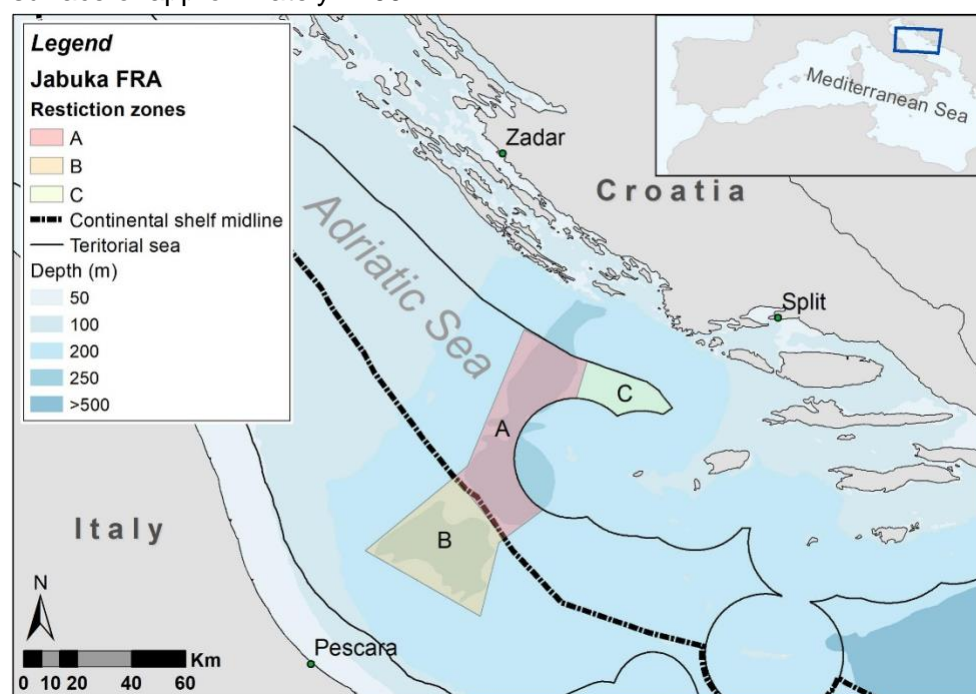
⁵ The General Fishery Commission for the Mediterranean identifies 32 Geographical Sub-Areas (GSAs) in the Mediterranean and the Black Sea, for fishery management purposes (Resolution GFCM/33/2009/2)



part of the Adriatic by bottom currents and retained in the area. Such complex topography of the area, combined with the oceanographic regimes of the Adriatic Sea, makes it a very peculiar environment in which the water exchange does not occur every year. These conditions can influence the nutrient cycle, with consequences on local biodiversity (e.g., the discovery of rare species) and on the trophic status of benthic communities.

The area is essential breeding ground, nursery area and habitat for different, commercially important fish and crustacean species such as European Hake (*Merluccius merluccius*), Norway Lobster (*Nephrops norvegicus*), Pink Shrimp (*Parapenaeus longirostris*), Blue whiting (*Micromesistius poutassou*).

Jabuka/Pomo Pit FRA is established within the broader Jabuka/Pomo Pit area, with the surface of approximately 2700km².



Jabuka/Pomo Pit in the Adriatic area (source:

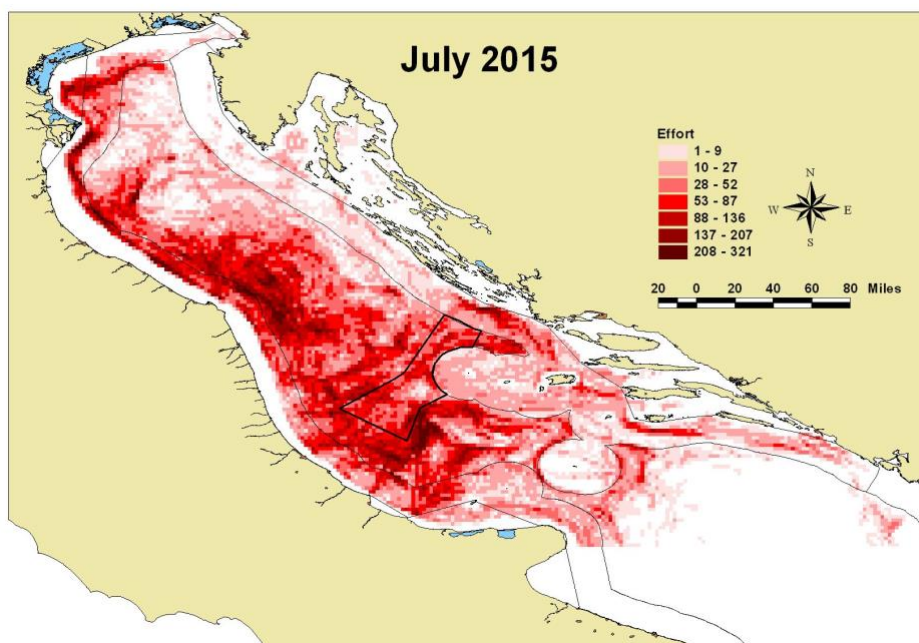
<https://www.frontiersin.org/articles/10.3389/fmars.2019.00759/full#F4>

Uses and human activities in place in the area (the most relevant)

The most relevant economic use in the area is *Extraction of living resources – professional fish harvesting (fishing)*.

It is estimated that the Pit contains about 23% of the entire biomass of commercial fish species present in the Northern and Central Adriatic, contributing about 30% of the entire bottom trawling catch of the Adriatic Sea, i.e. being the most important fishing ground in the Adriatic, together with the shallow North Adriatic. The main fishery is bottom trawling targeting benthic species. To a lesser extent, purse seiners also target pelagic small schooling fish.

The intensity of fisheries was significant from Croatian and in particular Italian side. Figure below indicates fishing intensity from 2013-2015 (before the establishment of the protected area).



Fishing effort in the Adriatic and Jabuka/Pomo pit (Image taken from the FAO AdriaMed project)

Anthropogenic pressures in marine environment (the most relevant)

Jabuka/Pomo Pit FRA has been established since the decades of exploitation of commercial stocks by bottom trawling had contributed to decline, changes in the demographic structure and some biological parameters of the population of commercial species resident in Jabuka/Pomo pit, mainly European hake and Norway lobster. This also contributed to degradation of marine habitats, food web alterations and overall loss of biodiversity.

Anthropogenic pressures in marine environment (the most relevant): in the description please make referenced to the ones identified under MSFD, see Table 2. To each pressure, a score will be assigned to assess its relevance

Jabuka/Pomo Pit FRA has been established since the decades of exploitation of commercial stocks by bottom trawling had contributed to decline, changes in the demographic structure and some biological parameters of the population of commercial species resident in Jabuka/Pomo pit, mainly European hake and Norway lobster. This also contributed to degradation of marine habitats, food web alterations and overall loss of biodiversity.

- Disturbance of species (e.g. where they breed, rest and feed) due to human presence. Score: 5/5
- Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities). Score: 5/5
- Physical disturbance to seabed (temporary or reversible). Score: 3/5
- Input of anthropogenic sound (impulsive, continuous). Score: 3/5

Ecological criteria:

- Protection of habitat (deep sea)



– Protection of species (fish)

Jabuka/Pomo pit was established to protect vulnerable marine ecosystem (VME) and important essential fish habitats for demersal stocks of European hake and Norway lobster. Namely, the area is the main Adriatic nursery for European Hake, *Merluccius merluccius*. Furthermore, the presence of muddy bottoms and other exogenous factors make it an ideal habitat for Norway Lobster, *Nephrops norvegicus*. The population of Norway Lobster in Jabuka/Pomo Pit is characterised by high densities of individuals smaller, and slower-growing than those from other areas of the Adriatic Sea. Among the other commercially and ecologically relevant crustacean specie is the Pink Shrimp, *Parapenaeus longirostris*.

Management measures

FRA is divided in zones A, B and C. Zone A is the most restrictive one and it can be characterised as a “no take zone”. Zones B and C have “regulated access” and “regulated gears” management measures, with zone B being more restrictive one. Management and monitoring of fishing capacity and fishing effort in the Jabuka/Pomo Pit FRA are defined in Part II of the Recommendation GFCM/44/2021/2 (Artt. 4-13), as follows:

Zone A

4. Any professional fishing activity with bottom-set nets, bottom trawls, set longlines and traps shall be prohibited in Zone A. Fishing activity with purse seiners and pelagic trawlers targeting anchovy or sardine shall be prohibited in this zone.

5. Any recreational fishing activity shall be prohibited in Zone A.

Zone B

6. Fishing activities with bottom-set nets, bottom trawls, set longlines and traps shall be prohibited in Zone B, from 1 September to 31 October each year, starting from 2022. Fishing activity with purse seiners and pelagic trawlers targeting anchovy or sardine shall be prohibited in this zone.

7. Without prejudice to paragraph 6, professional activities with bottom-set nets, bottom trawls, set longlines and traps may be allowed in Zone B, provided that the vessel and/or its master is in possession of a specific authorization and that historical fishing activities in Zone B are demonstrated. Contracting parties and cooperating non-contracting parties shall establish a register of the fishing vessels authorized to fish in this zone.

8. Authorized fishing vessels shall not be entitled to fish for more than two fishing days per week.

9. Authorized fishing vessels using otter twin trawl gear shall not be entitled to fish for more than one fishing day per week.

Zone C

10. Fishing activities with bottom-set nets, bottom trawls, set longlines and traps as well as recreational fisheries shall be prohibited in Zone C, each year from 1 September to 31 October, starting from 2022. Fishing activity with purse seiners and pelagic trawlers targeting anchovy or sardine shall be prohibited in this zone.

11. Without prejudice to paragraph 10, professional activities with bottom-set nets, bottom trawls, set longlines and traps may be allowed in Zone C, provided that the vessel or its master is in possession of a specific authorization and that historical fishing activities in Zone C are



demonstrated. Contracting parties and cooperating non-contracting parties shall establish a register of the fishing vessels authorized to fish in this zone.

12. Authorized vessels fishing with bottom trawls shall be entitled to fish on Saturdays and Sundays only, from 05.00 hours till 22.00 hours.

13. Authorized vessels fishing with bottom-set nets, set longlines and traps shall be allowed to fish from Monday 05.00 hours till Thursday 22.00 hours.

Trade-offs between sea uses and marine protection

There was no specific trade off apart from different zonation – zones A, B, C, as detailed above.

In a scale 1-5 how challenging was to achieve a compromise?

Score: 4/5: In order to protect the vulnerable habitats and fish stock from Jabuka/Pomo Pit, it was important to abolish fisheries from its most important part and “shift” it to the “outer” zones. But in order to do that, it was important to achieve a compromise, not only with the fishing sector itself but a compromise within two bordering countries – Croatia and Italy. This was very challenging to achieve, due to different views and priorities of Italian and Croatian parties. Negotiation process was lengthy and reversible at certain stages. One of the issues was the different geopolitical aspect of the Jabuka/Pomo Pit. Namely, for Croatian party it was part of Ecological and Fisheries Zones; for Italian it was part of the high sea regime where they had limited management options (they couldn’t establish protected area but only, to some extent, limit fishing activities for the Italian fleet). However, constant cooperation between scientist from both countries and cooperation with the fishermen helped reach the consensus.

In a scale 1-5 how much you think the solution found meets optimal protection objectives?

Score: 5/5: So far, all the monitoring activities confirm that protection measures are bringing favourable results for target species (see below).

Coexistence and multi-use of the sea: present good practices (info to be collected from interviews and/or desk analysis)

There is no multi-use in the area – it is only fishing zone so far.

Policy context in which the measure has been established

Since Croatia joined the European Union in July 2013, Jabuka/Pomo Pit was proposed as one of several Site of Community Importance (SCIs) under the EU Habitats Directive. In the same period, the parties of the Convention on Biological Diversity (CBD) identified this area as an ecologically or biologically significant marine area (EBSA). Having in mind the consistent negative trend in the commercial fish species biomass index, and the status of the benthic resources, scientists and authorities of Italy and Croatia negotiated for several years over the establishment of management measures in the area.

- The first annual agreement was effective from July 26, 2015, prohibiting benthic fisheries. After further negotiations, the moratorium for bottom trawlers was extended, based on the scientific recommendations, until October 16, 2016. Other types of fishing, such as longlines, were permitted in Italy (*Official Gazzete of the Italian Republic no 162 of 15/7/2015; Official Gazzete of the Italian Republic no 180 of 03/08/2016*) (see figure below; item a);



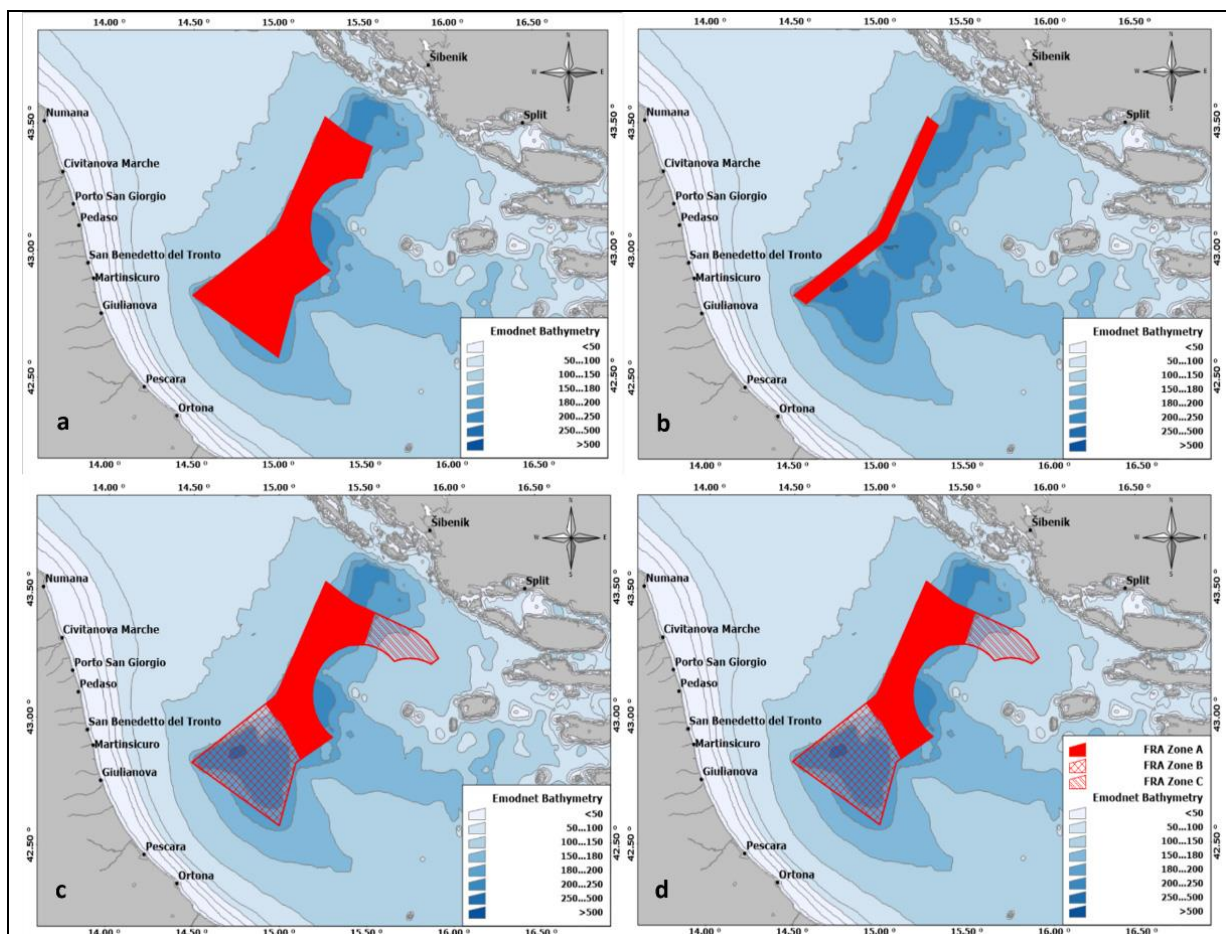
- after this period, most of the previously defined area was reopened to trawlers in Italy, but with some precautionary measures (limited number of licences and fishing days), with a fishing ban established in a limited area (*Official Gazzete of the Italian Republic no 2 of 03/01/2017*; (see figure below; item b); In the same period Croatia unilaterally closed bottom fishing in the nearby Croatian territorial waters from July 2015 till July 2016 (*Official Gazzete of the Republic of Croatia 79/2015, 68/2016*);
- in 2017, a fishing ban for the Italian fleet was established from 1 September 2017 in three different areas (in the western Pit and close to Croatian territorial waters; in the area including Italian territorial waters until 31 October 2017). A limited number of fishing authorizations were released for the area closest to the Italian coast with a series of additional management measures (e.g., the number of fishing days allowed for each vessel) (see figure below; item c). Croatia also introduced limits on fishing authorisations in 2017 (*Official Gazzete of the Republic of Croatia 47/2017, 90/2017*);
- Such weak measures resulted in prolonged unfavourable status of the fish stocks in the Jabuka/Pomo Pit. This initiated further bilateral negotiations that finally led to new agreement between Croatia and Italy in September 2017. Both countries agreed to create a large area with both controlled and fully restricted fisheries. The new 3-year agreement was put into effect on September 1, 2017 and was due to last until August 31, 2020, with the core area fully closed to all fisheries (see figure below; item d).

As fisheries management in the EU falls under the sole jurisdiction of the EC through the Common Fisheries Policy, on October 17, 2017 the GFCM adopted the EC proposal for the establishment of FRA in the Jabuka/Pomo Pit (Recommendation GFCM/41/2017/3). As the GFCM is a supranational body, the FRA should apply to all of the signatory states that would like to fish in the offshore waters of Italy and Croatia in the Jabuka/Pomo Pit.

The FRA was ratified in 2019 by the Regulation 2019/982 of the European Parliament and of the Council. With Recommendation 44/2021 GFCM, the FRA “Jabuka/Pomo Pit” was made permanent.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Management measures implemented in the Jabuka/Pomo Pit area since July 2015 (source: <https://doi.org/10.3390/su14137742>). (a) shows (in red) the area closed to trawl fishery from 26 July 2015 to 16 October 2016, other types of fishing activities such as longlines are permitted throughout the area. (b) shows (in red) the area subjected to a ban on all fishing activities and an area (red sparse grid) where a limited number of licences and fishing days for trawlers are allowed from 1 October 2016 to 31 August 2017. (c) reports (in red) the area prohibited for all fisheries from 01 September 2017 and the areas (red sparse grid) closed to all fishing activities until 31 October 2017 and then managed through special licences. (d) refers to the establishment of a fishery restricted area with zones "A" (in red) – closed to all fisheries; "B" and "C" (red sparse grid) - closure of fishing activities from 1 September to 31 October and restricted fisheries outside that season.

Main sector(s) involved in the OECMs

Established OECM is Fisheries Restricted Area (FRA), and therefore the main sector relevant for this OECM is fisheries.

Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring:



Jabuka/Pomo pit was established to protect vulnerable marine ecosystem (VME) and important essential fish habitats for demersal stocks of European hake and Norway lobster. Namely the area is the most important Adriatic nurseries for European hake, Norway lobster and others valuable species, such as horned octopus and monkfish, making it a critical area for the recovery and sustainability of these stocks and the fisheries that depend on them.

One of the assessments undertaken to evaluate the effects of Jabuka/Pomo Pit FRA (published in 2022) was using an innovative Before-Intermediate-After Multiple Sites (BIAMS) analysis. It was performed for zones “A” and “B” and one additional zone outside FRA (on the Italian side; so called “ext ITA”).

In zone “A”, the mean catch per unit of effort (CPUE) for biomass and density showed a gradual increase for Norway lobster and European hake. Increase for Pink shrimp was not significant since positive trend was observed even before the introduction of first management measures in 2015. This means that in the case of Pink shrimp the increase could not only be related to the introduction of measures but favourable environmental conditions (like temperature and salinity change).

In zone “B”, for European hake positive increase was observed on biomass index, but not on density having in mind that till 2017 bottom longline fishing, targeting hake, was allowed. For other two species the mean CPUE is variable.

In the area outside FRA (“ext ITA”) there is significant decrease for Norway lobster, that could be the result of displacement of fishing effort. For European hake the decrease is less evident and could be attributed to the combination of spillover effect and displacement (note: spill over for Norway lobster is less possible due to the sedentary behaviour of the specie).

Although, the time period from introduction of measures is relatively short, some preliminary conclusions could be drawn. Jabuka /Pomo Pit demonstrates the positive example of successful regeneration of fish population. The effects of fishing ban (applied in zone A) are immediate and positive for all 3 species (see figure below). On the other hand, introduction of only fishing limitations (not the full ban, applied in zone B) is not enough to observe the changes in such short period.

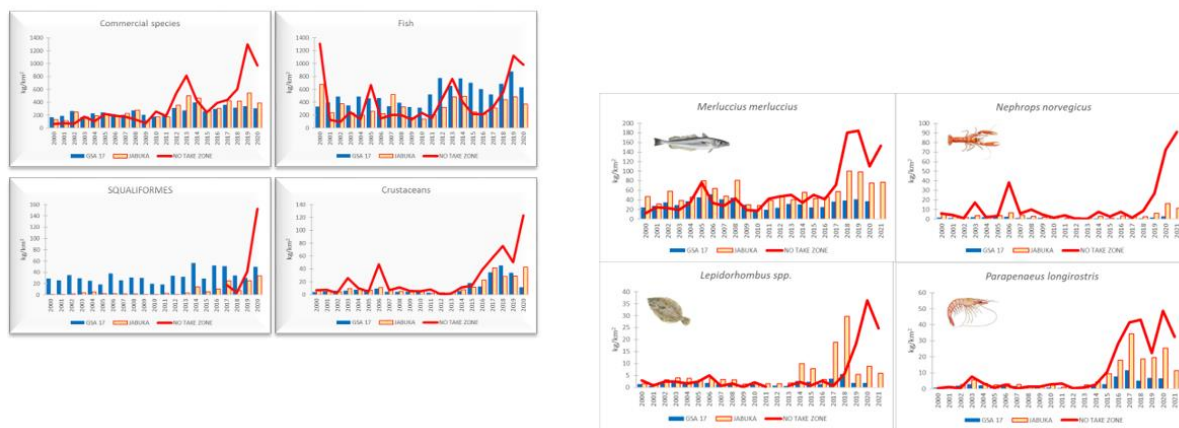
It is important to highlight that the restrictions have worked mainly because they were strongly driven by the joint initiative of scientists and fishermen and were not imposed in a top-down manner.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



BIOMASS INDICES OF THE MOST IMPORTANT CATEGORIES OF CATCHES AND SPECIES IN THE ADRIATIC SEA (BLUE); JABUKA PIT (YELLOW) AND FRA NO-TAKE ZONE (RED) – MEDITS DATA



<https://prod5.assets-cdn.io/event/8296/assets/8344720483-ca17806300.pdf>

Opportunities for establishing this type of OECMs in other areas of the sea-basins

Following the success of Jabuka/Pomo Pit, other proposals for similar FRAs in the Mediterranean were prepared. In 2018, MedReAct project submitted a proposal to the GFCM's Subregional Committee for the Adriatic Sea for a Fishery Restricted Area named *Deep water essential fish habitats and sensitive habitats in the South Adriatic*. There are also some ideas to establish similar type of area in the north Adriatic.

Dr Nedo Vrgoč former Director at the Institute of Oceanography and Fisheries in Split confirms that "the fishermen in the Adriatic see these measures as their own. They have been so successful that they ask for similar measures elsewhere". (<https://www.euronews.com/green/2021/02/23/protecting-the-sea-gives-glimmer-of-hope-to-fish-stocks-in-the-adriatic>).

Formally, GFCM prepared proposal for establishing FRA in the Bari canyon in Southern Adriatic (Recommendation GFCM/44/2021/3).

Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation

Strengths have been elaborated throughout the document.

So significant weaknesses to report at this stage.

Potential for strengthening of protection measures

There are some discussions to even strengthen the measures but these are not yet formalised.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Sources:

Chiarini M, Guicciardi S, Zacchetti L, Domenichetti F, Canduci G, Angelini S, Belardinelli A, Croci C, Giuliani G, Scarpini P, Santojanni A, Medvešek D, Isajlovic I, Vrgoč N, Martinelli M. (2022). Looking for a Simple Assessment Tool for a Complex Task: Short-Term Evaluation of Changes in Fisheries Management Measures in the Pomo/Jabuka Pits Area (Central Adriatic Sea). Sustainability. 2022; 14(13):7742. <https://doi.org/10.3390/su14137742>

Fanelli E, Bianchelli S, Foglini F, Canals M, Castellan G, Güell-Bujons Q, Galil B, Goren M, Evans J, Fabri M.C, Vaz S, Ciuffardi T, Schembri P.J., Angeletti L, Taviani M, Danovaro R (2021). Identifying Priorities for the Protection of Deep Mediterranean Sea Ecosystems Through an Integrated Approach. Frontiers in Marine Science Vol.8-2021. <https://doi.org/10.3389/fmars.2021.698890>

Mackelworth P.C., Seker Y.T, Fernández T.V., Marques M, Lopes Alves F, D'Anna G, Fa D.A., Goldborough D, Kyriazi Z., Pita C, Portman M.E., Rumes B, Warr S.J. and Holcer D (2019). Geopolitics and Marine Conservation: Synergies and Conflicts. Frontiers in Marine Science Vol.6 - 2019. <https://doi.org/10.3389/fmars.2019.00759>

An Essential Fish Habitats Network to Rebuild Mediterranean Fisheries. Oceana. Report OCTOBER 27, 2020. <https://europe.oceana.org/reports/essential-fish-habitats-network-rebuild-mediterranean-fisheries/>

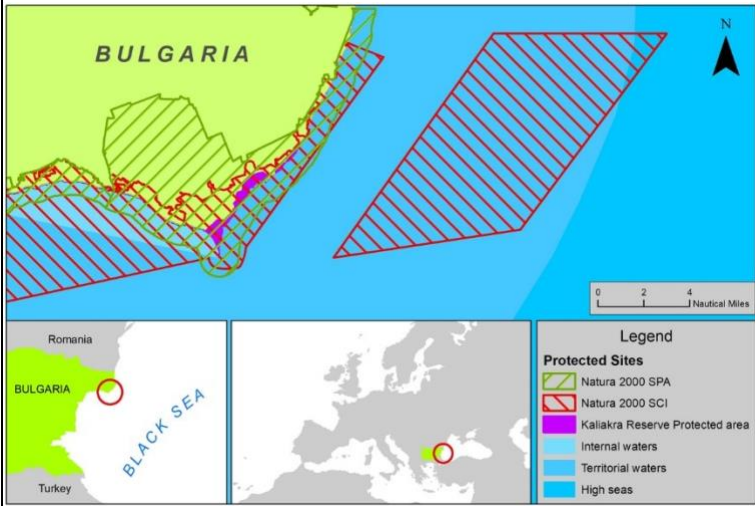
Euronews: Protecting the sea gives glimmer of hope to fish stocks in the Adriatic, <https://www.euronews.com/green/2021/02/23/protecting-the-sea-gives-glimmer-of-hope-to-fish-stocks-in-the-adriatic>, accessed on April 12.

Interview with dr Nedo Vrgoč, accessed on April 12



Black Sea

1. Kaliakra Natural Reserve/protected area (BG)

Sea- basin: Black Sea
Country: Bulgaria
Site name: Kaliakra Natural Reserve/protected area
Site map: 
Designation type: The area is subject to overlapping designation types - Natural and Archaeological Reserve “Kaliakra” under national legislation (Protected Areas Act, 1998) (11561). “Kaliakra” Reserve is the only one strictly protected MPA in Bulgaria at the end of 2022; and Site of Community Importance (SCI) (Habitats Directive) - protected area SCI BG0000573 "Kaliakra Complex", and Special Protected Areas (SPA) (Birds Directive) – protected area SPA BG0002051 "Kaliakra" (under Biodiversity Act, 2002) (Marine Protected Areas have coastal, shallow water and offshore sea parts).
Designation level: National (under Protected Areas Act, 1998) and European under Natura 2000 (Habitats and Birds Directives transposed in Biodiversity Act, 2002) and Important Bird Area.
Type of area: coastal, onshore and offshore
Brief general description of geographic, morphological and environmental features: The area is geographically located at the North Bulgarian coast, close to the border with Romania, and administratively - in the municipalities of Shabla, Kavarna and Balchik, which are part of Dobrich District. The site includes part of coastal Dobrudzha and the adjacent marine area of the Black Sea. The length of the coastline is around 50 km. The geographical scope includes also the large coastal and marine protected areas/Natura 2000 sites and Kaliakra Natural and Archaeological Reserve. The area includes part of the Bulgarian internal and territorial waters.



The maritime border of the study area is the territorial waters of Bulgaria - 12 nautical mile (NM) zone and the coastline.

Kaliakra Natural and Archaeological Reserve has an area of 713,67 hectares. The Reserve overlapped with Natura 2000 SPA Birds Directive and SCI Habitats Directive protected areas. Cape Kaliakra is located 12 km east of Kavarna town and it is the largest cape in Bulgaria jutting out 2 km into the sea (**see the map**). The coast comprises a mix of geomorphological features: spectacular small pocket sand beach, high limestone cliffs and sea caves. The coast here is steep with vertical cliffs reaching 70 m down to the sea. the coastline is predominantly cliffs with an average height of 40 m (maximum height of 65 m at Cape Kaliakra) and Northeast -East exposure. The coast and the adjacent underwater coastal slope are steep, made of resistant to wave erosion cavernous limestone. The sandy bottom is predominantly of the fine sand fraction extending up to 1000-1500 m from the shoreline. Towards the deep water are following sandy silt and silty materials. Between Cape Kaliakra and Batovska Valley the landslide type of shore is prevailing with an average height of the cliff of 17 m, with South exposure. The rocky bottom, extending on average up to 350 m from the shoreline, is composed of slumped limestone, calcareous sandstones and marls. These types of rocks are the typical habitat of the piddocks *Pholas dactylus* and *Barnea candida*.

The area is with best representatives in the country of lime steppe habitats as well as coastal cliffs habitats and coastal cave habitats. Industrial polluters are missing in large scale and that has positive influence on the status of the ecosystems including the marine ones. Calcareous rocky slopes with chasmophytic vegetation in the design process. In fact, its coverage is about 30%. Balchiska touzla and Nanevska touzla are assigned to one of the rarest types of ecosystems in the world - Natural hyperhaline lakes; Due to their shallow character they are especially vulnerable particularly because of their existence in a land-sliding region. The site is under strong tourist human impact because of the intensive summer tourism and constructions. The vulnerability of the site is connected mainly to several particular habitats. This is especially true for the coastline zone where the human influence is concentrated - fishing, water sports, sunbathing, parking of vehicles etc.

The rich history, the well-preserved landscape, and the beautiful panoramic views make Cape Kaliakra one of the most attractive tourist spots on the Black Sea coast. Cape Kaliakra and architectural complex on its territory has been announced as Archaeological Reserve since 2003 by a resolution of the Ministerial Council of Bulgaria.

Kaliakra Natural Reserve was declared in 1960. Later, in 2007 several Natura 2000 sites, both Special Protected Areas (SPAs) under the Birds Directive¹ and Sites of Community Importance (SCI) under the Habitats Directive² with large marine areas have been established. Since 2017, in order to protect valuable marine habitats, Kaliakra Complex Natura 2000 has been extended with additional MPAs.

Cape Kaliakra Reserve sits on the Via Pontica, a major bird migration route from Africa into Eastern and Northern Europe as it hosts many rare breeding birds (e.g., Pied Wheatear and European Shag). Other unusual breeding birds are Saker Falcon and Lesser Grey Shrike. Cape Kaliakra was designated as Important Bird Area by Bird Life International in 1989. In 2005 the area in its present territory was designated again as IBA. It also contains the Kaliakra CORINE Site, designated in 1998 because of its European value for rare and threatened habitats, plant and animal species, including birds. The Kaliakra IBA is the only site in Bulgaria, which keeps the remaining Eastern Dobrudzha steppe, as well as the biggest cliffs along the Bulgarian Black Sea



Coast. It supports 310 bird species, 71 of which are listed in the Red Data Book for Bulgaria (1985). Of the birds occurring there 106 species are of European conservation concern (SPEC) (BirdLife International, 2004), 17 of them being listed in category SPEC 1 as globally threatened, 21 in SPEC 2 and 68 in SPEC 3 as species threatened in Europe.

The area is rich in remains of coastal and underwater cultural heritage. Added to ecosystem values, the region is also an archeologically important area, where numerous underwater and coastal archaeological sites from different periods have been discovered – Prehistory, Antiquity (ancient Greek, Hellenistic, Roman), Mediaeval (Early Byzantium, Bulgarian). Several shipwrecks and underwater caves in the study area attract many divers to visit and explore them. As the area is still a low urbanised area compared to other overdeveloped coastal regions in Bulgaria, such conditions provide a good ground also for the development of nature-based, eco - and historical/cultural tourism.

Uses and human activities in place in the area (the most relevant):

1. Extraction of oil and gas, including infrastructure (In the most northern part of the study area)
1. Black Mussel Aquaculture farms
2. Cables
3. Fish & shellfish harvesting (professional, recreational)
4. Hunting and collecting (for non-food purposes)
5. Research and survey
6. Security/defence: Military operations (subject to Article 2(2))
7. Semi-permanent restructuring of seabed morphology
8. Small port and other coastal constructions
9. Tourism, recreation and sports
10. Transport – shipping lines
11. Waste and material disposal
12. Wastewater discharge

Anthropogenic pressures in marine environment (the most relevant):

- Input of nutrients and organic matter
- Input of contaminants (synthetic substances, non-synthetic substances, radionuclides) - diffuse sources, point sources, acute events
- Disturbance of species
- Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)
- Physical disturbance to seabed (temporary or reversible)
- Input of water — point sources

Ecological criteria:

- Protection of species (birds). Important migration route and resting area for species.
- Protection of species (mammal). Threat status: Vulnerable (IUCN). Animal of community interest in need of strict protection.



- Protection of species (fishes). Threat status: Vulnerable (IUCN).
- Protection of habitat (coastal - hard bottom). Natural habitat types of community interest whose conservation requires the designation of special areas of conservation.
- Protection of habitat (coastal - soft bottom). Natural habitat types of community interest whose conservation requires the designation of special areas of conservation.

Name of species and habitats should also be specified

- **Protected species: Fishes 2; Mammals 3.**

4125 *Alosa immaculata* Black Sea herring Fishes

4127 *Alosa tanaica* Fishes

1355 *Lutra lutra* Eurasian otter Mammals

1351 *Phocaena phocaena* Common Porpoise Mammals

1349 *Torsions truncatus* Bottle-nosed Dolphin Mammals

- **Protected habitat types:**

1110 Sandbanks which are slightly covered by sea water all the time

1140 Mudflats and sandflats not covered by seawater at low tide

1160 Large shallow inlets and bays

1170 Reefs

1240 Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp

8210 Calcareous rocky slopes with chasmophytic vegetation

8310 Caves not open to the public

8330 Submerged or partially submerged sea caves

- **Protected birds:**

133 bird species of the Nature Directives (Birds 133)

Management measures:

- Anchoring regulation
- Only allowed uses
- No take zone
- Regulated gears

Restrictions and prohibitions:

- ban of extraction of sand, gravel, stones; prohibition of breaking rocks, moving of rock blocks and stones
- prohibiting burial of habitats subject of protection under dredge disposals
- ban on sealing of habitats subject of protection with permanent structures, including artificial underwater reefs and islands
- prohibition of conducting actions associated with interference in hydrological processes leading to significant changes in temperature regime, salinity, currents and wave effects



- ban on the use of bottom trawling and dredging equipment, including sucking dredgers
- prohibiting the discharge of untreated wastewater
- prohibition on discharge of treated wastewater to a depth less than 20 meters
- prohibition on introduction of hazardous substances - synthetic, non-synthetic and radionuclides
- ban on commercial and recreational fishing of fish and molluscan aquatic organisms with the explosives, poisonous and intoxicating substances, electric current and other equipment stunning the fish, bottom trawling and dredging equipment, firearms, jigging
- prohibiting fishing for *Alosa* spp. species during their period of reproduction
- prohibiting fishing, carrying, transport, sell and buy of *Alosa* spp. smaller than 22 cm.

1. **Kaliakra Natural and Archaeological Reserve** – conservation measures are: expansion of the marine water area of the Nature Reserve; Development of a sustainable fishing plan; the Natural Reserve "Kaliakra" overlaps entirely within the Natura 2000 SPA and SCI areas. The underpinning legislation is the Protected Areas Act (1998); Protected species: Black Sea seal (*Monachus monachus*). The management plan is in force in 1997 and has already expired.

2. Proposed **Integrated Management Plan of protected area SCI BG0000573 "Kaliakra Complex"** for the protection of nature habitats and wild flora and fauna and protected areas SPA BG0002051 "Kaliakra" and SPA BG0002097 "White Cliffs" for the protection of wild birds. The conservation measures are related to monitoring of the environmental factors, as well as species populations in the MPA, with the aim of timely detection of negative trends; measures to prevent violations of environmental legislation and regimes in protected areas; a plan for the coordination of military trainings according to the subject of protection of target species of marine mammals, birds and fishes. The management plan was elaborated in 2017, however has not been put in force.

There are still no operational plans for the MPAs management, as the new operational programme "Environment" for the programme period 2021 - 2027 envisages the development of management plans for all protected areas of the Natura 2000 ecological network in Bulgaria.

Trade-offs between sea uses and marine protection: Results from the desk analysis and first interactions (interviews) with the CoP members in the Bulgarian test area (overlapping with Kaliakra Reserve) (WP5, Task 5.1) showed that stakeholders are not aware on the trade-off methods, one pointed that ecosystem-related trade-offs and balances in taking solutions given climate change scenarios and their possible impacts on biodiversity should be part of the process of development of management plans.

Coexistence and multi-use of the sea: Under the EMFF MARSPLAN-BS II project (2019-2021), that supported MSP in Bulgaria and Romania, good example is the elaborated Multi-Use case study on Tourism, Underwater Cultural Heritage and Environmental protection (MPAs) applying the H2020 MUSES project DABI approach (Stancheva, Stanchev, 2020).

The results from the interviews with stakeholders and findings from the study were published in the Marine Policy Journal as research paper (Stancheva et al., 2022). The case study reveals



the **MU combination of Tourism, UCH & Environmental Protection** and **MSP** as a ‘win-win’ situation as the MSP facilitates the MU implementation and the MU can ease the implementation of MSP. **UCH benefits in most cases from the conservation measures of environmental protection areas while tourism benefits economically from both sectors.** The preliminary DABI factors were discussed with participating stakeholders during face-to-face meetings and in-depth interviews.

For OECSs

• **Policy context in which the measure has been established**

1. Conservation measures to Programme of Measures (PoMs) - Marine Strategy Framework Directive (MSFD) with direct relation to MPAs and protection of biodiversity
2. Orders issued by the Minister of Agriculture and Food for temporary bans and restrictions on fishing in accordance with the rules of the Fisheries and Aquaculture Law;
3. OECSs under the Water Framework Directive (Key Types of Measures);
4. Measures under the European Maritime and Fisheries Fund (EMFF) 2014-2020

• **Main sector(s) involved in the OECSs:** fishery, aquaculture, coastal and maritime tourism, agriculture, shipping, climate change

• **Main environmental impacts targeted**

1. PoMs: Measure No. 13: Conservation of the migratory species Mediterranean shearwater (*Puffinus yelkouan*) and Middle cormorant (*Phalacrocorax aristotelis*) in the coastal, territorial waters and EEZ of the Black Sea states. To restore and protect marine ecosystems, including habitats and species; Measure No. 15: Establishment of synchronised and representative networks of MPAs in Bulgaria and Romania, as well as plans for their management. Increasing the area of the protected areas declared under the Protected Areas Act (1998). Improved control of regulated activities in protected areas and protected territories
2. Define areas where the use of beam trawling is prohibited, in order to reduce the impact of fishing on the structure of bottom ecosystems in specific areas in inland sea waters and territorial sea of the Republic of Bulgaria
3. Temporary bans on commercial and recreational fishing in the sea or separate areas of it to protect the populations of fish and other aquatic organisms are set up a ban on their exploitation for a certain period of time, not shorter than one year);
4. EMFF measure: Directly related to Natura 2000 activities is the implementation of the measures under Priority 6 "Promoting the implementation of the Integrated Marine Policy (IMP).



<ul style="list-style-type: none">• Existence of quantitative assessment (through monitoring) of direct and indirect implications for biodiversity and ecosystem protection. Institutions involved in monitoring: The report "Update of the first part of the Maritime Strategy, according to Art. 8 for the state of the marine environment, Art. 9 to determine the definitions of the GES (good state of the marine environment) and Art. 10 – determination of environmental targets and related indicators. (Ministry of Environment and Water - Black Sea Basin Directorate, Institute of Oceanology – Bulgarian Academy of Sciences). The purpose of the assessment is to determine the state of the marine environment in relation to Descriptor1 Criterion D1C6 Biodiversity – Pelagic habitats - Phytoplankton and Zooplankton in the marine areas of assessment in the Bulgarian water area of the Black Sea.
<ul style="list-style-type: none">• Opportunities for establishing this type of OECMs in other areas of the sea-basins: <i>General Fisheries Commission for the Mediterranean – GFCM:</i> Fisheries Restricted Areas (FRAs). Fisheries restricted area (FRA) is a geographically defined area in which some specific fishing activities are temporarily or permanently banned or restricted in order to improve the exploitation patterns and conservation of specific stocks as well as of habitats and deep-sea ecosystems. In the Mediterranean and the Black Sea, 1 760 000 km of sea habitats are protected by ten FRAs established by the GFCM. This includes one large deep-water FRA (1 730 000 km) in which the use of towed dredges and trawl nets in all waters deeper than 1000 metres is banned to protect deep-sea benthic habitats.
<ul style="list-style-type: none">• Strengths and weaknesses of the type of OECMs for biodiversity and ecosystem conservation: No activities have been started so far under the MSFD PoMs protection measures in regard to establishment of management plans and coherent MPAs between Bulgaria and Romania
<ul style="list-style-type: none">• Potential for strengthening of protection measures: Under the MSFD and new PoMs, as well as under the Fishery and Aquaculture Act
References: <ol style="list-style-type: none">1. Stancheva, M., Stanchev, H. 2020. Addressing the Multi-Use Concept with Maritime Spatial Planning in the Cross-Border Region (Bulgaria). MARSPLAN-BS II Project (EASME/EMFF/2018/1.2.1.5/01/S12.806725), Deliverable: WP2, Activity 2.4, June, 2020, 81 pp. http://www.marsplan.ro/en/results/marsplan-bs-ii-addressing-the-multi-use-concept.html.2. Stancheva, M., Stanchev, H., Zaucha, J., Ramieri, E., Roberts, T. 2022. Supporting multi-use of the sea with maritime spatial planning. The case of a multi-use opportunity development-Bulgaria, Black Sea. Marine Policy, 136, 104927. https://doi.org/10.1016/j.marpol.2021.104927; https://www.sciencedirect.com/science/article/abs/pii/S0308597X21005388



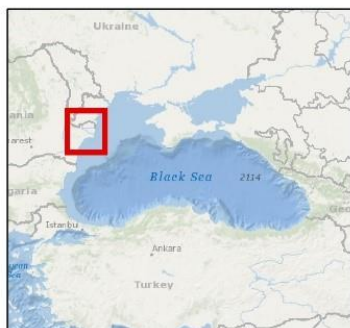
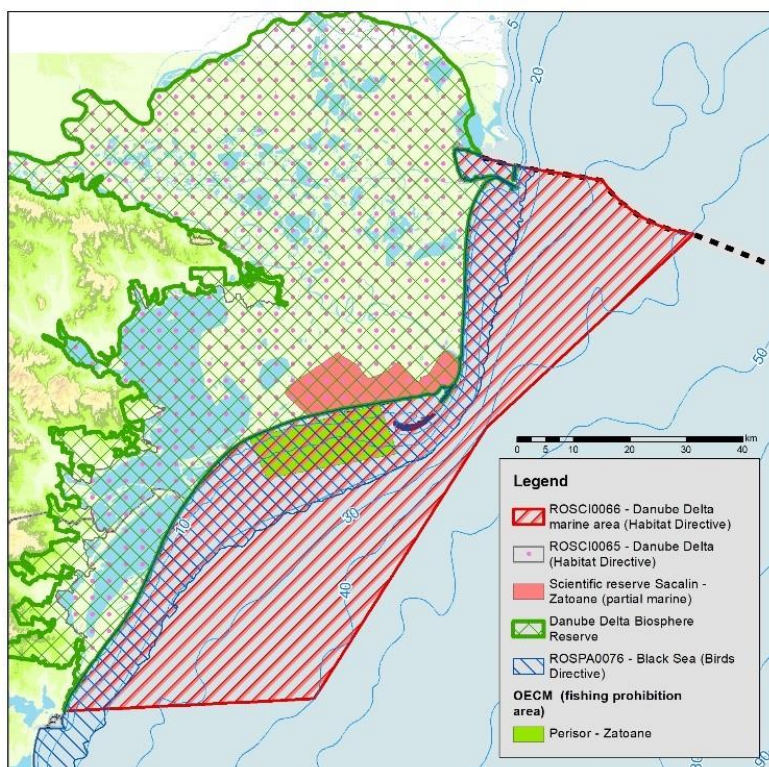
2. Danube Delta marine area (RO)

Sea- basin: BLACK SEA

Country: ROMANIA

Site name ROSCI0066 Danube Delta marine area

Site map:



Designation type: Site of Community Importance (Habitat Directive), partial (0-20 m depth) is also included in Danube Delta Biosphere Reserve and and Wetlands of International



<p>Importance (Ramsar Sites); also overlapped with ROSPA0076 – Black Sea (Site of Community Importance, Birds Directive)</p> <ul style="list-style-type: none">• Order of the Minister of Environment, Water and Forests no. 46/2016 on the establishment of the protected natural area regime and the declaration of sites of community importance as an integral part of the Natura 2000 network in Romania• Government Decision no. 1284/2007 regarding the declaration of special avifaunistic protection areas, as an integral part of the Natura 2000 ecological network in Romania• Order of the Minister of Environment and Sustainable Development no. 1964/2007 on the establishment of the protected natural area regime of sites of community importance, as an integral part of the European Natura 2000 ecological network in Romania• Law no. 5/2000 on the approval of the National Territorial Development Plan - Section III – protected areas• Decision of the International Coordinating Council of the Man and Biosphere Program (MAB) no. SC-98/CONF.201/CLD.4• Wetland area of international importance (Ramsar site) no. 521/21.05.1991• Decision of the governing bodies of the Man and Biosphere Program (MAB), from 1979
Designation level: National, European and international level
Type of area: coastal and marine (0 to approx. 40 m depth)
<p>Brief general description of geographic, morphological and environmental features:</p> <p>Within the Romanian marine area, the ROSCI0066 site occupies the Nordic part, along ~ 150 km general N-V direction, from the mouth of the Chilia arm in the North, to Cape Midia, in the South and up to a depth of 40-45 m in the East. It overlaps over a part of the continental platform (internal shelf), with the appearance of a smooth submerged plain with gentle slope that do not exceed 2°.</p> <p>The landform of the continental platform is relatively uniform, characterized by a small amplitude morphology, due to the large amounts of sediments brought by the hydrographic system, the type of sediments, the transgression and regression of sea during the Quaternary period.</p> <p>The area is characterized by an abrasion and accumulation plain, resulting from the sea level variations from the Quaternary period, on which are superimposed landforms resulting from the subsequent deposition of fluvial sediments, shaped by hydrological factors (waves, currents). From sedimentological point of view, the sandy fraction predominates on the internal shelf, followed by silty and mixed sediments.</p> <p>The morphology of the submerged shore in the northern unit is differentiated according to the dominant coastal processes:</p> <ul style="list-style-type: none">- the present of extensive foreshores, with several submerged bars, developed up to 3-4 m depth in the sectors where accumulation/dynamic balance predominates (north Sulina, north Sf. Gheorghe, the terminal sector of Sakhalin, the Perisor-Periteasca sector)- the erosional sectors - in transverse profile, the foreshores are less developed, the number of bars decreasing to 1-3, in some sectors disappearing (the central area of the Sulina - St. Gheorghe sector, the central area of the Sakhalin peninsula, Zăton-Perisor, Portita-Periboina).



The low accumulation shore that outlines the lagoon bay and deltaic shore consists of river-discharged sand and shell-bearing sand, reaching heights never exceeding 2 m is constantly reshaped by wind and waves.

Historical climate changes and especially recent changes induce important modifications in the shore configuration. Sea level rise and the intensification of meteorological and hydrological extreme phenomena due to climate change and in direct association with the decrease of sedimentary material transported by the Danube, coupled with modifications of sea currents, have resulted in pronounced erosion of the shores, the deltaic and lagoon sector being the most affected (Fig. 9).

The evolution of the shore varies according to the intensity of coastal processes, distinguishing distinct sectors:

-erosion sectors: southern Sulina - north Sf. Gheorghe, Zaton - Perisor sector, North Portita – Periboina - Edighiol sector.

-accumulative sectors: Sulina beach, Periteasca sector, Chituc sector.

-Narrow lagoon barriers with specific dynamics - bending and elongation to the southwest, accompanied by a translation movement to the west (Musura Bay Island, Sahalin Peninsula).

The Musura bay shore is swampy, with marsh vegetation that makes the delimitation land - water difficult to estimate. The Sulina dikes are the most important anthropogenic structures in the area, which have substantially altered the natural hydrodynamics both in the adjacent sectors and entire littoral. According to the initial project from year 1856, the dikes were designed to protect the waterway from clogging due to sediment transport on Chilia. The construction began in 1958, now reaching 8 km in length. The sediment transport was diverted offshore with consequences in the distribution of sediments on the southern beaches (Coastal Zone Diagnosis, 2011).

The disrupting of sediment transport from the Chilia branch had as a consequence the intensification of sedimentation processes in the area, forming sandy barrier structures that tend to close the Musura Bay and clogging the sector behind. The new formed enclosing barrier has the tendency to elongate to the south and to translate westwards, the specific evolution of the Danube Delta sand features.

The Sacalin Island appearing following the floods in 1897. The structure thus formed evolved in the peninsula by clinging to the shore in the north part. At present, it has an arched shape, with the general tendency of translation by successive retraction to the west, the clogging of the inner part and its extension to the southwest. The irregular evolutionary rhythms depend on the fluctuations in the solid flow on the Sfântu Gheorghe arm and the hydrological conditions.

Another important aspect are the changes at the level of shore shallow water and the biocenotic succession due to the behavior of the sandy formations with the accentuated dynamics. The Musura Bay area and the Sacalin lagoon are currently in the process of being filled up. Evolution models show a tendency to close these bays and transform them into lagoons with permanent or intermittent connection to the sea.

The Black Sea ecosystem belongs to the category of standing saltwater ecosystems, with unique features in terms of physical, chemical and biological characteristics. The ecosystems corresponding to the ROSCI0066 site are:

- Coastal marine waters - under the influence of Danube waters, which is reflected in the degree of mineralization (brackish water), in turbidity, transparency and polluting substances that have determined essential changes in the flora and fauna associations, being characterized by the



most pronounced natural eutrophication of the Black Sea. The fauna has a "mixed" character, meeting limnic species with wide limits of euryhalinity, but also marine species, including the rare species of ponto-caspian relicts, with a very restricted distribution throughout the Black Sea basin.

- Semi-enclosed bays - with freshwater intakes, which constitute lacustrine-marine ecosystems with important biocenotic structure (planktonic and benthic biocenoses, fresh and marine ichthyofaunal)

- Coastal lagoons

The northern unit of Romanian littoral is sparsely populated, human activities in the coastal area being reduced to fishing and small-scale tourism, also dedicated especially to environmental protection. The amplitude of the changes in the level of the emerged shore and the adjacent shallow marine area is high, having an impact mainly on coastal and marine habitats and fishing activities, in general due to erosion and silting processes.

The ROSCI0066 site (Danube Delta - marine part) was declared by Order of the Minister of Environment and Forests no. 2387/2011 for the amendment of the Order of the Minister of Environment and Sustainable Development no. 1964/13 December 2007 regarding the establishment of the regime of protected natural areas of sites of community importance as an integrated part of the European Natura 2000 ecological network in Romania. Based on Order no. 46/2016, the area of ROSCI0066 Danube Delta - marine area was increased approximately 2.7 times, from 123,320.50 ha to 336,200.20 ha. The bathymetric limit in the eastern area has been changed from 20 m to 40 m deep.

The revision of the management plan of the marine protected area, within POIM 123322 project – RBDD Revision of the Management, Rules and Regulation Plan started in 2019. The updated management plan and completed in 2022, is still in public consultation.

Uses and human activities in place in the area (the most relevant):

- Extraction of living resources - fish and shellfish harvesting (professional, recreational)
- Transport – shipping
- Physical restructuring of rivers, coastline, or seabed (water management) – canalisation and other watercourse modifications, restructuring of seabed morphology, including dredging and depositing of materials, coastal defence and flood protection
- Tourism and leisure activities
- Education and research

Anthropogenic pressures in marine environment (the most relevant):

- Biological:
 - Extraction of wild species (by commercial and recreational fishing activities)
 - Poaching
 - Input or spread of non-indigenous species.
- Physical:
 - Physical disturbance to seabed (temporary or reversible) - active fishing activities (demersal trawl, beam trawl), transportation (anchorage area), coastal erosion



- Physical loss (due to permanent change of seabed substrate or morphology and to extraction of seabed substrate) – dragging and disposal of sediments on Sulina channel
- Changes to hydrological conditions – due to Sulina channel which enter in marine area more than 7 km resulting in changes in local hydrodynamic and sediments transport
- Substances, litter and energy:
 - Inputs of nutrients, synthetic and non-synthetic substances and litter due to Danube River (mainly) and Dnieper, Dniester and Bug rivers (direct influence)

Ecological criteria:

- Protection of species (fish, marine mammals)
- Protection of habitats (coastal – soft bottom, *Mytilus galloprovincialis* biogenic reefs)
- Protection of habitats (pelagic)

Protection of species (species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and International Conventions)

- Fish:
 - *Huso huso* (code 2489, Beluga sturgeon)
 - *Acipenser gueldenstaedtii* (code 5040, Russian sturgeon)
 - *Acipenser stellatus* (code 2488, Starry sturgeon)
 - *Alosa immaculata* (code 4125, Pontic shad)
 - *Alosa tanaica* (code 4127, Black Sea shad)
- Marine mammals:
 - *Tursiops truncatus ponticus* (code 1349, Common bottlenose dolphin)
 - *Delphinus delphis ponticus* (code 1350, Common dolphin)
 - *Phocoena phocoena relicta* (code 1351, Harbour porpoise)

Habitats:

- 1110 – Sandbanks which are slightly covered by sea water all the time
- 1130 - Estuaries
- 1140 – Mudflats and sandflats not covered by seawater at low tide
- 1150 – Coastal lagoons
- 1160 – Large shallow inlets and bays
- 1170 - Reefs (biogenic reefs)
- 1180 – Submarine structures made by leaking gases

Management measures:

Conservation/management measures of species of community interest in ROSCI0066, aiming to maintain/achieve favorable conservation status for the species: *Alosa immaculata*, *Alosa tanaica*, *Huso huso*, *Acipenser gueldenstaedtii*, *Acipenser stellatus*, *Tursiops truncatus ponticus*, *Delphinus delphis ponticus* and *Phocoena phocoena relicta* :



- Establishing stricter fishing regulatory measures in ROSCI0066
- Ensuring compliance with the turbot prohibition period and the provisions concerning permitted gear and the minimum size of collected specimens.
- Permanent monitoring and control of commercial fishing activities in ROSCI0066 in order to ensure the veracity of fishery data for the correct estimation and stocks management.
- Stimulating the installation of pinger-type hydroacoustic devices on fishing gear
- Stimulating "environmentally friendly" practices by using fishing vessels less than 10 m in length and not using towed gear (small-scale fishing)
- Promotion and stimulation (including financial) of mollusk fishing and collection using "environmentally friendly" methods.
- Facilitation and implementation of "waste fishing" practices
- Creating the necessary capacities for the rescue operations of injured or sick cetaceans, supporting the intervention activities in the case of cetaceans failing to die and preparing a code of practice for the centers or laboratories involved in this activity.
- Development of specific rules regarding the level of noise produced by the engines of ships/boats navigating in ROSCI0066

Restrictive measures:

- Total prohibition for the fishing of sturgeons (*Huso huso*, *Acipenser gueldenstaedtii* and *Acipenser stellatus*) throughout the year (except for fishing for scientific purposes and, in this case, with their immediate release in viable state)
- Prohibition of commercial fishing of *Alosa immaculata* throughout the year in front of Danube mouths (in accordance with the annual prohibition orders)
- Banning the use of the beam trawl and the classic hydraulic dredge on the site territory, to 20 m depth; between the 20 - 40 m isobaths, the use will be allowed only by alternating in time and space of impacted perimeters with biological recovery perimeters, following the completion of specialized studies. It is allowed to use tools of smaller sizes and significantly reduced impact (hydro scraper, hydraulic scraper, manual harness dredger).
- Banning the use of pelagic trawling in ROSCI0066 below the 20 m isobath
- The total ban on catching dolphins, all year round, with the obligation to report accidental by-catches of cetaceans
- Prohibition of the deliberate introduction of invasive species into ROSCI0066

Conservation/management measures - in order to maintain/achieve the favorable conservation status of habitats 1110, 1130, 1140, 1160, 1170 and 1180

- Improving fisheries legislation
- Promotion and stimulation (including financial) of mollusk fishing and collection in environmentally friendly conditions
- Assessment of ecosystem functions and services
- Pressure evaluation and control



Restrictive measures - in order to maintain/achieve the favorable conservation status of habitats 1110, 1130, 1140, 1160, 1170 and 1180

- Prohibition in the use of the beam trawl and the classic hydraulic dredger in the territory of ROSCI0066 below the 20 m isobath, allowing the use only of small dimension tools with significantly reduced impact (hydro-rake, hydraulic-rake, manual harness dredge)

- Prohibition of the deliberate introduction of invasive species into ROSCI0066

References:

Nicolae, Carmen, Nenciu, M.I., Adrian, Filimon, Spanu, A.D, Monica, Marin, Pogurschi, Elena. (2017). Study on conservation status of marine mammals in the danube Delta Marine Zone (ROSCI 0066). Journal of Environmental Protection and Ecology. 18. 1005-1016.

Spînu, A.-D., Mihailov, E.-M., Buga, L., & Diaconeasa, D. (2018). A Short and Long Term Evaluation of along Shore Geomorphological Changes in the Danube Delta. Revista Cercetări Marine - Revue Recherches Marines - Marine Research Journal, 48(1), 161–170. <https://doi.org/10.55268/CM.2018.48.161>

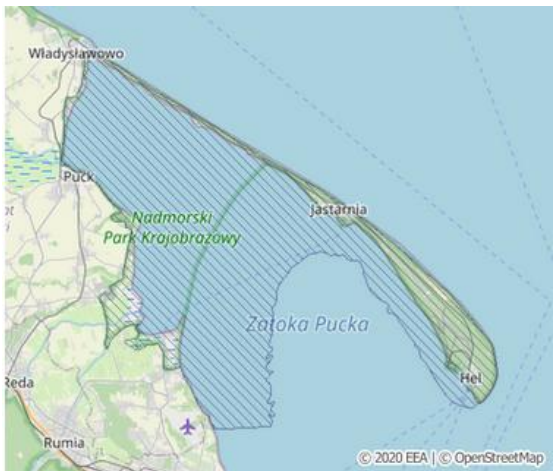
*** Management plan – ROSCI0066 Danube Delta – marine part, 2022, <https://ddbra.ro/wp-content/uploads/2023/02/PLAN-MANAGEMENT-ROSCI0066-ANEXE-CONSOLIDAT-3feb23.pdf>



Annex 3 – Examples of restoration measures

Baltic Sea

1. The Puck Bay and Hel Peninsula (PL)

Sea- basin: Baltic Sea
Country: Poland
Designation type: Special Areas of Conservation (SAC)
Site name (original - PL): Zatoka Pucka i Półwysep Hel, PLH220032
Site name (translation - EN): The Puck Bay and Hel Peninsula, PLH220032
Site map 
Type of area: Coastal (Internal Sea Waters)
Uses and human activities in place in the area <ul style="list-style-type: none"> • Land claim • Canalisation and other watercourse modifications • Coastal defence and flood protection • Restructuring of seabed morphology, including dredging and depositing of materials • Non-renewable energy generation Transmission of electricity and communications (cables) • Fish and shellfish harvesting (professional, recreational) • Fish and shellfish processing • Agriculture Forestry • Transport infrastructure • Transport — shipping



<ul style="list-style-type: none">• Transport — land• Urban uses• Industrial uses• Waste treatment and disposal• Tourism and leisure infrastructure• Tourism and leisure activities• Military operations (subject to Article 2(2))• Research, survey and educational activities
Type of impact: <ul style="list-style-type: none"><input type="checkbox"/> Degraded ecosystems in eutrophicated coastal areas (e.g. coastal cities, river estuaries)<input type="checkbox"/> Degraded ecosystems in highly polluted coastal areas (e.g. ports, coastal industrial sites)<input type="checkbox"/> Degraded marine vegetation<input type="checkbox"/> Degraded benthic community (soft bottom habitats)<input type="checkbox"/> Overexploited fish stock<input type="checkbox"/> Deterioration of nesting habitats for marine species
Ecological target for restoration: <ul style="list-style-type: none"><input type="checkbox"/> Marine vegetation<input type="checkbox"/> Soft bottom habitats<input type="checkbox"/> Nursery grounds
Type of measure <ul style="list-style-type: none"><input type="checkbox"/> Wastewater treatment<input type="checkbox"/> Remediation of contaminated sites (e.g. dredging of contaminated sediments)<input type="checkbox"/> Fisheries management measures<input type="checkbox"/> Restoration of soft bottom macrophytes



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



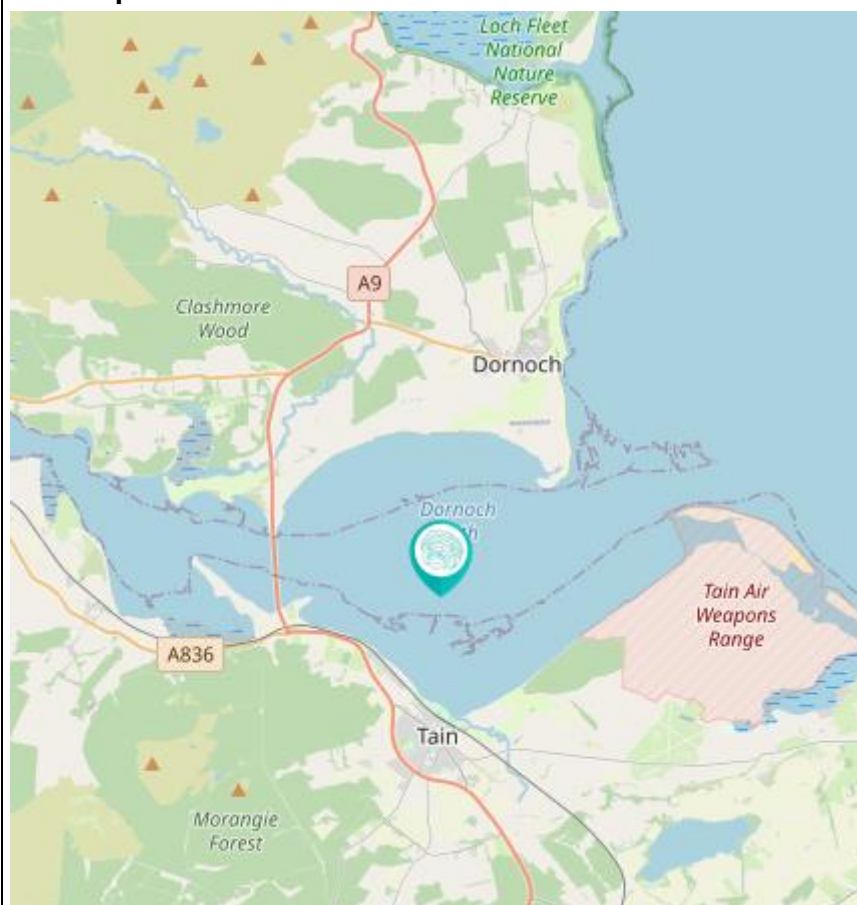
North Sea

1. Firth of Dornoch Native Oyster Restoration (UK, Scotland)

Country: United Kingdom (Scotland)

Site name: Dornoch Firth

Site map:



Source map: Dornoch Environmental Enhancement Project – Native Oyster Network, 2023.

Type of area:

coastal – river estuary

Uses and human activities in place in the area:

- Fish and shellfish harvesting
- Transport: shipping, and infrastructure
- Renewable energy generation (wind, wave, and tidal power)

**Type of impact:**

- Degraded ecosystems in eutrophicated coastal areas (e.g. coastal cities, river estuaries)
- Degraded ecosystems in highly polluted coastal areas (e.g. ports, coastal industrial sites)

Native oysters in the Firth of Dornoch went extinct about 100 years ago because of overfishing. The Dornoch Environmental Enhancement Project (DEEP), led by the Glemmorangie Distillery as well as scientists from Heriot-Watt University managed to return 20,000 native oysters to the Firth. The project started in 2014 after the Distillery became aware of the effects of its organic waste discharge in the Firth and its effects on water quality and on the overall marine environment. Restoring the oysters then became part of the wider sustainability strategy of the company, as these organisms have the capacity to purify large quantities of water. To date, 20,000 oysters have been successfully restored.

Ecological target for restoration:

- Water quality improvement
- Nursery ground

During the first part of the project in 2017, researchers placed 300 oysters in ballasted bags in two sites of the Dornoch Firth. Following the high survival rates seen in both sites, waste shell from the scallop and mussel industry were placed on the seabed to provide a first reef for oysters, stabilizing the sediment for oysters to grow. The overall target is to place 200,000 oysters in the next five years, for a total area of 40 hectares.

Type of measure:

Restoration of native oysters' populations

Sources

Heriot-Watt University, 2021. *Dornoch Firth enhancement project reaches 20,000 oysters milestone*. Available at: <https://www.hw.ac.uk/news/articles/2021/dornoch-firth-engancement-project-reject.htm>

Native Oyster Network, UK & Ireland.2023. *Dornoch Environmental Enhancement Project*. Available at: <https://nativeoysternetwork.org/portfolio/deep/>



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



2. Borkum Reefground (BRG) Biogenic reef restoration (DE)

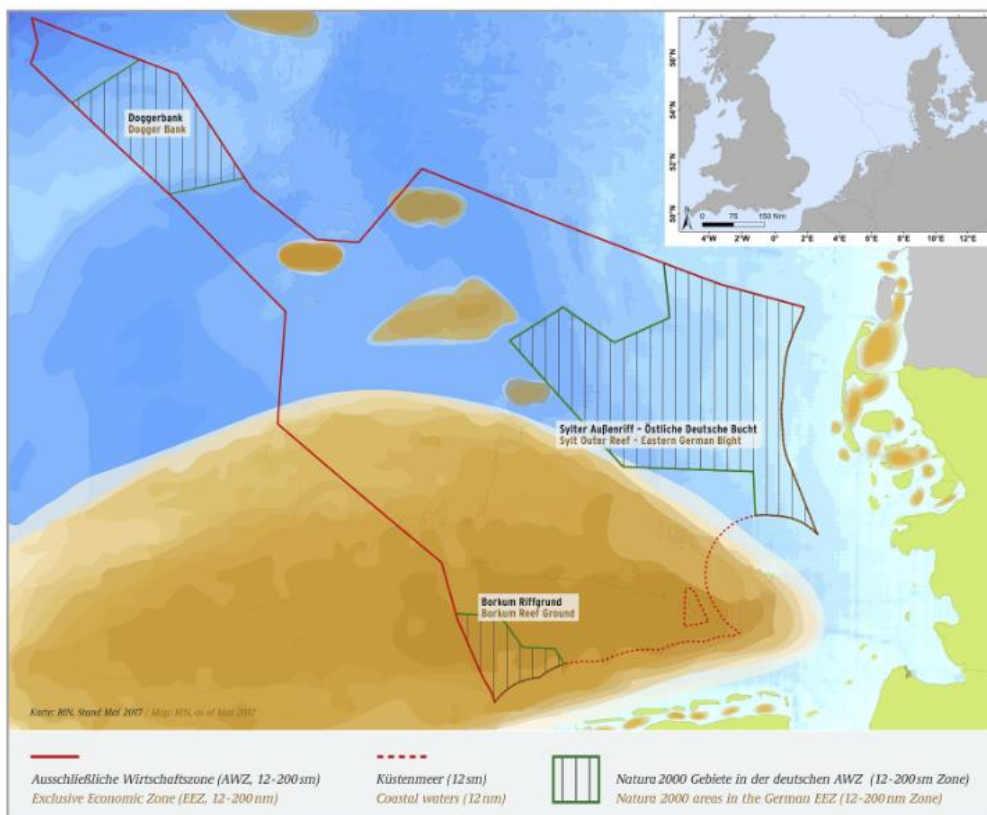
Country:

Germany

Site name:

Borkum Reefground (BRG) (Nature Conservation Area – NCA)

Site map:



(Source map: Pogoda et al, 2020, p.2165)

Type of area:

offshore (German Exclusive Economic Zone (EEZ))

Uses and human activities in place in the area:

Fish and shellfish harvesting

- Transport: shipping, and infrastructure
- Sand and gravel extraction
- Oil and gas extraction
- Cable laying

**Type of impact:**

- Degraded benthic community (hard bottom habitats)

Oysters are key ecological players, and oyster beds *Ostrea edulis* have been severely affected by overfishing – to an extent where they are considered extinct from the German part of the North Sea. The MPA is under high pressure from human activities (see human activities in place above).

Ecological target for restoration:

Hard bottom habitats – oyster reef

Type of measure:

- Biogenic reef restoration

Several sites have been chosen within the MPA to restore oyster beds, in areas where cable laying and shipping do not happen. Mobile bottom-contact fishing gear has been excluded from those sites, as well as extraction of sand, gravel, oil and gas.

Sources

Pogoda, B. et al. (2020) 'Site selection for biogenic reef restoration in offshore environments: The Natura 2000 area Borkum Reef Ground as a case study for native oyster restoration', Aquatic Conservation: Marine and Freshwater Ecosystems, 30(11), pp. 2163–2179. Available at: <https://doi.org/10.1002/aqc.3405>.

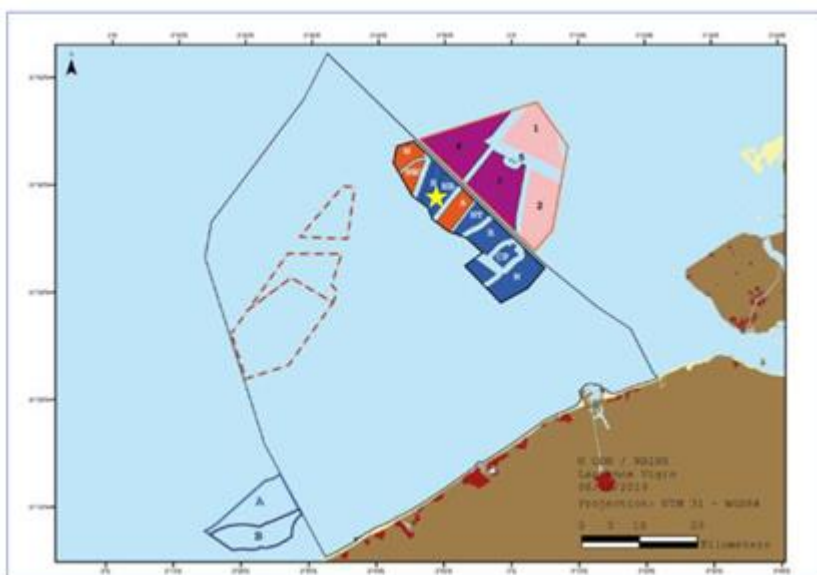


3. UNITED project oyster reef restoration (BE)

Country: Belgium

Site name: Multi-use combination of offshore wind, flat oyster aquaculture & restoration and seaweed cultivation

Site map:



Location of the offshore testing site is indicated with the yellow star, within the Parkwind windfarm site on the eastern side of the Belgian part of the North Sea (source map: Lukic et al., 2020)

Nearshore test site: Westdiep sandbank, near Nieuwpoort

Type of area: Coastal

Uses and human activities in place in the area:

- Production of energy: Renewable energy generation (wind power), including infrastructure

Site is within an offshore wind farm, and the safety zones that are in place around the turbines mean bottom fishing (as well as other vessel activities) is excluded from the windfarm. The windfarm consists of turbines on monopile foundations, which are protected with a scour protection layer. The turbines are connected with each other and with an offshore transformer station via subsea cables to transport the electricity generated by the turbines. Part of the project is to add additional substrate to the scour protection layer, to encourage the settlement of oyster larvae originating from the aquaculture, which could facilitate the restoration of oyster reefs in the natural environment.

- Cultivation of living resources: Aquaculture — marine, including infrastructure



The possibility of cultivating flat oysters and seaweed within the windfarm site has been investigated through this project. Within the project, different strains of seaweed are tested for cultivation.

Type of impact:

Degraded benthic community (hard bottom habitats – oyster reefs)

Oyster reefs were once present in the Belgian part of the North Sea, but in the early 20th century, bottom-contact fisheries (including a fishery targeting oysters) resulted in the decline of this habitat. Within the windfarm site, oyster reefs have the chance to return as the windfarm zones eliminate pressure from bottom-contact fisheries.

Ecological target for restoration:

Hard bottom habitats – oyster reefs

Type of measure:

Installation of artificial substrates

In combination with long line oyster aquaculture which is expected to lead to a flow of oyster larvae to the seabed, substrate is added to the scour protection layer of the wind turbines which should encourage settlement of oyster larvae (spat), facilitating the restoration of the oyster reefs.

The effectiveness of different substrates to facilitate settlement of larvae was first tested at a nearshore site, before installment at the offshore windfarm site.

The project is a collaboration between the private sector, research institutes and the government, and the idea is that the pilot project can be scaled up.

Sources

Lukic, I. Et al. (2020) Revision of the current environmental assessment and status of pilots (Deliverable 4.1, WP4 Environmental gain of multi-use of marine space and infrastructure).

R. Van Duinen et al. (2020) Current economic assessment and status of pilots (Deliverable 3.1, WP3 Economics of Multi-Use Platforms). Unpublished. Available at: <https://rgdoi.net/10.13140/RG.2.2.15322.00968> (Accessed: 16 May 2023).

UNITED project | Interview with Nancy Nevejan | #OffshoreNature22 (2022). Available at: <https://www.youtube.com/watch?v=cjUsbA> (Accessed: 16 May 2023).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



North-East Atlantic

1. Flat Oyster Recovery (FOREVER project), Brittany (FR)

Country: France

Site name: Flat Oyster Recovery (FOREVER project), Brittany

Site map and photo

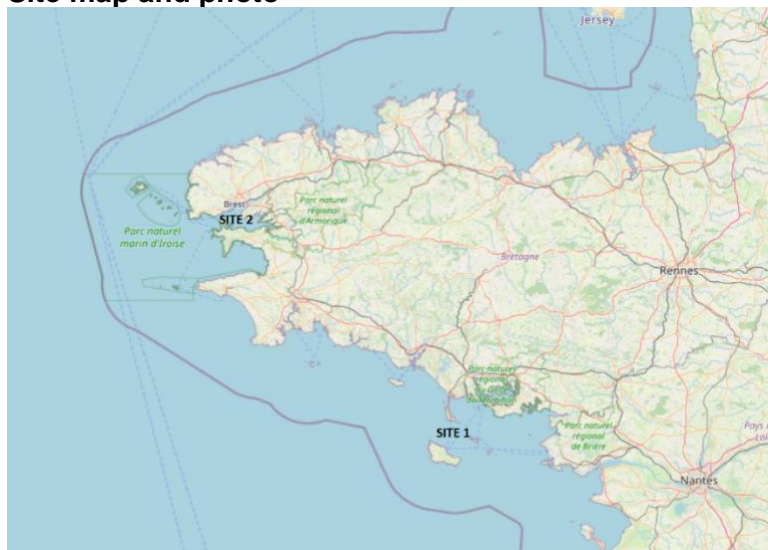


Photo credits: S. Pouvreau / Ifremer



Type of area: offshore

Description of the project:

In France, the European flat oyster (*Ostrea edulis*), is the sole oyster species native to the European coasts. Once dominant in most European coastal ecosystems, their living environment is now restricted to a few areas, like in Brittany and in Normandy (Duchêne et al., 2015).

Ostrea edulis was a flagship of French oyster farming. In the 1960s, the production reached more than 20,000 tons, but collapsed in the 1970's with approximately 2,000 tons harvested. The main cause of *Ostrea edulis*' decline was the emergence of two parasitic diseases still present today (*Bonamiosis* and *Marteiliosis*). To support the French oyster farming sector, a new species, the Japanese cupped oyster (*Crassostrea gigas*), was introduced

Ostrea edulis populations have never recovered since then. And in 2015, its production drastically dropped to 500 tonnes (Cochet et al., 2015), causing important socio-economic and cultural impacts on specialised oyster companies. Moreover, the species plays important ecological roles, such as: species sheltering through the formation of biogenic reefs, erosion control, water purification, and improvement of water quality. However, *Ostrea edulis* is vulnerable to environmental changes.

With the support of the OSPAR Commission and the Federal Agency for Nature Conservation, the Native Oyster Restoration Alliance (NORA) was created. NORA gathers more than a hundred scientists and planners across Europe. In France, the programme started in 2018. It is run by the FOREVER project (Flat Oyster REcoVERY) and financed by the European Maritime and Fisheries Fund for its first phase (2018-2020). *Ostrea edulis* was integrated to the objective reports and management plans for species protection of Natura 2000 sites.

The overall goal of this project is to restore *Ostrea edulis* and its habitats on European coasts.

Project coordination:

- Responsible body: Comité Régional de la Conchyliculture
- Scientific partner: IFREMER
- Additional partners: Office Français de la Biodiversité (OFB), Direction Départementale des Territoires et de la Mer (DDTM), gestionnaires des sites Natura 2000, Parc Naturel Régional d'Armorique, Bureau d'étude Cochet environnement
- Project name: FOREVER (Flat Oyster REcoVERY)
- Funded by the European Maritime and Fisheries Fund

Uses and human activities in place in the area.

- Tourism and leisure
- Extraction of living resources (fishing activities)
- Cultivation of living resources (oyster farming)

**Type of impact:**

Biological disturbance: parasites that have caused the decline of two endemic oyster species (*Bonamiose* and *Marteiliose*)

Ecological target for restoration:

- Soft bottom habitats (organisms)
- Hard bottom habitats (reefs)

Type of measure:Three types of restoration measures:

- Sowing oyster spat on sites: growth monitoring + predator control measures
- Eco-designed reefs made of oysters' shell debris: recycling the shells of *Bonamiose* and *Marteiliose* and mixing them with a specific cement to provide a high affinity substrate.
- Line the seabed with *Bonamiose* and *Marteiliose* oyster shells to provide shelter and a substrate for their larvea

Sources:

- Cochet, M., Brown, M., Kube, P., Elliott, N. and Delahunty, C. (2015) 'Understanding the impact of growing conditions on oysters: a study of their sensory and biochemical characteristics', *Aquaculture Research*, 46(3), pp.637-646.
- Duchene, J., Bernard, I. and Pouvreau, S. (2015) 'Vers un retour de l'huître indigène262 en rade de Brest', *Espèces*, (16), pp.51-57.
- Pouvreau, S., Juillet, E. and Gilante, H. (2021) 'Projet FOREVER (Flat Oyster Recovery): Restauration écologique de l'huître plate en Bretagne', *Génie écologique, Centre de ressources*. Available at: <https://archimer.ifremer.fr/doc/00742/85402/> (Accessed: 12 May 2023).



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.

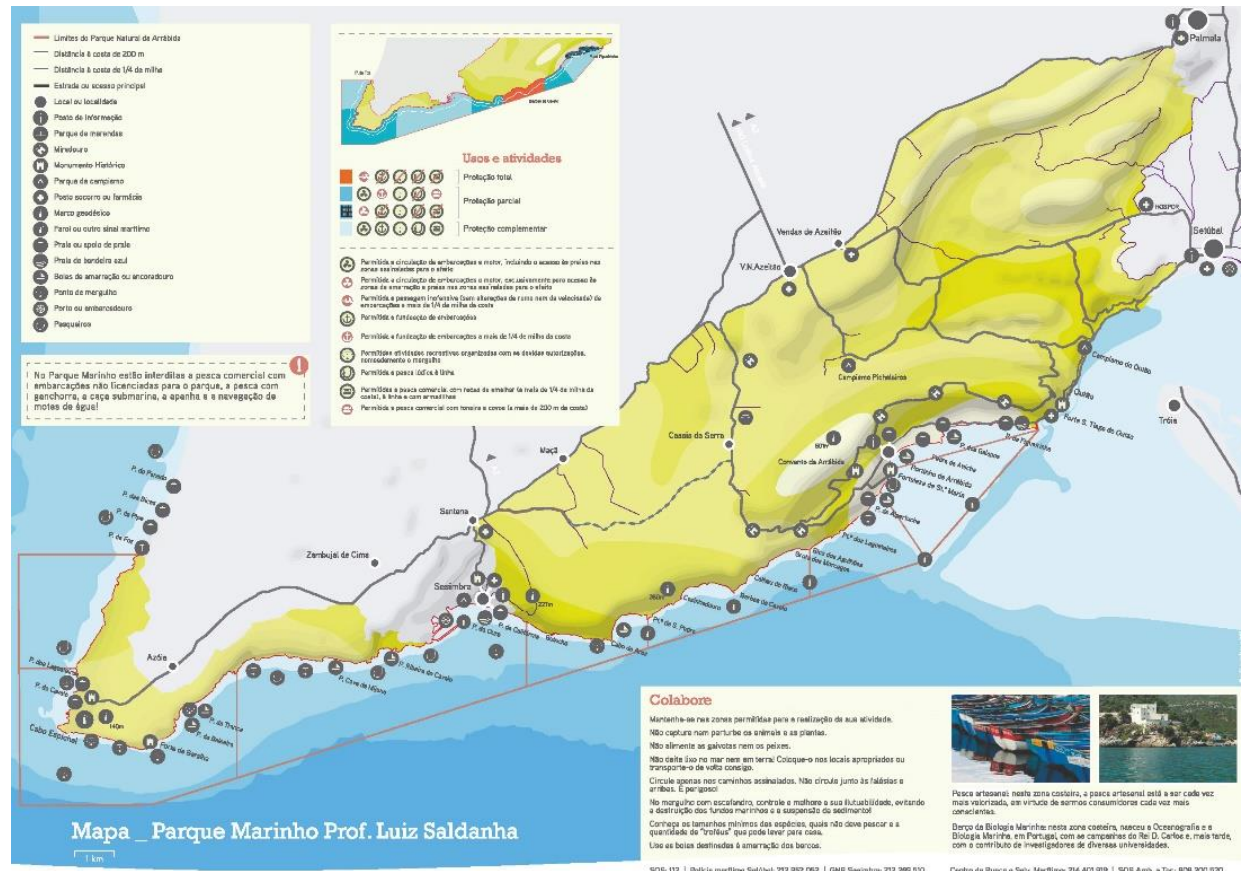


2. Parque Marinho Luís Saldanha (PT)

Country: Portugal

Site name: Parque Marinho Luís Saldanha

Site map:



Type of area: coastal

Uses and human activities in place in the area (the most relevant):

- Marine plant harvesting
- Tourism and leisure activities
- Fish and shellfish harvesting (professional and recreational)
- Research, survey and educational activities

Type of impact:

- Input or spread of non-indigenous species, Disturbance of species (e.g. where they breed, rest and feed) due to human presence, Extraction of, or mortality/injury to, wild



<p>species (by commercial and recreational fishing and other activities), Physical disturbance to seabed (temporary or reversible);</p> <ul style="list-style-type: none">• Input of litter (solid waste matter, including micro-sized litter); Input of anthropogenic sound (impulsive, discontinuous noise).
<p>Ecological target for restoration:</p> <ul style="list-style-type: none">• Marine vegetation (seagrass beds)• Fish stocks
<p>Type of measure:</p> <ul style="list-style-type: none">• No access zone• Regulated access• Speed regulation• Anchoring regulation• Only allowed uses• No take zone• Regulated gears• restoring the grassland <p>In 2011, they defined a way to successfully transplant 11 m² of the species <i>Zostera marina</i>, which persisted and expanded. This area, in 2014, had already increased about 5 times its initial size. However, the interviews showed that part of this recovery is not in place anymore.</p>
<p>Sources:</p> <ul style="list-style-type: none">• INFORBIOMARES (2023) Parque Marinho Professor Luiz Saldanha. Available at: https://arrabidaparquemarinho.ualg.pt/



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Mediterranean Sea

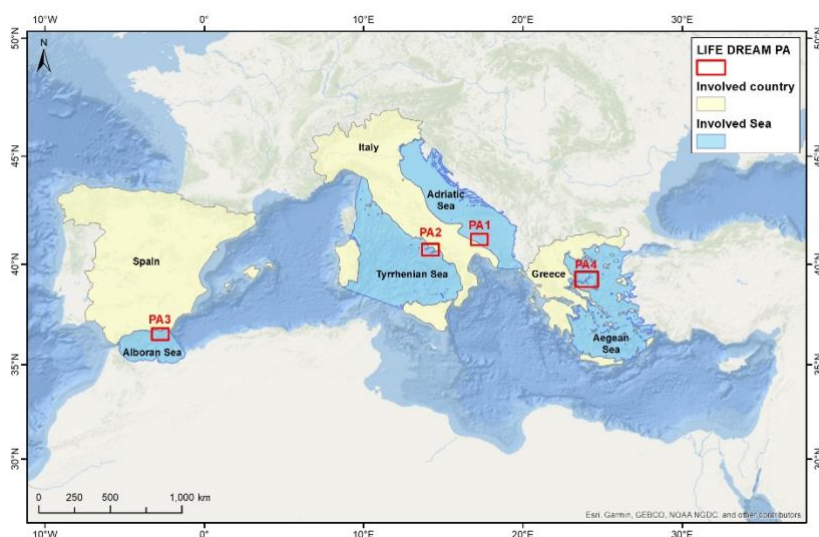
1. LIFE DREAM “Deep REef restoration And Marine litter removal” (GR, IT, SP)

Country: Italy, Spain, Greece

Site name:

1) Bari Canyon and Monopoli shelf (Apulia Region, Italy); 2) Dohrn Canyon (Campania Region, Italy); 3) Seco de los Olivos (Almeria Region, Spain); 4) National Marine Park of Alonissos (Thessaly Region, Greece)

Site map: *location of the project areas.*

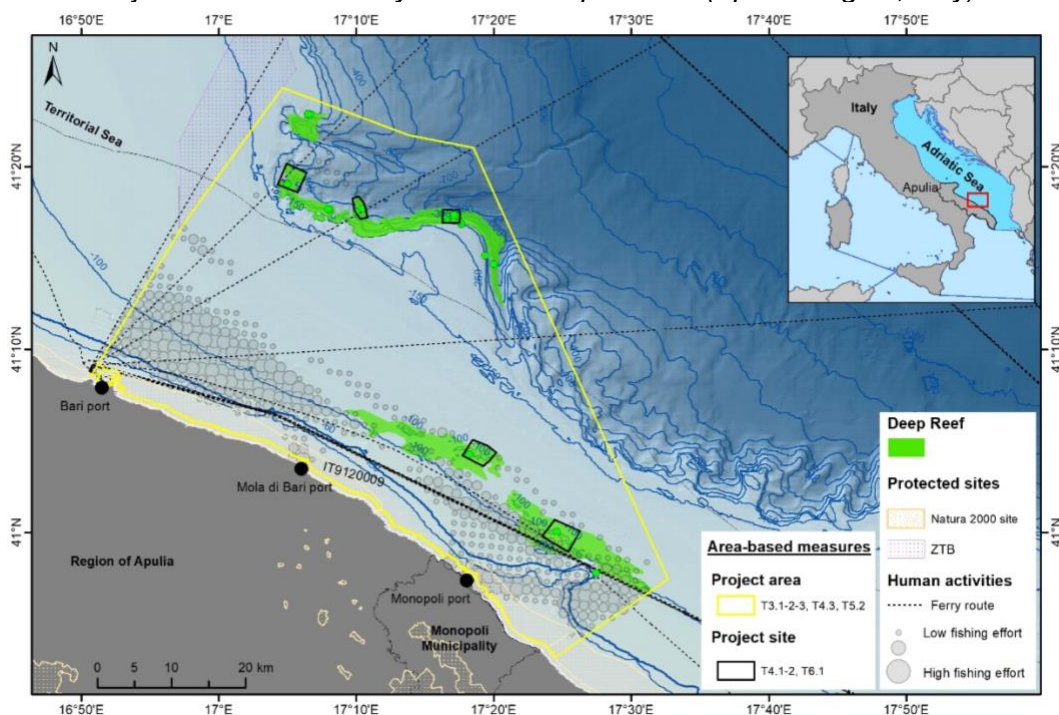




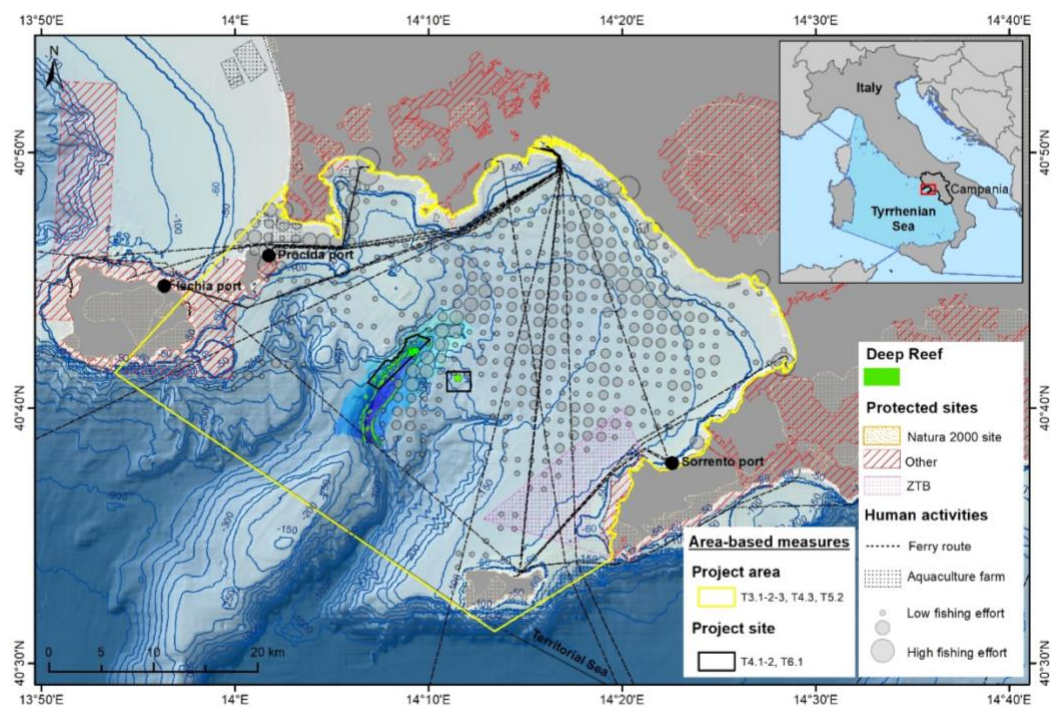
This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Project Area 1 Bari Canyon and Monopoli shelf (Apulia Region, Italy):



Project Area 2 Dohrn Canyon (Campania Region, Italy):

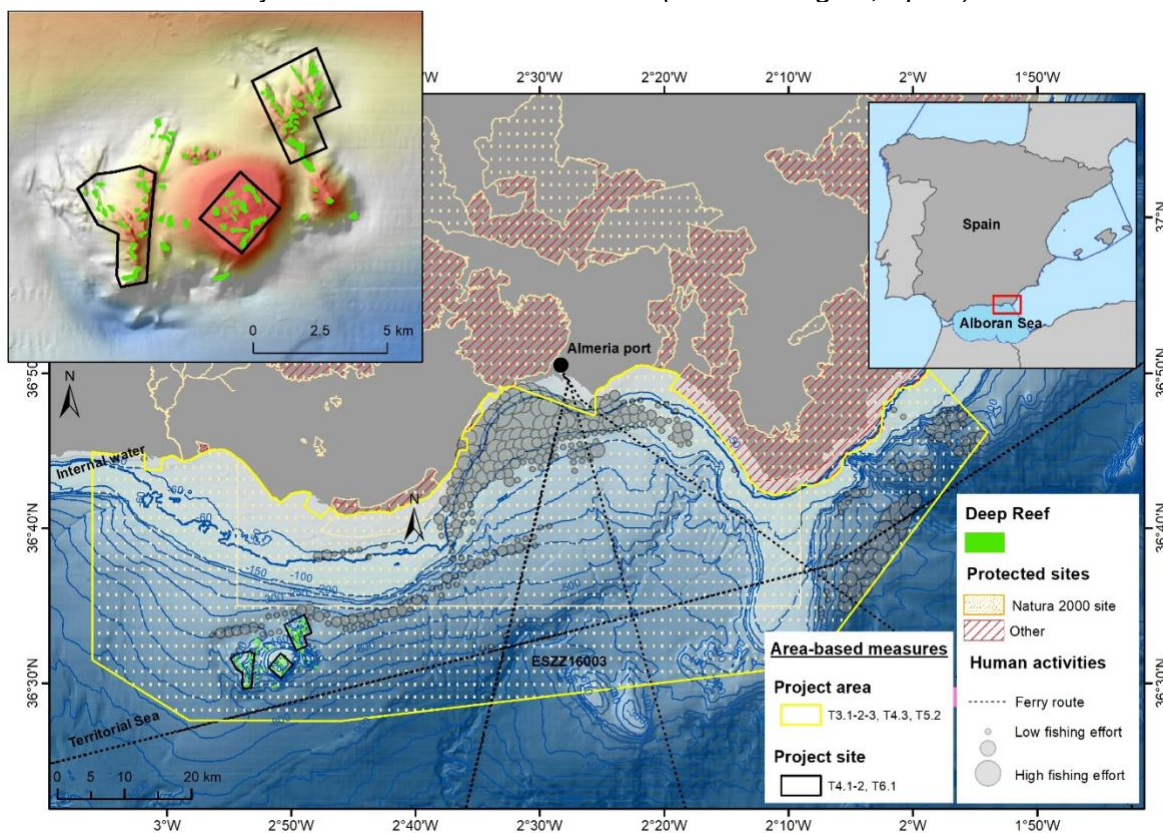




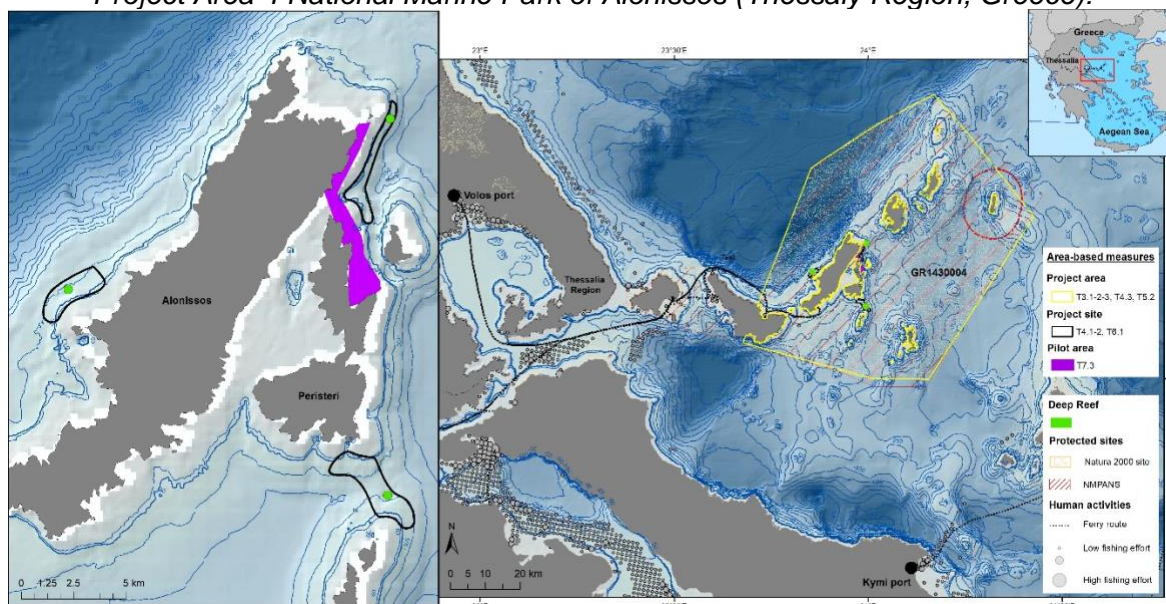
This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Project Area 3 Seco de los Olivos (Almeria Region, Spain):



Project Area 4 National Marine Park of Alonissos (Thessaly Region, Greece):



Type of area:



Continental shelf and slope deeper than 60 m hosting Deep Reefs (**DR**), in particular Coralligenous formations, Deep Water Oyster Reefs (**DWOR**) and Cold Water Corals (**CWC**).

Uses and human activities in place in the area:

- Intense marine traffic

This concerns mainly the project areas 1 and 2, where no Natura2000 sites or Marine Protected Areas are defined, and project area 3, where despite the Natura2000 site defined at conservation of the area, the marine traffic is still allowed.

- Intense fishing activities

All the project areas are threatened by intense fishing activities resulting in lost fishing gears (e.g., nets and longlines), often entangled with the habitats.

Type of impact:

- Illegal dumping and untreated sewage

The Dohrn Canyon is characterized by the presence on an impressive amount of illegal dumping of garbage bags and marine litter even of large size (i.e. tyres), so intense to completely drape the sea-bottom at places (see Fig. 8 in Taviani et al., 2019).

- Macro-littering

All the project areas are threatened by general littering, especially plastic items, that accumulate or stuck within the CWC colonies.

- Lost fishing gears (nets and longlines)

They are often found entangled in substrate asperities and biological communities.

Ecological target for restoration:

Deep Reefs (**DR**), in particular Coralligenous formations, Deep Water Oyster Reefs (**DWOR**) and Cold Water Corals (**CWC**)

Type of measure:

Marine litter removal through Remotely Operated Vehicle (ROV)

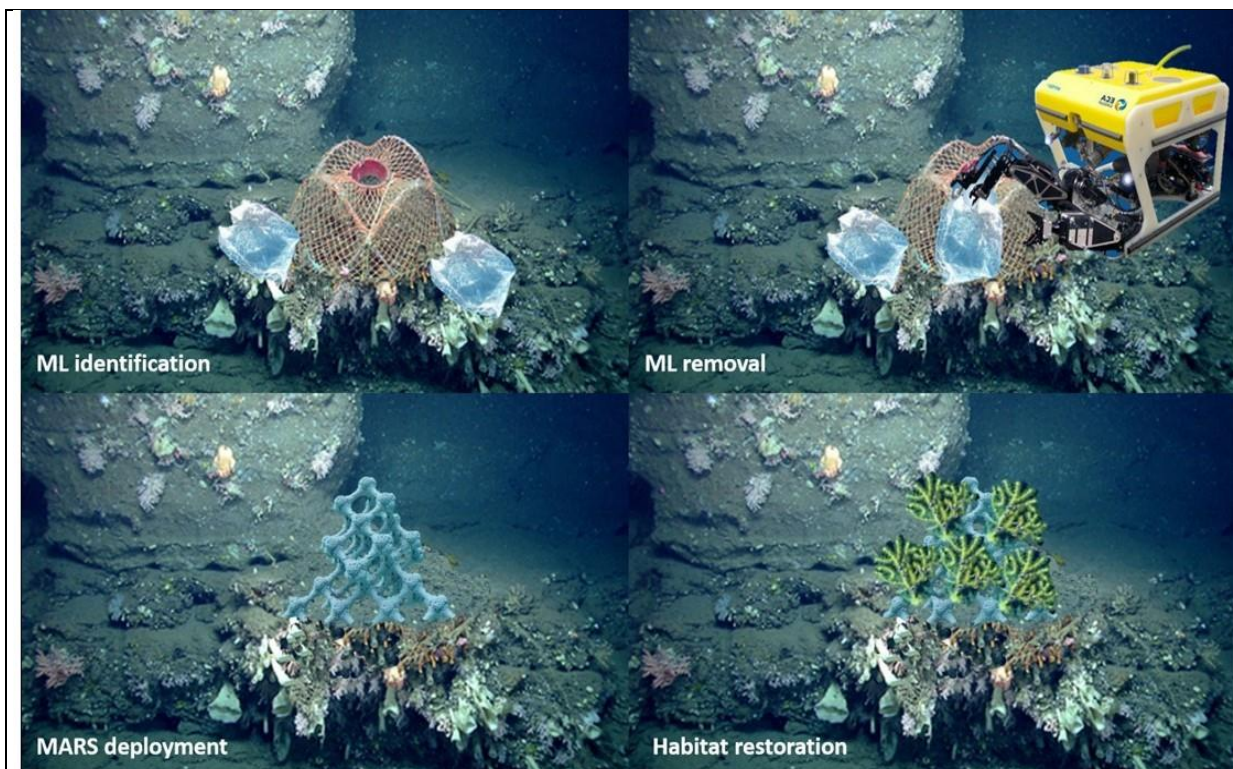
Punctual surveys aimed at removing specific items of marine litter from the project's areas, in particular from the most threatened sites selected, through ROV surveys. Also longlines entangled within colonies of CWC or oysters could be removed by cutting some parts using a high-precision manipulator mounted on the ROV.

Installation of Artificial Reef Structures (ARS)

In each project area, a number of ARS will be deployed in order to provide new hard substrates, good for the settlement of new colonies.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Conceptual image of the restoration activities foreseen in the project areas

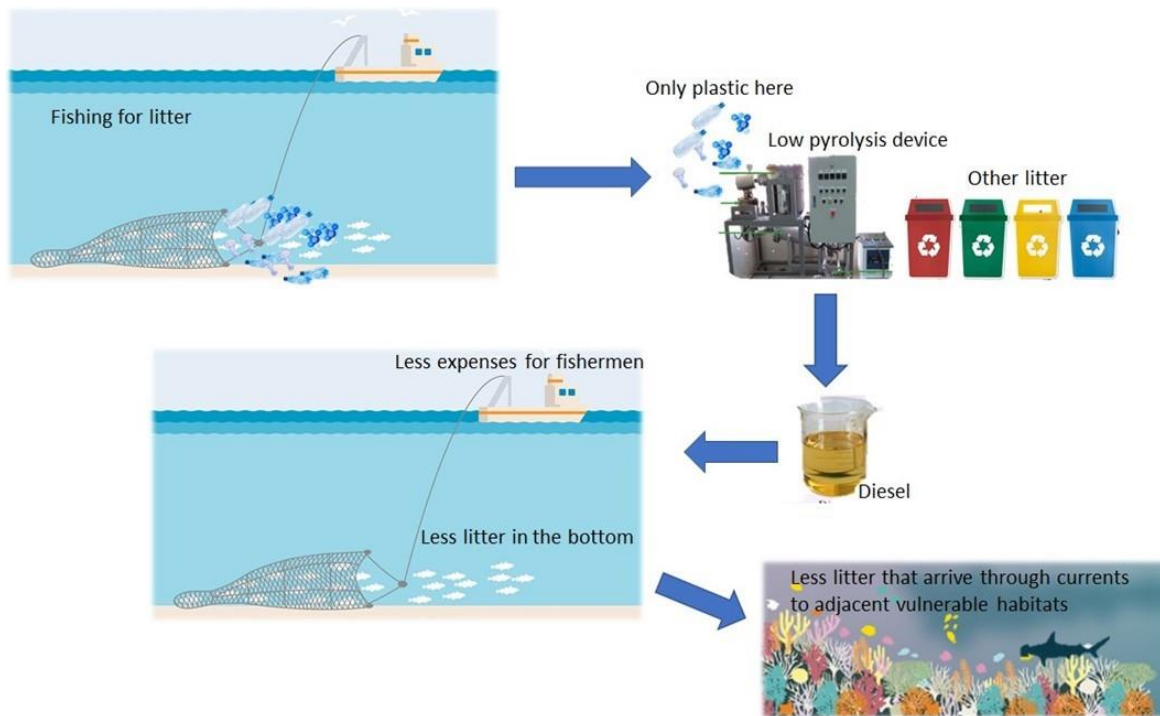


The first ARS produced for LIFE DREAM project



Fishing for litter activities (F4L) & Circular economy

In order to preserve the project areas from new marine litter accumulations, fishers will be involved through fishing for litter campaigns the area surrounding the restoration sites. The plastic fraction of the marine litter collected will be recycled into marine fuel, through a low-temperature pyrolysis prototype. This fuel will be used by fishers and will foster further F4L campaigns in the future.



Concept of the circular economy experiment

Sources

Taviani, M., Angeletti, L., Cardone, F., Montagna, P., & Danovaro, R. (2019). A unique and threatened deep water coral-bivalve biotope new to the Mediterranean Sea offshore the Naples megalopolis. *Scientific reports*, 9(1), 3411.



2. Installation of eco-friendly buoys to reduce the impact of anchoring on *Posidonia* meadows (HR)

Country: Croatia

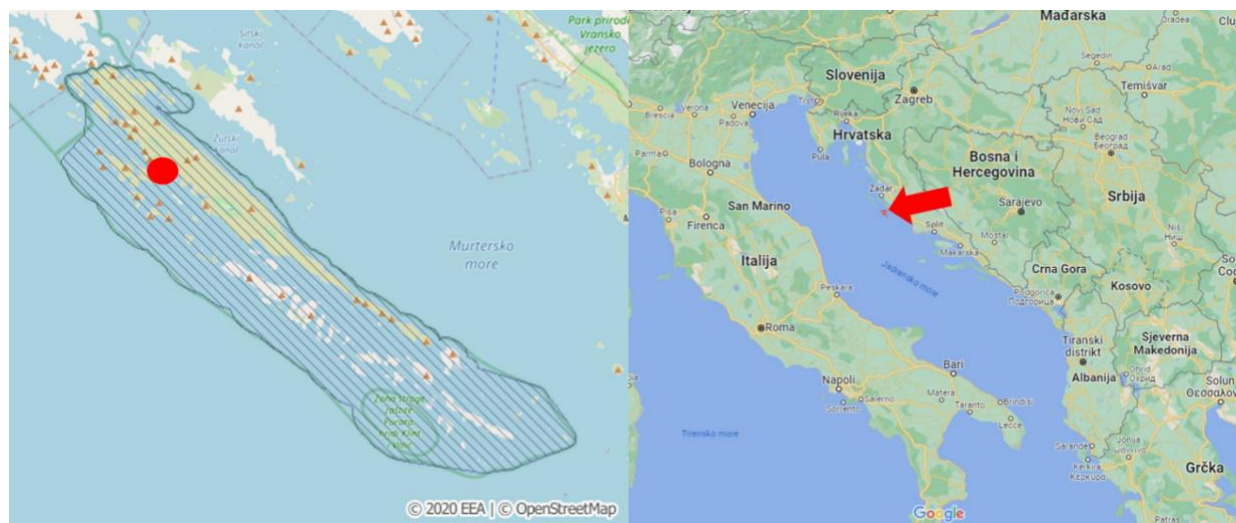
Site name National Park Kornati

Kornati National Park is designated as a Site of Community Importance SCI HR4000001 – “Nacionalni Park Kornati”. It was established in 1980 while its management began in 1982. It includes 89 islands and reefs (out of 149 in the entire archipelago), a total area of 217 km² (out of 320 km² in the entire archipelago), of which almost 80% is a marine territory (land 50 km²/sea 167 km²) and a total coastline of 238 km. Karst features dominate its geomorphology, with exceptional geomorphological features (“crowns”). Kornati islands were once covered with forests of evergreen oak that human activity has transformed into rocky pastures.

It is estimated that at least 2,500 to 3,000 families of benthic and pelagic fauna live in the Kornati archipelago such as 353 species of macroalgae, 3 species of underwater flower plants as well as about 850 animal species – 61 species of corals, 177 species of molluscs, 127 species of polychaetes, 61 species of decapod crabs, 64 species of echinoderms and 185 species of fishes.

Public Institution, under the competence of the Ministry of Economy and Sustainable Development, manages the Kornati National Park. The land part of the park is entirely privately owned (around 620 owners).

Site map



Kornati Natura 2000 area (code HR4000001) (on the left – source: <https://eunis.eea.europa.eu/sites/HR4000001>); with the red circle as the approximate location of the *Posidonia* restoration area location of Kornati in the Adriatic (on the right – source: Google maps)



Type of area: Coastal (archipelago)

Uses and human activities in place in the area:

Main human use that impacts the habitat in focus of restoration (i.e. conservation of *Posidonia* meadows) is anchoring by vessels (nautical tourism). The coast of Kornati attracts an impressive tourist flow – it offers numerous shelters and has small inlets where the anchoring, even overnight, of numerous pleasure boats is an element of strong pressure against the meadows that often reach almost to the surface in the best and healthy cases.

According to the MSFD classification of human uses/activities (Annex III of the MSFD Directive) these activities fall under *Tourism and leisure activities* and *Tourism and leisure infrastructure*.

Some other human activities have high impacts in the area, such as waste disposal and recreational fish harvesting, considering the MSFD classification. Other pressures have been recognized as having a high impact in the area (such as lack of fires and invasive/non-native species), although they do not directly correspond to any of the MSFD categories

The entire list of threats, pressures and activities with impacts on the area can be found here: [Ekološka mreža \(biportal.hr\)](http://Ekološka mreža (biportal.hr))

Type of impacts

- degradation of marine vegetation
- degradation of benthic communities (soft bottom habitats).

The main impact considered is the degradation of *Posidonia*'s meadows by current anchoring practices. Although the condition of *P. oceanica* in the Park is generally good, this is not the case in numerous bays where the leisure boats drop anchors. The average size of these boats, the frequent use of chain catenary, the spillages and the sewer result in a strong disturbance against the meadows, which show retreatment estimated as over 50% in these minor embayments.

It is estimated that every linear meter of chain deployed leads to a loss of 2.5–3 m² of *Posidonia* meadow. Each time the anchor locks into the bottom and gets retrieved with an electrical windlass around 50 shoots per m² are lost. This depends on the size of the boat and the type of an anchor – larger boats usually have greater impact.

Ecological target for restoration

- Marine vegetation
- Soft bottom habitats

Posidonia oceanica's meadows cover an area of 2100 ha within Kornati national park, but the data quality is considered *poor* (e.g., rough estimation). The degree of representativity of the habitat type on the site (a measure of 'how typical' a habitat type is), its conservation of the structure and functions, and the global assessment of the value of the site for conservation of the natural habitat, are considered *good*. However, in bays where the leisure boats drop anchors, the conservation status changed from moderate to poor according to monitoring between 2019 and 2022.

Type of measure



- Installation of artificial substrates

Installation of eco-friendly buoys in National Park Kornati is aimed at avoiding the use of anchors by leisure boats. Installing buoys for mooring prevents anchoring “in the wild” and thus prevents endangering the vegetation cover on the seabed. The impact of eco-friendly buoys is negligible both on the seabed and seagrass beds of *Posidonia oceanica* and other protected species.

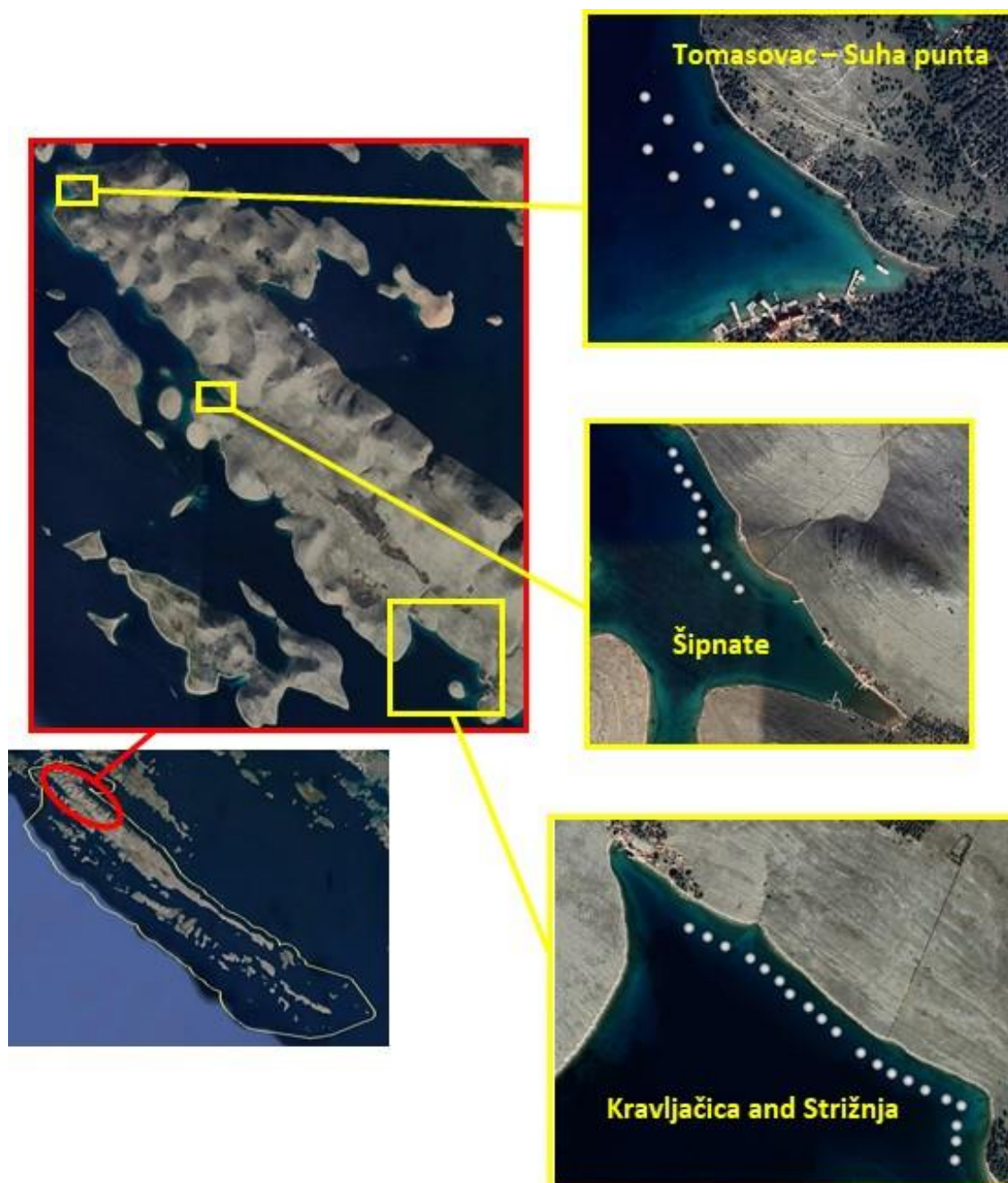
During the installation and later exploitation of the anchorage in eco-buoy system, there is no contact and thus no damage to the vegetation cover, as is the case with concrete blocks. The elements of the anchor system must also be taken into account, and a solution was chosen that ensured that the anchor chain did not touch the seabed even during the lowest water level.

Within this system no structures are envisaged on the coast. Furthermore, it contributes to eliminating the turbidity produced by the operations of lowering and hauling the anchors, including dragging the chains on the seabed.



Eco-friendly buoys in Kornati area

First eco-buoy fields (for the anchoring system) were placed in 2021-2022 through the Interreg SASPAS project in four locations (10 buoys in each area, so 40 in total): Kravljačica Bay, Tomasovac Bay, Stržnja Bay and Šipnate Bay. Afterwards, through other initiatives, more buoys have been installed, so at the moment the park has concession for 302 buoys in 19 anchoring areas. The distance between buoys is at least 30 m. Vessels are anchored with the possibility of sailing around the buoy depending on the wind direction. It is calculated that the wind will act on all ships equally and turn them in the same direction. This system allows mooring of boats up to 16 m in length.

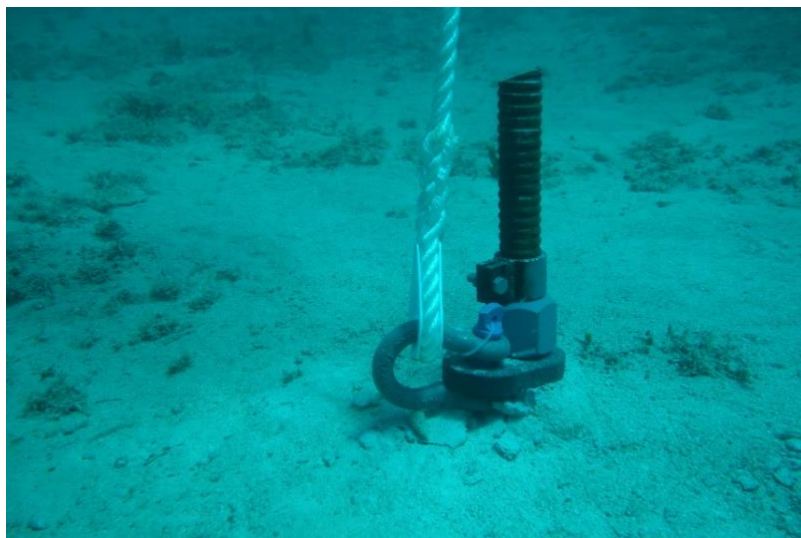


Locations of the buoys' fields in Kornati NP

Considering stopping the use of large concrete blocks and anchoring chains that negatively impact the environment, especially the seabed, the Manta Ray underwater system was preferred and specifically modified and adapted. The advantage of such anchor systems over traditionally used concrete blocks is that their impact is negligible both on the seabed and seagrass beds of *Posidonia oceanica* and other protected species. In addition, the sea is not impacted by deploying cement blocks to the sea, and also, the eco-buoys can be considered as visually more acceptable.



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



Anchor pin fixed in the bottom rock

The project and specific concrete actions involved local, regional and national public authorities, protected areas/natural heritage management bodies, associations, NGOs, education and training organizations, universities, and research institutes. Managers of protected areas, local, regional and national public bodies, environmental associations, NGOs, and the general public, mainly benefited from project activities. The project foreseen a participatory process with the inclusion of stakeholders – the Park has developed an operation of continuous informal daily contacts with associations, boat brokers, marinas and other interested parties, which has been rewarding for spreading attention to the valuable habitats to be protected.

The Kornati National Park Public Institution first started the process of setting up an anchoring system (“buoy”) intended for mooring visitor vessels in the Park area in 1996. The basic idea of the Public Institution was to install a suitable number of anchorages in the appropriate bays inside the Park area and subsequently to completely prohibit free anchoring in the Kornati National Park.

The advantages of establishing such an anchor system are:

- preserved biocenosis of the seabed in the bays where visitors enter with their vessels
- the maximum number of vessels per day in the Park area is determined and regulated
- designated locations where visitor vessels may be confined
- improving navigation and mooring safety in the Park area.

Following the decision to install the anchor system, the Kornati National Park Public Institution went through the process of collecting the necessary documentation and permits, which included the following steps:



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.



- preparation of the study of anchorages and moorings to determine the number of anchor systems in the park area and potential locations for their installation
- harmonization of the Spatial Plan of the Kornati National Park (OG 118/2003) together with the Ordinance on Internal Order in the Kornati National Park (OG 141/2010 and 53/2011) which enable the installation of anchor systems in the Park area
- preparation of the Preliminary anchor systems design for each bay in the Park in which their installation is planned, made based on the Study of anchorages and moorings
- obtaining location permits
- obtaining a concession; and
- announcing a tender for the public procurement of anchoring systems.

Before starting the process of obtaining the necessary permits to install an anchorage system, it was necessary to prepare a study of anchorages and moorings. This study serves as an expert basis that defines the spatial scope based on numerous characteristics such as meteorological, traffic navigation, maritime safety measures, and technical methods of anchoring and proposes the number of anchorages and the locations for their installation at the proposed area.

Installation of eco-buoys in Kornati National Park was a part of [Interreg SASPAS project](#). Most details and photos were retrieved from the Project's [deliverable 5.2](#). PAP/RAC wants to thank Ms Zrinka Jakl for all the help in preparation of this text.



Black Sea

1. Atanasovsko Lake (BG)

Country: Bulgaria
Site name: Atanasovsko Lake BG0000270 (SPA&SCI)
Site map:
Type of area: coastal lake
Uses and human activities in place in the area (the most relevant): traditional salt extraction (since 1906); transport (land and air); pollution from the agricultural land; urbanization, etc.
Type of impact: <ul style="list-style-type: none"> <input type="checkbox"/> Degraded ecosystems in highly polluted coastal areas (e.g. ports, coastal industrial sites) <input type="checkbox"/> The modified water regime of Atanasovsko lake determines the ecosystem and continuous efforts are needed to maintain it
Ecological target for restoration: <ul style="list-style-type: none"> <input type="checkbox"/> Nursery grounds <input type="checkbox"/> Restoration of the typicality and representativeness of the habitat Coastal lagoons by colonizing three lake basins with the salt-tolerant water plant <i>Ruppia maritima</i>; <input type="checkbox"/> Increase the breeding and roosting sites for the bird species in the lagoon by restoring the water regime over 16 ha freshwater habitat of species of conservation concern
Type of measure: <ul style="list-style-type: none"> <input type="checkbox"/> Wastewater treatment



- ☐ Installation of artificial substrates
- ☐ Improved protection against floods and decreased pollution from surface water inflow by repairing the bypass channel, protective dyke and sluice gate
- ☐ Restoration of the optimal water regime by developing a system for active management of water levels, water circulation and salinity with 35% of the total traditional salt production infrastructure restored
- ☐ Ensured participatory management of AL by involving stakeholders and the general public to mitigate the effects of urbanization
- ☐ Restoration of the typicality and representativeness of the habitat Coastal lagoons by colonizing three basins with the salt-tolerant water plant *Ruppia maritima*; Increase the breeding and roosting sites for the bird species in the lagoon by restoring the water regime over 16 ha freshwater habitat of species of conservation concern

Assessment of restoration success:

- ☐ The whole area of the Coastal lagoon habitat (1,459 ha) has been protected from floods and nutrient-loaded water inflow – during the floods in December 2014 and in October 2018 the bypass channel safely conducted the large volumes of water to the sea;
- ☐ Increased presence of Greater Flamingo in AL from 5 individuals in 2014 to 2300 in 2022 and its presentation throughout the year in AL.

Restoration projects:

- ☐ Urgent Measures to Restore and Secure Long-term Preservation of the Atanasovsko Lake Coastal Lagoon/ LIFE11 NAT/BG/000362 (Salt of Life). Financed by LIFE+ Programme of the EU. The project referent number: LIFE11 NAT/BG/000362. Project duration: 1.07.2012 – 31-08-2018. Coordinating beneficiary: Bulgarian Biodiversity Foundation. Total value: 2 013 027 € (<https://cinea.ec.europa.eu/system/files/2021-03/SaltLifeProject-afterlife.pdf>, https://saltoflife.biodiversity.bg/en/General_information-c88)



This publication was funded by the European Union. Its contents are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Union.

