Transboundary platform about benthic habitats of community interest knowledge and management

# North-western Mediterranean deep reefs cross-border seminar

Marseille, 2023 November 8th et 9th

## PROCEEDINGS - SEPTEMBER 2025

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# PROGRAMME

## Day 1

**08:30 Welcoming coffee, signature and distribution of badges**

**09:00 Keynote speech**

### Axis 1 : Scientific knowledge overview and conservation status evaluation

**Session 1**

**09:15 Plenary presentations| Maïa Fourt**

09:15 **Atef Ouerghi** | Conclusions and prospects of « *Conservation of coralligenous and other calcareous bio-concretions* » and « *Conservation of the dark habitats* » sessions from the 2022 Mediterranean Symposia

09:30 **Olga Bolzinger / Anthony Caro** | Overview of past and ongoing French biodiversity agency (OFB) studies at French Mediterranean marine scale

10:00 **Leonardo Tunesi / Anthony Caro / Ludovic Aquilina** | RAMOGE explorations 2015, 2018, 2022: A long experience of cross-border collaboration on deep habitats of conservation interest

10:15 **Nadine Lebris** | Long-term monitoring of cold-water coral habitats in the Mediterranean Sea: the Lacaze-Duthiers canyon case-study and perspectives from the ENTENTE cruise

10:30 **Questions & Answers**

10:45 Coffee break

**11:15 Plenary presentations| Maïa Fourt**

11:15 **Franck Lartaud** | Results of French Marine Strategy Framework Directive/fauna-flora habitat directive overview for deep habitats

11:30 **Francesco Enrichetti** | Assessing the environmental status of temperate mesophotic reefs : the MACS Index

11:45 **Michela Angiolillo** | The monitoring of Mediterranean upper bathyal biogenic reefs within the marine strategy framework directive objectives

**12:00 Questions & Answers**

**12:15 Plenary debates**

**Maïa Fourt** | Synthesis and conclusions

12:30 Lunch break – Cocktail buffet

**Session 2**

**14:00 Round tables | Karine Olu**

**Leonardo Tunesi / Nadine Lebris / Jordi Grinyo**

14:00 Cooperation possibilities for lasting common transboundary data acquisition campaigns

14:30 Development of one or several observatories based on one or several pilot site(s) for each country in order to make similar measurements/surveys

15:00 Coffee break

**15:30 Round table | Maïa Fourt**

**Patrick Astruch / Francesco Enrichetti / Elena Guijarro**

Toward common indicators including pressure gradient and deep ecosystem approach

**16:00 Plenary presentation | Maïa Fourt**

**Jean-Laurent Massey / Jean-Damien Bergeron / Julien Marticorena** | Knowledge needs for management: example of the program SEAMONTI runned by the Marine natural park of Cap Corse and Agriate

**16:30 Questions & Answers**

**16:45 Plenary debates**

**Maïa Fourt** | Synthesis and conclusions

17:00 Field trip : Cosquer cave visit

19:30 Cocktail dinner

20:15 Laurent Ballesta | GOMBESSA Conference-debate

22:00 End

## Day 2

**08:30 Welcoming coffee, signature and distribution of badges**

### Axis 2 : Management and implementation into public policies

### Session 3

**09:00 Plenary presentations | Alain Pibot**

09:00 **Franck Lartaud** | Responses to main threats to Mediterranean cold-water corals
09:15 **Benoit Guerber** | H2Med – BarMar : The first large green hydrogen corridor in Europe
09:30 **Elena Guijarro** | INTEMARES project : compromise to improve the RN2000 MPA network in areas under fishing pressure

**09:45 Questions & Answers**

**10:00 Coffee break**

**10:30 Plenary presentation | Alain Pibot**

**Susan Gallon** | Knowledge and needs for deep reefs management measures identification in Mediterranean MPAs

**10:45 Round table | Paula Masia Lillo**

**Marie-Claire Fabri / Zaira Da Ros / Jordi Grinyo**
Evaluation of ecosystems resilience capacities following pressures removal

**11:15 Questions & Answers**

**11:30 Plenary debates**

**Alain Pibot** | Synthesis and conclusions

**12:00 Lunch break – Cocktail buffet**

### Session 4

**13:30 Plenary presentations | Alain Pibot**

13:30 **Christophe Le Visage** | Introduction to legal context of management for protection of deep-sea habitats
14:00 **Vedran Nikolic** | Legal framework for protection and cross-border protection
14:15 **Elena Ruiz de la Torre** | Marine Protected Areas designation and key management issues in Spain

**14:30 Questions & Answers**

**15:00 Coffee break**

**15:30 Plenary presentation | Alain Pibot**

15:30 **Anaïs Baude Soares** | Transboundary Biosphere Reserves : Opportunities to cooperate
15:45 **Hervé Magnin** | Example of a cross-border Natura 2000 site « Canyon Lacaze-Duthiers, Pruvot and Bourcart » between France and Spain in North-West Mediterranean

**16:00 Questions & Answers**

**16:15 Plenary debates**

**Alain Pibot** | Synthesis and conclusions

**16:30 Closing and thanks**

# SUMMARY

# INTRODUCTION

The discovery of deep, cold-water coral reefs dates back several centuries, but their scientific recognition as complex and ecologically significant ecosystems is relatively recent. As early as the 18th century, cold-water corals were mentioned in the logbooks of fishermen operating in the North Sea and off the coast of Norway. *Lophelia pertusa* (now classified as *Desmophyllum pertusum*) was first described by Carl von Linné in 1758, although he was unaware at the time that this species was a key reef-building organism in deep-sea environments.

Major oceanographic expeditions, such as the voyage of HMS Challenger (1872–1876), collected cold-water coral samples from great depths, marking the beginning of their formal scientific study. However, their ecological role and their capacity to form extensive reef structures remained poorly understood for decades. Until the mid-20th century, deep-sea corals received limited scientific attention, as marine research largely focused on shallow and tropical waters. Although bottom-trawl fisheries occasionally reported the presence of corals, their destruction often went unnoticed.

With advancements in marine exploration technologies—such as multibeam sonar, remotely operated vehicles (ROVs), and manned submersibles—scientists began to uncover vast and structurally complex cold-water coral reefs occurring between 200 and 1000 meters in depth. A notable milestone occurred during the 1960 Cousteau expedition in the Lacaze-Duthiers Canyon, during which biologist D. Reyss of the Arago Laboratory provided the first scientific description of deep coral reefs using a manned submersible.

Today, cold-water coral reefs are observed throughout the North Atlantic, particularly off the coasts of Norway, Scotland, Ireland, and Canada, as well as in several submarine canyons of the Mediterranean Sea. These ecosystems are now recognized for their high biodiversity, serving as habitats for numerous species including fish and crustaceans. However, they are increasingly threatened by destructive practices such as bottom trawling.

Launched in 2017, the *LIFE Marha* integrated project, coordinated by the French Biodiversity Agency in collaboration with 14 public partners, aims to enhance the effectiveness of the Natura 2000 network, with a particular focus on rocky deep-sea habitats classified under Habitat type 1170 (Reefs) of Community Interest. Several Natura 2000 sites have been specifically designated to protect and manage these unique ecosystems.

Despite these efforts, very few concrete measures have been implemented to ensure their protection. Many of these habitats lie beyond territorial waters, making their management and conservation particularly complex.

Over the course of the event, we will share current knowledge on the ecology of these deep-sea habitats, examine the main pressures they face, and explore the legal frameworks that apply to the designated sites. A central objective is to identify the tools already available for their protection and, ultimately, to work collectively toward defining effective management measures for the future.

Alain Pibot, LIFE Marha Coordinator,

Office Français de la Biodiversité


marha
marine habitats
North-western Mediterranean deep reefs
cross-border seminar

# KEYNOTE SPEECHES

## Ilinca Mathieu, Ministry for Ecological Transition and Territorial Cohesion (Ministère de la transition écologique et de la cohésion des territoires)

Deep reefs bring together some of the most critical challenges we face in the field of environmental protection: these ecosystems are at the same time extremely vulnerable, subject to multiple human pressures, often in a poor state of conservation, and yet remain largely unknown. As the saying goes, “out of sight, out of mind.” This is why it is so important that this conference reflects on these remote habitats and address, in a comprehensive way, the challenges of protecting and improving their management in the beautiful Mediterranean Sea.

Deep reefs are a rich source of biodiversity. They are home to a wide variety of fauna that perform major ecological functions: they provide shelter, nurseries, feeding areas and breeding grounds for numerous benthic and pelagic species, including mammals and seabirds, particularly in marine canyons. Although human activities are less intense in offshore areas than in coastal zones, these deep-sea environments remain particularly sensitive to anthropogenic pressures (bottom-trawling, energy production and transport, pollutions). They are also heavily impacted by global warming, with the Mediterranean region being especially at risk, as its waters are warming 20 % faster than the global average.

In France, an important step was taken in 2018 with the designation of new Natura 2000 sites, in response to the European Commission’s 2010 assessment of the sufficiency of our network. Since then, major efforts were made to designate new offshore sites, and notably with regard to deep reefs. These efforts represent a substantial contribution to the EU Biodiversity Strategy and the Nature Restoration Law. In particular, the President of France has made a political commitment to strictly protect 5 % of the French Mediterranean by 2027, and there is no doubt that the ecological importance of deep reefs will be a central consideration in this process.

For deep reefs, the specific characteristics of offshore sites, which often have very large perimeters, require to adapt stakeholder engagement strategies, targeting more specifically foreign counterparts to integrate regional and cross-border issues. The governance of offshore sites is still being established, and there is much work ahead to finalise a robust and effective network. Our objective is to complete the governance of all Natura 2000 sites by 2026 at the latest, and the LIFE Marha project plays a major role in supporting this effort.

In parallel, the acquisition of scientific knowledge, especially through large scale campaigns, to better locate reefs assess their conservation status and identify pressures is to be strengthened. Based on this knowledge, the management of protected areas needs to be improved. One of the key objectives of the French National Strategy for Protected Areas is to move beyond a focus on surface coverage and strengthen the quality and effectiveness of management: improving our capacity to ensure compliance with regulations and to assess whether conservation objectives are being achieved.

In this context, this conference provides a forum for discussion and an important basis for considering management measures tailored to these habitats. It will enable to better identify and characterise pressures and impacts, and to define the key measures we should prioritise.

The diversity of participants gathered (scientists, government services, and representatives from Spain and Italy) will ensure rich exchanges of views. This opportunity must be seized to translate our discussions into action and give new momentum to the management of deep reefs, which are so precious for marine biodiversity.

## André GROSSET, Mediterranean maritime prefect (Préfecture maritime de Méditerranée)

Since 2004, the Maritime Prefect has been entrusted with responsibilities in the field of environmental protection. In this capacity, he is in charge of the governance of marine protected areas and has overseen the process of designating offshore Natura 2000 sites. This process is still ongoing, as the designation of these sites also involves ensuring their coordination and management. In the Mediterranean, eight offshore Natura 2000 sites are concerned, four of which are specifically related to reef habitats.

The experience gained from this work highlights a number of lessons learnt. First of all, scientific knowledge of these deep ecosystems remains very limited. These environments, which are of great ecological richness, are also subject to numerous pressures, but the data available are still too incomplete to support effective and well-adapted management. It also appears that regulating activities in these offshore areas is more complex than in coastal zones, due in particular to issues linked to maritime boundaries and the application of European regulations. Lastly, the monitoring and control of these distant zones remains challenging because of the limited human and technical resources available.

Alongside the Natura 2000 network, another major undertaking is now underway for the Maritime Prefect: the identification of areas of strong protection in the Mediterranean. This work is part of the National Strategy for Protected Areas, which sets ambitious objectives: to bring 30% of the national territory under protection by 2030, with 10% under strong protection. For the Mediterranean, an additional target has been set by the President of the Republic: 5% of marine areas must benefit from strong protection.

This objective represents a considerable challenge. It requires us to strengthen our knowledge and to conduct precise assessments of the risks threatening the good ecological status of these environments, to identify priority issues across the entire Mediterranean basin and to define appropriate measures allowing these areas to be designated.


# AXIS 1: SCIENTIFIC KNOWLEDGE OVERVIEW AND CONSERVATION STATUS EVALUATION

The first day of the conference was dedicated to reviewing the current state of scientific knowledge on Mediterranean deep and mesophotic habitats and assessing their conservation status. Bringing together recent findings, long-term monitoring results, and methodological developments, this axis enabled participants to share insights, identify knowledge gaps, and explore opportunities for stronger cooperation.

Session 1 featured seven presentations and two Q&A sessions, covering topics from the synthesis of the outcomes of a recent Mediterranean symposium, to national and cross-border research initiatives, such as the French biodiversity agency's large-scale studies and the RAMOGE exploration campaigns. Long-term monitoring programs, illustrated by the Lacaze-Duthiers canyon case study, were presented, with a focus most recent monitoring technologies, including the ARIANE ROV. Several presentations presented methodologies used for reporting under the Marine Strategy Framework Directive and the Habitats Directives, and a focus was made on the new MACS composite index for mesophotic reefs. These contributions underscored the value of 15 years of data collection and collaboration in the northwestern Mediterranean, their increasing availability, and the importance of fine-scale approaches such as 3D photogrammetry for tracking ecological change. While significant progress has been made, persistent knowledge gaps, particularly in species identification and ecosystem functioning, highlight the need for sustained research and strengthened transboundary cooperation.

Session 2 shifted to a more interactive format, with three round tables and Q&A discussions addressing enhanced cooperation in transboundary data acquisition, the establishment of deep-sea habitat observatories, and the definition of common indicators to improve the assessment of deep-sea habitats. Participants emphasized the logistical and financial challenges of deep-sea exploration, the potential of shared data portals, and the value of pilot sites jointly managed by multiple countries. Methodological discussions pointed to the central role of ROVs and acoustic mapping for deep-sea habitat surveys, the need to design indicators suited to these data types, and the importance of including mobile species in assessments. Testing existing indices, such as MACS and its forthcoming cold-water coral adaptation, on existing datasets across the sub-region was recommended as a practical next step.

# SESSION 1 - ADVANCES IN SCIENTIFIC KNOWLEDGE AND ASSESSMENT METHODS FOR DEEP-SEA HABITATS

## Conclusions and prospects of « Conservation of coralligenous and other calcareous bio-concretions » and « Conservation of the dark habitats » sessions from the 2022 Mediterranean Symposium

**Atef Ouerghi - UNEP-MAP-SPA/RAC**

The Mediterranean Action Plan (1975) and the Barcelona Convention (1976) provide the oldest regional framework for addressing marine environmental challenges in the Mediterranean. The Convention's Specially Protected Areas and Biological Diversity (SPA/BD) Protocol is legally binding and obliges signatory countries to establish marine protected areas (MPAs) and Specially Protected Areas of Mediterranean Importance (SPAMIs) to safeguard ecosystems and species listed in Annex II.

To support the implementation of these strategic objectives, countries rely on several operational instruments, including the Post-2020 Strategic Action Programme for Biodiversity (SAPBIO), updated in 2021, which aligns with the Global Biodiversity Framework and aims at achieving the target of 30% marine protection by 2030, through a well-connected, ecologically representative network of MPAs.

Among the thematic tools, the Action Plan for Coralligenous and Other Calcareous Bio-concretions, adopted for five-year cycles, promotes regional scientific cooperation, data sharing, and capacity-building on habitats such as coralligenous assemblages and maerl beds.

Dark habitats, including deep-sea environments and marine caves, are also targeted by a dedicated action plan (2021-2026) that seeks to preserve their integrity, functionality, and enable natural restoration. Concrete example of action led in the framework of this plan includes the "Deep-Sea" Lebanon project, which explored Lebanese deep-sea habitats to inform local conservation planning. Another result of the action plan is the publication of "Guidelines for inventorying and monitoring of dark habitats in the Mediterranean Sea".

The 3rd Mediterranean Symposium on Dark Habitats (Genoa, 2022) identified several priorities (e.g., the need for baseline studies, impact assessments, data collection and sharing), and called for stronger regulatory enforcement, stakeholder engagement (e.g. fishers, local communities), and effective management and conservation measures (e.g. reducing net soak time, gear modification). Given the high cost of deep benthic research, interdisciplinary and international cooperation is essential. Progress towards new and modern monitoring techniques should be encouraged, along with a more holistic approach to caves and deep-sea systems. Finally, public outreach, including through education and youth involvement, was recognised as crucial to raise awareness and support for the conservation of dark habitats and vulnerable species.

# Overview of past and ongoing French biodiversity agency (OFB) studies at French Mediterranean marine scale

**Olga Bolzinger & Anthony Caro – Office Français de la Biodiversité (OFB)**

The Mediterranean continental slope is structured into a series of submarine canyons deeply incising the continental shelf. These canyons, as well as other geological structures such as seamounts, are key structures that locally modify water circulation, funnel particles, provide various physical substrates and therefore greatly contribute to the Mediterranean Sea biodiversity. Despite the exploration efforts conducted during the six last decades, deep-sea habitats remain partly unknown. Monitoring such habitats implies significant technical and financial investments, adding difficulties to improve or update knowledge about their ecological state.

The French Biodiversity Agency (OFB) contributes to knowledge acquisition by leading or supporting a scientific and technical work in partnership with research organisations. As part of its mission to create and manage marine protected areas, OFB (former French Marine Protected Areas Agency) has been involved in 2008 in the first large inventory programme of French Mediterranean canyons, with the aim of defining protected areas and appropriate protection measures. The exploration of certain sites provided the knowledge needed to define the boundaries of new protected areas such as the two marine nature parks or offshore Habitats Directive sites, beyond 12 nautical miles.

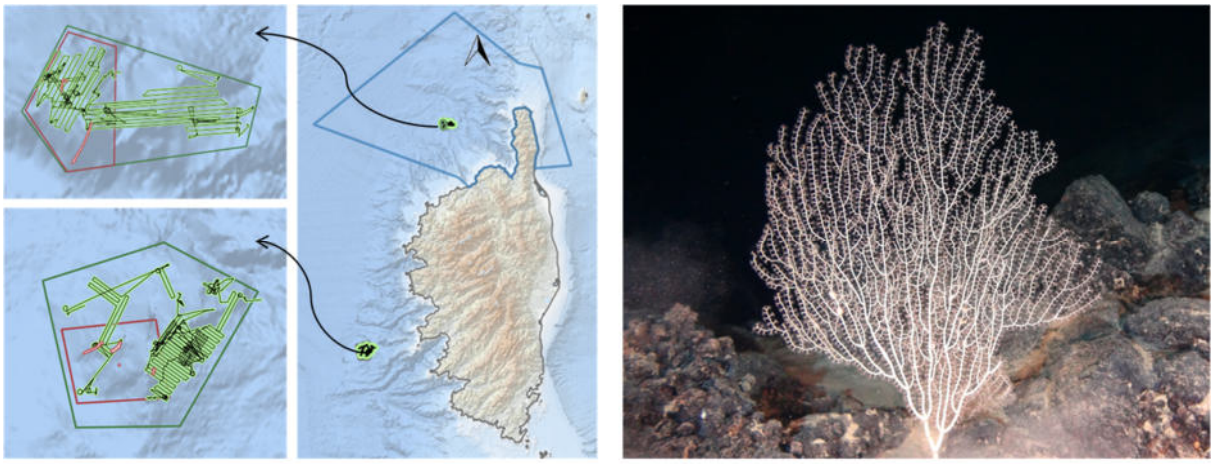

*Figure 1 - 2022 and 2023 SEAMONTI oceanographic campaigns in seamounts of the Corsican coasts, laying on between 2500 m and 1300 m depth, allowing the mapping of benthic structures*

Since then, deep-sea ecosystems have received increasing attention and new missions have been carried out: identification of coral rings in the Cap Corse, inventory of megabenthic biodiversity on Corsican seamounts and other submarine canyons, campaigns on focus ecological areas of the RAMOGE agreement area.

Recently, a central database focusing on deep habitats has been set up to facilitate the access to every type of data such as campaign report, GIS data, acoustic data, photos and videos, maps and 3D models. Moreover, an interactive mapping tool (Lizmap) is available to visualise all exploration transects all over these oceanographic campaigns.

This presentation platform provides an overview on last and actual studies about North-western Mediterranean deep reefs and allows to discover different ways to access every campaign result through OFB's data.

# RAMOGE explorations 2015, 2018, 2022: A long experience of cross-border collaboration on deep habitats of conservation interest

**Leonardo Tunesi – Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)**

**Anthony Caro – Office Français de la Biodiversité (OFB)**

**Ludovic Aquilina – Direction de l'Environnement de Monaco**

In 2014, the Mediterranean workshop organised by the Convention on Biological Diversity (CBD) identifies one Ecologically and Biologically Significant Area (EBSA) for the benthic habitats of the north-western Mediterranean. Because this EBSA concerned the entire area covered by the Agreement, RAMOGE decided to start campaigns for two main objectives: enabling the countries of the Agreement to have useful information for the creation of new MPAs, as recommended by the CBD, and to strengthen the exchange and collaboration among scientific communities of the three countries to support the definition of common methodologies.

The first oceanographic exploration campaign was carried out in 2015 by mean of the ISPRA R/V "Astrea" exploring the depth range 50-400 meters in order to study some relevant sites to establishing an inventory of habitats, protected and commercial species and anthropogenic pressures. To this purpose six areas of ecological interest have been selected, two per Member State. The collected information represented a significant contribution, both in terms of knowledge of biodiversity and the anthropic pressures.

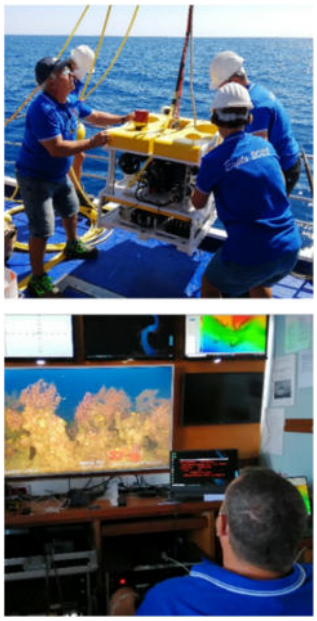

*Figure 2 - RAMOGE Explo 2022*

Following the same approach, the campaign "RAMOGE Explo 2018", was carried out in summer 2018 by mean of the IFREMER R/V L'Atalante and the ROV Victor6000. The stakes of this new field activity were centered on habitats, species and marine litter, in the depth range 2000-3000 meters, focusing on seamounts and to verify the presence of a facies at Isidella elongata recorded in the sixties. Seven sites were studied, three in France and in Italy and one in the Principality of Monaco waters. The 2022 campaign, carried out with ISPRA's R/V Astrea, allowed to investigate five areas: two in France and in Italy and one in the Principality of Monaco waters.

The RAMOGE initiative, with the collaboration of the scientific components of the three signatory countries to the Agreement, is an example of international cooperation in defining standardised activities for studying and monitoring deep-sea habitats. The direct collaboration of researchers from the three countries, both on board research vessels and for the joint processing of the data collected, demonstrates the importance of this initiative in contributing to the definition of common standards for data collection and analysis, and in defining shared indices for the assessments required at both European (MSFD & HD) and Mediterranean (Barcelona Convention - EcAp process) levels.

## Q&A Session

**In the framework of RAMOGE, can data on litter be collected during the upcoming campaigns, and are planned management measures targeting this issue?**

- The campaigns have shown marked differences between countries: in Italy, pollution is mainly due to lost or abandoned fishing gear while in France, and in Monaco, other waste types are linked to coastal or port discharges. The issue of litter accumulation in canyons is extensively documented in the RAMOGE publication, which include a dedicated part on this issue as well as recommendations adapted for each country. Recent observations (2018) also show that litter affects areas far offshore, confirming that this is a transboundary problem.

# Long-term monitoring of cold-water coral habitats in the Mediterranean Sea: the Lacaze-Duthiers canyon case-study and perspectives from the ENTENTE cruise

**Nadine Le Bris – Sorbonne Université, UMR7205 ISYEB**

Cross-border collaborations were initiated decades ago on submarine canyons of the Gulf of Lion and Catalan margins, focusing on their role in the hydrology and sedimentology of the area. In 2008, a new phase of collaboration dedicated to benthic biodiversity in canyon heads started with the MedSeaCan exploration campaign of the French Agency of MPA, and lead to the designation of areas for conservation (PMNGL and Natura2000). In parallel, a long-term research program (2010 to 2018) has been developed to investigate the ecological dynamics of the Lacaze-Duthiers canyon. In this context, a partnership between Sorbonne University/UPMC - CNRS and OFB – PMNGL was established to initiate a long-term non-invasive monitoring strategy of sentinel CWC assemblages. In 2015, a 3D-photogrammetric survey of sentinel sites was realized, benefiting from the newly developped COMEX ROV-3D. The ENTENTE cruise in 2022 associated CNRS-SU, CNRS-UPVD and CSIC-ICM with the aim of complementing this monitoring and build on this experience to further expand the study of CWC and associated megafauna.

Using the ROV ARIANE (Ifremer-GENAVIR) the ENTENTE cruise had three main objectives: characterizing multiannual changes of the sentinel scleractinian-built structures mapped in relation to environmental changes, 3D-surveys of mirror sentinel sites in the Cap de Creus canyon head and expanding the exploration deeper at the junction of the two canyons.

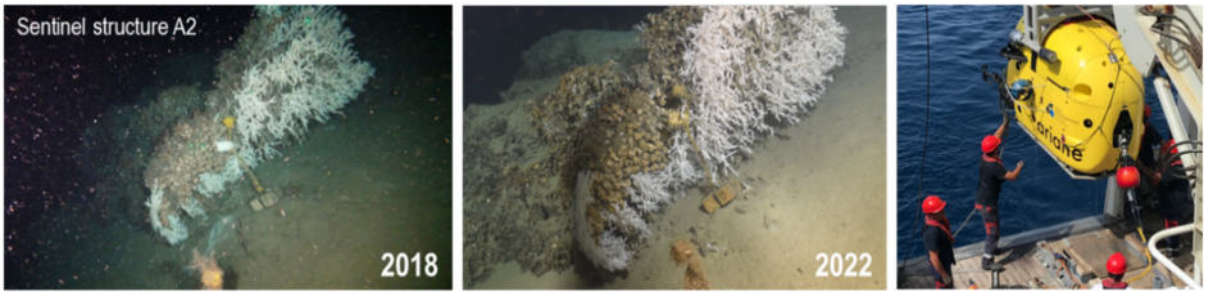


*Figure 3 - 2022 ENTENTE Cruise (FOF) - R/V ANTEA with ARIANE HROV*

Although ROV failure only allowed the first leg of the cruise to be realized, the ENTENTE cruise paved the way for future cross-border collaboration, combining interdisciplinary expertise on benthic biodiversity, oceanography and geomorphology. Documented changes will allow further assessment the influence of climate changes on CWC in this area and beyond, and their capacity to cope with stressors combinations.

Q&A Session

**Is there an identified link between the sedimentation observed in canyons (notably at Lacaze-Duthiers) and specific human activities or maritime uses?**

- This issue is not yet fully identified for the Lacaze-Duthiers canyon, but studies conducted in Cap de Creus and Palamos canyons, heavily trawled areas in Spanish waters, have demonstrated a very strong impact of trawling on sediment resuspension. These studies have shown impacts on coral growth and significant morphological changes at the canyon scale. In the framework of offshore windfarm development, these sedimentation processes should be carefully investigated.

**Do you know if these sedimentation processes are a recent phenomenon directly linked to trawling, or an older process now amplified by oceanographic and climatic conditions (for example, in the Gulf of Lion)?**

- In these habitats, the sediments dynamics are extremely fast: after a cascading event, currents can temporarily clean the area, but sediments are continuously brought back. There is therefore a combination of natural (currents and climate) and anthropogenic (trawling) effects. Studies on Spanish canyons show that sometimes changes occur in a matter of days.

Do we know how far sediment plumes can travel from the continental shelf into the canyon heads?

- This depends strongly on the geomorphology and currents of each canyon. In the case of the Cap de Creus and Palamos canyons, sediment transport has been observed all the way down to the abyssal plain at around 1500 meters depth. At the Lacaze-Duthiers station, monitoring with sediment traps is occasional and localised, and detailed mapping is still lacking.

# Results of French Marine Strategy Framework Directive/fauna-flora habitat directive overview for deep habitats

**Franck Lartaud – Sorbonne Université / Observatoire Océanologique Banyuls**

The Habitats Directive (92/43/CEE) and the Marine Framework Directive (MFD) are important political pillars of the European Union in terms of marine biodiversity and ecological status of marine environments. Under the directives, each Member State must report periodically the conservation status and evolution trends of species and habitats of Community interest. This conservation status of habitats is characterised by four parameters: (1) habitat range, (2) habitat area, (3) habitat structure and functions, and (4) future prospects according to the pressures acting on the habitat and the management measures put in place.

In previous reports, the assessment of the 1170-Reefs habitat considered only partially the geological and biogenic reefs of the deep sea (bathyal). To overcome such a knowledge gap, a scientific review was carried out according to the four evaluation parameters in order to advance an overall assessment of the bathyal Reefs for the French Atlantic and Mediterranean marine biogeographical regions.

A lack of indicators was pointed out by the panel of scientists who carried out the MSFD Assessment. Knowledge and data are still sparse compared to coastal areas. Particularly, the survey of the geographical distribution of reefs is incomplete. Some research focused on the temporal dynamic, but it is restricted to very local areas, currently identified as “hotspots”. The difficulty of characterising the impacts of anthropogenic pressures, through dedicated monitoring, makes it difficult to qualify and spatialise the ecological status of habitats. Acquiring more spatial data in addition to the necessary long-term monitoring is thus a prerequisite to respond to the descriptors of the MSFD.

Regarding Habitats Directive, the overall assessment of the conservation status of bathyal reefs is « unfavourable-inadequate » in the Atlantic and « unfavourable-bad » in the Mediterranean. Although management measures are in place or planned, they are not sufficient to ensure a favourable conservation status for the bathyal Reefs in the long term.

*Figure 4 – Scleractinian, Gorgonian, Antipatharian and Oyster reefs observed in the Bay of Biscay (CheReef, 2022 and 2023, IFREMER)*

Q&A Session

**Do we know what the specific or direct impacts of fishing activities on the interfluves themselves?**

- These impacts are not observed in the Mediterranean but in the Atlantic (Catalan margins mostly), where trawling is taking place on the interfluves and where damage has been recorded, including loss of fishing gears (longlines) and coral crushing.

# Assessing the environmental status of temperate mesophotic reefs: the MACS Index

**Francesco Enrichetti – University of Genova**

The multi-parametric Mesophotic Assemblages Conservation Status (MACS) index has been developed to evaluate and monitor the environmental status of temperate mesophotic reefs, known to host complex megabenthic communities often threatened by human activities.

The index uses a seascape approach, based on the analysis of 200 m-long video transects, particularly suitable for assessments within wide geographical areas. It combines 12 metrics reflecting the most up-to-date knowledge regarding structuring habitats, both in terms of benthic community status as well as response and resilience to impacts. All these metrics are easily inferable from the analysis of video footage and belong to the list of the Marine Strategy Framework Directive (MSFD) parameters and allow the integrating of three MSFD descriptors, namely biological diversity, seafloor integrity, and marine litter. Furthermore, the MACS index combines status and impact indicators following a DPSIR (Drivers – Pressures – Status changes – Impacts – Responses) approach.

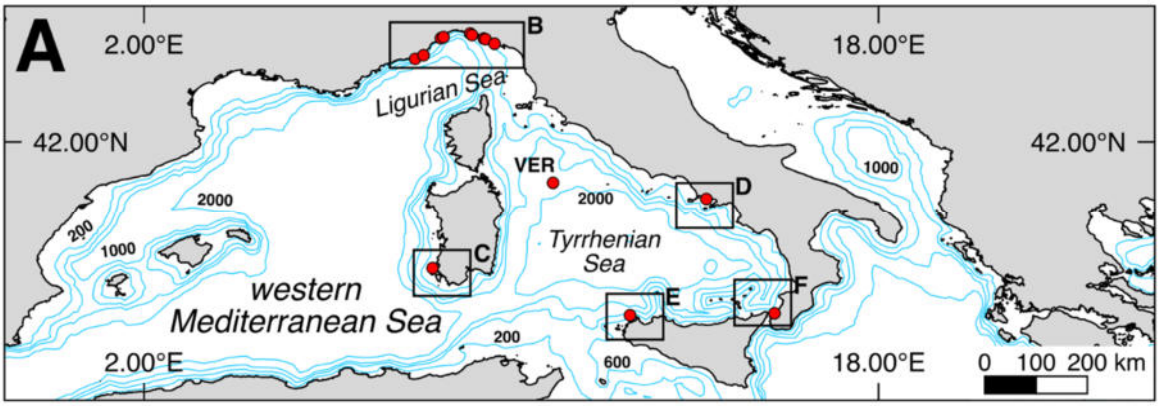


*Figure 5 – Map of the 14 mesophotic reefs selected for MACS index calibration and testing*

The MACS index includes two independent components, namely the Index of Status (Is) and the Index of Impact (Ii), both composed of six metrics. The Index of Status targets conspicuous species diversity, basal layer, and canopy composition, whilst the Index of Impact focuses on siltation level, canopy condition, and marine litter occurrence. The index has been calibrated on 14 temperate mesophotic reefs of the Ligurian and Tyrrhenian seas, all characterized by the occurrence of temperate reefs but subjected to different ecological settings and levels of human pressures.

The MACS index shows a high potentiality to distinguish among a wide range of environmental conditions, with local critical situations mainly related to high fishing pressure. Results have been validated through the application of an independent dataset of pressures, using the number of inhabitants, berths, and fishing vessels in a radium of 25 km from each site as a proxy for siltation, pollutants, maritime traffic, marine litter, and fishing effort. With respect to other existing indices, MACS is based on a larger number of parameters, resulting in a higher ability to disentangle natural and anthropogenic factors, hence leading to a better interpretation of local situations.

The MACS index represents a contribution to the requirements for the monitoring of marine environments set by the EU MSFD and for the identification of the areas where specific management measures must be undertaken to allow achieving the GES.

## Q&A Session

**How is locally collected data integrated or aggregated to provide to a broader assessment of the overall environmental status?**

- In the two sub-indices, each metric is aggregated and averaged, and then the results of three different transects are averaged as well to obtain the final MACS value for the site. The obtention of a final value for a whole regional area (e.g., Tyrrhenian Sea) hasn't been envisaged. However, a general overview could be provided by extrapolating the results of the individual sites.

- Additional comment from Leonardo Tunesi: in Italy for instance, assessments of the good environmental status are required for three marine sub-basins (western, central, and southern) and the last monitoring cycle is ongoing. Current data remain at the site level and efforts are ongoing to determine appropriate aggregation criteria for regional assessments under the Marine Strategy Framework Directive (MSFD). Also, site identification (both for offshore habitats and deep-sea corals) was based on available data and aimed to be representative of both habitat condition and types of pressure. However, aggregating these site-specific evaluations into a general assessment of Good Environmental Status (GES) at sub-basin level remains a methodological challenge.

**How is the mobile fauna of these habitats being considered in the parameters for assessing the environmental status?**

- Fish were excluded to avoid distortions in the results due to fish response to ROVs (which are afraid of the noise and tend to swim away). The indices instead focus on structuring benthic species, which better reflect ecosystem functionality, including benthic-pelagic coupling and biogeochemical cycles. It was suggested from participants that technologies like acoustic sensors or hydrophones, currently in development for shallower areas, could potentially be used to overcome the limits of the use of ROVs.

# The monitoring of Mediterranean upper bathyal biogenic reefs within the marine strategy framework directive objectives

**Michela Angiolillo – Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)**

The Marine Strategy Framework Directive (MSFD, 2008/56/EC) was adopted to achieve a Good Environmental Status (GES) in the EU's marine waters and to protect resources and ecosystem services, including the deep-sea waters and seafloor. Due to the ecological importance and vulnerability of the habitat-forming cold-water corals (CWCs), which are known to form Vulnerable Marine Ecosystems (VMEs), Italy has extended the implementation of the MSFD to the deep sea. Specific monitoring programmes on the scleractinian CWCs are carrying out, using a non-invasive Remotely Operated Vehicle (ROV)-imaging methodology.

Eleven areas, known for the presence of upper bathyal CWC reefs and representative of diverse seabed morphologies, environmental conditions, and anthropogenic pressure intensities have been identified to be monitored every three years, starting from 2020 in each of the three subregions bordering Italy.

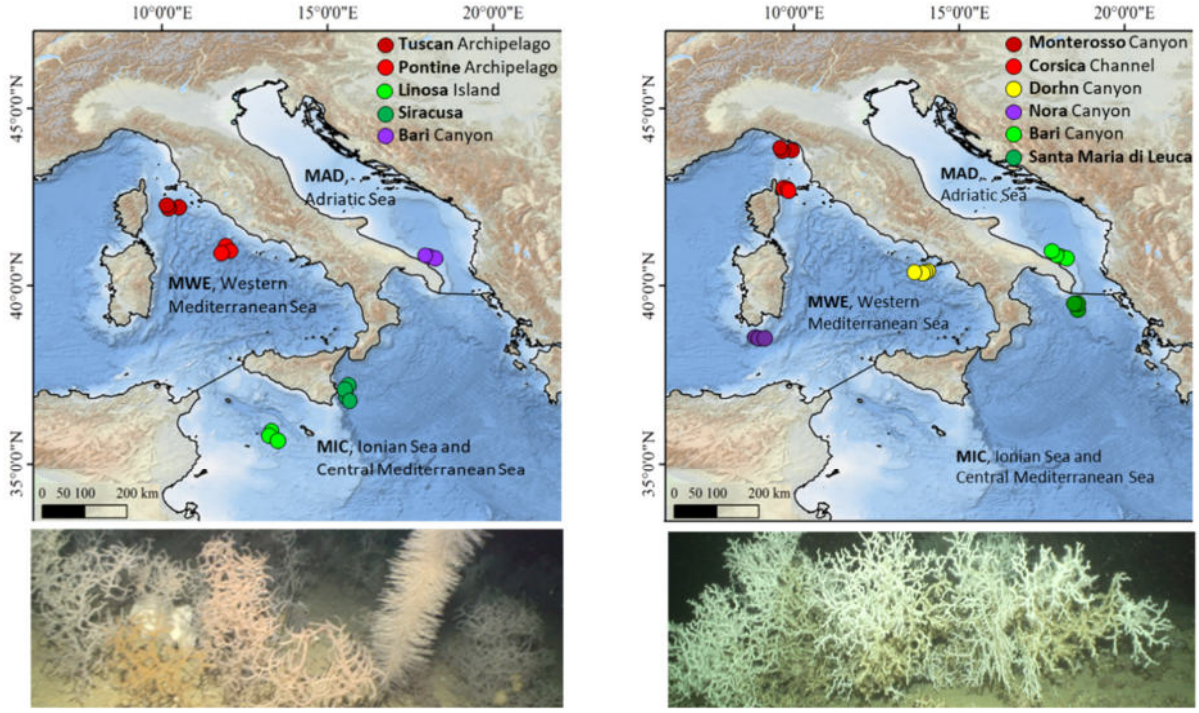


*Figure 6 - Monitoring sites for deep coral forests (left image) and Scleractinian CWCs (right image)*

To assess the GES of benthic habitats, the Italian MSFD stipulates simultaneously the use of three descriptors, namely D1 – Biodiversity, D6 – Habitat integrity, and D10 – Marine litter. Relative criteria are used as a proxy to evaluate habitat health status and measure and the extent of anthropogenic effects on the biological components. A standardized monitoring protocol has been validated to obtain reliable, coherent, and comparable data for future monitoring activities. In order to assess the environmental status of monitored assemblages over time using a robust and structured numeric method, a multi-parametric ecological index is under development.

The index integrates both the Index of Status (Is) and the Index of Impact (Ii). The Is includes six metrics, targeting conspicuous species diversity, canopy composition, and biogenic substrate, whilst the Index of Impact consists of four metrics targeting sedimentation level, entanglement and marine litter occurrence. This approach improves scientific knowledge on CWC reefs, and it will also allow defining threshold values useful to compare data at a large scale. Furthermore, it is pivotal in defining long-term monitoring activities to assess the effectiveness of specific protection measures adopted to preserve these VMEs, as required by the MSFD.

## Q&A Session

**Do you have access to the data from the cable-laying campaign conducted around Elba Island and Corsica?**

- These data are currently not publicly available, as they were collected by a commercial company. Efforts will be made to contact national authorities and attempt to recover and share these datasets. The discussion highlighted the broader issue of accessing data from non-scientific campaigns, and the need to establish national-level mechanisms or agreements to make such data available for conservation purposes.

# SESSION 2 - ROUND TABLES: TOWARDS IMPROVED AND MORE COLLABORATIVE MONITORING OF DEEP-SEA HABITATS

## ROUND TABLE 1 - Cooperation opportunities for lasting common transboundary data acquisition campaigns

**Facilitator: Karine Olu (IFREMER)**

**Leonardo Tunesi – Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)**

**Nadine Le Bris – Sorbonne Université**

**Jordi Grinyo – Institut de Ciències del Mar**

This roundtable addressed the opportunities and challenges associated with establishing long-term, transboundary scientific campaigns for the acquisition and analysis of deep-sea data in the north-western Mediterranean. Building on the previous session, it reviewed ongoing collaborations and discussed future perspectives.

Several initiatives were highlighted as examples of successful joint efforts, including the RAMOGE explorations (Cannes and Monaco canyons, Spinola, Janua and Ulisse seamounts), the ABRIC1 cruise (Blanes canyon), the ENTENTE campaigns (Lacaze Duthier and Cap de Creus canyons), the CALADU cruise (Lacaze Duthier canyon) and finally the ECOREST LIFE project (involving Spain, Italy and Tunisia). These projects have demonstrated the scientific and logistical benefits of pooling expertise and resources: extended data collection, improved exploration capacity, harmonised methodologies, and access to shared data repositories. They also illustrate the potential of these campaigns to generate significant scientific outputs, such as the discovery of coralligenous reefs 900 meters deep in the Cap de Creus canyon, and the mapping of cold-water coral reefs in the Blanes canyon. These scientific advances support subsequent long-term monitoring of deep-sea habitats and the joint identification of tailored management measures towards better protection, contributing directly to the EU Biodiversity Strategy for 2030.

The discussion first emphasised the need for, coordinated international programs to advance knowledge on deep-sea canyons and seamounts. Secondly, while a substantial body of data and imagery has been collected, there is a pressing need to strengthen joint analytical capacity and to move from data acquisition towards shared frameworks for data interpretation, indices, and indicators. Thirdly, the identification of pilot cross-border areas, such as the seamount located between France, Corsica and Italy, offers opportunities for cooperative management and protection, including the designation of joint Natura 2000 sites and the implementation of harmonised conservation measures. The collaboration engaged under the RAMOGE exploration could serve as an example and could inspire regional (Mediterranean) and international agreements.

Looking ahead, the participants called for the continuation and expansion of transboundary research efforts. However, the availability of fundings remains the backbone of scientific exploration and a key challenge for long term cross-border campaigns, which are essential to inform the rapid changes happening in the marine environment. To this end, the preparation of joint proposals for future funding instruments (e.g., INTERREG, LIFE) is a way forward.

# ROUND TABLE 2- Development of deep-sea habitats observatories in the Mediterranean: status, opportunities and success-factors

**Facilitator: Karine Olu (IFREMER)**

**Leonardo Tunesi – Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)**

**Nadine Le Bris – Sorbonne Université**

**Jordi Grinyo – Institut de Ciències del Mar**

The discussion of this round table focused on the development of observatories of the Mediterranean deep-sea habitats, based on a compilation of national pilot sites, aiming to harmonise monitoring efforts, methodologies and overall improve our understanding of deep-sea ecosystems.

Examples of existing monitoring activities were shared: in France, while most canyons have been mapped, the Lacaze-Duthiers canyon is one of the only Mediterranean sites with long-term data. On the Atlantic side, an inspirational observatory (MARLEY) has been deployed at the Lampaul Canyon (780m depth) since 2021, combining repeated small-scale survey and long-term ecological and physical and chemical monitoring. In Spain, efforts are concentrated along the Catalan margin (Cap de Creus and Palamos canyons), the Balearic Islands, and more recently, the Cabliers Seamount in the Alboran Sea. However, recurrent monitoring has only started in new MPAs along the Catalan shelf (permanent no-take zones). In Italy, in addition to N2000 sites, representative unprotected sites have been identified around the peninsula (excluding the northern Adriatic) and are monitored with standardized national protocols developed under the Marine Strategy Framework Directive (MSFD). These include multibeam processing innovations combined with video analysis.

Based on these experiences, participants highlighted a number of requirements that observatories should meet. These apply to the Mediterranean case, but many are relevant to most deep-sea ecosystems around the globe.

As an introduction, the need to include multiscale spatial and temporal approaches was emphasised, from centimeters to kilometers, and from days to years, necessary to capture both fine-scale ecological dynamics (e.g. species interactions) and management issues (e.g. fisheries regulation, spatial planning).They also stressed the need to combine high-tech tools (e.g. ARIANE) with simpler, low-cost technologies, including landers, in order to expand observational capacity without relying solely on large, well-equipped vessels.

The selection of sentinel sites for future monitoring should account for the heterogeneity of habitats and morphological units, including the variability of sedimentary regimes and biological productivity.

A diversified network should be developed, including both impacted areas and reference sites with minimal human disturbance, such as MPAs (particularly important for understanding the effects of climate change). Transboundary sites (e.g. Lacaze-Duthier canyon, Spinola Spur) could be considered as good candidates, allowing for collaborative scientific monitoring.

Finally, participants raised the urgency to act despite incomplete knowledge. The data currently available is already sufficiently clear to initiate concrete protection measures, especially for seamounts, known to host sensitive habitats such as white and black corals. Italy, for instance, has launched a project to create a network of Natura 2000 sites beyond the 12 nautical mile limit, including strictly protected no-take zones on deep-sea seamounts. Same goes for Lacaze-Duthiers, where it is already obvious that protection measures and fisheries regulations are essential.

The roundtable concluded with strong support for a collaborative, multi-site, multi-scale project, combining robust ecological monitoring with practical management objectives, and adapted to the challenges of global change.

# ROUND TABLE 3 - Toward common indicators including pressure gradient and deep ecosystem approach

**Facilitator: Maïa Fourt (GIS Posidonie)**

**Patrick Astruch – GIS Posidonie**

**Francesco Enrichetti – University of Genova**

**Elena Guijarro Garcia – Instituto Español de Oceanografia**

The session gathered experts and practitioners to exchange experiences and explore ways to improve monitoring and assessment of deep-sea habitats in the north-western Mediterranean, in line with EU and regional policy requirements.

Participants noted that, to meet the assessment obligations of the Marine Strategy Framework Directive (MSFD), the Habitats Directive, and UNEP/MAP's Integrated Monitoring and Assessment Programme (IMAP), monitoring tools should be agreed at the sub-regional scale. They emphasised the importance of an ecosystem-based approach in selecting tools for deep-reef assessment, the need for well-designed sampling plans, and the relevance of identifying vulnerable or sentinel species to follow over time. It was suggested that adapting existing indices to NW Mediterranean deep reefs could be a cost-effective strategy. Indices combining both state and pressure parameters were seen as promising for assessing mesophotic and deep-sea reefs.

The MACS Index, already tested on Italian mesophotic habitats, was highlighted as a sufficiently discriminating tool. Participants recommended:

- Continuing its adaptation to cold-water coral habitats.
- Testing it on larger, existing datasets in the NW Mediterranean.
- Exploring the inclusion of highly mobile species (e.g. fish, cephalopods) to strengthen the ecosystem-based approach, with comparative testing to assess their added value.

Experts emphasized that, to further assess the functioning of the ecosystem as a whole, it is crucial to account for mobile species, such as crustaceans and fish. Even partial assessments, or those targeting specific taxa, despite the acknowledged bias introduced by ROV-related disturbance, would contribute to achieving the most comprehensive, ecosystem-based evaluation possible.

Spanish experience adapting OSPAR indices BH1 and BH3, together with the BESITO index, was also discussed. These tools, which link sentinel species to sensitivity to bottom trawling and longlining, are now being trialled in the Mediterranean. Participants stressed that defining thresholds for fishing pressure will require adjustment to regional ecological and fishery contexts.

## Q&A Session

**Could it be possible to integrate fish into the MACS index?**

- The MACS index already considers highly mobile fauna, such as crustacean. It might be possible to use fisheries data for these analyses. ROV footage could also provide valuable information, making it potentially feasible to include fish, cephalopods, and even marine mammals, as many of these species use deep reefs during their life cycles.

**Isn't the disturbance created by the ROV a problem when taking fish into account?**

- In other ecosystems, fish populations are assessed even though there are potential issues caused by scuba diving, such as air bubbles. Noise generated by the ROV is indeed a concern, but another major challenge is that working in dark habitats implies the use of artificial light, which often causes fish to flee.

- From another perspective, this avoidance behaviour can actually serve as a proxy: if many fish escape the light, it indicates their presence and abundance. Mobile fauna should definitely be integrated into assessments of ecosystem functioning. Moreover, it is often easier to justify the protection of an area by referring to fish populations than by saying, for example, “there are three gorgonians.”

# Knowledge needs for management: example of the program SEAMONTI runned by the Marine natural park of Cap Corse and Agriate

**Jean-Laurent Massey – Office Français de la Biodiversité (OFB)**

**Jean-Damien Bergeron – Abyssa**

**Julien Marticorena – Abyssa**

In 2022, the Cap Corse and Agriate Marine Natural Park and ABYSSA company set up a deep oceanographic campaign to study the Agriate seamount: the SEAMONTI campaign. Seamounts are relatively rare geomorphological formations in the Western Mediterranean. The Agriate seamount is the only seamount present within the perimeter of the Marine Natural Park. Moreover, there is very little knowledge available on this formation which is the subject of an offshore Natura 2000 site. In its management plan, the Park had therefore identified major knowledge gaps and lack of data acquisition on this unique deep-sea structure in its area.

The SEAMONTI campaign is a research and development project which proposed a program for acquiring new knowledge through the deployment of an autonomous underwater vehicle (AUV). Three types of data have been collected in 3 successive steps using a combination of sensors, 'flight' plans and altitudes:

- High-resolution bathymetric data with operating altitude of 60 m above the seabed,
- High-resolution acoustic imaging data on relatively uneven areas with operating altitude of 15 m above the seabed
- Optical data on sectors with flat bottoms with operating altitude of 5 m above the seabed

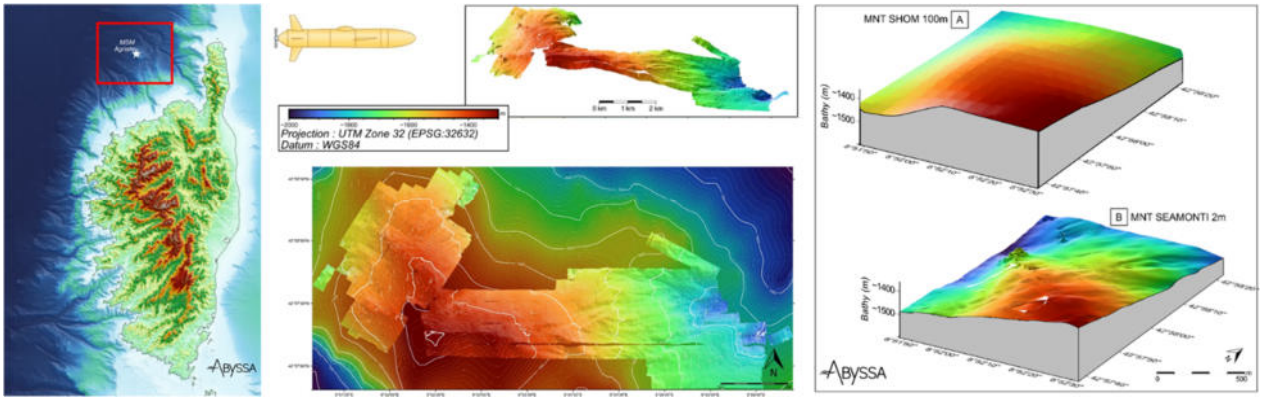


*Figure 7 - High resolution bathymetry maps (AUV survey)*

The first elements collected allowed us to learn more about the geomorphology of the seamount and give us crucial information about biological assemblage's distribution. However, it turned out that the AUV's safety protocols had to be optimized facing rough topography. In addition, a weather stand-by period prevented teams from working for several days. These unforeseen events therefore led to reduce the data acquisition capacity.

After the post processing of the data collected with the AUV, the team was able to highlight some hot spots in the Agriate seamount. The Marine Natural Park and ABYSSA therefore decided to organize a complementary mission using an ROV in order to more precisely explore these specific morphological features structuring deep-sea habitats. Thanks to this additional campaign, valuable elements of knowledge were collected: identification of numerous species, estimation of specific richness, observations of feeding traces of marine mammals and identification of a new species.

In conclusion, the SEAMONTI campaign has not only allowed the acquisition of a wealth of knowledge but has also successfully validated a scientific methodology tailored for acquiring insights specific to seamounts. Additionally, it has underlined the importance of AUV and ROV complementarity.


@ M. Angiolillo's presentation

# AXIS 2: MANAGEMENT MEASURES AND PUBLIC POLICIES

The second axis of the conference focused on moving from scientific understanding to concrete management measures and embedding these within public policy frameworks. Bringing together case studies, legal analyses, and collaborative initiatives, the discussions addressed the practical challenges of conserving Mediterranean deep-sea habitats under growing human and environmental pressures.

Session 3 explored the management of human activities and their impacts on the deep-sea natural heritage. Presentations addressed topics ranging from the sensitivity of cold-water corals to climate and pollution pressures, to the potential impacts of large-scale infrastructure projects (H2Med–BarMar), the expansion of Spain's Natura 2000 network through the INTEMARES project, and the current state of coralligenous habitat protection in Mediterranean MPAs. The session concluded with a round table on the resilience of deep-sea habitats, bringing together experts who highlighted five key indicators of resilience, stressing the need to interpret them in light of natural variability. They called for a deeper understanding of trophic chains and ecological functions, and for strengthening connectivity between marine protected areas. Participants also argued for multi-species restoration approaches aimed at creating self-sustaining, climate-resilient ecosystems.

Session 4 examined the legal and governance dimensions of deep-sea habitat protection. The first part mapped the EU legal architecture -key directives and the Common Fisheries Policy- and the specific hurdles in the Mediterranean, including the absence of clearly delimited EEZs in most areas and the jurisdictional complexity of transboundary canyons. The second part explored avenues for transboundary progress under UNCLOS and the Barcelona Convention, as well as cooperative designations such as transboundary biosphere reserves; the Lacaze-Duthiers Canyon was discussed as a candidate for coordinated protection. The session closed with a round table on resilience after pressure removal, focusing on operational tools, monitoring methodologies and indicators, and strategies such as reinforcing MPA connectivity and applying precautionary measures in high-risk areas.

# SESSION 3 – IDENTIFYING PRESSURES AND EVALUATING THE RESILIENCE OF MEDITERRANEAN DEEP-SEA HABITATS

## Responses to main threats on Mediterranean cold-water corals

**Franck Lartaud – Sorbonne Université / Observatoire Océanologique Banyuls**

Reef-building cold-water corals (CWC) act as ecological engineers and support a high biodiversity. Therefore, deep-sea reefs represent key ecosystems to preserve and/or restore.

The Mediterranean Sea is known as the source of coral colonization of the North-East Atlantic populations, subsequent to glacial – interglacial cycles. Today, Mediterranean CWC populations face many threats, including fishing activities, plastic pollution and especially climate change as they already live close to their upper known temperature limit (i.e., 13°C). However, many knowledge gaps exist regarding their biology and ecology, making it difficult to project their response to global change.

To fill these gaps, in situ experiments were conducted during 10 years in the Lacaze-Duthiers canyon (Gulf of Lion), using ROV and deployment-recovery techniques, on the reef-building corals *Desmophyllum pertusum* (former *Lophelia pertusa*) and *Madrepora oculata*. Growth, reproduction and coral microbiomes were analyzed at different temporal and spatial scales.

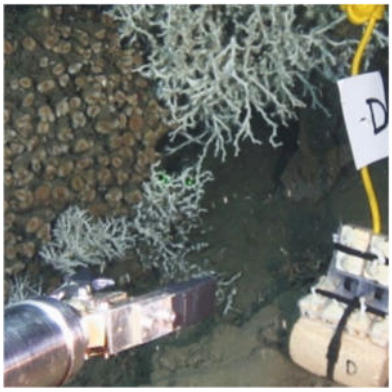

*Figure 8 - In situ experiments to characterize coral biology (including at spatial and temporal scales)*

In addition, laboratory experiments on the effect of temperature changes and exposure to plastic particles were conducted to forecast the consequences of a changing Mediterranean Sea. Coral physiology (growth, behaviour, energy reserves) and microbiome were investigated to assess their response at the holobiont level.

The two species display different habitat preferences, with a better health status of *M. oculata* at shallower depths. *Desmophyllum pertusum* appears more resilient to the current environmental dynamic but is more sensitive than *M. oculata* to anthropogenic pressures. This could impact future deep reefs seascapes as *D. pertusum* forms the most abundant and widespread reefs to date.

### Q&A Session

**Are the results of laboratory observations (conducted at atmospheric pressure) consistent with in situ observations of coral growth and health in submarine canyons?**

- Regarding Mediterranean corals, growth rates observed in the laboratory correspond closely to in situ conditions. For Atlantic corals, which come from greater depths, new experiments conducted under pressure have been initiated, and results are not yet available. Preliminary observations suggest that Atlantic corals under atmospheric pressure are in good conditions (but they come from deeper areas – around 900 meters). For Mediterranean species, atmospheric pressure may cause minor stress or mortality, but this effect has not been observed over the past 10 years. Also, corals continue to reproduce and live under aquaria condition.

# H2Med – BarMar: The first large green hydrogen corridor in Europe

**Benoit Guerber – GRT gaz**

The H2Med-BarMar initiative stands as a pivotal project in establishing a high-pressure hydrogen pipeline corridor. This corridor aims to seamlessly connect the eco-friendly and cost-effective hydrogen sources from the Iberian Peninsula to primary demand hubs, notably Germany, through France. The ambition is to commence hydrogen transportation by 2030. Recognized in the REPowerEU strategy, this Mediterranean hydrogen import corridor is poised to transport an impressive 2 Mt/year of hydrogen. Such capacity paves the way for decarbonization of numerous vital industries situated along the corridor.

A significant announcement on 20th October 2022 in Brussels highlighted the H2Med-BarMar project. French President, a Spanish politician, and a Portuguese public figure collectively endorsed the development of this corridor. Central to their vision is the BarMar initiative, a marine pipeline bridging Barcelona and Marseille. By January 2023, an extension of the H2Med initiative reaching Germany was jointly unveiled by the French President and a German politician.

The orchestration of the H2Med project involves a consortium of five transmission system operators: Enagas from Spain, REN of Portugal, GRTgaz and Teréga representing France, and Germany's Open Grid Europe. The collaborative BarMar endeavor is a tripartite venture involving Enagas, GRTgaz, and Teréga. Moreover, H2Med is vying for the coveted title of Project of Common Interest, under the fresh Trans-European Energy Networks (TEN-E) Regulation (EU/2022/869).

In 2022 and 2023, preliminary feasibility examinations for the BarMar project were conducted. These studies unveiled multiple viable options, encompassing both nearshore and deepwater alternatives, aligning with project specifications. An inaugural phase of engineering research is slated for an early 2024 kick-off. This phase aims to discern the most suitable corridor and its technical specifications from the available choices.

Selecting the ideal corridor will hinge on several criteria: safety, technicality, environmental considerations, societal impact, and economic feasibility. The chosen corridor will then undergo a subsequent phase of rigorous technical and environmental evaluations to pinpoint the least disruptive route for the initiative. Concurrently, potential landfall sites, like Port-la-Nouvelle in the Occitanie region, will be explored. This phase culminates in an environmental review, followed by public consultations. The project is anticipated to secure necessary authorizations by 2026.

## Q&A SESSION

**Why route the pipeline offshore and what would happen if it broke?**

- The offshore route is primarily a political choice, and not an economical one. Different options were available to develop infrastructure across Europe and onshore options were envisaged but not successful. Offshore pipelines already exist for natural gas (e.g., in Spain) even though they don't appear as the "easiest" option. This infrastructure would be the first offshore hydrogen pipeline, and its feasibility is currently under study. Regarding safety considerations, offshore pipelines are subject to the same safety requirements as onshore ones (which also present vulnerabilities). Related risks are fully included in the study to avoid leaks or accidents.

**How would the pipeline be attached on the seafloor?**

- This kind of question is addressed in the technical study. Several options exist for laying pipelines, but in general pipelines are directly laying on the seafloor. They are sometimes weighted with concrete (as for Nord Stream) or anchored or fixed in places depending on topography. Nearshore and in shallow waters, pipelines are buried, to protect from anchors and fishing gear. Construction methods will therefore be adapted on environmental conditions and technical constraints.

**Did buffer zones been designed around pipelines for fishing, and especially trawling? And if so, what type of buffer zones?**

- Protective measures can be used to reduce interactions (e.g., burying the pipeline to avoid damage from anchoring). These measures and their geographical scope still need to be defined. The main impact on fishing will occur during the construction phase as it may be temporarily restricted, but the post-construction objective is to allow fishing activities.

**Is ROV used to monitor the area?**

- The project foresees a series of surveys, including reconnaissance surveys on both routes using multibeam, side-scan sonar, and sub-bottom profiling. More detailed AUV-based surveys will be performed once the route is selected as well as post-construction periodic surveys to monitor the condition of the pipeline.

# INTEMARES project: compromise to improve the N2000 MPA network in areas under fishing pressure

**Elena Guijarro Garcia – Instituto Español de Oceanografia**

INTEMARES is a wide-ranging LIFE Integrated Project aiming to the efficient management of the Spanish marine N2000 areas. The improvement of knowledge on habitats and species to propose new SCIs is one of its actions.

One of the three areas selected for prospection of VMEs was the Submarine canyons from Cape Tiñoso, Seco de Palos seamount and adjacent pockmarks field. There was previous evidence of presence of VMEs but it had never been investigated before. In addition, it lies between the SCIs of Chella Bank and the Mallorca Channel.

Directed sampling was carried out in those locations where the geophysical data suggested highest probability of encountering the target habitats due to logistic constraints: the area is 7500 $km^2$, with depth range of 200-2000m, very diverse geomorphology, slopes, bottom types and ship time was limited.

Our goals were i) finding Habitat 1170, mixed substrates with *Leptometra phalangium* & *Gryphus vitreus*, compact mud with *Isidella elongata*, mud with *Funiculina quadrangularis* and Habitat 1180; ii) to carry out studies on interaction and potential conflicts between conservation and economic activities.

Data were collected with non-invasive and traditional sampling methods. Multivariate statistics and expert criteria were used for habitat identification. Potential habitat distribution was estimated with habitat prediction modelling using depth, rugosity and slope as environmental variables. We found most target habitats:

Hard substrate:

- upper bathyal rock with sediments (Demospongiae, small gorgonians and *Gryphus vitreus*);
- upper bathyal rock with Alcyonacea, incrusting Demospongiae and *Neopycnodonte*;
- medium bathyal with black corals, Scleractinians, gorgonians, structuring Demospongiae, Hexactinellidae, *Leptometra phalangium* and *Neopycnodonte zibrowii*;
- *Paramuricea clavata* on the plataform edge;
- CWC.

Soft substrate:

- mid bathyal mud with *Isidella elongata* facies and *Thenea muricata* facies;
- upper bathyal mud with facies of Pennatulaceans, Ceriantharia and *Astrorhiza*.

The presence of Habitat 1180 in the study area cannot be confirmed or discarded with our data.

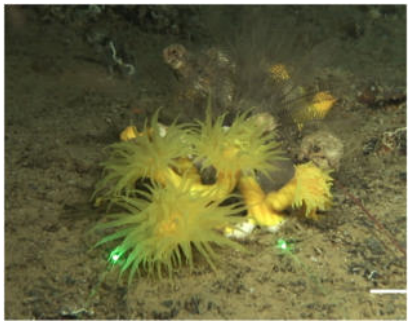

*Figure 9 - Scleractinia facies (Dendrophyllia , Caryophyllia)*

*Figure 10 - Viminella facies*

The main pressure is the bottom otter trawls (OTB) fleet. There is also evidence of longlining on the seamounts. Fishing impact is unevenly distributed among the potential areas of distribution of the target habitats. Diverse sealitter was found, mostly from commercial and recreational fisheries and ranging from old fishing gear to plastic, clothing and other items. Marine traffic conflicts with cetacean and reptiles. Possible chemical pollution from old mining industry is suspected, although we lack data from our depth range. Part of the study area will be suggested for the creation of a new SCI.

## Q&A SESSION

**Regarding the INTEMARES project, has there been any dialogue with fishers about the conservation proposals presented, and what has been their reaction so far?**

- There has been no prior direct engagement with the fishing community in this area. However, provided that the proposed protection measures are well justified and do not result in significant economic losses, major conflicts are not anticipated. Fishing activity in the area appears to be relatively dispersed, and the proposed restrictions are not expected to significantly overlap with the main fishing grounds.

**In the species distribution models presented, were only topographic variables considered, or were also environmental variables (temperature, currents) included?**

- The models used depth, rugosity, and slope as variables. These variables explained most of the observed variability in the data.

# Knowledge and needs for deep reefs management measures identification in Mediterranean MPAs

**Susan Gallon – MedPAN**

Since 2010 and every 4 years, MedPAN (the Network of Mediterranean Marine Protected Areas) and the UNEP Barcelona Convention's Regional Activity Center for Specially Protected Areas (SPA/ RAC) support Mediterranean countries, NGOs, MPA management bodies and other regional organizations to take stock of progress toward Mediterranean marine protected area (MPA) goals in international and regional commitments. In 2020, 8.33 % of the Mediterranean Sea is under protection status . However, 97.33 % of the total Mediterranean surface under protection status is located in EU member countries' water and the cumulative surface of no-go, no-take or no fishing area represents only 0.04 % of the Mediterranean.

Managers from 152 nationally designated Mediterranean MPAs shared their experience via an online survey in 2019. The data collected show that the three habitats with conservation targets that were mostly cited by MPAs with a national status are Posidonia oceanica meadows (69 %), coralligenous biocenosis (43 %) and hard beds and rocks (24 %).

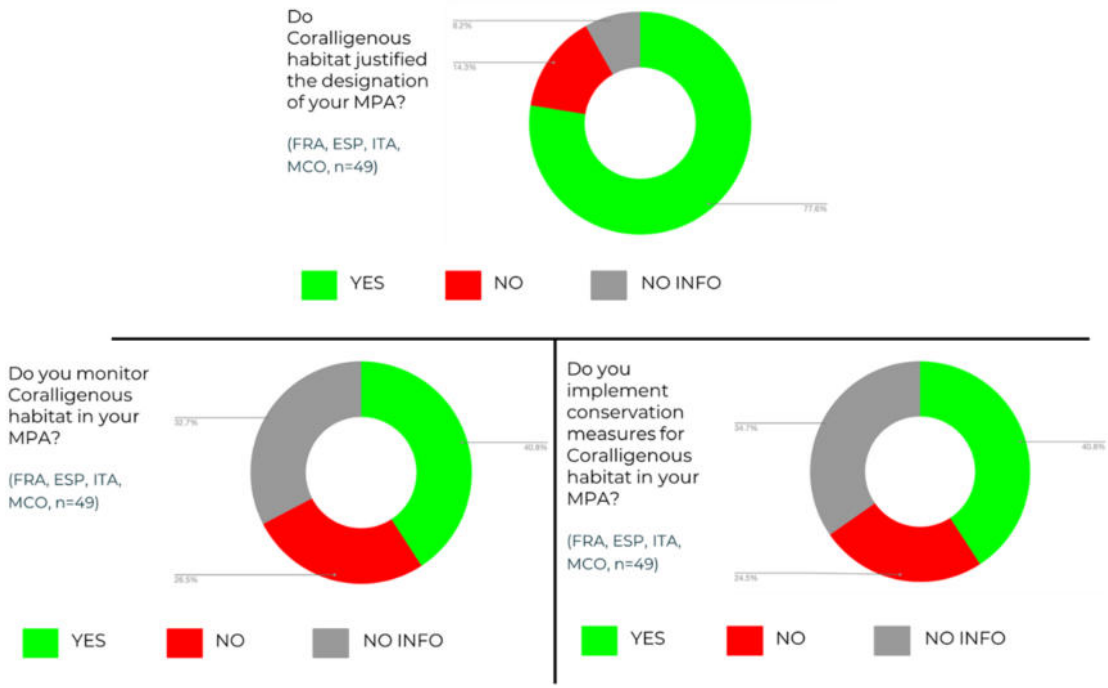


*Figure 11 – Results of the 2019 MedPAN survey on Coralligenous habitats*

A habitat of primary interest for much of the Mediterranean biodiversity and the ecosystem processes, Coralligenous habitats (IV.3.1), is listed in 56 MPAs across 10 countries and officially designated MPAs cover about 39 % of Coralligenous habitats mapped in the Mediterranean. The majority of those sites are found in France (31 sites), Spain (9 sites) and in Italy (7 sites). Moreover 2 sites are found in Monaco.

A good knowledge and understanding of the context of an MPA is essential to set objectives, plan and implement relevant management measures. For national MPAs in the Mediterranean, less than a quarter of them have baseline maps on habitats or substrates and a good monitoring and evaluation system in place. This presentation will provide an overview of the means needed for effective deep reefs management measures implementation in Mediterranean MPAs.

# ROUND TABLE 4 - Evaluation of ecosystems resilience capacities following pressures removal

**Facilitator: Paula Masia Lillo – Polytechnic University of Marche**

**Marie-Claire Fabri – IFREMER**

**Zaira Da Ros – Polytechnic University of Marche**

**Jordi Grinyo – Institut de Ciències del Mar**

The round table brought together three experts working on deep-sea ecosystem research and restoration in the Mediterranean and beyond. Marie-Claire Fabri (IFREMER) described her work in the Lacaze-Duthiers and Cassidaigne canyons, two sites hosting cold-water coral reefs but facing very different pressures: chemical pollution in Cassidaigne, and fisheries (trawling and long-line) in Lacaze-Duthiers. Using habitat modelling and photogrammetry, she has mapped probable coral habitats, quantified coral cover and density, measured structuring species' populations, and assessed visible impacts such as sediment cover and lost fishing gear.

Zaira Da Ros (Polytechnic University of Marche) presented the LIFE Dream project, which operates across four sites in Spain, Italy, and Greece. Actions include removing marine litter from sensitive habitats with ROVs and trialling artificial reef structures made of 3D-printed organic ceramic to promote coral recruitment in the Bari and Dohrn Canyons. This pioneering approach seeks not only to restore reefs but also to expand existing protected areas and establish two new Natura 2000 sites to safeguard these deep ecosystems.

Jordi Mignot (NIOZ) shared experience from the Atlantic and Mediterranean, where he has studied cold-water corals and sponge grounds using long-term observatories to capture seasonal and event-driven dynamics. In the Life Ecorest project in Catalonia, his team developed the "badminton method" to restore benthic organisms from bycatch, achieving survival rates above 90%. Jordi stressed the importance of selecting restoration sites that are sheltered from future climate impacts, noting that some areas in the project have already been discarded due to recurring summer mortality linked to warming waters.

In the discussion, Marie-Claire highlighted five key indicators of resilience: cover and density of structuring species, recruitment and reproduction, genetic diversity, associated species diversity, and predator populations, while stressing that these must be interpreted against the backdrop of natural variability, determined through long-term monitoring. Zaira explained that post-restoration monitoring in her projects combines high-resolution imaging with analyses of coral density, associated fauna, and food-web structure. She called for greater understanding of deep reefs' trophic chains and ecological functions, and for enhancing resilience by improving connectivity between MPAs and extending protection to nearby biodiversity hotspots. Jordi argued for multi-specific restoration targeting self-sustaining, climate-resilient ecosystems. He stressed the need to restore hard substrates lost to trawling, as they act as biodiversity magnets, and to manage donor populations carefully - minimising stress during recovery and, where possible, replicating natural sex ratios to support reproduction.

From these exchanges, the following recommendations emerged:

1) Understand the natural variability of key ecosystem indicators through long-term monitoring to establish meaningful baselines.

2) Address critical knowledge gaps in the ecology and biology of deep-sea ecosystems.

3) Strengthen legislation by integrating explicit criteria for assessing resilience capacity.

4) Ensure the long-term viability of restored assemblages by adopting multi-species approaches that account for species interactions, habitat connectivity, and the provision of suitable substrates.

## Q&A Session

**In relation to the recommendation on public policies and especially resilience indicators, could this be translated into more operational guidance for public policies? For instance, could it include specific actions regarding the boundaries of MPAs where sensitive habitats are present?**

Jordi Grinyo (NIOZ) highlighted the example of the Catalan MPA where discussions took place on the possible establishment of a buffer zone surrounding the no-take area, several hundred meters to 1 km wide, where bottom trawling is prohibited, but certain artisanal fishing techniques (e.g., longlines or trammel nets) could be allowed.

The aim is to reduce indirect impacts such as sediment resuspension and to enhance the recovery potential of species through spillover effects. This proposal is still under discussion with the fishing sector and remains sensitive due to competing uses of space.

Importance of pressure removal and buffering: a general comment stressed by a participant is that improving resilience depends first and foremost on the actual removal of human pressures, which should be a priority. This includes both the designation of no-take areas and the creation of buffer zones to ensure that stressors are reduced. Research and monitoring can then focus on documenting the positive effects of these removals, but such effects will only be visible if pressures have truly been alleviated.

Long-term monitoring and baselines: several participants noted the need for long-term monitoring and baseline studies to evaluate the effect of pressure removal, as it is difficult to assess ecosystem recovery without pre-removal data. It is also to be noted that sometimes, not all pressures can be fully removed (e.g., marine litter remains on the seabed).

Jordi Grinyo (NIOZ) added that, in Catalonia, there is no proper monitoring of fishery activities and compliance with protection measures due to the lack of resources. However, fishermen have observed a significant recovery of commercially valuable species, reinforcing their acceptability to establish these zones. Once the added-value of the no-take zone is proven, they more easily get involved in the monitoring of their own activity. This creates a feeling of ownership of the area.

What are the natural disturbances impacting communities and how often should they be monitored?

According to Marie-Claire Fabri (IFREMER), since deep-sea monitoring is costly, a long-term observatory placed on the seabed for an extended period (e.g., one year) can provide continuous data on seasonal variability. This approach is more efficient than conducting repeated short-term cruises.

Most deep-sea MPAs are located in the north-western Mediterranean, partly be because EEZs have been formally defined in this part of the basin. How can the establishment of EEZs in the east be encouraged, as the absence of these zones seems to hinder the designation of offshore protected areas?

Susan Gallon (MedPAN) reminded that EEZs in the Mediterranean largely remain theoretical. Even with existing claims from countries such as France, Italy, and Spain, the process is not fully finalised. However, promoting

new EEZ declarations could be politically sensitive, as it might heighten the risk of disputes between neighbouring States.

Rather than focusing on EEZ declarations, the recommendation was to use the existing legal tools available to establish MPAs beyond national jurisdictions, such as Natura 2000 or the Barcelona Convention, particularly the SPAMI mechanism (Specially Protected Areas of Mediterranean Importance). Through this mechanism, neighbouring countries can also agree to designate transboundary MPAs without the need to declare EEZs.

The prevalence of MPAs in the north-western Mediterranean is primarily due to historical patterns of designation. Opportunities still exist in other parts of the basin, including in Greek waters, to create deep-sea MPAs.

# SESSION 4 - LEGAL AND MANAGEMENT FRAMEWORKS FOR DEEP-SEA HABITAT PROTECTION

## Legal framework for protection and cross-border protection

**Vedran Nikolic – DG Environment European Commission**

The European Union's legal framework provides robust tools for the conservation of deep-sea habitats, including those in the Mediterranean Sea. Central to this is the Habitats Directive (92/43/EEC), which obliges Member States to designate and manage Natura 2000 sites and to implement protection measures, covering deep-sea features such as coralligenous formations, Lophelia reefs, and submerged sea caves. Its Article 6.2 establishes a powerful preventive provision through the obligation to avoid the deterioration of habitats and species and adopt a proactive prevention of disturbances. Article 12 mandates the strict protection of key ecological functions such as resting, breeding, and spawning areas, which deep-sea habitats often support. Article 14 further regulates the exploitation of species like red coral, commonly associated with these ecosystems.

The Marine Strategy Framework Directive (2008/56/EC) complements this by setting ecosystem-based objectives, notably the maintenance of seafloor integrity, a key indicator of deep-sea habitat health. Recently adopted threshold values now require Member States to implement concrete measures to limit adverse impacts on these habitats. The 2024 Nature Restoration Regulation adds momentum through binding restoration targets for degraded marine habitats, including deep-sea types, with a goal of full restoration by 2050.

While Member States hold full competence over nationally regulated activities (e.g., mineral extraction, maritime infrastructure, spatial planning), managing activities under international frameworks, such as shipping or fisheries, remains more complex. To this regard, the Common Fisheries Policy (CFP) offers legal levers, notably through Article 11, allowing conservation measures to be adopted in support of environmental obligations. Instruments such as the Mediterranean Regulation (No 1967/2006), which bans bottom trawling over coralligenous and maërl beds (though not in deep-sea areas), and the Deep-Sea Access Regulation (No 2016/2336) in the North-East Atlantic demonstrate the potential of this mechanism.

However, the practical implementation of these legal instruments remains limited, especially in the Mediterranean. Despite the region's ecological richness and vulnerability, no fisheries-related measures have been adopted under Article 11 of the Common Fisheries Policy (CFP) to support the conservation of deep-sea Natura 2000 sites. This implementation gap stems largely from the lack of joint measures among Mediterranean Member States, and the challenges of cross-border cooperation beyond 12 nautical miles. Strengthened political will, intergovernmental coordination, and scientific support are urgently needed to translate the EU's robust legal framework into tangible conservation outcomes for the Mediterranean's deep-sea ecosystems.

Q&A SESSION

**Does the Habitat Directive require Member States to protect each sub-category of Habitat type 1170, and if so, where is this legal requirement indicated?**

- Although the directive does not define the "reefs" habitat type in detail, the European Commission has published an interpretation manual which outlines a wide range of reef types (biogenic, geogenic, coralligenous, and others), based on regional and national classifications. If subtypes of reefs are recognised and included in Natura 2000 sites, they must be effectively protected through clearly defined conservation objectives. The recent Nature Restoration Law further refines this habitat

definition by referring to EUNIS level 4 or 5 habitats, more compatible with national and regional classifications.

How many proposals of joint recommendation did not reach consensus between Member States? Did the Commission already use Article 11 from CFP allowing to act without consensus of Member States?

- A well-known example is the Dogger Bank in the North Sea. Negotiations, particularly concerning the Dutch area, spanned nearly a decade before a joint recommendation was finally submitted. In parallel, the European Commission initiated legal action against Member States for failing to adopt the required conservation measures. Regarding the implementation of Article 11, the Commission has not yet applied emergency measures under this provision. The threshold for triggering such action is high, and to date, it has only been considered in cases involving species at risk of extinction (such as in the Baltic Sea), not for entire habitat types. Moreover, these emergency measures are strictly time-limited, with a maximum duration of one year, and cannot serve as a long-term solution. That said, with strong scientific evidence and a clear demonstration of urgency, this legal mechanism can still be activated as an exceptional measure.

What happens in cases such as the Dogger Bank, where regional discussions fail to reach consensus? Can the European Commission take a final decision?

- The Commission does have the ability to propose protective measures, but it cannot adopt them unilaterally, except under specific emergency provisions. If the Commission wanted to adopt measures in the absence of consensus among Member States, it must therefore go through the full legislative procedure, requiring approval from both the European Parliament and the Council. In essence, this would amount to proposing a new piece of legislation, making it a lengthy and complex process. This procedural complexity is precisely what the regionalization mechanism was intended to overcome. By allowing Member States to develop and agree upon tailored, region-specific measures, regionalization enables a more flexible and responsive approach. The Commission, for its part, does not have the capacity to adopt thousands of localised measures across all EU marine regions, making national and regional cooperation essential to effective marine protection.

What are the relationships, in the Mediterranean, with the General Fisheries Commission for the Mediterranean (GFCM)?

- The GFCM, as a regional fisheries management organization, plays an important role and could offer a complementary way to introduce protective measures applicable across the Mediterranean. The GFCM has already addressed the issue of Vulnerable Marine Ecosystems (VMEs), notably through the ban on fishing below 1000 meters and the establishment of area-specific closures. However, the focus of today's presentation was on the binding obligations for Member States under EU law. While GFCM measures primarily concern fish stock management, bycatch reduction and seabed protection, the GFCM scope is broader, as it involves both EU and non-EU countries.

# Introduction to legal context of management for protection of deep-sea habitats

**Christophe Le Visage – Stratégies Mer et Littoral**

The protection of deep-sea habitats in the Mediterranean relies on international maritime law, notably UNCLOS, which grants coastal States both the right and the duty to safeguard ecosystems within their jurisdiction, including Exclusive Economic Zones (EEZs). EU directives and regional agreements such as the Barcelona Convention provide legal tools, but their effectiveness ultimately depends on national implementation, clear jurisdiction, and strong enforcement. In the Mediterranean however, overlapping EEZ claims create legal grey zones that undermine conservation.

Effective protection requires more than legal frameworks - it needs robust management of human activities. Two main regulatory approaches exist: outright prohibition, which is simple and enforceable, and regulation of permitted activities, which is more complex and often less effective. In some ecologically sensitive areas, the question is not how to regulate fishing, but whether it should be allowed at all - a political choice still largely unaddressed. In addition, sectoral frameworks such as the Common Fisheries Policy prioritise resource use, making habitat protection harder; outright bans, especially in fisheries, remain rare.

An integrated management structure is therefore essential, combining strategic (priority setting), planning (spatial and temporal allocation), and operational (tools like Environmental Impact Assessments) levels. To this end, environmental law under UNCLOS offers a stronger legal basis than fisheries law for restrictions or bans. Even in disputed maritime areas, UNCLOS obliges States to cooperate through provisional arrangements without prejudicing claims. The Lacaze-Duthiers Canyon, shared by France and Spain, illustrates this: coordinated management or harmonised overlapping MPAs could enable protection despite jurisdictional uncertainty.

## Q&A SESSION

**You mentioned that it is sometimes easier to ban certain activities than to implement management measures. Could you elaborate on what this means in practice? Why might prohibition be more straightforward than regulation?**

- From an administrative and enforcement perspective, prohibiting access to a defined area (e.g. through no-take zones) is more straightforward than regulating specific activities. Surveillance, for instance, is easier when the rule is binary (presence vs. absence), rather than conditional on practices (e.g., gear type). However, this simplicity does not extend to negotiation processes, which remain complex.

**An example was raised of a failed attempt to protect a submarine canyon south of the Rhône River. Despite minimal fishing activity and years of NGO advocacy, the European Commission -at France and Spain's request -suspended discussion on the issue until at least 2030. This raised concerns about the GFCM's ability to safeguard Vulnerable Marine Ecosystems.**

- In such cases, the coastal State decides which parts of the ecosystem are designated as resources. The GFCM then allocates these resources among fishers, taking into account traditional rights and other factors. The creation of new resources is a political decision, involving choices about which areas can be fished, and which should be closed. The fishing industry naturally seeks to maximize access, so negotiations must clearly define protection objectives from the start. These decisions should be grounded in solid scientific evidence, and where uncertainty remains, a precautionary approach - such as temporary fishing bans - may be necessary to ensure ecosystem protection.

# Marine Protected Areas designation and key management issues in Spain

**Elena Ruiz de la Torre – LIFE IP INTEMARES, Fundacion Biodiversidad**

The LIFE INTEMARES project, "Integrated, innovative and participative management of the Natura 2000 Network in the Spanish marine environment", is one of the largest marine conservation projects in Europe, which aims to work towards the effective management of the marine Natura 2000 Network in Spain, with social participation and science as basic tools.

The project is coordinated by the Biodiversity Foundation from the Ministry for the Ecological Transition and the Demographic Challenge, and includes a wide and diverse partnership, with the Ministry itself through the General Directorate of Biodiversity, Forests and Desertification; the Regional Government of Andalusia, through the Department of Sustainability, Environment and Blue Economy, in addition to the Environment and Water Agency; the Spanish Institute of Oceanography (IEO-CSIC); AZTI; the University of Alicante; the Polytechnic University of Valencia; the Spanish Fisheries Confederation, SEO/BirdLife and WWF-Spain. It receives funding from the European Union LIFE Programme.

This integrated project engages the different sectors involved (fishing sector, public entities, tourism, society in general, energy...) and addresses different policies such as the Habitat and Birds Directive Directives, Marine Strategy Framework Directive, EU Common Fishery Policy, Convention on Biological Diversity among others. It also has endorsed the Biodiversity Strategy towards the target of 30% protection by 2030 in which actively contributes through working in the designation of new marine protected areas and also by enabling their effective management.

Regarding to the designation of new areas, 6 new areas have been identified to be included in the Natura 2000 Network through oceanographic campaigns, two of which correspond to canyons or submarine mountains in the Mediterranean Sea. Additionally, 7 more are under declaration processes, after developing a HCI gap analysis. In both cases, the objective is the preservation of deep habitats.

On the other hand, concerning the MPA management, work is being carried out on the approval of management plans (based in participatory processes) that will include different kinds of specific measures for protecting deep reef habitats, including zoning.

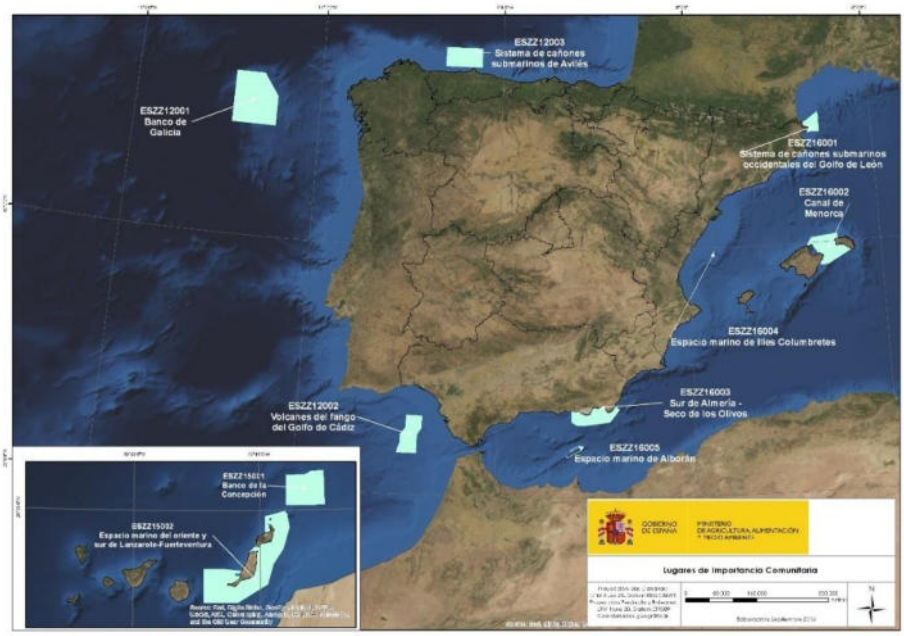


*Figure 12 - MPAs undergoing participatory processes for management plan adoption*

# Transboundary Biosphere Reserves: Opportunities to cooperate

**Anaïs Baude Soares – UNESCO Man and Biosphere**

A biosphere reserve is a tool proposed by the UNESCO MAB programme to facilitate the integration of different public policies and the effective and efficient implementation of the principles of sustainable development. This UNESCO designation can be envisaged on a transboundary scale, Transboundary Biosphere Reserves (TBR) being cooperative projects that address the management of socio-ecological systems across borders.

This particular tool would give the land and sea area of the western Gulf of Lion, the eastern Pyrenees and Catalonia a dimension suited to the issues at stake. This tool should not be seen as a "reserve" in the sense of additional legal protection, but rather as a basis for successful cooperation involving all stakeholders for sustainable, coherent and equitable management of the area.

France has 16 biosphere reserves, including 2 transboundary biosphere reserves. The Mont Viso Biosphere Reserve and the Vosges du Nord / Pfälzerwald Biosphere Reserve. 2 examples of the management of Natura 2000 sites on both sides of the border.

To go further, a new TBR must have a common ecosystem, the will to jointly manage this area using the biosphere reserve concept, a common culture and traditions, a tradition of exchange and cooperation at local level, and a political commitment embodied in a formal agreement between the national authorities of the countries concerned.

It's established with an area-wide zoning (common understanding of the characteristics of each zone and similar management regimes), agreement and publication of a common zoning map and definition of common objectives and indicators, with a work plan, timetable and budget.

In terms of institutional mechanisms, a TBR must have a coordinating structure on each side of the border, a permanent secretariat and operating budget, a focal point for cooperation on each side of the border, regular plenary meetings of the coordinating structures and thematic groups set up on an ad hoc basis (discussion platform and knowledge exchange), joint teams for specific tasks and an association to promote the TBR.

In summary, a transboundary biosphere reserve must be based on zoning and defined jointly in consultation with the communities, the operation of the TBR requires the establishment or identification of a coordinating structure, if possible with a budget and a secretariat, and the work plan must be defined and financed over several years.

# Transboundary site management tool through Lacaze-Duthiers canyon biosphere reserve project case

**Hervé Magnin – Office Français de la Biodiversité**

The marine natural Park of gulf of Lion is located in the western Mediterranean on the Spanish border. The park's offshore extension was motivated by the presence of exceptionally rich submarine canyons, including the Lacaze-Duthiers, which is of major interest to the French coastline. As the park's limits reach extends beyond territorial waters, France proposed the delimitation of an exclusive economic zone (EEZ) in 2012, followed in 2013 by Spain, with an overlap of several hundred km². This was followed by the transmission of Sites of Community Interest (Natura 2000) on these canyons, the first in 2014 by Spain, followed by France in 2018, implanted on this "grey zone". Cooperation is one of the objectives set by the Park's decree, and this management challenge is included in its management plan (adopted in 2014, for 15 years).

A great deal of knowledge is available about the ecological richness of the area, despite the difficulties and cost of deep-sea exploration. Pressures and the threat they represent for conservation have also been assessed. Finally, the vulnerability of deep-sea reefs to the effects of global change (global warming and plastic pollution) has been confirmed, underscoring the urgent need for action. A particularity of the area is that it is fished almost exclusively by the spanish.

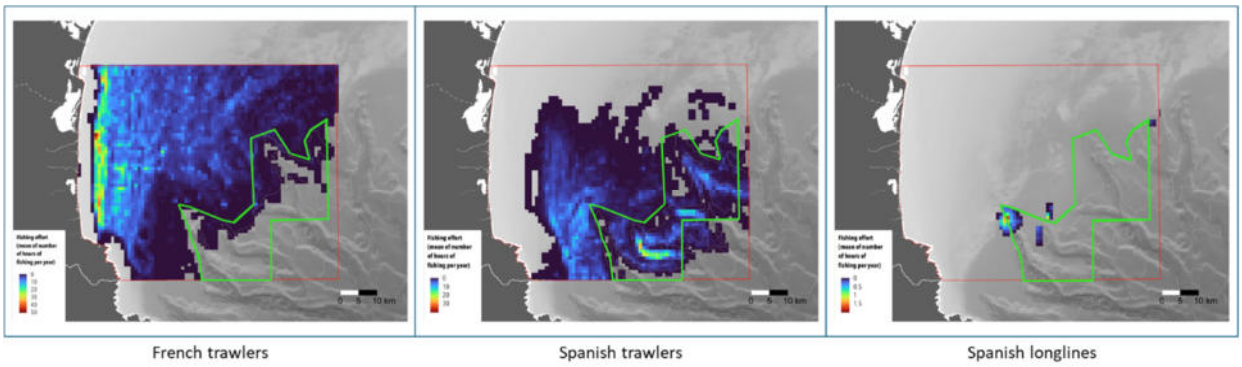


*Figure 13 - Fishing activity in the Lacaze-Duthiers areas (in green)*

Overcoming these border difficulties to initiate co-management measures between France and Spain could be supported by the integration of this area in the network of cross-border biosphere reserves (MAB – UNESCO Program). This area has a number of keys to help it move in this direction: a good level of knowledge and established scientific cooperation, a shared desire on the part of the two States to move towards the conservation of these ecosystems, and the presence of the marine natural Park of gulf of Lion, endowed with management and control resources on the sea.

## Q&A SESSION

A general comment was made by a participant regarding France's Maritime Spatial Planning update. France is entering a new phase of public debate, which will bring together NGOs, fishers, offshore wind developers, shipping representatives, and State authorities to negotiate the spatial allocation of marine activities. As part of this update, planning documents will include new thematic maps, notably one showing submarine canyons, including the Lacaze-Duthiers canyon. One of the key objectives of the process is the designation of *Zones de Protection Forte* (ZPF – strict protection zones), which must be identified within three years and effectively implemented by 2027.

However, since MSP processes are conducted on a national basis, Spanish stakeholders will not be part of France's planning debate - even though the canyon in question straddles both French and Spanish jurisdictions. This raises concerns about the lack of cross-border coordination in areas of ecological continuity.

Nevertheless, the existing MSP for Biodiversity (MSP4BIO) project, in which CEREMA and others are engaged, offers opportunity for cross-border dialogue Spanish counterparts. Given the tight ZPF timeline and overlapping ecological areas, coordinated discussion, especially around the canyons, will be necessary to ensure coherent and effective protection measures on both sides of the border.

## Alain Pibot | Closing:

*We are all deeply aware of the importance of managing not only human uses of the sea, but above all, the pressures exerted on the marine environment - an environment whose value lies not only in its intrinsic richness, but also in the vital ecosystem services it provides today and will continue to offer future generations.*

*Over these two days, we have seen how substantial data now allows us to better identify the main pressures - and that these are not always those we initially expected. In many areas, aside from fishing activities, direct physical damage remains limited; yet other threats, such as microplastic pollution, are emerging as serious and insidious risks for deep-sea corals. The priority must therefore remain the removal of ongoing pressures and the prevention of new ones, before restoration can be meaningfully undertaken. In this respect, the precautionary principle must guide our actions.*

*Our discussions have also underlined the value of constructive engagement with the fishing sector to co-design protection measures that are both effective and acceptable. This is particularly relevant in transboundary contexts such as the Gulf of Lion canyons, where Spanish fleets operate most of the fishing activity, making collaboration with our Spanish partners - including through initiatives such as LIFE INTEMARES - a decisive opportunity. Equally, the example of the planned hydrogen pipeline reminds us that large-scale projects tend to follow paths of least constraint. If we wish to protect sensitive habitats, we must anticipate these developments by establishing clear spatial constraints within marine planning frameworks.*

*Above all, this conference has reinforced the importance of dialogue and cooperation with our Spanish and Italian colleagues on future joint efforts for cross-border marine protection. Whether addressing specific sites or broader strategies, progress will depend on our capacity to move forward together with mutual trust and coordinated action. The real substance of these two days lies in the quality of our exchanges, and in the strong spirit of cooperation that has emerged. I sincerely thank all of you for your presence, your thoughtful contributions, and the constructive, generous debates you have engaged in throughout these discussions.*

*OFB PNMCCA Study (@Laurent Ballesta)*

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Marha aims to restore and maintain the good conservation status of the 9 marine habitats of Community interest in mainland France. It mobilizes all players involved in the management of Natura 2000 marine or coastal sites designated under the Habitat Fauna Flora Directive (Mediterranean Sea and lagoons).

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