mspmed

# D12: Pilot case for maritime spatial planning in the Region of Murcia with respect to the habitat conservation

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# Acronyms

| | |
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| ACI | Asset of Cultural Interest |
| AGE | General State Administration |
| AIS | Automatic Identification System |
| AMP | Marine Protected Areas |
| ANSE | Naturalists Association of the Southeast |
| AOL | Areas of Interest |
| AP | Preferred Areas |
| APC | Conditional Preferred Areas |
| ARQVA | National Museum of Underwater Archaeology |
| CARM | Autonomous Community Region of Murcia |
| CCAA | Autonomous Regions/Communities |
| CSIC | Spanish National Research Council |
| DC | Coastal Demarcation |
| DGBBD | General Directorate for Biodiversity, Forests and Desertification |
| DGCM | General Directorate for the Coast and the Sea |
| DGOPA | General Directorate for Fisheries Management and Aquaculture |
| DGPEM | General Directorate for Energy Policy and Mines |
| DM | Marine sub-region |
| DM LEBA | Levantine-balearic marine sub-region |
| EIA | Environmental Impact Assessment |
| EMFAF | European Maritime, Fisheries and Aquaculture Fund |
| EMP | Environmental Monitoring Plan |
| EU | European Union |
| FAO | Food and Agriculture Organization of the United Nations |
| FARM | Federation of aquaculture producers of the Region of Murcia |

| | |
|---|---|
| GES | Good Environmental Status |
| IEO | Spanish Institute of Oceanography |
| IMEDEA | Mediterranean Institute of Advanced Studies |
| JACUMAR | National Advisory Board for Marine Aquaculture |
| LSI | Land-Sea Interaction |
| MAPA | Ministry for Agriculture, Fisheries and Food |
| MITERD | Ministry for the Ecological Transition and the Demographic Challenge |
| MR | Marine Reserve |
| MSP | Maritime/Marine Spatial Planning |
| MSPD | MSP Directive |
| NGO | Non-Governmental Organization |
| PER | Recreational Vessel Skipper's Licence |
| PNB | Basic Navigation Skipper Practical Course |
| POEM | MSP Plan (Spain) |
| R+D+I | Research + Development + Innovation |
| RMIP | Marine Reserve of Fishing Interest |
| ROVs | Remotely Operated Vehicles |
| SCI | Site of Community Importance (Natura 2000 network, Habitat Directive) |
| SGP | General Secretariat for Aquaculture, Fisheries Marketing and Structural Actions |
| SPA | Special Protection Area for Birds (Natura 2000 network, Birds Directive) |
| UA | University of Alicante |
| UCH | Underwater Cultural Heritage |
| UM | University of Murcia |
| UNESCO | United Nations Educational Scientific and Cultural Organization |
| ZAP | High Potential Areas |
| ZAPAC | High Potential Areas for Aquaculture |

| | |
|---|---|
| ZIA | Areas of Aquaculture Interest |
| ZICM | Areas of Interest for Marine Crops |
| ZP | Potential Areas |
| ZPC | Potential Conditional Areas |
| ZUP | Priority Use Areas |
| WWF | World Wildlife Fund |



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# 1. Introduction

The Region of Murcia is located in the southeast of the Iberian Peninsula and it is one of the 17 autonomous communities (CCAA) of Spain. The Region of Murcia has approximately 275 km of coastline with a high concurrence of different types of maritime uses and activities in its sea waters such asnavigation of large commercial vessels, anchorages, military manoeuvres, aquaculture, etc. In addition, it has a richbiodiversity, with the presence of numerous species and habitats, many of which are listed in the European Habitats Directive, the Birds Directive and/or the Spanish Law 42/2007, Of December 13th, Of Natural Heritage And Biodiversity to be protected, for instance, seagrass meadows (*Posidonia oceanica* and *Cymodocea nodosa*), maerl beds and coralligenous outcrops.

Due to its location, the sea waters of the region are included in the levantine-balearic sub-region (DM LEBA) according to the Spanish Law 41/2010, of December 29, 2010, on the protection of the marine environment, establishing the subdivisions of Spanish waters for the application of the Marine Strategy in Spain (*figure 1*). In this sense, and for the implementation of the Maritime Spatial Planning Directive in the same sub-region, Spain approved the Royal Decree 363/2017, of April 8, establishing a framework for maritime spatial planning, which is a legal extension of the Law 41/2010, by means of which the maritime spatial plans in Spain should be elaborated in the same subregions as indicated in the law itself. Currently, the Maritime Spatial Plans are expected to be approved during 2022.

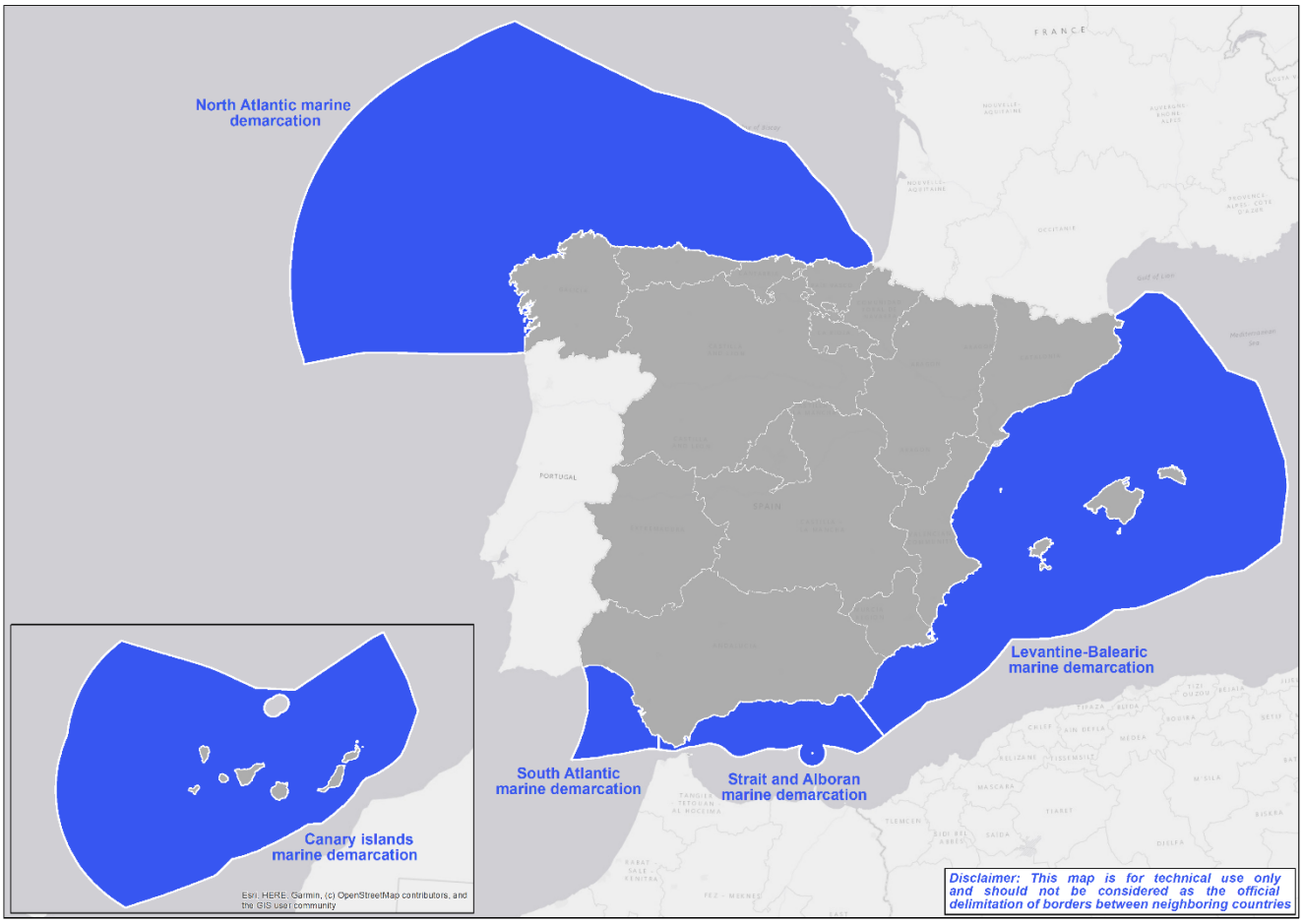


*Figure 1. Spanish marine sub-regions. *Disclaimer: The limits of the marine demarcations do not correspond to the jurisdictional limits of the Spanish marine waters. They should not be considered as official delimitation with neighbouring countries. Own elaboration. IEO,CSIC*

The MSP national process and the pilot projects developed by EU Member States for implementing the MSP Directive, such as the MSPMED project, are dual processes on a single track. Key to this is that there is a considerable overlap between both, objectives and the results of the pilot projects, that could be applied directly in the national MSP process. The Region of Murcia has a demand of marine space for specific maritime activities and uses, for example, marine aquaculture and the anchoring of recreational boats, which could enter into conflict with marine conservation. For this reason, the case study of the Region of Murcia analyses the current status of some uses and activities to identify conflicts, synergies and lack of knowledge to obtain recommendations that could be used for the MSP national process, specifically in the elaboration of the levantine-balearic MSP plan.

## 2. Case Study Area

The case study area is located on the southeast coast of the Iberian Peninsula and it encompasses the waters that bathe the Region of Murcia up to the edge of the continental shelf as it is represented in *figure 2*. All these waters belong to the levantine-balearic marine sub-region (DM-LEBA), one of the five marine sub-regions in which the Spanish marine waters are divided. This sub-region is located entirely in the Mediterranean Sea and includes all the Mediterranean waters from Cabo de Gata (Almería) to the border between Spanish and French jurisdictional waters in the Gulf of Lion. Nevertheless, this specific study case will be focused just in the Region of Murcia.

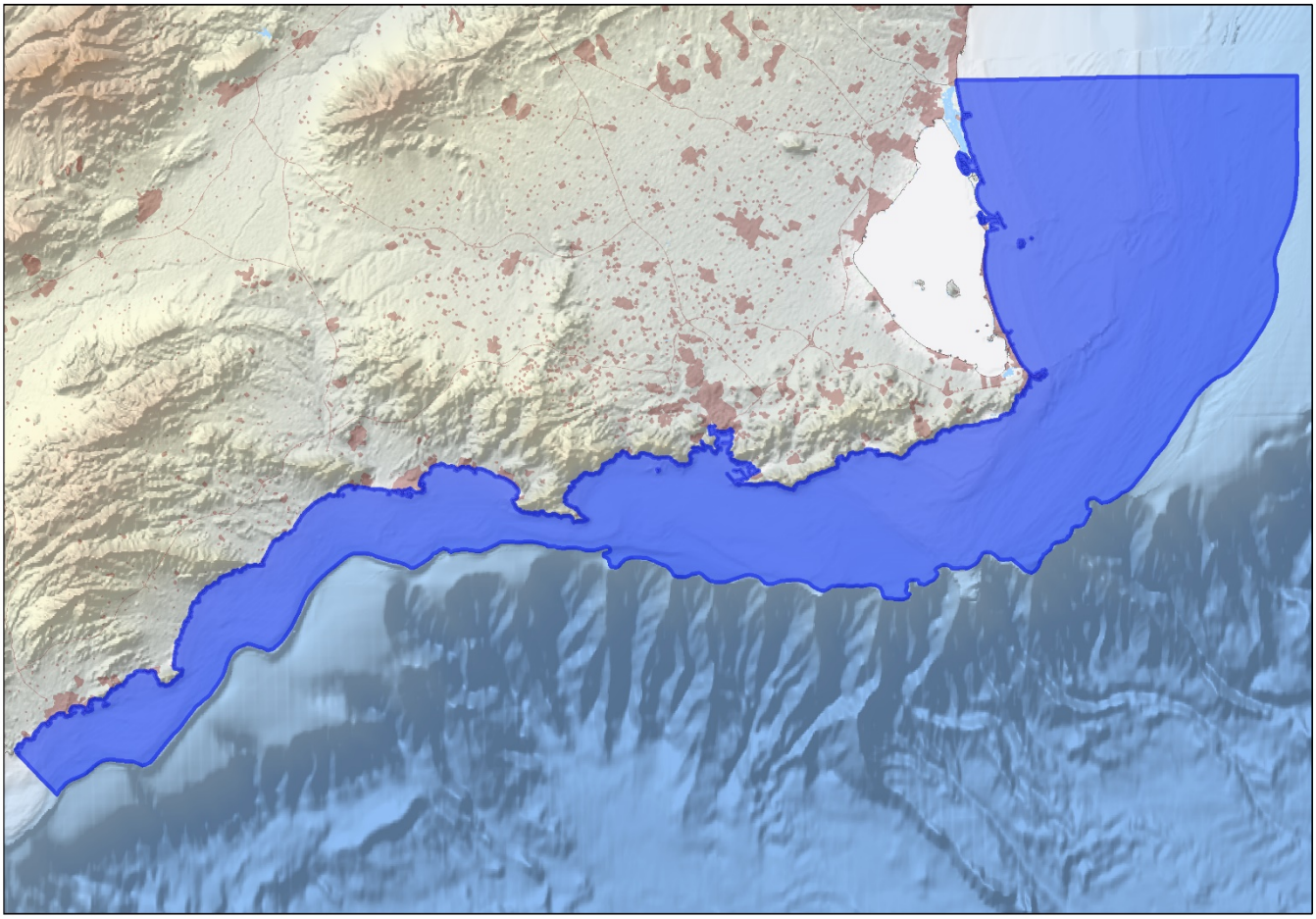

*Figure 2.Case study area-Region of Murcia maritime waters (levantine-balearic marine sub-region (DM LEBA)). Source: Own elaboration. IEO, CSIC.*

The objectives of this case study are:

- To a nalyse the current uses and activities occurring in the marine waters of the Region of Murciathrough the elaboration of a GIS geodatabase by selecting some of these maritime uses in order to assess to find possible conflicts, synergies and information gaps.
- To organize local stakeholders' workshops on the topics selected in order to identify conflicts, synergies and information gaps and to obtain recommendations that could be used in the MSP national process.

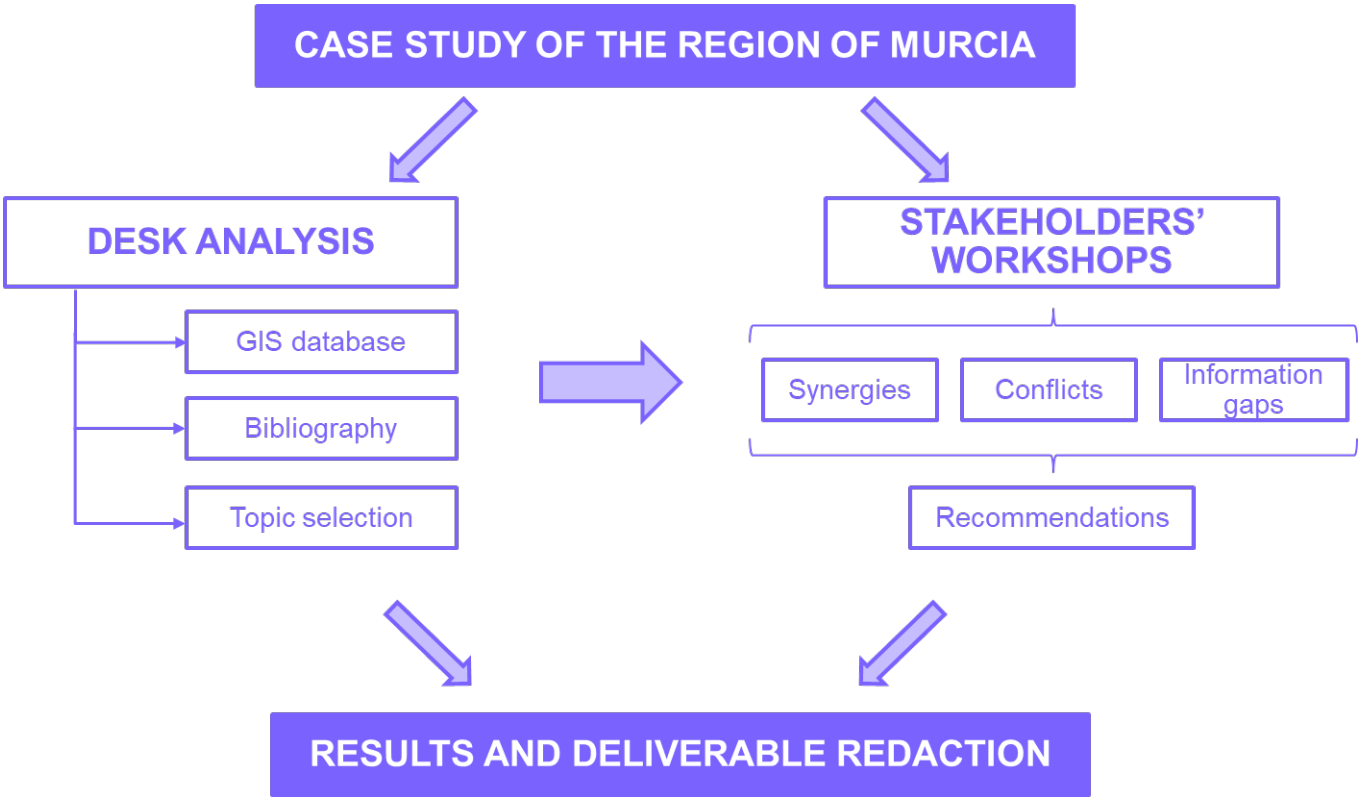


*Figure 3.Works carried out in the Case study of the Region of Murcia. Source: Own elaboration: IEO,CSIC.*

# 3. Methodology

## 3.1 – Cartography analysis in the case study area

In order to carry out an analysis of the concurrence of uses and activities occurring within the study area, a search and compilation of cartographic information available on marine activities and uses in the marine waters of the Region of Murcia was undertaken. For this purpose, a cartographic data search was carried out in different reference sources, such as the Spanish Institute of Oceanography, the Ministry for the Ecological Transition and the Demographic Challenge or EMODNET, to compile all the cartographic data available related to the uses and activities included in the POEM (MSP Plan) of the levantine-balearic marine sub-region and to be used in the case study.

Once the search process was completed, 3 cartography products were created in order to subsequently determine which cartographic layers would be useful depending on the topics to be addressed in the case study, as will be explained in the following section:

- an excel table was prepared with the inventory of the layers obtained to be registered,
- the cartography was included in a GIS database,
- a working GIS (QGIS and ArcGIS format) in which the layers were visualized.

The table with the list of layers collected, together with a description and the source from where they have been obtained, can be looked up in table 3 of *annex 1*. In addition, below the table, there is an explanation of the different processes executed to select the information needed for the current analysis and the steps followed to obtain determinate layers with the information definite for the case study.

Through this mapping work carried out, it was possible to observe the high concurrence of uses and activities in the area, and the prevision of an enormous increase in the demand for space in the marine waters due to the will of fostering the blue economy, that would consequently enable the economic growth of the region.

## 3.2 - Analysis of potential topics to be addressed in the case study

In order to determine the most significant issues to be considered in the case study, a first list of issues of interest in the region of Murcia to be considered in the sub-region POEM. was performed. Thus, the first list of possible topics considered for the study case are shown in *Table 1*.

*Table 1. Topics evaluated for the task 2.3 of the MSPMED project called: Pilot case for maritime spatial planning in the Region of Murcia with respect to the habitat conservation. Source: own elaboration (IEO,CSIC).*

| TOPIC | INFORMATION |
|---|---|
| **a. Maerl beds versus aquaculture** | Aquaculture has become one of the sectors with the greatest projection in the Region of Murcia. Waste substances that are generated within the aquaculture fish cages could modify and degenerate vulnerable habitats as maerl, coralligenous bottoms and seagrass meadows. Maerl beds form fragile ecosystems due to their low growing rate and low resilience and are great indicators for climate change. |
| **b. Expansion of the Escombreras dock versus Construction of a new harbour in the Gorguel bay area** | The main goal of these two projects is to satisfy the growing demand for container traffic and to increase bulk traffic in the area.<br>To meet that goals, there are two possible options:<br>• To expand Escombreras dock: Port public domain and Port areas I and II won't be modified.<br>• To build a new harbour in the Gorguel bay area: Port public domain and Port areas I and II will be modified. The expansion of these areas would match with the "area of marine farming of Gorguel Bay" and High Potential Areas for Aquaculture (ZAPAC) and overlap with most of the RN2000 Site of Community Interest (SCI) "Valles submarinos del Escarpe de Mazarrón" and a Special Protection Area (SPA) area with the same name. Moreover, it overlaps with a great area identified as "valuable for bird species" within the project INTEMARES. The overlapping between the future propose Public Port Domain. |
| **c. Contamination in Portmán Bay versus coastal environment** | The ecological disaster of Portmán Bay occurred from 1959 to 1990, when millions of tons of mining waste were dumped into the bay by the company Peñarroya. This event reached such a magnitude that mineral waste gained 12 km from the sea line and 14 m deep.<br>Nowadays, the situation has not changed much. In the long term, unprecedented socioeconomic and environmental damage have been generated.<br>During the last decades, several Non-Governmental Organizations (NGOs) and neighbours have fought for the regeneration of the bay, but the situation has not changed in the last 30 years.<br>The goal is to remove the rubble to recover the environmental and landscape values in order to favour the |

| | |
|---|---|
| | recovery of the fishing and touristic resources to revalue the region. |
| **d. Unregulated anchorages versus biodiversity conservation and underwater cultural heritage** | Within the maritime waters of Murcia there are several areas with numerous and concurrent unregulated anchorages, problem that increases considerably during summer months. This fact put into risk the Good Environmental Status (GES) of habitats of community interest (Natura 2000 network) like seagrass meadows, coralligenous outcrops and maerl beds. Since Automatic Identification System (AIS) is required only for vessels over 15 m length, it is difficult to quantify this issue or to calculate the bearing capacity and/or the impact that takes place in these natural ecosystems. In fact, a system to locate fishing boats not obligated to use AIS has been established in the region, but this system does not include recreational boats yet.<br>This issue put into risk, as well, the integrity of the underwater cultural heritage (UCH), which also stresses the need for an improvement in the zoning of assets of cultural interest, also known by its acronym BICs.<br>To preserve the marine ecosystems and the UCH, it is necessary to regulate the practice of touristic activities that can endanger the integrity of habitats, species and BIC. |

The methodology applied for the selection of the topics to be further discuss in the stakeholder's workshops is detailed below.

The primary document used to carry out the selection was the levantine-balearic marine sub-region POEM (1), which is the Maritime Spatial Plan (MSP Plan) for this specific sub-region; always considering the general POEM (2) for the five Spanish marine sub-regions as the reference document.

First of all, the "Activities, uses and interests considered of general interest" were attended, which include, among others, the Marine Environment and the protection of the Underwater Cultural Heritage, considering as well uses and activities of economic maritime sectors like Aquaculture, Marine Traffic-Port sector and Tourism-Recreational Activities. Those were the main activities and uses that we decided to focus on. Thereby, the four themes explained above that reflect various conflicts between the different uses, were selected. Additionally, the four topics are of great importance in the Region and need to be addressed.

Thereafter, an analysis of the interactions between the current and future uses was performed. In addition, the Spanish competent authority in MSP was consulted in order to obtain information on the most relevant issues of interest for the MSP national process. The conclusions and the justification for the chosen topics are set out below:

a. **Maerl beds versus aquaculture.** This is a truly urgent topic to resolve within the Region of Murcia. Being aquaculture one of the greatest booming sectors of the region, evaluating the effect of this activity on natural ecosystems becomes especially relevant. This and the fact that there is a specific section dedicated to the interactions between aquaculture and other uses in the DM LEBA POEM, give us a clue of how important is to develop and try to resolve the conflicts between the different uses or, at least, to find the best practices to reduce the detrimental effects of aquaculture on vulnerable habitats such as maerl beds. Thus, this was one of the two chosen topics to be developed in a face-to-face stakeholder's workshop.

b. **Expansion of the Escombreras dock versus construction of a new harbour in the Gorguel bay area.** In this case, it has been decided to do not go further with this issue due to several facts. First of all, both procedures or options are under progress. The new Gorguel harbour procedure started in 2005 and it is still under study to find possible solutions to compensate the environmental impacts that would generate and, on the other hand, the works to expand and improve the access to the Escombreras dock are already being carried out. Therefore, this topic was discarded.

c. **Contamination in Portmán Bay versus coastal environment.** This issue arose more than 30 years ago, but there has been no progress, even counting with the support of the local population. Although it is an important Land-Sea Interaction (LSI) that need to be solved, it has been considered as a coastal matter more than maritime, beyond the MSP scope. Hence, it was dismissed for this pilot case.

d. **Unregulated anchorages versus biodiversity conservation and underwater cultural heritage.** As it has been enunciated in the previous table (*table 1)*, unregulated anchorages are putting into risk vulnerable marine ecosystems that host an important biodiversity and the maintenance of the underwater cultural heritage in an adequate state. This problem is enhanced noticeably during summer months. There is an urgent need of solving this conflict in order to preserve the natural and cultural heritage. Besides, within the POEM there is a specific chapter where the problem with the anchorage of recreational boats is exposed. Accordingly, this was the other chosen topic to be discussed in a stakeholder's workshop.

To summarize, these are the two topics chosen to be discussed further in stakeholder's workshops:

- Topic 1: Maerl beds versus marine aquaculture.
- Topic 2: Unregulated anchorages versus biodiversity conservation and underwater cultural heritage.



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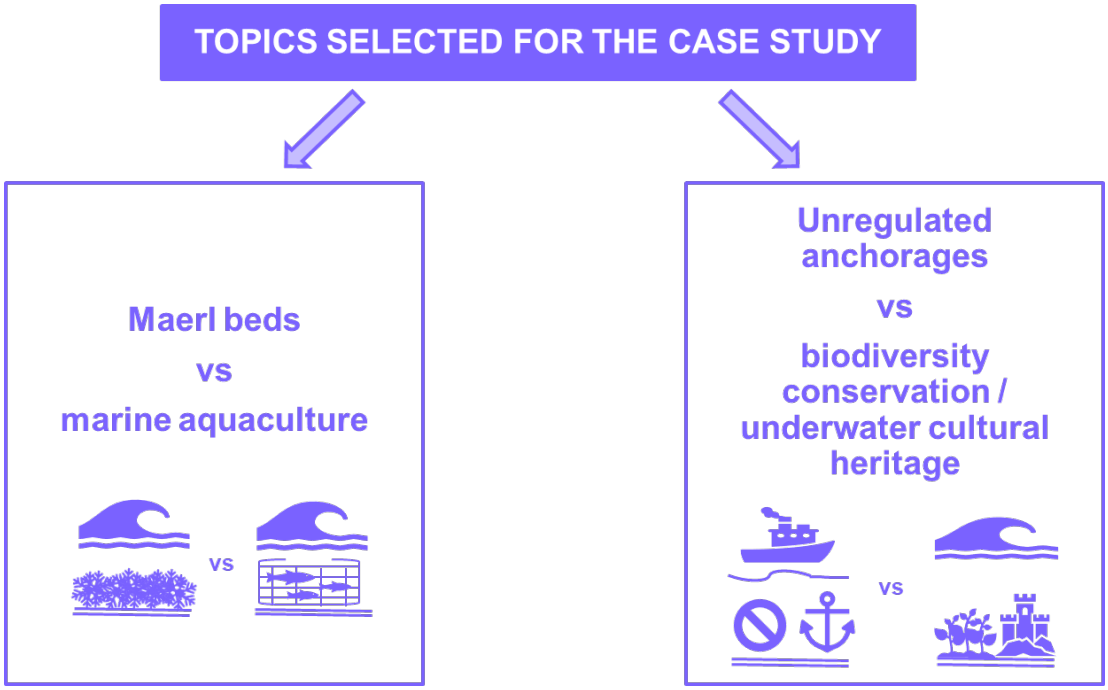


*Figure 4. Topics selected for the Case study of the Region of Murcia. Source: Own elaboration: IEO,CSIC.*

Once these two topics were determined, cartography data to be used was selected, and the organization and preparation oftwo distinct events in order to address these issues with experts and stakeholders started.

## TOPICS SELECTED TO BE ADDRESSED IN THE CASE STUDY

### Topic 1: Maerl beds versus marine aquaculture

#### Current situation

The Region of Murcia hosts one of the highest aquaculture productions at a national level. This fact is primarily a consequence of the quality of its waters, due the absence of industrial discharges in most of the area and the smooth physiography of its continental platform.

In *figure 5*, the current distribution of farming cages and mollusc production in the Region of Murcia can be observed. It is relevant to note that, thanks to the technical workshop celebrated

in Murcia with relation to this topic, it is known that most of the shellfish production areas showed in the map, categorised as "in operation" are under closure, so they are not currently producing.

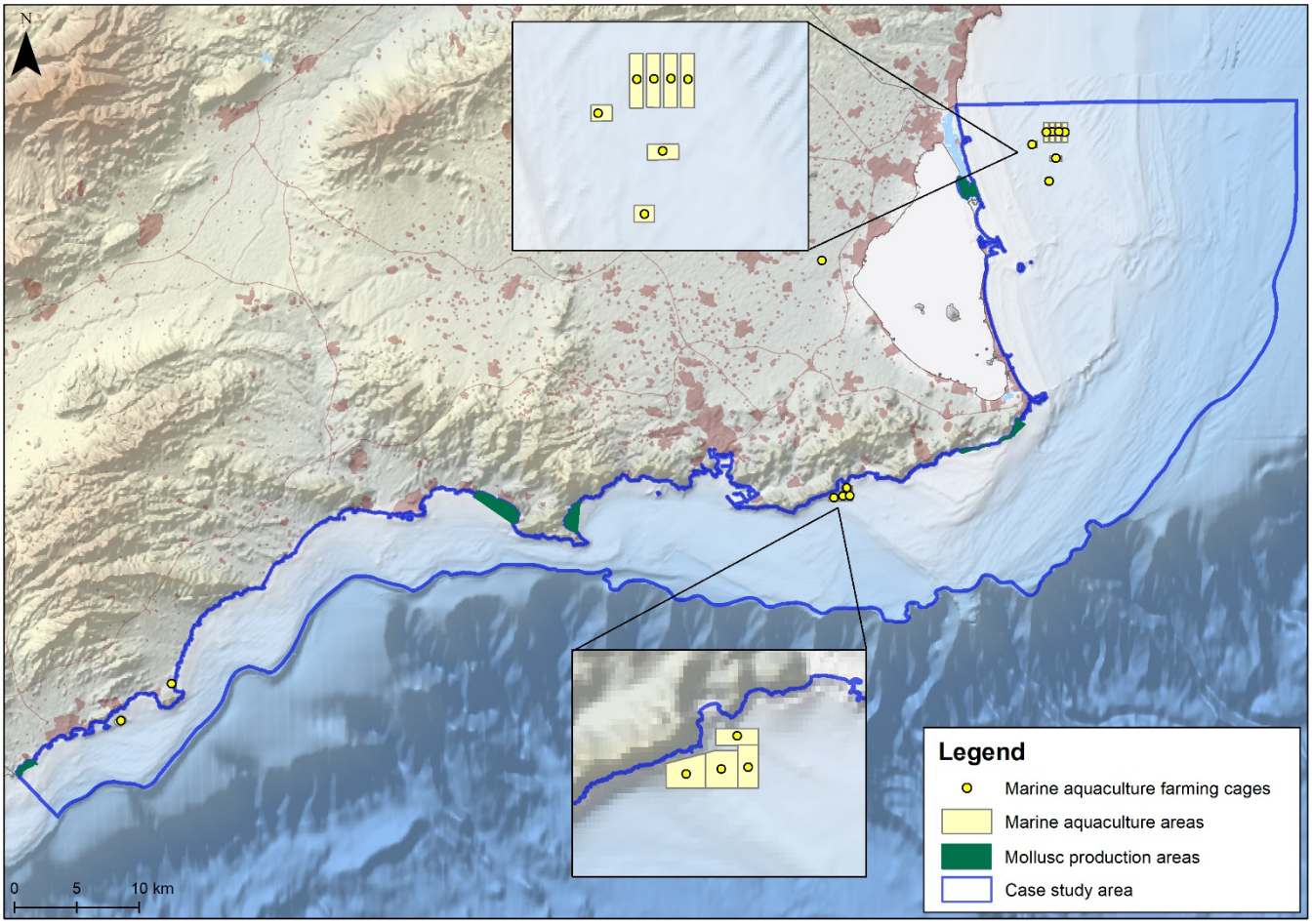


*Figure 5. Current distribution of aquaculture farming cages and mollusc production areas in the Region of Murcia. Source: Own elaboration: IEO(CSIC), with GIS aquaculture data provided by the Fisheries Secretariat from the Ministry of Agriculture, Fisheries and Food (MAPA).*

The aquaculture sector in this area is continuously growing, fostering the economic growth of the region. As far as authorised establishments are concerned, Murcia has 6 recirculation tanks and 11 hatcheries or fattening cages. Specifically, the polygon of San Pedro has an authorized annual production of more than 10.000 tons. There are currently about 200 farming cages, located in the open sea at about 4-5 nautical miles from the coast, and this place has been determined as an ideal place to increase the aquaculture production in the region, as it can be observed in *figure 5*. In fact, a new project has been developed in the region to install two new nearby facilities that would almost double the current production capacity. At the same time, there is another important farming site in the Region, "*The Gorguel bay marine farming area*" where, actually, the production was increased in 1.000 tons per year for the Atlantic bluefin tuna (*Thunnus thynnus*) farming in 2018.

The fish production in the Region of Murcia is focused on Gilthead seabream (*Sparus aurata*), European seabass (*Dicentrarchus labrax*) and Atlantic bluefin tuna. According to the "*2020 aquaculture report in Spain*" [3] Murcia was producing the 30% of the Gilthead seabream and European seabass at a national level and in relation to the Atlantic bluefin tuna, Spain was producing the 14,4 % of this species at a global level, being Murcia the main producer of not only Spain, but the whole European Union before 2019. In 2019, according to the "*2021 aquaculture report in Spain*" [4], there was an important increasing of aquaculture facilities with respect to the previous year, 187 new facilities for the whole country. In 2020, due to climatic and epidemiological episodes occurred in both, 2019 and 2020, the losses of the production were accused and it went from 53.915 tons from 2019 to 41.911 in 2020, that is, -22.3% fewer marine fish produced. Unluckily, the Region of Murcia has been the most affected region by these episodes so its production has decreased from 12.087 tons in 2019 to 4.805 tons in 2020, -60,2% less than the previous year, which means that the fish production in Murcia during 2020 accounts only de 11,5% of the national production. These data are highly worrying and it is extremely relevant to reverse this tendency to foster the economic growth in the area. Spain is still, however, the Member State with the biggest fish farming production for 2019.

In the following chart (*table 2*), obtained from the cited "*2021 aquaculture report in Spain*", the annual fluctuations in the production of different type of fish in each Spanish Region can be observed. Maintaining healthy marine ecosystems would help to the prevention of epidemics and to ensure the long-term viability of the sector the sector.

*Table 2. Commercialized production of farmed marine species (tons). Source: 2021 aquaculture report in Spain (APROMAR, 2022).*

| PRODUCCIÓN COMERCIALIZADA DE ESPECIES MARINAS DE CRIANZA (toneladas) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **DORADA** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021[P]** |
| Andalucía | 1.818 | 1.530 | 1.786 | 1.136 | 2.333 | 1.605 | 980 | 1.560 | 1.606 | 920 | 930 |
| Baleares | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Canarias | 3.259 | 2.740 | 3.013 | 1.588 | 1.884 | 2.492 | 2.063 | 2.380 | 2.380 | 1.893 | 1.900 |
| Cataluña | 1.471 | 1.570 | 1.292 | 952 | 514 | 656 | 654 | 0 | 0 | 0 | 0 |
| Murcia | 3.469 | 3.880 | 3.730 | 3.892 | 4.103 | 3.368 | 4.356 | 3.184 | 2.906 | 1.107 | 1.610 |
| Valenciana | 6.913 | 9.710 | 6.974 | 8.662 | 7.397 | 5.619 | 5.590 | 7.806 | 6.629 | 2.668 | 6.355 |
| **TOTAL** | **16.930** | **19.430** | **16.795** | **16.230** | **16.231** | **13.740** | **13.643** | **14.930** | **13.521** | **6.588** | **10.795** |
| Variación % | -16,8% | 14,8% | -13,6% | -3,4% | 0,0% | -15,3% | -0,7% | 9,4% | -9,4% | -51,3% | 63,9% |
| Precio €/Kg. | 5,00 € | 4,31 € | 4,79 | 5,45 | 5,84 | 5,78 | 4,87 | 4,37 | 4,10 | 4,20 | 0,00 |
| Valor (M€) | 84,7 | 83,7 | 80,4 | 88,5 | 94,8 | 79,4 | 66,4 | 65,2 | 55,4 | 27,7 | 0,0 |
| **LUBINA** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021[P]** |
| Andalucía | 3.895 | 4.000 | 3.777 | 2.815 | 5.356 | 6.081 | 3.261 | 4.479 | 7.120 | 3.950 | 7.494 |
| Canarias | 3.478 | 3.500 | 4.286 | 5.097 | 5.767 | 5.507 | 5.900 | 5.793 | 6.253 | 5.596 | 4.900 |
| Cataluña | 250 | 390 | 66 | 0 | 318 | 236 | 146 | 30 | 30 | 70 | 70 |
| Murcia | 3.956 | 3.880 | 4.987 | 5.519 | 6.009 | 8.164 | 6.990 | 7.525 | 9.181 | 3.585 | 6.746 |
| Valenciana | 2.788 | 2.500 | 1.591 | 3.945 | 3.874 | 3.457 | 4.972 | 4.633 | 4.751 | 8.508 | 4.112 |
| **TOTAL** | **14.367** | **14.270** | **14.707** | **17.376** | **21.324** | **23.445** | **21.269** | **22.460** | **27.335** | **21.709** | **23.322** |
| Variación % | 15,0% | -0,7% | 3,1% | 18,1% | 22,7% | 9,9% | -9,3% | 5,6% | 21,7% | -20,6% | 7,4% |
| Precio €/Kg. | 4,96 € | 5,42 € | 5,35 € | 5,79 € | 5,64 € | 5,67 € | 5,18 € | 4,64 € | 3,80 € | 4,30 € | |
| Valor (M€) | 71,3 | 77,3 | 78,7 | 100,6 | 120,3 | 132,93 | 110,17 | 104,21 | 103,87 | 93,35 | |
| **RODABALLO** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021[P]** |
| Asturias | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0,00 | 0 | 0 | 0 |
| Cantabria | 50 | 100 | 75 | 75 | 108 | 50 | 105 | 100,00 | 0 | 0 | 0 |
| Galicia | 7.690 | 7.845 | 6.729 | 7.733 | 7.607 | 7.346 | 8.441 | 7.350,00 | 8.258 | 7.681 | 7.680 |
| País Vasco | 15 | 25 | 10 | 0 | 0 | 0 | 0 | 0,00 | 0 | 0 | 0 |
| **TOTAL** | **7.755** | **7.970** | **6.814** | **7.808** | **7.715** | **7.396** | **8.546** | **7.450** | **8.258** | **7.681** | **7.680** |
| **CORVINA** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021[P]** |
| Andalucía | 0 | 40 | 0 | 0 | 0 | 46 | 46 | 50 | 23 | 23 | 24 |
| Canarias | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cataluña | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Murcia | 1.300 | 1.000 | 0 | 23 | 42 | 0 | 0 | 0 | 0 | 85 | 348 |
| Valenciana | 1.510 | 600 | 89 | 1.067 | 1.600 | 1.752 | 1.886 | 2.450 | 3.600 | 4.817 | 2.953 |
| **TOTAL** | **2.880** | **1.640** | **89** | **1.090** | **1.642** | **1.798** | **1.932** | **2.500** | **3.623** | **4.925** | **3.325** |

As it can be observed in the next figure (*figure 6*), there is a huge High Potential Area for Aquaculture (ZAPAC, by its Spanish acronym) in the surroundings of the biggest fish farming production area of the region, according to the DM LEBA POEM, so the growing aquaculture previsions are high.



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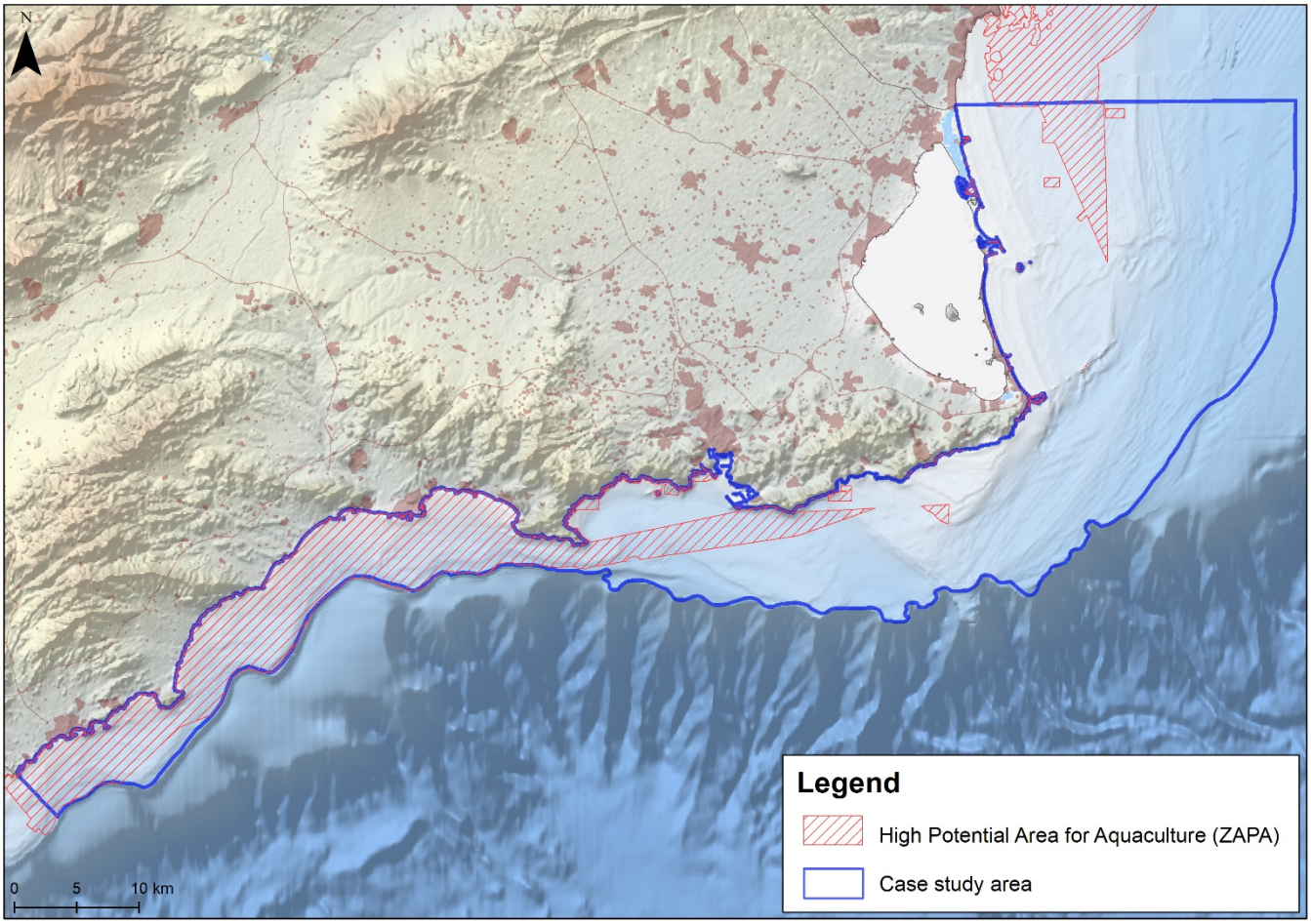


*Figure 6.Representation of high Potential Area for Aquaculture (ZAPA) in the Region of Murcia. Source: Own elaboration: IEO(CSIC), with the GIS data provided by the Ministry for Ecological Transition and the Demographic Challenge (MITERD).*

On the other hand, the Region of Murcia has a significant and valuable marine biodiversity, which needs to be conserved. One of the most affected ecosystems by marine aquaculture and especially by the Gilthead seabream and European seabass farming in floating cages are maerl beds or rhodoliths (if a broader spectrum is considered). Maerl beds are made of calcareous or coralline red algae that grow as unattached nodules. In this case study area, we can mainly find *Lithothamnion corallioides* y *Phymatolithon calcareum*, although other species can be encountered. These two species are both listed in the Annex V of The Habitats Directive, that includes animal and plant species for which Member States must ensure that their exploitation and taking in the wild is compatible with maintaining them in a favourable conservation status, as well is included as protected habitat in the Spanish Law 42/2007. Besides, maerl beds are part of habitat 1110 "*Sandbanks which are slightly covered by sea water all the time*", included in Annex I of the same Directive, that includes habitats for which the states must declare Special Areas of Conservation (SAC). And lastly, the *Council Regulation (EC) No 1967/2006, of 21 December 2006*, concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, amending *Regulation (EEC) No 2847/93 and repealing*

*Regulation (EC) No 1626/94* prohibits the use of fishing gear such as trawling, seine or dredging on seabed that is home to maerl communities.

These formations add heterogeneity to the sedimentary bottoms where they occur and shelter numerous species of flora and fauna. Furthermore, they are used as spawning zones by many species of economic interest (fish, cephalopods and bivalves). The three-dimensional structure of maerl beds, with enough interstitial space, provides a wide range of niches that enable the settlement of many infauna and epifauna species. Moreover, being a natural source of calcium carbonate, they contribute to the regulation of the sea pH.

In the Mediterranean, maerl beds are generally found between 30 and 80 m deep, always in the photic zone. This type of algae experiences a very slow growth of 1-2 mm per year, so its regeneration and recovery capacities are low. This community is considered to be a non-renewable resource due to its very slow growth rate and its inability to sustain direct exploitation (Barbera et al., 2003[5]; Wilson et al., 2004[6]). Growing occurs mainly insummer and the growth rate is considered as a great indicator for climate change.

There are numerous anthropic pressures that are putting these marine habitats at risk, such as trawling, dredging, beach regeneration, coastal engineering works or aquaculture farming cages. Broadly, any activity with the potential of increasing the turbidity of the water, sedimentation and / or pollution can lead to the burial and destruction of this type of habitat.

Consequently, assessing the impact of increasingly abundant aquaculture activities on these natural communities is essential for a sustainable economic growth and to avoid irreparable damage to the seabed. To be able to assess accurately the impact of aquaculture on maerl communities and other vulnerable habitats, the seabed needs to be mapped. There is already a potential mapping of these habitats in the region as we can observe in *figure 7*. This map shows the predicted occurrence probabilities for maerl beds in the study area (Martin et al. ,2014[7]).

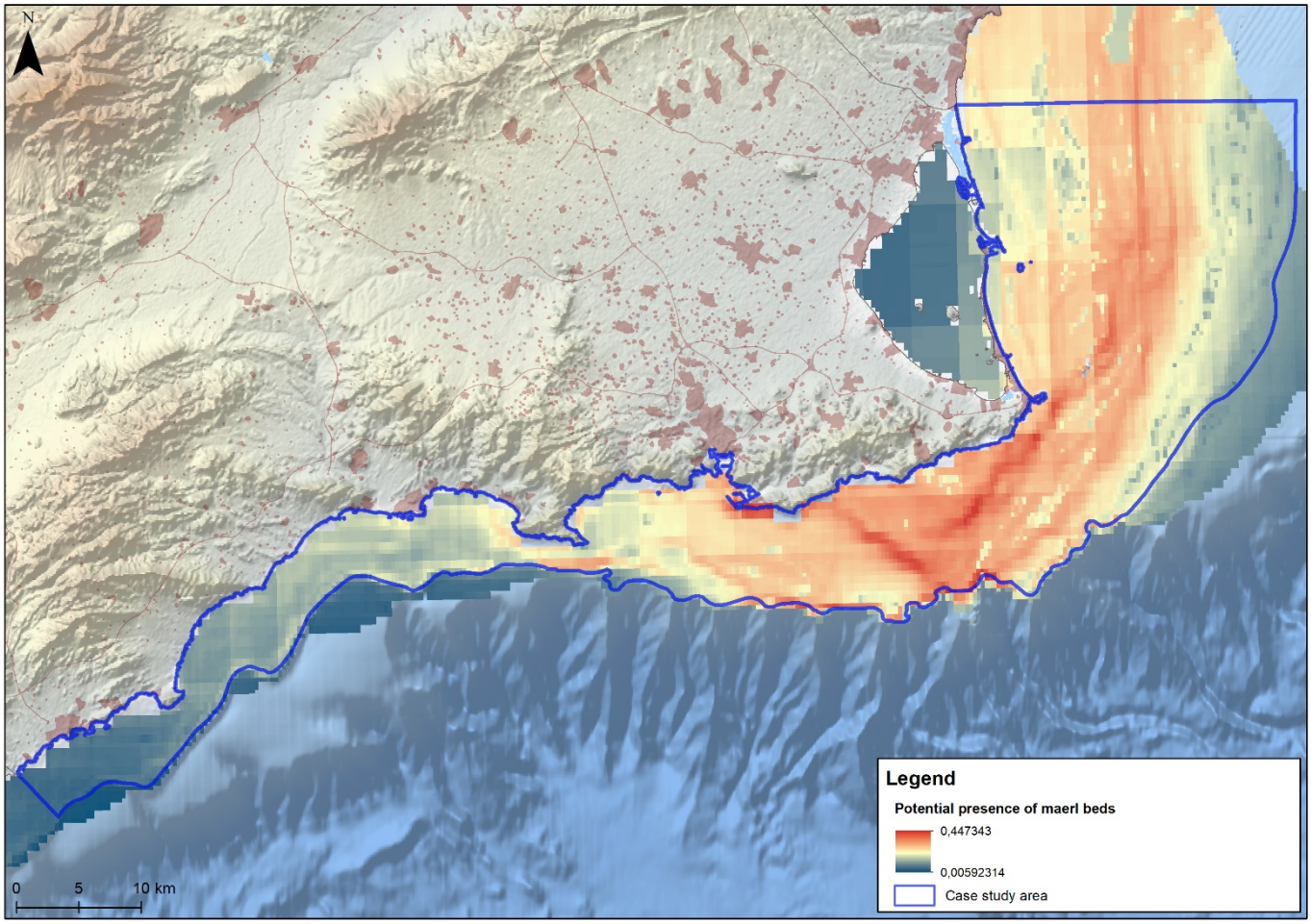


*Figure 7.Potential presence of maerl beds in the Region of Murcia. Source: Own elaboration. IEO, CSIC.*

The problem is that, in the same region, there is a high concurrence with other maritime uses and activities such as navigation of large commercial vessels, anchorages, military manoeuvres, etc. Additionally, there is presence of vulnerable habitats as seagrass meadows, maerl and coralligenous outcrops. Thus, the implementation of Maritime Spatial Planning is highly recommended due to the importance of analysing the compatibility between environmental conservation and aquaculture extension in the region and the existence of conflicts between the different activities and uses.

In this specific case, which is occurring entirely within Spanish jurisdictional waters, regional cooperation is a must and should be executed in a coherent and representative manner as the competence of planning and management of aquaculture is regional.

## Maerl beds and aquaculture interaction

As it is specified in the previous section, increasing aquaculture production in Murcia's jurisdictional waters is a priority in order to enable the economic development of the region. This

activity, however, involves possible harmful effects on the marine ecosystems that must be considered before, during and after the production process.

In order to evaluate the interaction between activities, the GIS data collected were used to overlap the layers of aquaculture and maerl beds distribution in the Region of Murcia. If the layers of the current farming cage facilities and potential maerl communities are superposed, it could be verified that there is currently an interaction between them. In this sense, and to avoid further consequences in these valuable natural areas, especially in a growing scenario of the aquaculture sector, it is important to take into consideration their vulnerability, the fact that these communities possess some mobility and the need of a buffering protection area, so the surroundings areas of the zones with the highest occurrence probabilities must be considered. In *figure 8*, it could be observed how the overlapping between these fragile ecosystems and fish farming areas turns even higher when we add the cartographic layer of the ZAPAC designed in the general Spanish MSP plan.

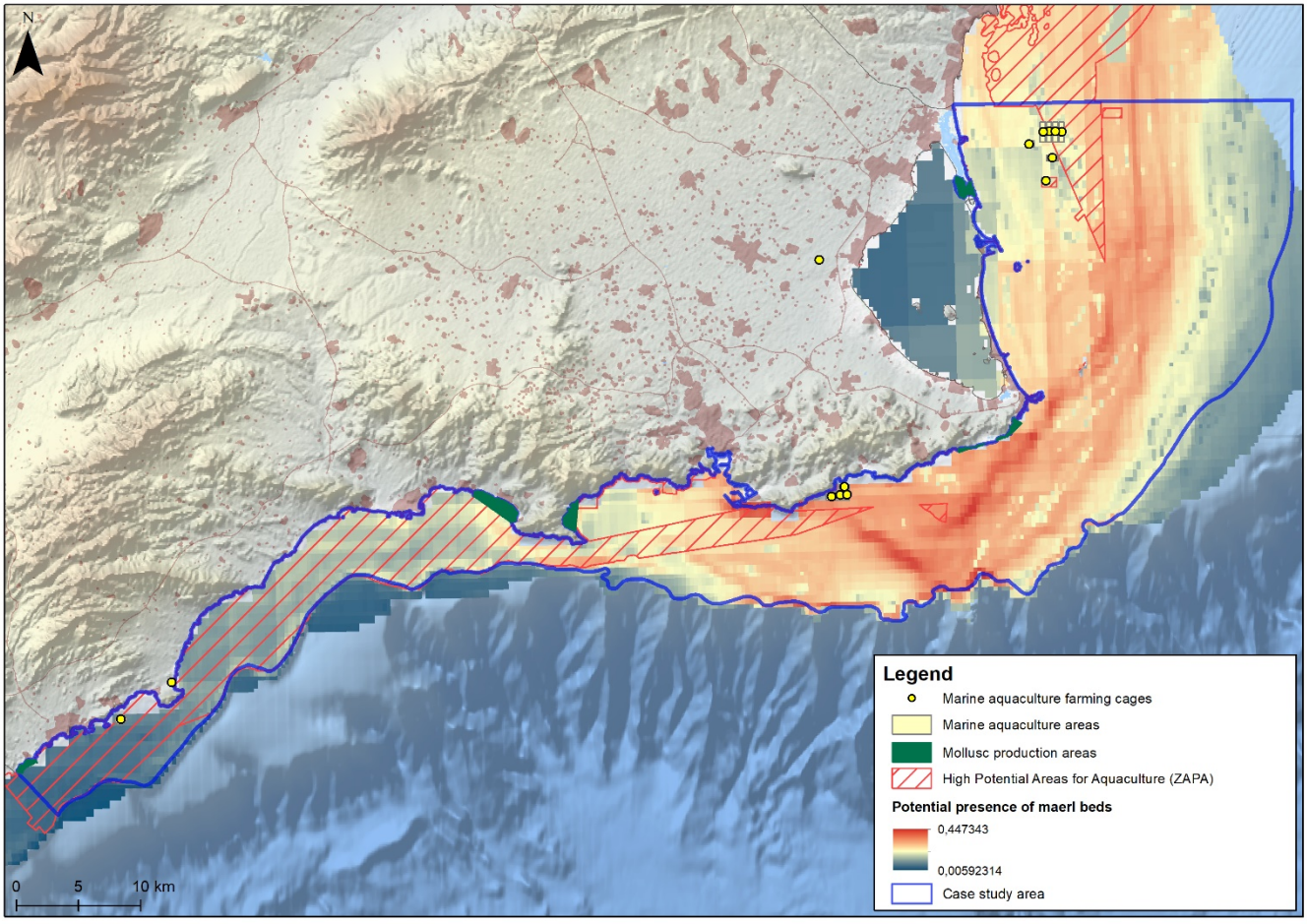


*Figure 8. Potential presence of maerl beds in the Region of Murcia, current farming aquaculture, mollusc production areas and ZAPAC. Source: Own elaboration: IEO,CSIC, with the GIS data used to the elaboration of the POEM provided by MITERD and the GIS data of the probability of presence of maerl beds from EMODnet.*

The fragility of the marine ecosystems and the conflicts between uses are the main reasons why all stakeholders were called upon to identify synergies, conflicts, and information gaps in order to draw up a serie of recommendations to improve the management and distribution of marine aquaculture and maerl seabeds, to ensure their long-term viability.

## Interested stakeholders

Given the context and in order to obtain reliable results of the case study, a workshop focused on the interactions between marine aquaculture and maerl beds was organized, in order to: (i) involve stakeholders in the analysis of conflicts, synergies and information gaps by the interaction of the topics; (ii) obtain some recommendations related to the interactions that could be used in the MSP national process by the competent authority if appropriate; and (iii) establish a dialogue at the regional and technical level between sectors.

For this purpose, the first step was a stakeholder mapping exercise to consider representatives of all the sectors involved in the uses and/or activities mentioned above in a technical, scientific and administrative way at a national and a regional scale, as it can be observed in the following diagram (*figure 9*).

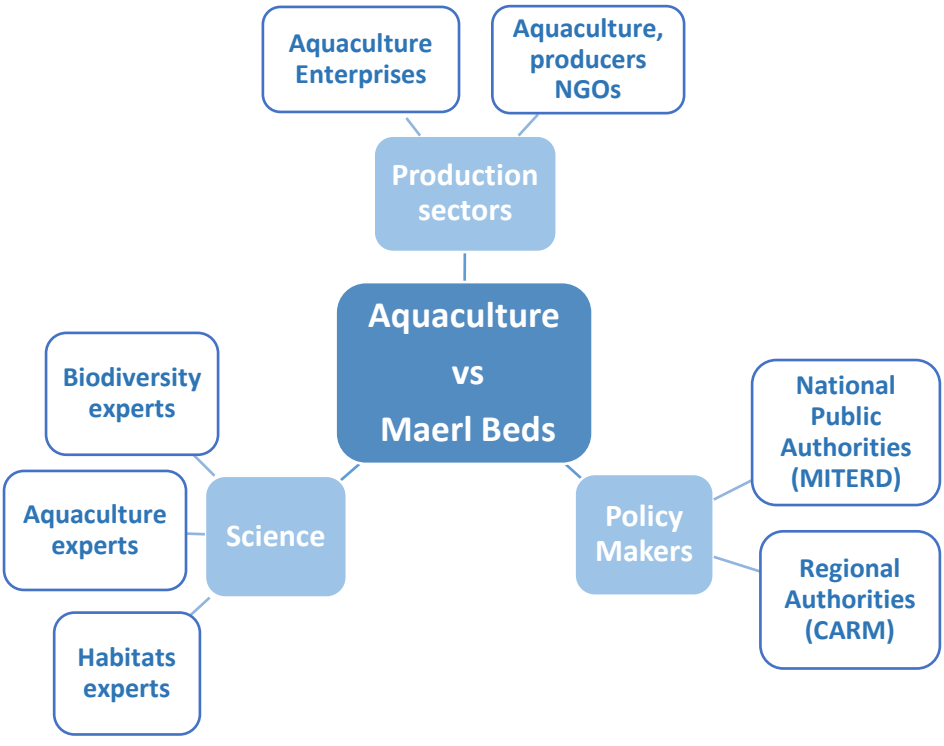


*Figure 9. Interested stakeholders for the topic of marine aquaculture versus maerl beds. Own elaboration: IEO,CSIC*

## Topic 2: Unregulated anchorages versus biodiversity conservation and Underwater cultural heritage

### Current situation

The Region of Murcia, located on the East Coast of the Iberian Peninsula, counts on an excellent weather practically the whole year round. This, together with the great gastronomy and the high quality of its marine waters, makes this place as an ideal vacation spot. Although the temperatures are mild during the whole year, it is during the summer months (July and August) when the highest concentration of tourists is registered, especially in relation to all the activities concerning the use of coastal and maritime areas. Thus, each summer, hundreds of boats arrive to Murcia's coast to enjoy its beautiful caves and landscapes, contributing to increase the income in the region. The problem is that numerous of these boats do not anchor in the designated areas. Therefore, the Good Environmental Status (GES) of the underwater ecosystems and the conservation of the underwater Assets of Cultural Interest (BIC, by its Spanish acronym) are put into risk.

The shallow and sheltered coastal sites usually concentrate the highest number of private boats moorings. Although these anchoring places should be regulated, they are often installed and managed without any control by the public administrations (either national, regional or local). In fact, according to the Coast Law (Lay 22/1988, of the 28th of July, of Coasts), in article 51.1 but further developed in art. 108.1: "*The activities in which, even without requiring works or facilities of any kind, attend to special circumstances of intensity, danger or profitability, will be subject to prior administrative authorization, and, likewise, the occupation of the Terrestrial-Maritime Public Domain with removable facilities or with movable goods*". But this regulation is often ignored.

One of the principal problems of the spontaneous selection of certain zones as anchoring places is that these areas are, often, of high interest for conservation since they host the optimal conditions for the development of seagrass meadows and other types of sensitive habitats and species. Apart from the risks for the seabed, these boats invade the beaches up to the shore, with the consequent danger for bathers (Cameáns, Manuel et al., 2009 [(9)]).

Inasmuch as most marine ecosystems and sea beds are largely unknown and it is, therefore, truly difficult to assess the real impacts that they suffer due to the terrestrial and maritime uses and activities, we do know, have information and, in some cases, cartography of some habits of community interests such as coralligenous outcrops, maerl beds and seagrass meadows. One of the habitats that may be more affected by the problem of unregulated anchorages are the seagrass meadows. To be more specific, the *Posidonia oceanica* meadows conservation is of particular concern. This underwater plant, endemic to the Mediterranean Sea has a coastal distribution and can be found from the surface until roughly 35-40 m deep, even deeper in case of very transparent waters. *P. oceanica* meadows constitute a habitat of community interest 1120, whose conservation is a priority; hence, it has been included in Annex I of the European habitat Directive.

Marine phanerogams face multiple threats nowadays. Apart from the anthropogenic pressures such as maritime and terrestrial pollution, coastal protection infrastructures, maritime traffic,

aquaculture, etc., climate change should also be considered as a transversal impact in order to evaluate the cumulative effects throughout the different marine ecosystems. Particularly, Posidonia survival is threaten by the future heat waves (Laura Guerrero-Meseguer et al., 2017[10]) and it is highly sensitive to hypersaline stress (Lázaro Marín-Guirao et al., 2011 [11]), also lead by a higher evaporation rate; factors that are likely account for the decline in leaf growth and shoot survival. Climate change alters ocean conditions which triggers the redistribution of marine ecosystem services that will surely affect, eventually, marine activities and societal value chains.

Seagrass meadows provide numerous ecosystem services crucial for coastal areas. One of the most valuable effects is the decreasing of water turbidity due to the reduction of the resuspension and the contribution to sediment retention which also leads to a minor erosion in coastal areas (E. Garcia et al., 2001[12]). For these reasons, the interaction between non-regulated anchorages and the conservation of these valuable habitats should be analysed.

On the other hand, the UNESCO Convention on the Protection of the Underwater Cultural Heritage states that "*The underwater Cultural Heritage (UCH) encompasses all those traces of human existence that are or have been underwater, partially or totally for at least 100 years and have a cultural, historical or archaeological character*". Spain ratified this Convention in 2009 through the publication in the BOE (State Official Bulletin) of the "Instrument of Ratification of the Convention on the Protection of the UCH, made in Paris on November 2nd, 2001", with the range of an international agreement, with which it acquires the commitment of protecting and preserving these goods. The Assets of Cultural Interest (BIC from now, by its Spanish acronym) are of great importance for the Spanish Heritage. The Region of Murcia treasures an important number of BIC, that must be preserved. Due to the relevance of this issue in the region, the National Museum of Underwater Archaeology (ARQUA), which has been included by UNESCO in the Register of "Good Practices of UCH", which stands out the actions undertaken to promote the protection and awareness in this topic, has been located in the city of Cartagena (Murcia). Numerous BICs have become a must for the underwater tourism in the area. Wrecked boats are one of the most sought treasures by the diving sector worldwide since, apart for diving into history, they harbour numerous species of flora and fauna that find there a shelter from the often-harsh living conditions of the marine environment. Murcia possesses numerous underwater treasures deserving of special attention. The knowledge of our coastal heritage must go forward through the elaboration of Archaeological Charts, cataloguing instruments that have been proven useful for both, terrestrial and underwater archaeological heritage. In fact, it would be highly recommendable the establishment of a National Underwater Archaeological Chart with the collaboration of every Autonomous Community (CCAA) (Ministry of Culture, 2010). Andalucía already possesses an updated and complete Underwater Archaeological Chart for its waters which could serve as a perfect example of good practices.

There is a general agreement, among experts in the field, on the need of creating specific protection figures for the UCH, because there are huge management differences with the terrestrial heritage. It is difficult to establish an effective protection due to, on the one hand, the

location in the middle of a harsh and changing environment that, in occasions, even hide the remains and, on the other hand, the technical difficulties for the surveillance and protection of the marine areas that would imply the allocation of means for this purpose and the coordination with the Security Forces and Corps, as well as the provision of specialists that corroborate periodically the good state of the archaeological remains. One of the most effective methods of protecting the UCH is the public awareness that would end up in a collaboration between the citizens and the public institutions for the protection through the reporting of illegal acts.

It has been proven that public access to UCH has a positive effect on the local economy. Raising awareness and education in the local communities would favour their involvement and participation in the protection of the heritage.

In order to address the problem of unregulated anchoring on UCH, it is important to highlight the initiatives that are already being implemented in different places. The most accepted method of avoiding the damage on natural and cultural goods is the installation of anchoring buoys that, apart from the protection of these environments, would prevent, as well, sediment resuspension that could affect the archaeological remains.

## Unregulated anchorages and biodiversity conservation interaction

The coastal area of Murcia is very dynamic. Multiple uses and activities coexist in a narrow strip. One of the most difficult issues that this hustle leads is that all these uses and activities must be performed without preventing the development of the rest of maritime uses and, at the same time, in a respectful way to preserve the fragile marine ecosystems.

The influence of boat anchoring on *Posidonia* meadows is tragical. Even light weight anchors (4-12 kg) used by small recreational boats (length < 9 m) destroy from 5 to 34 shoots during just one anchoring event. It is important to value that most recreational boaters (72% based on a study performed in Mallorca) support the use of mooring buoys and even the pay of a small fee (around 5 euros per day) to reduce anchor damage to seagrass meadows (Terrados, Jorge & Diedrich et al., 2012 [13]).

To better address the importance of solving the unregulated anchorage problem, we must pay attention, not only to the affection on the seagrasses itself, especially *Posidonia oceanica* mentioned above, but on the species depending on these biodiverse habitats. For example, the endemic *Pinna nobilis*, classified as Critically endangered (CR) in the IUCN red list (Kersting et al., 2019[14]) and catalogued in the Habitat Directive (Annex IV) as community interest species for which it is necessary a priority strict protection is severely affected by this unsustainable practice (Maite Vázquez-Luis et al., 2015[15]).

The issue of recreational boats anchoring in no-regulated areas is an increasing problem in the Region of Murcia. In *figure 10*, it can be observed how the most common anchoring points share space with the seagrass meadows within the case study area.

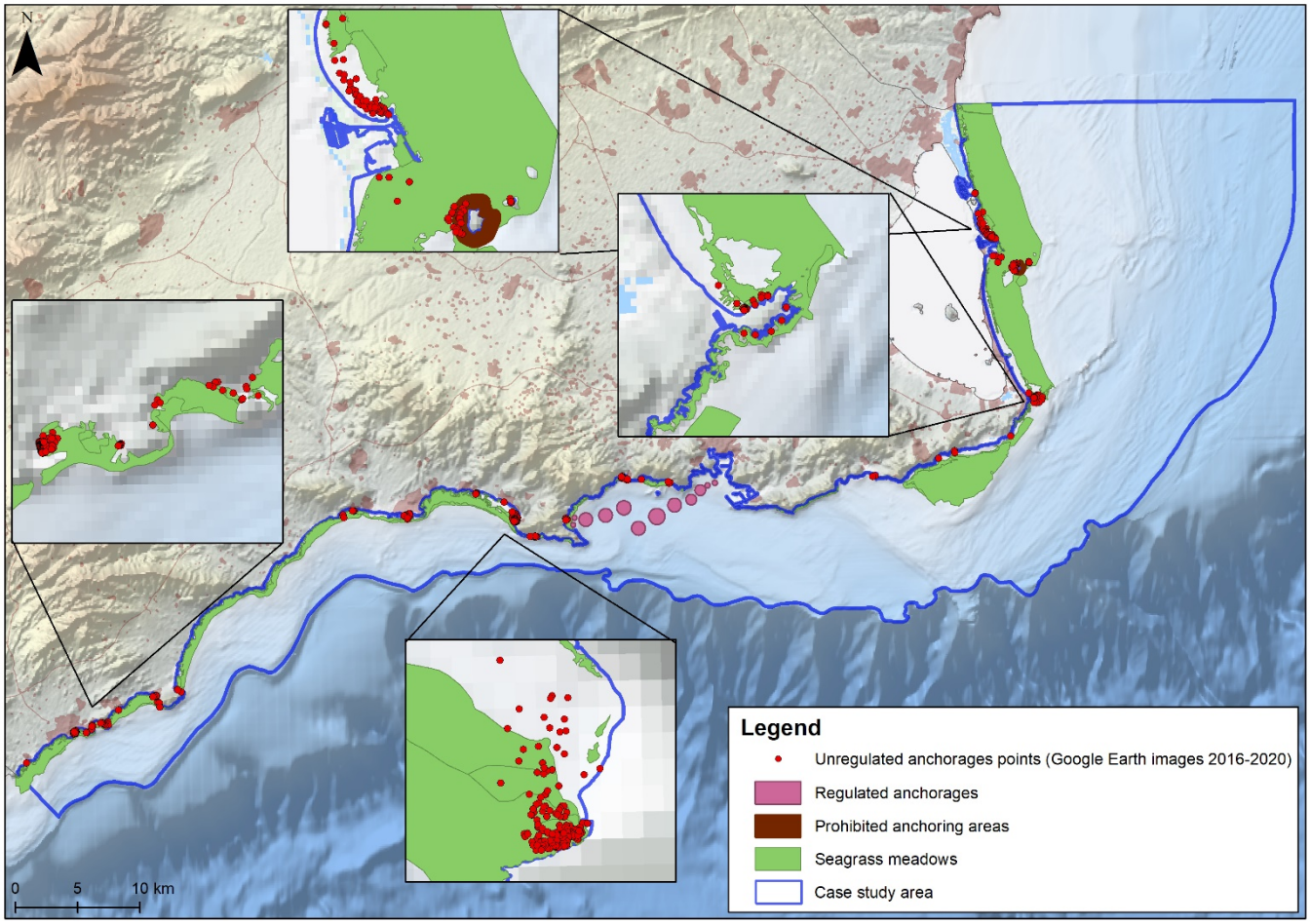


*Figure 10.Unregulated anchorages points obtained from Google Earth images taken between 2016 and 2020 (IEO(CSIC) data), seagrass meadows (IEO(CSIC) data), regulated anchorages and prohibited anchoring areas (MITERD data) in the case study of the Region of Murcia. Source: Own elaboration. IEO.CSIC*

## Unregulated anchorages and Underwater Cultural Heritage interaction

Unregulated anchorages constitutethen an important threat to the integrity of the underwater cultural heritage. Recreational boats are increasing year by year. Thus, it is vital to anticipate and solve this conflict before the damage becomes irreparable.

To be conscious of the magnitude of this issue, *figure 11* could be observed. Within this figure, the overlapping of anchoring sites and UCH protection areas is revealed.

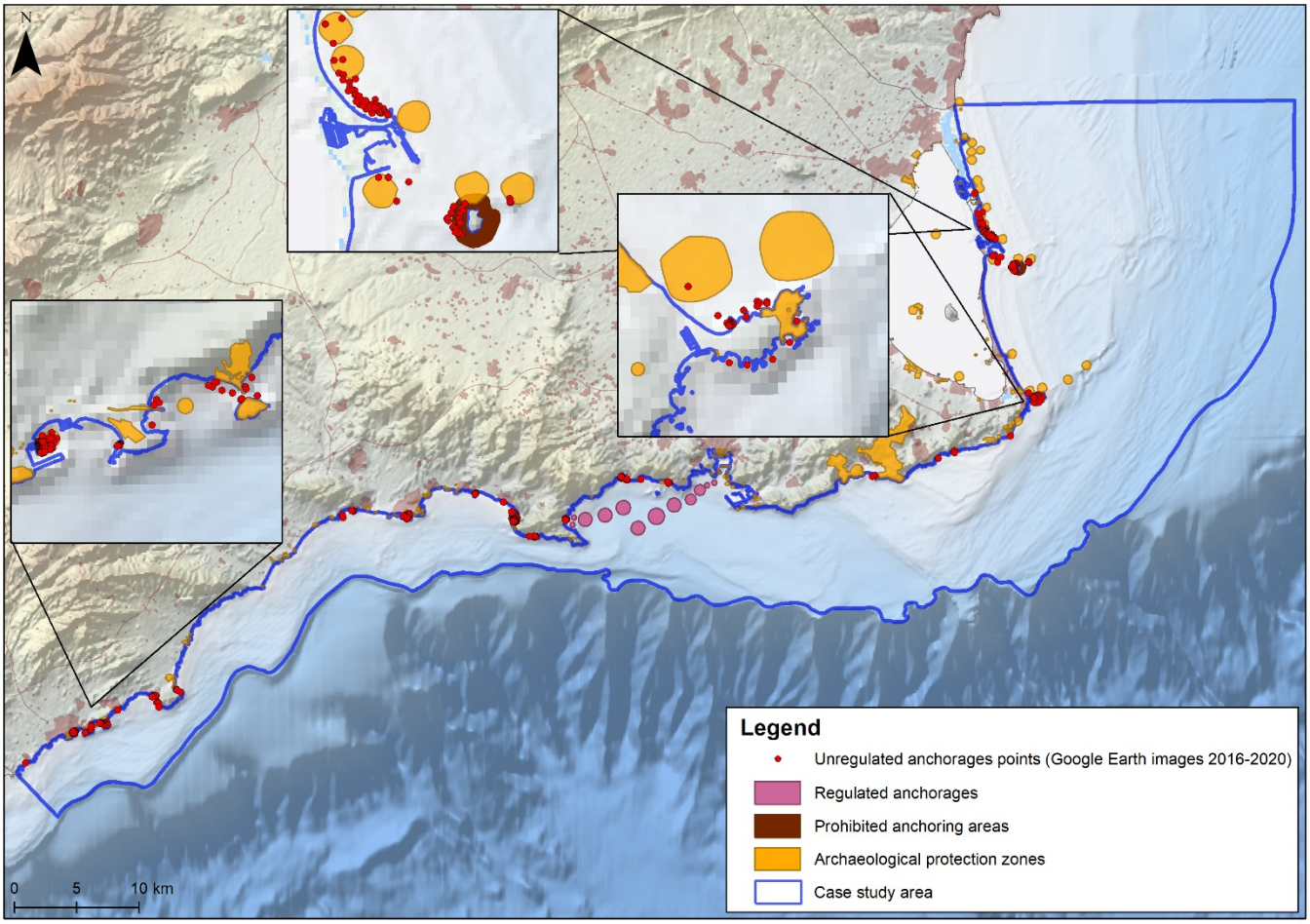


*Figure 11. Unregulated anchorages points obtained from Google Earth images taken between 2016 and 2020 (IEO(CSIC) data), regulated anchorages, prohibited anchoring areas and archaeological protection zones in the Region of Murcia (MITERD data). Source: Own elaboration, IEO,CSIC.*

## Interested Stakeholders

Under this multisectoral scenario, it is necessary to map all the interested stakeholders related to the recreational nautical sector, the marine conservation and the UCH, including the public authorities at different scales, to try to find a solution to stop this increasing and highly harmful activity. The summary of the stakeholders invited for the workshops is resumed in the next diagram (*figure 12*).

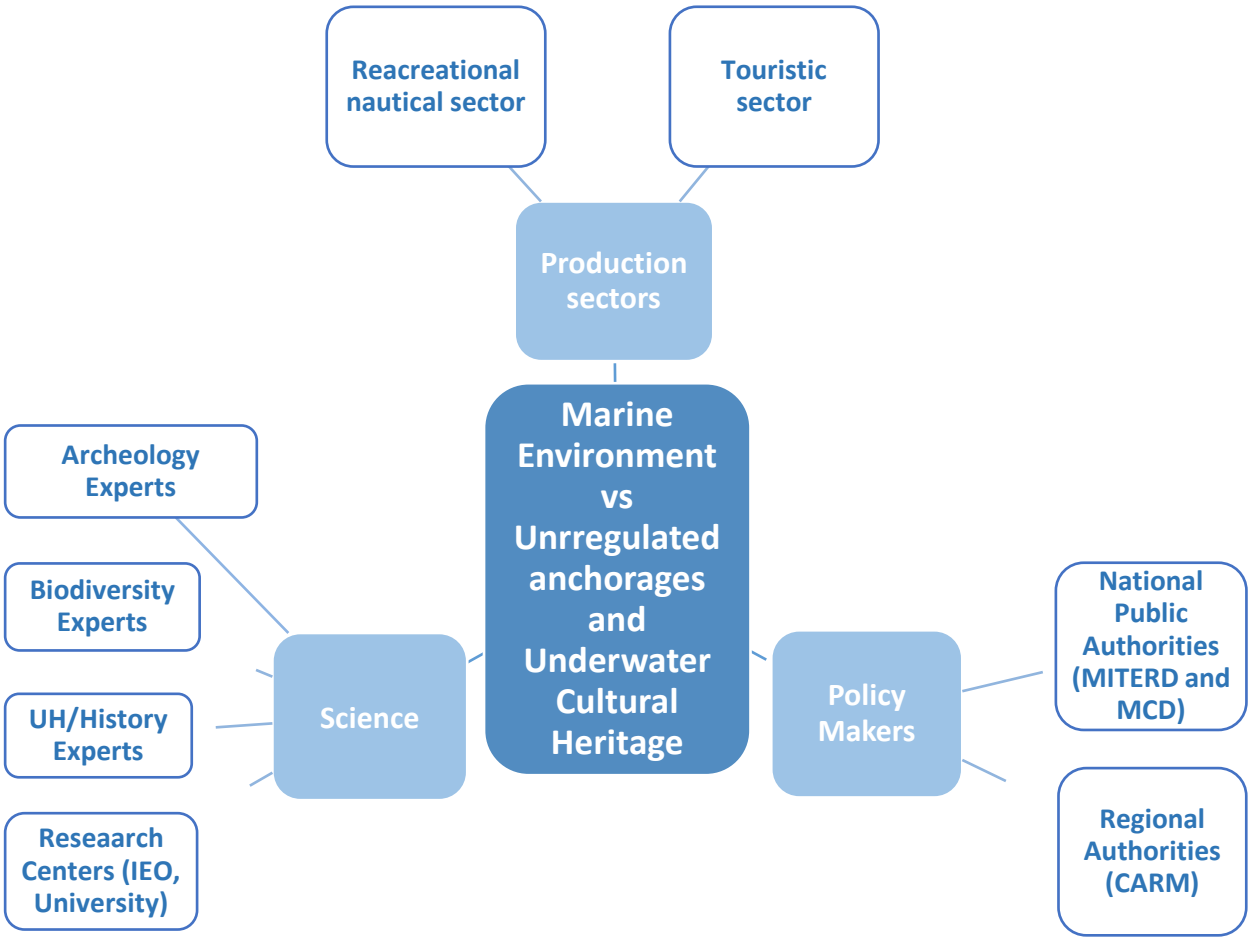


*Figure 12. Interested stakeholders for the topic: interaction of unregulated anchorages with biodiversity and UCH. Own elaboration, IEO,CSIC.*

## 3.3 – Workshops layout in the case study

In order to obtain better results from the analysis conducted for the case study, two participatory workshops were held with the sectors involved in the two selected topics These workshops were thought to bring together interested stakeholders from the different sectors involved, that present a spatio-temporal overlapping in the region. As it could be checked in the previous sections for both topics*("Interested Stakeholders")*, there were multiple stakeholders related to these topics.

It was crucial to keep in mind that governmental entities for decision making were invited from both, the national and regional public administrations.

The workshop focused on the interaction between maerl beds and marine aquaculture for the case study of the Region of Murcia, was discussed in a face-to-face format on the 27th of April, 2022. On the other hand, the workshop to analyse the interaction between non-regulated anchoring with biodiversity and UCH in the Region of Murcia was held in a face-to-face workshop performed on the 28th of April, 2022. Both workshops were held in the Oceanographic Centre of Murcia (IEO,CSIC).

The methodology and format of the workshops were the sameThe objective was to establish a dialogue among sectors from each topic in order to analyse the interactions and identify conflicts, synergies and information gaps in order to obtain recommendations that could be implemented in the framework of the MSP national process if the competent authority considers it appropriate.

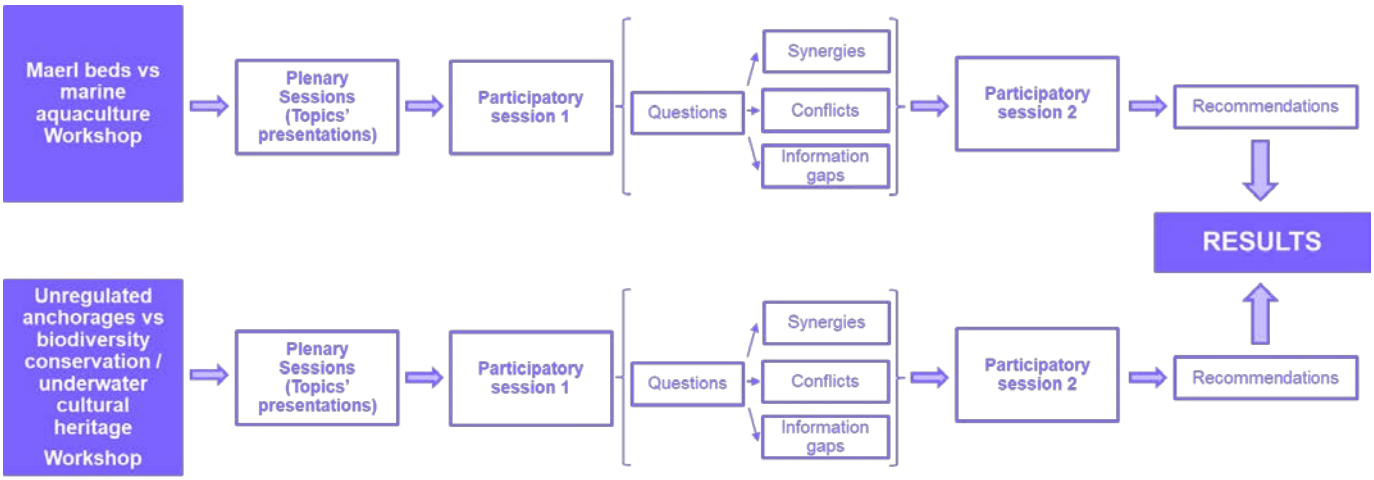


*Figure 13. Workshops methodology. Own elaboration: IEO, CSIC.*

The workshops were divided into two parts:

- Plenary Sessions
- Participatory sessions: 1 and 2.

**Plenary Sessions.** To start and contextualize the workshop, a plenary session was held to present the topics of each workshop. The objective was to introduce each topic in order to establish the context of the issues to be addressed during the participatory sessions. To this end, both workshops began with presentations of the case study of the Region of Murcia in the framework of MSPMED and a representative of the MSP competent authority from the MITERD, to frame the context in which the workshops had been organized within the scope of marine spatial planning. Subsequently, in each of the workshops, specific presentations were made by the sectors and/or experts on the topics that were selected.

**Participatory sessions:** The participative session 1 (PS1) was conducted to**:**

- Undertake a *post-its* session on the key questions prepared in advanced.
- Discuss and select conflicts, synergies and lack of information.

During this section, a moderator/facilitator helped to ease an adequate development of the process and to assure the equal participation of the partners; and a time manager/rapporteur made sure that all the questions raised were answered in time. For the *post-it* session, several cardboards were handled on the wall with one key question handwritten in each of them.

After reading the questions aloud, *post-its* were distributed to the participants so they could express their opinions, comments or points of view regarding each question by writing it on a post-it and pasting it on the corresponding carboard.

When the time was over, the facilitator led the discussion of the different answers to find common points and favour the debate. Right after, it was the time to classify the responses received for the key questions into three more carboards labelled as conflicts, synergies/opportunities, lack of knowledge. Recommendations were also found, although there was a specific section for this in the end of the workshop. The moderator and time manager/rapporteur figures were maintained for this phase. After that, more conflicts, synergies and lack of information were detected.

Once all these conflicts, synergies and lack of knowledge were collected and distributed in the proper cardboard, the first part of the workshop was concluded with the vision focused on the resolution of the conflicts detected and the possible solutions to deal with the lack of knowledge, which took place in the second part.

The participative session 2 (PS2) was conducted after a brief summary of the results obtained in the first part of the event and was divided into:

- *Post-its* session: Proposal of recommendations.
- Evaluation and validation of recommendations.

It was relevant to remind to all the participants that the common goal of the process was finding a way to achieve the sustainable coexistence between the marine environmental conservation and the aquaculture viability in a long-term, without risking the economic, ecological and social interests of the Region of Murcia.

Thereby, it was the turn of the most interesting part of the workshop, dedicated, on the one hand, to face the challenge of solving the gaps of knowledge by finding the way to compensate this absence and, on the other hand, to find solutions to the conflicts detected between topics of each workshop by delivering recommendations as a conclusion for the process.

The final reports of each workshop can be found in *annexes II and III*.

## 4. Results and conclusions

The analyses carried out in the case study have allowed to understand the real interactions of the topics of marine aquaculture, unregulated anchoring, underwater cultural heritage and biodiversity conservation in the context of a detailed marine spatial planning needed in the Region of Murcia. This has been obtained through the bibliographic review, the compilation of existing cartography data on the maritime uses and activities selected for the characterization of the case study area, the spatio-temporal analysis of the interaction between uses and activities of the selected topics and the identification of conflicts, synergies, and spatial demands through the active participation of the interested actors to obtain recommendations of interest for the MSP national process.

One of the main results obtained in the case study has been the need to establish an **effective participation process** of the actors involved that allows a dialogue in relation to the interactions between the sectors analysed. The collaboration between sectors and different public administrations is essential to perform an effective MSP plan in the Region of Murcia. The more useful and updated information of the area, the better decisions will be taken, hence, putting together all the actors involved at the different levels was considered highly recommendable to the development of the MSP plan of the levantine-balearic marine demarcation.

The workshops were thought to bring together interested stakeholders from the activities/uses that present a spatio-temporal interaction. In addition, responsible stakeholders for decision making were invited from both, national and regional public administrations. Firstly, it was necessary to assure that every person understood that the need of a blue planning is beyond question because of various reasons (Jan Kleine Büning et al.,2017[8]):

- It is likely that the spatial impacts grow.
- There is an increasing competence between uses and activities in the Region.
- There is an increasing of the intensity of the maritime uses.

Stakeholders of both workshops indicated that there was a need to **establish a dialogue** for discussing this kind of interactions at small scales, as well as the need to continue the dialogue in the future, in order to participate in the process of the levantine-balearic marine demarcation plans' updating. In this sense, and in connection with another of the main conclusions obtained, there is the need of a **better coordination and communication between administrations and sectors**. Some stakeholders expressed that it is necessary to establish common criteria for the sectors at the national level, as well as to improve communication between administrations and sectors, in order to favour accessibility to more detailed and updated information. There was a reflection about the need of improving this communication (among administrations as well as between the administration and the sectors) for the POEMs to reflect a realistic and agreed planning encompassing the criteria and the time frame considered.

Regarding each topic analysed, it was highlighted the need of differentiating in the POEMs and in the INFOMAR cartographic viewer between preferential areas and potential areas for the development of different uses and activities. It means also the need to **invest in science**, in order to **acquire high-resolution cartography**, especially habitat distribution, to be applied in the analysis of interactions between uses and activities and biodiversity conservation, that in the end, could define better the areas for each sector at-sea. In addition, it is highly important to take this into consideration for the monitoring programs of MSP plans.

Linking this to the MSP national process, there is a set of **measures** to be addressed during the period of validity of the plans that have been identified to improve the management of uses and activities.Some of them are directly related to the issues discussed in the workshops:

- **Measure OEM1:** The spatial analysis of accumulated pressures derived from the spatial concentration of certain uses and activities.

- **Measure OEM4:** In those areas where there is a high density of unregulated recreational boat anchoring, management plans for those anchoring will be drawn up, seeking solutions at the appropriate scale. Priority will be given to the management of this activity in: (a) areas of priority use for the protection of biodiversity and natural heritage, (b) especially protected areas declared for its benthic habitats or (c) areas of priority use for the protection of cultural heritage in those places where it is detected that this heritage may be at risk or (d) areas of high value for the conservation of biodiversity, especially due to their relevance for benthic habitats.

- **Measure OEM5:** Creation of working groups to address management issues in an adequate detail and scale. One of the questions that there groups will tackle is the anchoring of recreational boats and their interaction with vulnerable benthic habitats.

The main added value of the case study is related to the **recommendations** obtained to be considered in the national process, as one of the most important characteristics of the EU projects as MSPMED is the applicability of its results in the national processes of MSP. Also, the case study supported the process in terms of stakeholder engagement and awareness. Furthermore, it complied information and identified gaps of information to be considered in the next cycle of the POEMs. [(18)].

Specific outputs for each topic's workshops can be consulted in *Annexes II* and *III*.



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# ANNEX I: GIS Database

Down below, it is possible to find the table (*table 3*) that encompasses all the GIS layers utilized for the present Region of Murcia case study. These layers have been obtained from several sources that are listed in the table itself. In addition, a brief description of each layer is added.

Some of the layers utilized for the case study have been elaborated specifically for this purpose by performing some processing on the original layers stated. Below the table, there is a summary of all the processes followed to prepare the ones included in our study. Most of them have been created through GIS skills as buffering or the smoothing skill within the R software. The explanation below corresponds to those layers whose processes of elaboration required a deeper treatment.

In *table 1* only the final cartography used has been included. Previously, a huge amount of data coming from IEO(CSIC), EMODnet, different Ministries cartography and other sources was analysed. Data-layers including data from land-sea interactions was included. Nevertheless, in the final selection, these layers have been excluded due to the lack of relationship with the present case study that treats maritime uses and activities.

The most updated cartographic information available at the moment of the conducting this work, was used.



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*Table 3. Table 3: Selected layers used for the final maps of the Pilot case for maritime spatial planning in the Region of Murcia with respect to the habitat conservation. Source: own elaboration (IEO, CSIC).*

| Layer Name | Description | Reference |
|---|---|---|
| (*) Anchored recreational boats | File obtained from VMS data. This information is based on the presumption that at certain speeds, it is highly likely that the boat is anchored. This databased is from July and August, 2020. | IEO(CSIC) |
| (*) Coralligenous outcrops | Occurrence probabilities for coralligenous outcrops. | EMODnet |
| (*) Kinetic Energy-Currents | Kinetic energy at the seabed due to currents. | Own elaboration based on CMEMS MEDSEA_ANALYSIS_FORECAST_PHY_006_013 |
| (*) Kinetic Energy-Waves | Kinetic energy at the seabed due to waves. | Own elaboration based on CMEMS MEDSEA_HINDCAST_WAV_006_012 |
| (*) Longline coordinates | Longline coordinates extracted via AIS. | IEO(CSIC) |
| (*) LUSI | LUSI Index analysis in the region of Murcia. | Own elaboration based on layers as land uses, rivers, industrial uses, etc. included in this database. |
| (*) Maerl beds | Occurrence probabilities for maerl beds. | Emodnet |
| (*) Murcia study area | Coastline, regional limits, boundary of outer waters. | Own elaboration based on MITERD, Segura Hydrographic Confederation, EMODnet layers. |

| | | |
|---|---|---|
| (*) Purse seine coordinates | Purse seine coordinates extracted via AIS. | IEO(CSIC) |
| (*) Shipping density | Ships density and routes density (2019). | EMODnet-EMSA (European Maritime Security Agency) |
| (*) Shipping Routes density | Represent the routes density in 2019. Numbers 600 and 700 refers to the number of routes per km²/year. Obtained through an EMODnet raster. | EMODnet |
| (*) Ships anchored in unregulated anchorages | Boats anchored in unregulated anchorages 2017-2020. Google Earth images. | Own elaboration based on Google Earth images |
| (*) Trawling coordinates | Trawling coordinates extracted via AIS. | IEO(CSIC) |
| Aquaculture conditioned preferential areas | Aquaculture conditioned preferential areas: provisional future uses (December 2021). | ACUIVISOR - General Secretariat for fisheries and Competent Authorities of the Regions (MAPA) |
| Aquaculture facilities | Aquaculture facilities in Murcia (polygons and points) (December 2020). | ACUIVISOR - General Secretariat for fisheries and Competent Authorities of the Regions (MAPA) |
| Areas of Archaeological protection | Areas of Archaeological protection (polygons and points). | Marine Strategies, MITERD |
| Areas of Interest for Marine Crops (ZICM) | Areas that, due to their optimal conditions for such activity, are recommended for official protection. (December 2021). | ACUIVISOR - General Secretariat for fisheries and Competent Authorities of the Regions (MAPA) |
| Artificial Coastline | Artificial structures on the coastline of Murcia. | Marine Strategies, MITERD |

| | | |
|---|---|---|
| Artificial reefs | Artificial reefs in Murcia (polygons). | Marine Strategies, MITERD |
| Artificial Regeneration beaches | Artificial regeneration beaches within the Region of Murcia. | Marine Strategies, MITERD |
| Bathing areas | Bathing areas within the marine waters of the Region of Murcia. | Marine Strategies, MITERD |
| Bathymetry | Bathymetry of the maritime area of Murcia. | Eco cartography Murcia, MITERD |
| Bionomy | Posidonia (different conservation status), C. nodosa, Z. noltii, dead Posidonia and mixed meadows, maerl (rhodoliths), sand, non-studied area, circalitoral and/or coralligenous, infralitoral and mid-littoral beds, soft beds, detritic and sludge beds. | Eco cartography Murcia, MITERD |
| Cables and Pipelines | Cables and Pipes in the marine waters of the regions of Murcia. | Marine Strategies, MITERD |
| Coastal erosion | Coastal erosion line within the case study area. | Marine Strategies, MITERD |
| Desalination points | Municipalities desalination points within the Region of Murcia. | Marine Strategies, MITERD |
| Discharges into the public domain | Discharges made into the public domain in all hydrographic demarcations, both those authorized by the basin organizations and autonomous hydraulic administrations in the case of discharges into the public hydraulic domain, as well as discharges made from land | Censo Nacional de Vertidos, MITERD |

| | | |
|---|---|---|
| | to sea, according to the data provided by the regions. | |
| Discharge points | Discharge Points in Murcia from land to sea. | MITECO, MITERD |
| Diving spots | Diving spots in the Region of Murcia. | Marine Strategies, MITERD |
| Dredging points | Dredging in Murcia. | IEO(CSIC) |
| Drilling survey areas | Drilling surveys within the maritime area of Murcia. | Marine Strategies, MITERD |
| Land Uses | Land uses on the coastline. | Eco cartography Murcia, MITERD |
| Marine angiosperms | Seagrass meadows Atlas-Region of Murcia. Bionomic cartography. | General Directorate of the Environment - CARM / IEO(CSIC) |
| Military Areas | Areas with restrictions or occupied by military services within the marine waters in Murcia (polygons and points). | EMODNet |
| Mollusc harvesting areas (polygons) | Maritime, lagoon or estuary areas where there are natural banks or bivalve mollusc farming areas and where live bivalve molluscs are collected (December 2021). | ACUIVISOR - General Secretariat for fisheries and Competent Authorities of the Regions (MAPA) |
| Murcia seabed | Seabed bionomy through reflectivity. | IEO(CSIC) |
| Natura 2000 sites | SCIs, SACs and SPAs in the marine area of Murcia. | IEO(CSIC) |
| OSPAR | River pollutants and river nutrients. | Marine Strategies, MITERD |
| Population areas | Population nuclei within the coastal area of Murcia. | Marine Strategies, MITERD |

| | | |
|---|---|---|
| Port Public Domain | Port Public Domain 2021. | State Ports - Ministry of transport, mobility and urban agenda |
| Ports dredging | Dredging points in Murcia's ports. | Geoportal, MITERD |
| Potential aquaculture areas (2021) | Large areas in which marine aquaculture can be developed, according to general parameters and without considering current technical limitations (December 2021). | ACUIVISOR - General Secretariat for fisheries and Competent Authorities of the Regions (MAPA) |
| Potential conditioned aquaculture areas (2021) | Provisional aquaculture areas that may be limited by parameters, other uses or regulatory limitations (December 2021). | ACUIVISOR - General Secretariat for fisheries and Competent Authorities of the Regions (MAPA) |
| Preferred aquaculture areas | Preferred aquaculture areas: provisional future uses (December 2021). | ACUIVISOR - General Secretariat for fisheries and Competent Authorities of the Regions (MAPA) |
| RAMSAR | RAMSAR sites. | IEO(CSIC) |
| Registered anchorages | Anchorage sites designated by the competent authorities within the Region of Murcia. | Marine Strategies, MITERD |
| Sand extraction sites | Sand extraction sites (polygons and points). | Marine Strategies, MITERD |
| SPAMI | SPAMI sites. | IEO(CSIC) |
| Surface water bodies | Information on the status of surface water bodies - Water Framework Directive. | General Directorate of the water, MITERD |

| | | |
|---|---|---|
| Wrecked ships | Wrecked ships in the marine waters of Murcia. | Marine Strategies, MITERD |
| Beaches with anchoring area | Beaches with anchoring area. There is an updated version but the layer use for the MSP plan was the one from 2020. | MITERD Beach Guide 2020 |
| Limitations to aquaculture activities | Limitations to aquaculture activities. Information obtained by the review of management plans for Natural protected Areas. This layer may not be complete as there are spaces that have a management plan and that have not been analysed within the framework of the POEMs. | MITERD |
| Prohibited Anchoring Area | Prohibited anchoring areas in the Region of Murcia. | CEDEX, based on the Navigation Charts |
| Areas of high potential for port activity | Predictable ampliation of the Port Public Domain for the future. | State Ports-Ministry of transport, mobility and urban agenda |
| Anchorages | Anchoring points for all kind of boats (from oil tanker to recreational boats). | CEDEX, based on the Navigation Charts |

*Fields with asterisk (*) are detailed in the following paragraphs.*

### (*) Study Area of Murcia

To create this layer, the following data has been used:

- Coastline: Official data of Spanish coastline coming from National Geographic Institute.
- Limits with the regions of Comunidad Valenciana and Andalucía: The regional limit of the Segura hydrographic confederation for internal waters has been used; for external waters, this line has been continued until it intersected with the limit of the continental shelf.
- Limit of the external waters: This is not the official limit of the external waters but was accorded internally to extent the limit until the end of the continental shelf in order to include uses and activities that use this area. The EMODnet layer of continental shelf has been used.

### (*) Ship Density and Route density

AIS data are not easily available, some countries make them available publicly, some others grant access to selected users. In most cases, only terrestrial AIS data are available, as satellite AIS data are property of private companies, which have their own satellite constellation. As of 2019, there is no source that makes available free terrestrial and satellite AIS data for the whole of Europe. Therefore, it was decided to purchase a set of data from a commercial provider, Collected Localization Satellites (CLS) (https://maritime-intelligence.groupcls.com/), a French company specialized in space-based added-value products and services for maritime applications. The dataset covered the year 2017 for an area covering the Area of Interest (AoI) described above and included both terrestrial and satellite messages. CLS were given the coordinates of the vertices of the polygon corresponding to the AoI. A partial pre-processing of the data was carried out by CLS, based on a method agreed with the EMODnet Human Activities team.

- Ship density: Hours per square km per month
- Route density: Routes per square km per month.

### (*) Kinetic Energy-Currents

Kinetic energy at the seabed due to currents - Mediterranean (mean of annual 90th percentile).

Kinetic energy due to currents at the seabed in the Mediterranean Sea, mean of annual 90th percentile values between 2016 and 2018. Created using the CMEMS MEDSEA_ANALYSIS_FORECAST_PHY_006_013 monthly mean products, postprocessed to evaluate energy at 1m from the seabed 1/24-degree horizontal resolution (about 3.5 km).

Created by the EMODnet Seabed Habitats project consortium using E.U. Copernicus Marine Service Information.

Confidence in kinetic energy due to currents at the seabed in the Mediterranean. Values are on a range from 1 (Low confidence) to 3 (High confidence).

The confidence assessment considered factors such as:

- Quality of training data and methods used to construct the model.
- Temporal resolution.
- Spatial resolution

Detailed information on the confidence assessment in: Populus J. et al 2017. EUSeaMap, a European broad-scale seabed habitat map. Ifremer. http://doi.org/10.13155/49975

In Spain the confidence is 2.

**(*) Kinetic Energy-Waves**

Kinetic energy at the seabed due to waves - Iberian Peninsula, Macaronesia, western Med (mean of annual 90th percentile).

Kinetic energy due to currents at the seabed in the Iberian Peninsula, mean of annual 90th percentile values between 2016 and 2018 - Created using the CMEMS MEDSEA_HINDCAST_WAV_006_012 3-hourly products, post processed to evaluate energy at 1m from the seabed. 1/24 degree horizontal resolution (about 3.5 km).

Created by the EMODnet Seabed Habitats project consortium using E.U. Copernicus Marine Service Information.

Confidence in kinetic energy at the seabed due to waves - Iberian Peninsula, Macaronesia, western Med.

Confidence in kinetic energy due to currents at the seabed in the Iberian Peninsula, created by the EMODnet Seabed Habitats project consortium using E.U. Copernicus Marine Service Information.

Values are on a range from 1 (Low confidence) to 3 (High confidence).

The confidence assessment considered factors such as:

- Quality of training data and methods used to construct the model.
- Temporal resolution.
- Spatial resolution

Detailed information on the confidence assessment in: Populus J. et al 2017. EUSeaMap, a European broad-scale seabed habitat map. Ifremer. http://doi.org/10.13155/49975

In Spain the confidence is 3.

**(*) Maerl beds and Coralligenous outcrops**

The maps show the predicted occurrence probabilities for coralligenous outcrops and mäerl beds: values 0 and 10 correspond to the lowest and highest occurrence probabilities, respectively. Hence, the maps provide information about where the habitats are most likely to occur.

In order to create different layers which could represent the density, the pixels where the probability of occurrence was 25,30 or 40% were selected from the EMODnet original layers in the case of maerl. However, for the coralligenous, the pixels selected were those with probability of occurrence over 50%. Once these layers were obtained, an algorithm of smoothing was applied using R software in order to smooth pixel boundaries and outputs a vector layer with densities equal to or greater than 25, 30, or 40 for the first case and equal or greater than 50 for the second one.

Based on these occurrences and a starting set of 12 environmental variables, maximum entropy (Maxent) was used to model and predict occurrence probabilities. Please refer to Martin et al. (2014) for full details. Earlier versions of the models were presented in Task 1.3 of Giannoulaki et al. (2013). The predictive maps published in Martin et al. (2014) are based on a more extensive occurrence dataset and more finely-tuned models. Due to data limitations on species lists across the various component datasets, coralligenous outcrops and mäerl beds were each modelled as a whole, instead of modelling multispecific assemblages with distinct habitat preferences.

Coralligenous: Bathymetry, slope of the seafloor and nutrient input were the three main contributors to the model (combined contribution of 84.1%), whilst the remaining three predictors (euphotic depth, phosphate concentration and geostrophic velocity of sea surface current) had a combined contribution of 16%.

Maërl: Phosphate concentration, geostrophic velocity of sea surface current, silicate concentration and bathymetry were the four main contributors to the model (combined contribution of 83.6%), whilst the remaining three predictors (bottom salinity, euphotic depth and slope of the seafloor) had a combined contribution of 16.4%.

The work was financed by the Commission of the European Union (Directorate General for Maritime Affairs, DG MARE) through the “Mediterranean Sensitive Habitats” (MEDISEH) project, within the MAREA framework (service contract SI2.600741). Some of the work was also financed through the projects Coconet (FP7, Grant agreement no: 287844) and the projects Prin 2010–2011 (MIUR) and RITMARE (MIUR).

Geo-referenced occurrence records for coralligenous outcrops and mäerl beds across the Mediterranean basin were compiled as part of two international research projects (Mediseh and CoCoNET).

Spatial management measures for fisheries that are aimed at protecting coralligenous outcrops and maerl beds should not be based solely on the model outputs presented here; targeted ground trothing should be carried out so that informed decisions are taken.

**(*) Coordinates for Trawling, Purse Seine and longline fishing**

Points obtained via AIS data from IEO(CSIC). These points correspond to the location of the most representative fishing arts locations in the Murcia coast. All of them have been analysed and cleaned in order to represent the moment when they are fishing. In the case of the trawling vessels, fishing speed could range between 2 and 4 knots. In purse seine the average speed is between 0,5-1 knots and within the long-line vessels, the speed is 1,5 knots.

With this data, presence probability maps were done through a kernel density model.

There is an important lack of data related to artisanal and recreational fishing due to the lack of obligation of using an AIS system. Especially, the recreational fishing is growing faster so it is important to get the fishing effort of the region due to this kind of fishing.

**(*) Anchored recreational boats**

File obtained from VMS data. This information is based on the presumption that at certain speeds, it is highly likely that the boat is anchoraged. This databased is from July and August, 2020.

**(*) Ships anchored in unregulated anchorages**

Boats anchored in unregulated anchorages 2017-2020. Google Earth images obtained during the high season of these three years were used to elaborate the layer.

**(*) LUSI Index**

What this Index shows is the pressure of the territory on the coast, considering factors such as industrial zones, populations or agriculture, in addition to the hydrographic basin, it generates an index that can help you see the pressure that is being done on the coast (Flo Eva et al. (2019).

**(*)600_2019 and 700_2019 Layers**

These vectoral layers have been obtained through an EMODnet raster where all the boats that moved in our case study area during 2019 are represented. This information is based on the density of their routes and the objectives is to understand in which areas they move the most. Numbers 600 and 700 refers to the number of routes per km²/year. Thus, the polygon is showing the areas owning routes density over either 600 or 700 routes per km²/year.

# ANNEX II - REPORT OF THE TECHNICAL WORKSHOP ON THE INTERACTION BETWEEN AQUACULTURE AND MAERL BEDS

## Index






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# Acronyms

| | |
|---|---|
| AGE | General State Administration |
| AMP | Marine Protected Areas |
| AP | Preferred Areas |
| APC | Conditional Preferred Areas |
| CARM | Autonomous Community Region of Murcia |
| CCAA | Autonomous Regions/Communities |
| CSIC | Spanish National Research Council |
| DGBBD | General Directorate of Biodiversity, Forests and Desertification |
| DGCM | General Directorate for the Coast and the Sea |
| DGOPA | General Directorate for Fisheries Management and Aquaculture |
| DGPEM | General Directorate for Energy Policy and Mines |
| DM LEBA | Levantine-balearic marine sub-region |
| EIA | Environmental Impact Assessment |
| EMFAF | European Maritime, Fisheries and Aquaculture Fund |
| EMP | Environmental Monitoring Plan |
| EU | European Union |
| FAO | Food and Agriculture Organization of the United Nations |
| FARM | Federation of aquaculture producers of the Region of Murcia |
| GES | Good Environmental Status |
| IEO | Spanish Institute of Oceanography |
| JACUMAR | National Advisory Board for Marine Aquaculture |
| MAPA | Ministry of Agriculture, Fisheries and Food |
| MITERD | Ministry for the Ecological Transition and the Demographic Challenge |
| MSP | Maritime/Marine Spatial Planning |
| MSPD | MSP Directive |
| POEM | MSP Plan |
| R+D+I | Research + Development + Innovation |
| UA | University of Alicante |
| UM | University of Murcia |
| ZAP | High Potential Areas |
| ZAPAC | High Potential Areas for Aquaculture |
| ZIA | Areas of Aquaculture Interest |
| ZICM | Areas of Interest for Marine Crops |
| ZP | Potential Areas |
| ZPC | Potential Conditional Areas |
| ZUP | Priority Use Areas |
| WWF | World Wildlife Fund |

# REPORT OF THE TECHNICAL WORKSHOP ON THE INTERACTION BETWEEN AQUACULTURE AND MÄERL BEDS - Case study in the Region of Murcia

Wednesday, 27th April, 2022– 9:30 am– 17:00 pm

In the context of the MSPMED project, a participatory workshop was held with stakeholders to discuss the interaction between marine aquaculture and the conservation of maerl beds, as an analysis of the pilot case being developed in the Region of Murcia. Within this case study it is being analysed the current and future effects that aquaculture activity may have on the maerl beds. The aim of the workshop was to involve stakeholders from different sectors and administrations in the elaboration of useful recommendations for the process of Maritime Spatial Planning (MSP) in the Levantine-Balearic marine sub-region, which includes the Region of Murcia.

In order to tackle this problem, 17 participants from the sectors with possible interests in the study area were brought together: (1) Conservation, (2) Public Research Institutions/Universities, (3) Aquaculture sector and (4) Public Administration. The workshop consisted of several presentations on the topics to be addressed and two participatory sessions dedicated to the identification of possible synergies, conflicts and information gaps, in order to obtain final recommendations.

The participatory sessions enabled contact to be established between sectors, highlighting the need for dialogue with a view to improving monitoring and research, as well as the application of new technologies for the monitoring and protection of marine biodiversity and the improvement of marine aquaculture facilities and production systems.

# 1. Context

The Region of Murcia has one of the largest marine aquaculture productions at the national level and, at the same time, a high biodiversity in terms of habitats and species.

The success of marine aquaculture in this region is due to several factors, mainly the excellent quality of its waters in most of the area due to the absence of industrial discharges, the smooth physiography of its continental shelf and the technological improvements and innovation in the sector. The aquaculture sector in this region is constantly growing, thus favouring the economic growth of this autonomous community. In 2020, according to "*Spain's contribution to the strategic guidelines for a more sustainable and competitive EU aquaculture 2021-2030*"[1] there are 17 authorized establishments in the Region of Murcia and the Maritime Space Management Plan (POEM) of the Levantine-Balearic marine demarcation (DM LEBA), where the study area is located, has established new areas suitable for the development of aquaculture, categorising them as Areas of High Potential for Aquaculture (ZAPAC).

With regard to marine biodiversity, in this region it is possible to find highly biodiverse sea beds, with the presence of habitats of Community interest (in accordance with Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive) such as coral beds, mäerl beds or seagrass meadows. The mäerl beds or rhodoliths[2] (habitat 1110 of the Habitats Directive) constitute a habitat of great interest for the Region. They are made up of coralligenous red algae, essentially consisting of the species *Lithothamnion corallioides* and *Phymatolithon calcareum*. In the Mediterranean, these formations are found between 30 and 80 metres deep, always in the photic layer. These algae have such a slow growth rate (1-2 mm per year) that they are considered a non-renewable resource. They add heterogeneity to sedimentary bottoms and offer shelter to a multitude of flora and fauna species. They are also used as breeding and nursery grounds for many species of commercial interest.

The interaction between maerl beds and aquaculture activity can lead to the deterioration of these ecosystems, as the waste substances generated by aquaculture activities can increase the turbidity of the water and create, in turn, a layer of sediment on top of these beds with low mobility. These circumstances greatly hinder the photosynthetic activity of these algae, putting their

[1] "Spain's contribution to the strategic guidelines for a more sustainable and competitive EU aquaculture 2021-2030". General Secretariat of Fisheries (GGP), Ministry of Agriculture, Fisheries and Food (MAPA) (Government of Spain). (Not published, June 2022).

[2] During the workshop, the expert Alfonso Ramos Esplá, professor at the University of Alicante, emphasised the confusion between these two concepts, since mäerl refers to beds of rhodoliths of the species *Lithothamnion corallioides* and *Phymatolithon calcareum,* while the term "rhodoliths" encompasses other species.

survival at risk. According to potential mapping, there are several areas in the Region of Murcia where there is a clear interaction between marine aquaculture and mäerl beds. However, great research efforts are still required to obtain detailed information and mapping of the habitats and species present in the study area; therefore, it is still difficult to assess the real impacts and pressures caused by marine uses and activities on them.

## 2. Case study of the Region of Murcia

The case study in the Region of Murcia is framed within the MSPMED Project (*Towards the operational implementation of MSP in our common Mediterranean Sea*), co-funded by the European Commission (EC), and aimed at facilitating the implementation of the Maritime Spatial Planning Directive (MSPD) in the Mediterranean Sea.

In order to achieve the proper implementation of the Maritime Spatial Planning (MSP) in the Mediterranean Sea, the project develops case studies to address different issues that help to improve the implementation of MSP in specific areas of the Western Mediterranean. The IEO (CSIC) is carrying out a case study in the Region of Murcia to evaluate the interactions, synergies and conflicts between some activities and uses with the marine environment in order to establish recommendations that could be used to feed the national MSP process, whose final objective is the drafting of a Maritime Spatial Management Plan (POEM) for each of the existing marine demarcations in Spain.

This case study is framed within the Levantine-Balearic marine sub-region and analyses the waters of the Region of Murcia in a study area defined from the coastline to the level where the continental shelf ends (*figure 1*).

*Figure 1: Zoning of the Murcia Region case study in the MSPMED project. Source: Own elaboration, Spanish Institute of Oceanography, CSIC.*

# 3. Aim of the workshop

The aim of the workshop was to establish a dialogue between the sectors involved in the themes addressed in order to identify possible conflicts, synergies and information gaps (during a first participatory session) and, with this information, to obtain a series of recommendations (second participatory session) with the aim of, on the one hand, favouring a better spatial and temporal use of this study area, favour a better spatial and temporal use of this study area, which in turn allows for the short, medium and long-term coexistence of all these uses and, on the other hand, establish recommendations that could be useful in the Maritime Space Management Plan for the Levantine-Balearic marine demarcation, should the competent authority deem it appropriate.

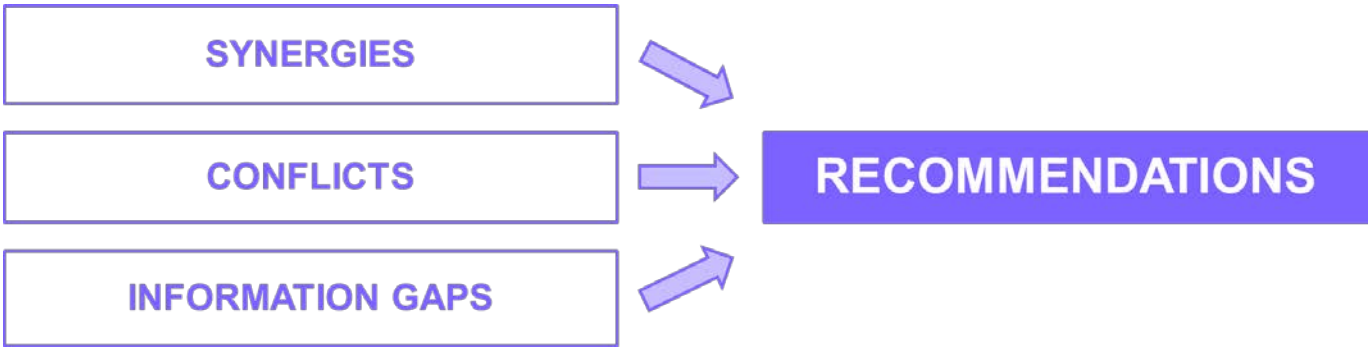


*Figure 2: Objectives of the Murcia Region case study workshop in the MSPMED project. Source: Own elaboration, Spanish Institute of Oceanography, CSIC.*

## 4. Welcome and introduction of the guests

María Gómez Ballesteros (IEO, CSIC) welcomed the guests to the workshop (*image 1*) and explained the agenda of the event (*annex I*). It was emphasised that this was not a decision-making process, but a participatory workshop in which the aim was to end up with a series of recommendations favourable to all the sectors, which would be passed on to the competent authorities, who would evaluate their consideration during the process of drawing up and updating the Maritime Spatial Plans.

The video MSP in a nutshell was played to facilitate the understanding of the concept of Maritime Spatial Planning by all attendees.

In addition, there was a brief presentation of the participants listed in t*able 1* of a*nnex II*.





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*Image 1: María Gómez Ballesteros, head of the marine environment and environmental protection area of the Spanish Institute of Oceanography (IEO, CSIC) welcoming the workshop on interaction between aquaculture and sea beds in the Region of Murcia, held on the 27th April, 2022. Source: Spanish Institute of Oceanography, CSIC.*

# 5. Presentations

In the first part of the workshop, different presentations were given in order to put all the attendees in context about the workshop final objective, the project within which it is framed, the process of maritime spatial planning in Spain and the current situation of the sectors participating in the workshop.

A total of five presentations were given, four in person and one remotely.

## *MSP in Spain and POEMs - Aurora Mesa Fraile (DGCM, MITERD)*

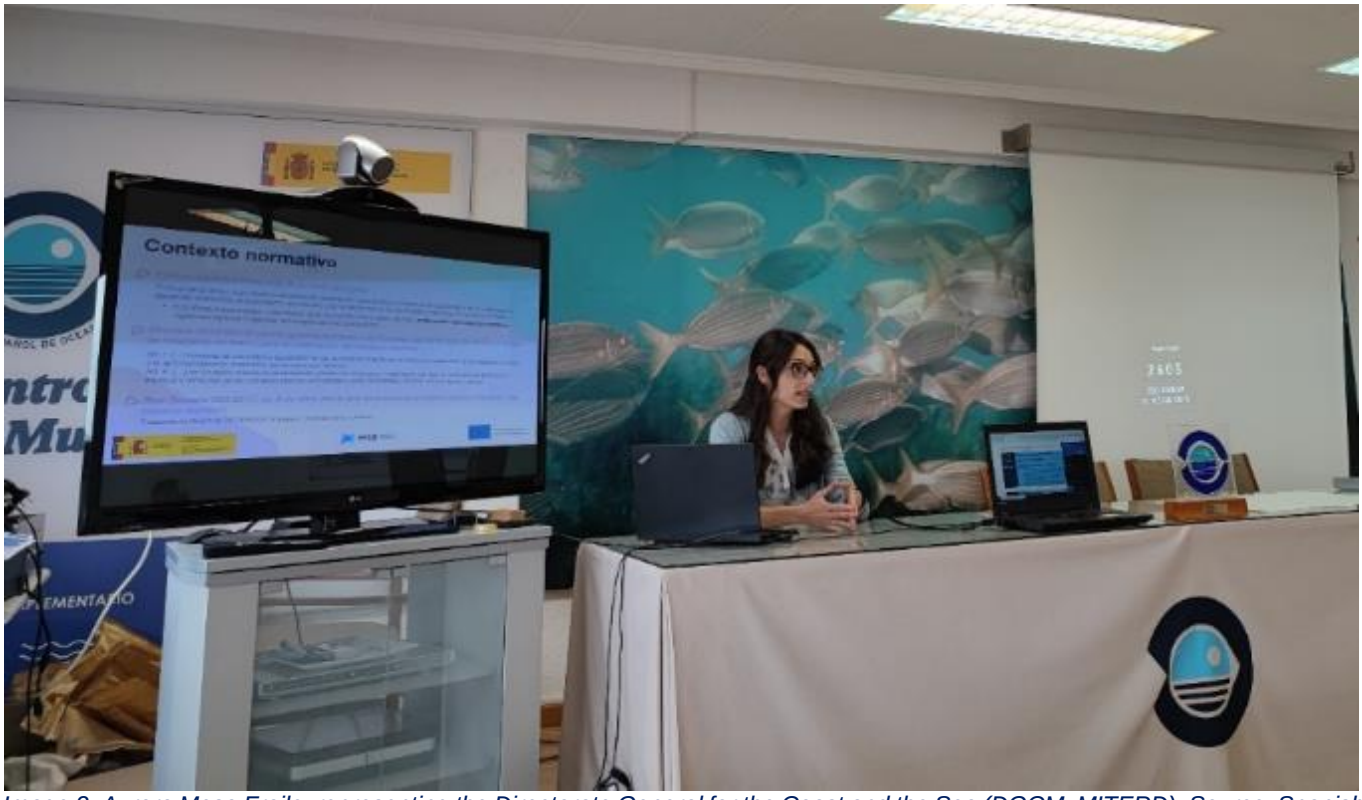


*Image 2: Aurora Mesa Fraile, representing the Directorate General for the Coast and the Sea (DGCM, MITERD). Source: Spanish Institute of Oceanography, CSIC.*

Aurora Mesa Fraile *(image 2*), representing the Directorate General for the Coast and the Sea (DGCM) of the Ministry for Ecological Transition and Demographic Challenge (MITERD) presented the status of Maritime Spatial Planning. She explained the legal basis of this process, which is part of the Integrated Maritime Policy of the European Union and is set out in Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning. This directive has been transposed into our legal system through Royal Decree 363/2017, of 8 April, establishing a framework for maritime spatial planning.

She also explained the process that has been followed for the elaboration of the POEMs, the chronology of working and their processing status, which are expected to be approved before the end of the year 2022. She indicated that the POEMs were in the phase of analysis and integration of the allegations from the public participation process required for the approval of these plans. The MITERD is aware of the fact that public participation had been lower than expected and planned at the time.

Aurora indicated the need for the MSP for the coexistence of uses and activities in the marine environment, which allows the maintenance of the Good Environmental Status (GES) of the

marine environment in accordance with Law 41/2010, of 29 December, on the protection of the marine environment. She explained that, for certain uses, specifically those considered to be priority uses and of general interest, Priority Use Zones (ZUP) are established. For those uses and activities that require a specific spatial location, High Potential Zones (HPZ) are established.

The structure of the POEMs was presented, which include five blocks:

Block I: Context and scope of application.
Block II: Guiding principles and management objectives.
Block III: Diagnosis of the spatial distribution of uses, activities and interests. The diagnosis is specific to each of the five marine sub-regions.
Block IV: Maritime Spatial Planning.
Block V: Monitoring of the Management Plans.

She also talked about INFOMAR, a geoportal where provisional cartography can be consulted until the final approval of the POEMs.

She then explained the place of aquaculture in the POEMs. The planning and management of aquaculture is an exclusive competence of the Autonomous Communities. The General Directorate for Fisheries Management and Aquaculture, through the Sub-Directorate for Aquaculture, Fisheries Marketing and Structural Actions (that belongs de the Ministry of Fisheries, Aquaculture and Food, MAPA), is responsible for coordinating regional aquaculture policy and participation in international organizations.

The National Advisory Board for Marine Aquaculture (JACUMAR) is the body for coordination and collaboration between the General State Administration and the Autonomous Communities with regard to marine aquaculture.

The interactions between aquaculture and other uses are specified in section III or diagnosis, for each marine sub-region. In order to analyse and consider the opinion of the different agents interested in this sector, consultation and public information processes have been carried out with councils, companies, associations, NGOs, etc.

With regard to the zoning of aquaculture in the POEMs, the informative cartography of the POEMs gathers the inventory of current uses (authorized establishments, declared areas of interest and shellfish production areas) and future uses (ZAPAC). The aforementioned ZAPACs, defined as “Areas of High Potential for the development of aquaculture”, have been defined on the basis of data provided by the competent authorities of the Autonomous Communities (CCAA), through JACUMAR. These areas include potential areas, conditioned potential areas, preferential areas and conditioned preferential areas. In turn, the regulatory cartography of the POEMs includes the ZAPACs (with its four typologies) as well as areas of interest declared by the Autonomous Regions (Areas of Aquaculture Interest (ZIA) and Areas of Interest for Marine Crops (ZICM)).





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It is important to know that, those ZAPACs that overlap with areas of priority use for the protection of biodiversity, caution must be taken to ensure that the installations do not jeopardise the conservation values for which the protected marine area has been declared.

Finally, specific measures for the aquaculture sector are included in the POEMs:

1. Declaration of areas of interest (CCAA).
2. Drawing up planning and management instruments for the declared Areas of Interest (ZIAs and ZICMs) (CCAA).
3. Actions related to spatial planning within the framework of *the Strategy for the sustainable development of aquaculture 2021-2030*, currently being drawn up (CCAA and the Directorate General for Fisheries and Aquaculture Management (DGOPA) of the Ministry of Agriculture, Fisheries and Food (MAPA).

## QUESTIONS

After the presentation, a round of questions was opened.

Óscar Esparza (WWF) began by asking when the Royal Decree approving the POEMs would be published and whether the issue of the war in Ukraine could affect these plans or not. Aurora Mesa (DGCM, MITERD) replied that they do not know exactly how long the administrative process will take, but that the approval will be during this year 2022 and she indicated that she had no information on how the war may affect this issue. Finally, Óscar Esparza (WWF) questioned if the POEMs and the areas specified in them as suitable for offshore wind development would repeal the previous plans or would be in conflict with the information contained in the 2009 document. Aurora Mesa (DGCM, MITERD) indicated that the 2009[3] document is repealed, as there is now better knowledge for the designation of areas suitable for windfarm development, which will be designated by the Directorate General of Biodiversity, Forests and Desertification (DGBBD) and the Directorate General of Energy Policy and Mines (DGPEM) of MITERD.

Antonio Belmonte (Federation of Aquaculture producers of the Region of Murcia, FARM) was struck by the ZAPACs shown on the map that Aurora had shown, as many of them, according to him, have zero potential of development. María Gómez Ballesteros (IEO, CSIC) indicated that those are potential zones, which does not imply that the whole area will be occupied with aquaculture uses. Aurora Mesa (DGCM, MITERD) indicated that the CCAA and JACUMAR (with information from the CCAA) established these zones, which are very large areas where the activity could be established. From these, preferential or conditioned preferential areas were mapped, in which interaction with other uses and their real potential are considered.

[3] Resolution of 30 April 2009, of the undersecretariat, ordering the publication of the joint Resolution of the General Secretariat for Energy and the General Secretariat for the Sea, approving the strategic environmental study of the Spanish coastline for the installation of offshore wind farms.



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Juan Manuel Ruiz (IEO, CSIC) pointed out that there is a misconception, because what cannot be carried out cannot be declared as potential, as is the case with the Cabo Tiñoso marine reserve or the SCIs in areas declared as ZAPAC.

Victoria Palacios (TRAGSATEC technical assistance to the SGP, MAPA, and representing JACUMAR), indicated that, in the definition of the inventory of future uses, two geographical scales have been worked on:

- Potential areas: broad areas in which marine aquaculture can be developed, according to general parameters and without attending to current technical limitations;
- Preferred areas: More restricted areas where exhaustive studies have been carried out or will be carried out and which are currently considered optimal for the development of aquaculture activity.

Antonio Belmonte (FARM) indicated that, if this information is lacking, it is not viable to approve these zones, as this could end up damaging the sector. As an example, he mentioned the strip declared as ZAPAC that goes from Cabo Tiñoso to Cabo del Agua. In all this strip we find depths between 200 and 300 m and high maritime traffic. It is not potential, it is unviable.

Additional post-workshop input:
General Secretariat of Fisheries (SGP, MAPA) specified in response to Antonio Belmonte question, that these zones have been defined with future aquaculture development in mind, including more possibilities, and including innovation in farming systems and technology that would make aquaculture activity feasible; for example, the selection of future sites in a climate change scenario, as well as offshore technologies. On the other hand, among the selection criteria applied when defining these zones, there is the bathymetry, whose cartography has been used when defining the potential zones of the DM-LEBA, which consider a range of 0-100 m, so the statement that the visualised zones are at 200-300 m is incorrect.

Lastly, the CCAA did not provide cartographic information on maritime navigation routes, as this information was not available for its incorporation into the process of delimiting potential and potential conditioned areas in the DM-LEBA. Maritime traffic separation devices (DST) have otherwise been excluded.

Juan Manuel Ruiz (IEO, CSIC) insisted that such a map cannot be considered even as something provisional because it is already known that in many of these areas the possibility of developing the activity is equal to zero.

Victoria Palacios (Tragsatec; SGP, MAPA) indicated that in the definition of the potential DM-LEBA areas for Murcia, certain parameters and criteria have been considered, some of which have not been transferred to the cartography as no information was available from the Autonomous Regions, and whose delimitation is provisional. This is the case of maritime traffic, which is considered an exclusion criterion. Thanks to the exercise undertaken in the framework of the POEMs for the compilation of information and the analysis of interaction between uses and activities, these aspects may be incorporated in the future.

María Gómez Ballesteros (IEO, CSIC) stressed the importance of confronting other uses and activities before approving areas such as these, because if this prior work had been done, certain areas would have been directly unlisted. One conclusion of this workshop could be this.

Alfonso Ramos Esplá (University of Alicante) expressed his doubts about the MSPMED project and its context. María Gómez Ballesteros (IEO, CSIC) explained the objective of the project and the pilot case studies. She explained that MSP is a new process for all EU Member States and, as such, it must be improved over time.

Alfonso Ramos (UA) expressed his concern if this is another process where work is done quickly and ineffectively just to cover the dossier. He hoped that, due to the early stage, this will not happen. María Gómez Ballesteros (IEO, CSIC) explained how the case studies of the MSPMED project are developed and why the case study of the Region of Murcia has been chosen. Aurora Mesa (DGCM, MITERD) also indicated that measures of the POEMs such as OEM7 (public participation) or OEM8 (on ad hoc groups) were added to try to create a process of continuous improvement, to improve the POEMs and the national process.

Óscar Esparza (WWF) asked, given that the project is ending up this year and that the POEMs are in the final processing phase, when and where the results of the workshop will be included. He asked if they will wait for the second cycle of the POEMs, scheduled for 2027. Aurora Mesa (DGCM, MITERD) indicated that these recommendations will be transferred to the MITERD and that, given that the POEMs are in the phase of integrating allegations, it will not be possible to include them in this first cycle.

## *Presentation of the MSPMED Project and the topic to be addressed - Elena Gutiérrez Ruiz (IEO, CSIC)*


*Image 3: Elena Gutiérrez Ruiz (IEO, CSIC) presenting the project MSPMED. Source: Spanish Institute of Oceanography, CSIC.*

Elena Gutiérrez Ruiz (*image 3*), member of the MSPMED project team of the IEO (CSIC) and organiser of the workshop, detailed the scope of the MSPMED project and briefly presented the MSP case study in the Region of Murcia with respect to habitats conservation, within which the present workshop on the interaction between aquaculture and mäerl beds is framed. She justified the choice of the themes selected within the case study and focused on how the workshop would be developed.

She explained that aquaculture has a high prospect for the future in the Region of Murcia, where it has been growing over the years, since the 1990s. The sustained growth of this sector has brought numerous socio-economic benefits to this region, which has become one of the major producers of marine fish at a European level. For its part, Murcia's maritime waters are home to an important natural heritage and a high level of biodiversity. One of the most valuable habitats in these waters are the mäerl beds, which provide numerous ecosystem services of incalculable value. The spatial-temporal planning of both activities is necessary to favour the coexistence between aquaculture activity and marine biodiversity conservation in the short, medium and long term.

Elena also briefly detailed the main objective of the workshop, which was dedicated to obtain favourable recommendations for all the sectors involved, identifying conflicts, synergies and information gaps beforehand. She stressed that this was not a decision-making process, but rather a process of suggestions to improve coexistence between the two uses over time.

## QUESTIONS

Questions time could not be opened due to lack of time.

### *Maerl beds, importance and vulnerability – Juan Manuel Ruiz Fernández (IEO, CSIC)*

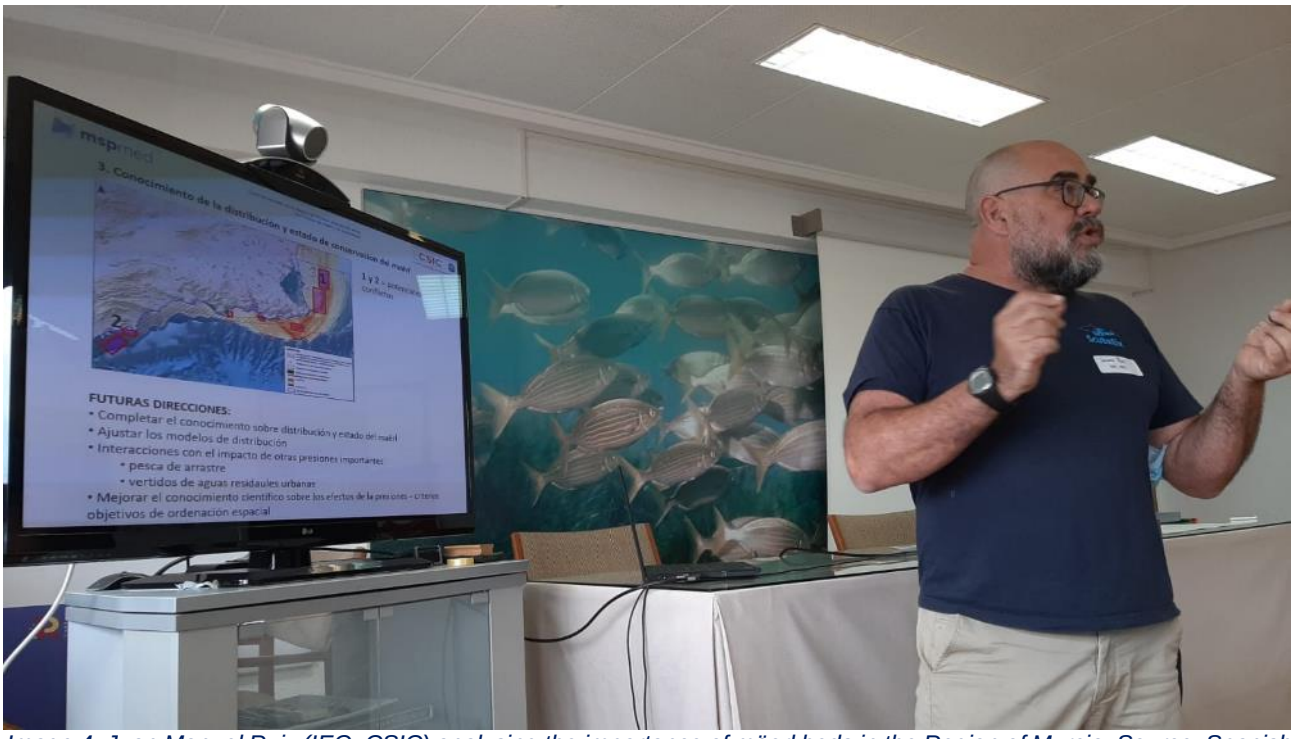


*Image 4: Juan Manuel Ruiz (IEO, CSIC) analysing the importance of mäerl beds in the Region of Murcia. Source: Spanish Institute of Oceanography, CSIC.*

Juan Manuel Ruiz (*image 4)* began by quoting a related scientific article highlighting the "scarce attention that the ecology of mäerl beds in the Mediterranean and Northeast Atlantic has received, in contrast to other marine communities, such as kelp forests or seagrass meadows"[4].

[4] Barberá, Carmen & Bordehore, Cesar & Borg, Joseph A & Glémarec, M. & Grall, J. & Hall-Spencer, Jason & Huz, Ch & Lanfranco, Edwin & Lastra, Mariano & Moore, P.G. & Mora, Jose & Pita, M.E. & Espla, Alfonso A. & Rizzo, M. & Sánchez-Mata, Adoracion & Seva, A. & Schembri, Patrick & Valle, Carlos. (2003). Conservation and management of NE Atlantic and Mediterranean maerl beds. Aquatic Conservation: Marine and Freshwater Ecosystems. 13. S65 - S76. 10.1002/aqc.569.

To understand the importance of the mäerl, it is essential to know what it is and where it occurs. Mäerl communities occur on sedimentary bottoms, to which they bring spatial heterogeneity. They consist of small (<10 cm), free-living, non-articulate calcareous red algae of the families *Corallinaceae* and *Peyssonnneliaceae*. These algae are slow-growing and form large (hectares) layers of living and dead biomass. Bathymetric distribution depends on water transparency. In the case of the western Mediterranean, they are usually found between 30 and 90-100 metres depth. They have a sparse and discontinuous heterogeneous distribution depending on environmental conditions.

As an example of the biological diversity of rhodoliths, in a single case study[5] carried out in the Region of Murcia over 18 months to study the effect of aquaculture farms on mäerl, 44 species were found; and, worryingly, it was found that all the mäerl under the farming cage disappeared, causing variations in the surrounding communities, as well. This habitat acts as a carbon sink and it is vulnerable to numerous anthropogenic pressures, including aquaculture. Mäerl beds are known to be very sensitive to sedimentation, especially to the presence of nutrients, which affects the physiological functions of the mäerl, an effect similar to that studied for seagrass meadows.

The diversity of mäerl at a global scale is immense, with more than 600 known species, although there is a great lack of knowledge on the subject.

With regard to the identification of current and potential conflicts between marine aquaculture and the conservation of mäerl beds in the Region of Murcia, it would be necessary to begin by completing the knowledge on the distribution and status of mäerl, as the models must be experimentally verified and adjusted to reality. In the case of our study area, there are known mäerl beds that do not coincide with areas of high probability of mäerl occurrence.

It is important to note that everything that it was said about mäerl could be applied to the study and protection of coralligenous beds and that aquaculture does not exert pressures in isolation; other pressures, such as dumping, must be considered in order to be able to carry out adequate planning.

## QUESTIONS

Questions time could not be opened due to lack of time.

[5] F. Aguado-Giménez, J.M. Ruiz-Fernández, Influence of an experimental fish farm on the spatio-temporal dynamic of a Mediterranean maërl algae community, Marine Environmental Research, Volume 74, 2012, Pages 47-55.

Felipe Aguado (IEO, CSIC), a remote participant in the workshop, added via email, a comment after the event:

"To the lack of knowledge of the location and conservation status of rhodolith beds in practically the entire Spanish coastline, little information on how aquaculture affects these beds is added. To the best of my knowledge, the only specific study carried out on the Spanish coast is the one mentioned by Juan Manuel Ruiz (IEO; CSIC) in his presentation[4], of which I am co-author. There are not many others worldwide. That study was published 15 years after it was carried out, and its data were obtained from a monitoring of the environmental impact of the experimental concession held by company X, prior to its final relocation from its initial location to the current one, which is precisely where the experimental concession under study was located. The conclusions of that study indicated the unsuitability of locating the farm so close to the rhodolith beds, based on the evidence of deterioration observed just below the farming cages with a very small production and that, in any case, the cage trains were positioned in such close proximity to the existing rhodolith beds, the trains of cages should have been positioned parallel to the coast, occupying a strip where the rhodolith cover was scarce and not very diverse between the lower limit of the *Posidonia oceanica* meadow and those rhodolith belts that were in an excellent state of conservation, maintaining a "prudential" distance between both biocenoses (at that time there was still no talk of "minimum distances/buffer zones").

During all this time, the company has presumably been carrying out the corresponding EMP (Environmental Monitoring Plan), and it would be very interesting to know how these PVAs were designed and the results of the EMP, particularly with regard to the rhodolith beds. I propose as a recommendation the possibility of requesting these EMPs from the company to see how the bottom has evolved over the years. I predict that with a sustained production over the last 10-12 years of more than 1,500 MT/year, the maerl beds must have disappeared. From the information obtained in these EMPS, relevant information could be extracted on the tolerance of this type of seabed to the impact of aquaculture, which would be useful for obtaining criteria for establishing the buffers (minimum distances) that were discussed at the workshop and are mentioned in this report".

### *Aquaculture and productive sector – Paloma Carballo Tejero, SG. for Aquaculture, Fisheries Marketing and Structural Actions. DG Fisheries Management and Aquaculture, MAPA - REMOTE*

Paloma Carballo began her presentation by talking about the institutional and jurisdictional framework of aquaculture, for which the CCAA have assumed the competences attributed to them by the Spanish Constitution in article 148 and have developed regulations for the direct management of the activity.

The General State Administration (AGE) does not have power over the direct management of aquaculture, but it does have it for the development and coordination of policies and strategies to promote the activity. JACUMAR is a body of the Ministry of Agriculture, Fisheries and Food set

up to facilitate coordination and cooperation on aquaculture between public administrations and the production sector.

Spain is one of the most important aquaculture producers in the world. In fact, in 2019, with nearly 300.000 tonnes, it was the largest producer in the EU. Although production has fallen in the last two years for various reasons, the value has remained stable, with a much less pronounced drop.

There is a wide variety of species cultivated throughout Spain, mainly in cages. If we look at marine and continental production data, Murcia represents 3.92% of the national total, but accounts for 20.77% of the total value of production. The main fish produced in this region are sea bass, bluefin tuna and sea bream.

As far as authorised establishments are concerned, Murcia has 6 recirculation tanks and 11 hatcheries or fattening cages.

Paloma explained the objectives of the *Multiannual Strategic Plan for Spanish Aquaculture 2014-2020*, whose objective 2 focuses on increasing aquaculture production through sectoral planning and the selection of new areas of interest. One of the strategic actions highlighted is the integration of Marine Spatial Planning (MSP) for aquaculture in Spain into the POEMs.

One of the strategic actions is the creation of specific documents for the Aquaculture MSP, where existing and future uses are included. The information handled by JACUMAR is provided by the CCAA.

The objectives of the MSP in the field of aquaculture are various and include strengthening competitiveness and job creation, the development of environmentally compatible aquaculture, implementing technological adaptations and the transversal concept of climate change, and contributing to the growth of the activity by streamlining procedures.

Following Paloma Carballo, Victoria Palacios, TRAGSATEC technical assistance to the SG. of Aquaculture, Fisheries Marketing and Structural Actions Fisheries Management and Aquaculture. MAPA took the floor to talk about the Inventory of authorised uses and the Inventory of future uses: potential zones (ZP), conditioned potential zones (ZPC), preferential areas (AP) (more restricted zones, in which exhaustive studies are being carried out, including the analysis of the interaction with other uses and activities, in order to carry out aquaculture activities in the short term) and conditioned preferential areas (APC).

In the Region of Murcia, a series of areas suitable for the development of aquaculture have been defined, based on the analysis of sectoral criteria of the different bodies and competent authorities consulted and their subsequent cartographic processing.

For the new *Strategic framework: 2021-2030* (until 2027 with the new European Maritime, Fisheries and Aquaculture Fund (EMFAF)), an extremely participatory work has been carried out with all stakeholders, including the aquaculture sector. The document is finalised and will be

available for public participation very soon. This plan complies with the premises of *the EU Green Deal 2019-2024*, using as pillars the "*Farm to Table Strategy*" and the "*Blue Growth Plan*".

For the new *Spanish Aquaculture Strategy 2021-2030*, 5 strategic objectives, 14 development guidelines and several challenges, such as environmental sustainability in the sector, have been established.

## QUESTIONS

Questions time could not be opened due to lack of time.

## *Rhodoliths beds – Alfonso Ramos Esplá (University of Alicante)*


*Image 5: Alfonso Ramos Esplá (University of Alicante) talking about rhodolith beds, importance and main features. Source: Spanish Institute of Oceanography, CSIC.*

Despite not being on the original agenda of the event, Alfonso Ramos, Senior Lecturer at the University of Alicante (*Image 5*), asked to make a brief presentation to clarify important concepts that would lay the groundwork for the discussion that would follow.

He pointed out that it is important to specify that talking about mäerl beds is a very specific concept because **mäerl includes only 2 species**: ***Lithothamnion corallioides*** **and**

***Phymatolithon calcareum***. It is more correct to name these ecosystems as rhodolith beds because all species are included.

Rhodoliths form a scarce and mosaically distributed habitat, highly vulnerable to anthropogenic impacts, which supports species such as octopus and alligator shark.

Rhodolith beds can be classified into mäerl and "praline" beds. There is a diversity of shapes (branched and laminar) and sizes among the different species, which can reach up to 10 cm.

Alfonso agreed with Juan Manuel Ruiz (IEO, CSIC) that it is a poorly studied habitat for which precision mapping is needed. It can be distributed in bands, patches or with homogeneous coverage. It is considered a rhodolith bottom if there is a minimum of 10% live thallus cover[6].

Larger rhodolith size is an indicator of low anthropogenic disturbance. They have little mobility; if they move and enter an unfavourable area, they die.

## QUESTIONS

María Gómez (IEO, CSIC) reflected on the relevance of defining the range of movement of the mäerl in order to define the protection buffer correctly.

Alfonso Ramos (UA) insisted on the complex distribution of rhodoliths, in very localised mosaics that form small patches of approximately 1 $km^2$ in a hectare, and agreed with the need for precision mapping to determine the mobility of the mäerl and calculate the protection buffer. He also explained the difficulty in differentiating mäerl beds from coastal detritic beds and stated that mäerl and coralligenous beds should be managed together, as coralligenous is often degraded mäerl.

Alberto Belmonte (FARM) was very pleased with Alfonso Ramos' explanation, as he resolved many doubts and insisted on the importance of reaching a consensus between all the administrations and research institutions on the definition as rhodolith beds when there is 10% coverage.

Alfonso Ramos (UA) explained that 10% has been agreed at the Mediterranean level, but that it would be necessary to reach a consensus at the national level and with the competent administrations.

[6] Basso, D., Babbini, L., Ramos-Esplá, A.A., Salomidi, M. (2017). Mediterranean Rhodolith Beds. In: Riosmena-Rodríguez, R., Nelson, W., Aguirre, J. (eds) Rhodolith/Maërl Beds: A Global Perspective. Coastal Research Library, vol 15. Springer, Cham. https://doi.org/10.1007/978-3-319-29315-8_11.

# 6. Participatory session 1

## *Post-its session on key questions and discussion*

During this section, participants were invited to respond to the key questions included in the working material, sent via email prior to the workshop. The questions posed were the ones that follow:

1. Why is the development of aquaculture necessary in the Region of Murcia and how important do you consider it to be?
2. Are you aware of the need for the conservation of the mäerl beds?
3. In your opinion, are there any logistical or methodological changes that could be implemented to reduce the impacts and pressures on the marine environment from aquaculture facilities?
4. Could there be a sustainable coexistence between aquaculture farming and the survival of the mäerl beds?
5. Is the current system of aquaculture production economically and environmentally viable in the long term?
6. How would an increase of aquaculture farms affect the surrounding marine ecosystems?

The participatory session was carried out using post-it notes (*image 6*) where each participant wrote their answers, which served as a basis for establishing a subsequent dialogue between the participants, and for identifying possible conflicts, synergies information gaps with respect to the topic raised in each question.

After allowing time for each of the key questions to be answered, the answers provided by the participants were read out loud and discussed. The cards with the questions and the different answers received are shown in *images 7, 8, 9, 10, 11 and 12.*



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*Image 7: First participatory session. Source: Spanish Institute of Oceanography, CSIC.*

**Question 1: Why is the development of aquaculture necessary in the Region of Murcia and how important do you consider it to be?**

| OBTAINED ANSWERS |
|---|
| It is just another economic sector. Market forecasting can contribute to decrease fishing pressure on the ecosystem. |
| Aquaculture is essential to provide protein from the sea (fishing is more limited). |
| Aquaculture is an alternative to extractive fishing that helps to reduce pressure on fish stocks. |
| It is important because it is a source of protein that makes more of the general public have access to this type of food. It is not necessary for Murcia, it is necessary in general. |
| Economic development of the Region. Need for sustainability for its long-term viability. |
| Aquaculture is an FAO and EU commitment as a source of animal protein. In the Region of Murcia, it is of considerable economic importance. |
| Because of the "potential" offered by its coastline and the opportunity to take advantage of the knowledge acquired during the development of this sector in the Region. |
| It generates wealth and expands, while maintaining leadership in a productive sector with great capacity for expansion. |
| It has a turnover 6 times more than the regional fisheries and generates approximately the same number of jobs. |

| |
|---|
| Because of its economic and social importance (size, employment it generates and has the potential to generate, etc.). |
| It cannot be separated from the development of the fisheries sector. A balance must be found. |
| Aquaculture represents an important economic sector in the Region of Murcia and has a social impact in terms of job creation. However, the growth and expansion of the sector must be sustainable with the conservation of marine ecosystems. |
| Aquaculture is among the primary production activities with the greatest potential for sustainable employment and growth. |

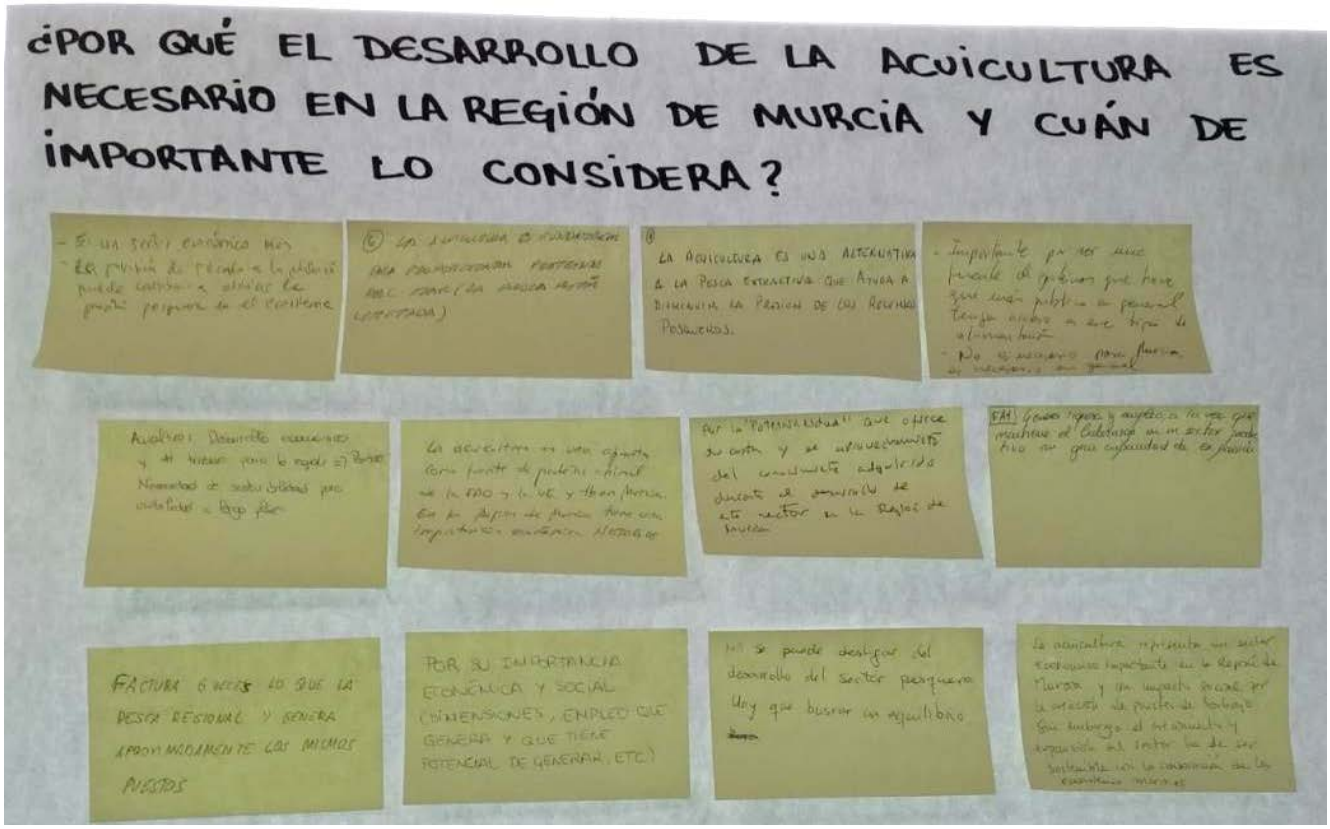


*Image 7: Answers to question number 1. Source: Spanish Institute of Oceanography, CSIC.*

María Gómez (IEO, CSIC) presented the need for scientific knowledge and mapping. R+D+I research in the aquaculture sector is essential to improve the sustainability of the sector and to carry out exhaustive studies of diffuse pollution, considering currents and other hydrodynamic factors. The IEO (CSIC) itself has an aquaculture plant for R+D+I in Murcia.

Antonio Belmonte (FARM) commented that, in relation to contamination, the creation of polygons to group production has been criticised a lot because, by accumulating biomass, pathologies increase. As for antibiotics, there is a health programme approved by the autonomous community. In the case of San Pedro del Pinatar (Murcia), there is a disease in sea bass, informally called "*San Pedro's disease*", for which the origin is not known, nor can it be eradicated.

Crops are being changed for this reason. It is true that there is a generalised use of antibiotics because diseases arise.

Alfonso Ramos Esplá (UA) indicated that the objective is to reduce antibiotics and increase vaccination at hatching level. He gave as an example a pilot case in Norway in which they have had very good results in salmon production with this method.

Aurelio Ortega (IEO, CSIC) said that antibiotics cannot now be used preventively. They require veterinary prescription and there is an exhaustive control; even so, their use must be continuing reduced and this is the general trend at present.

Felipe Aguado (IEO, CSIC) wanted to express his opinion remotely with regard to the development of aquaculture, saying that with the means currently available for the sector, things are being done quite well. In order to improve, a lot of investment is needed, which is very difficult at the company level because of the small difference between the price at which the product is sold and the costs of the current production system. He again cited the example of salmon, which has reached important levels of development and sustainability. He stressed the urgency of looking at other species and improving production systems. There are certain strategies with proven effectiveness in reducing the incidence of epidemiological episodes which, for example, in the Region of Murcia are very frequent and wreak havoc on production, such as having fish of a single age class or allowing fallow periods, among others. The path must be oriented towards the search for species that allow greater profitability and, in turn, increase the technology used in production.

**Question 2: Are you aware of the need for the conservation of the mäerl beds?**

| ANSWERS OBTAINED |
|---|
| Yes, but the lack or difficulty of access to a cartography of their distribution hinders their conservation. |
| Yes, conserving ecosystems and ensuring their good environmental status is essential to maintain the ecosystem services they provide for society as a whole and to make a sustainable use of marine resources. |
| Yes, it is a rare, fragile and vulnerable habitat. |
| Yes, as biodiversity conservation. |
| Yes, they are key marine ecosystems for their ecosystem services and functions, similar to those of angiosperm meadows, laminaria forests, etc. |
| Maerl bottom species constitute a habitat of Community interest, protected under the Habitats Directive. Conservation obligatory. |
| Confusion as to what mäerl beds really are. No specific protection status. |
| Yes, although it should be clarified whether a certain impact can be assumed on those sea beds with a lower proportion of rhodoliths; and if localised and limited impacts are acceptable. |

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| There is a need for greater awareness of the importance of rhodolith beds in general. Perhaps they are little known, as well as the interaction of different activities with them. |
| Yes, but there is a lack of detailed mapping to enable better knowledge and, thus, better management of the habitat. |
| Yes, but we do not yet know the real distribution of these seabeds and their conservation status. |
| Yes, although I am equally aware of the need to increase efforts to raise awareness and disseminate information about them. |
| Absolutely, but it is a complex issue because of everything that has been discussed: distribution, location (need for fine cartography), mobility (I think it is scarce, but it is not known with any accuracy), sensitivity, etc. |
| Absolutely. They are habitats that are home to a high biodiversity, breeding and nursery areas for commercial fishery resources and also $CO_2$ fixers, which is essential in the current context of climate change. |
| Yes, since these are sensitive communities that are highly vulnerable to impacts, mainly due to sediment clogging, increased turbidity, erosion and seabed alteration and climate change, among others. |

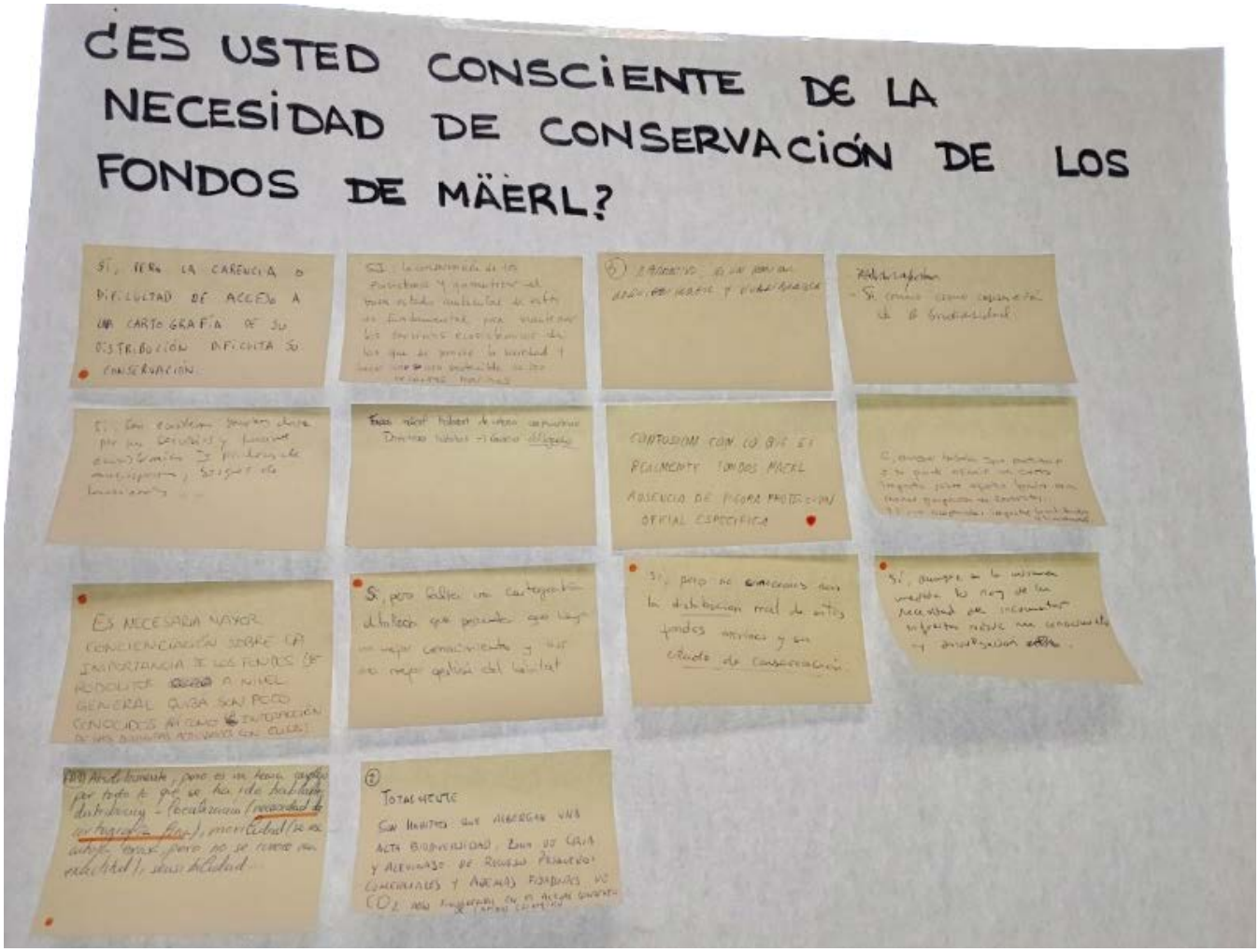


*Image 8: Answers to question number 2. Source: Spanish Institute of Oceanography, CSIC.*

Alberto Belmonte (FARM) insisted on the need for detailed cartography, but explained the difficulties in obtaining such cartography in certain areas, due to oceanographic conditions, depth, etc.

Alfonso Ramos (UA) expressed his belief that maerl and coralligenous beds should be managed together. Both form blocks and structures on soft bottoms. They are interrelated and there are intermediate substrates. It makes no sense to separate their management.

Juan Manuel Ruiz (IEO, CSIC) agreed on a joint management and persisted in the problem of lack of knowledge.

Alfonso Ramos (UA) explained that, in fact, from the administrative point of view, the maerl beds, included in habitat 1110: Sandbanks permanently covered by shallow seawater, and the coralligenous, which is part of habitat 1170: Reefs, should go together.

María Gómez (IEO, CSIC) explained that the shortcomings in the habitat classification of the Habitats Directive[7] are due to the fact that the Natura 2000 Network has been based more on the Nordic countries. Our habitat 1110, where the mäerl is included, would include all our beaches, which is unfeasible, as they cannot be protected. These habitats are therefore unprotected. The same types of habitats cannot be protected in the Mediterranean and in the Baltic. The same types of protection must be adapted to the different bioregions because, even within Spain, we have 3 marine bioregions that are very different from each other. Likewise, there must be coherence between neighbouring Member States in transboundary areas because species do not understand jurisdictional limits, but at the same time, the freedom of countries to adapt protection figures to the peculiarities of the ecosystems found in their maritime waters must be facilitated.

Alfonso Ramos (UA) highlighted the deficiencies in terms of marine habitat studies. He indicated that it is necessary the participation of experts on marine habitats and species in the Natura Network, in order to provide knowledge that will have an impact on European policies.

**Question 3: In your opinion, are there any logistical or methodological changes that could be implemented to reduce the impacts and pressures on the marine environment from aquaculture facilities?**

| OBTAINED ANSWERS |
|---|
| Increase efficiency in:<br>- Feed supply<br>- Waste management<br>- Structural maintenance<br>- Preliminary studies prior to location scouting |
| Yes. Precise knowledge of the distribution of vulnerable habitats (maerl, coralligenous, meadows) and scientific knowledge of the critical distances between these and aquaculture facilities. |
| Apply precautionary criteria. Do not base the detection of impacts only on the Environmental Monitoring Plan (EMP) because vulnerable habitats respond to pressures from thresholds, in a non-linear way. |
| Affirmative.<br>- Polycultures of filter-feeding invertebrates under cages<br>- Artificial reefs as biofilters |
| Precision aquaculture for improved feed supply (vision and/or acoustic technology), sectoral corporate commitment. |
| Formally agreed voluntary agreements with companies. |
| Yes.<br>- Maritime spatial planning<br>- PVA with focus on bottom effects. |

[7] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

| |
|---|
| - Use of new monitoring and tracking technologies<br>- Improved production systems |
| Yes, all derived from new marine environmental planning and protection tools that are being implemented and that need to be regularly reviewed and updated. |
| Improve waste management systems. |
| Existence of science-based adaptive management mechanisms. |
| Ensure adequate and coordinated scientific monitoring. More standardisation of monitoring data. |
| Yes, first in the Environmental Impact Assessment (EIA) phase, with an adequate characterisation of the seabed. Then with proper environmental monitoring of the impacts on rhodolith seabed communities.<br>Offshore aquaculture decreases these impacts. |
| Market tools and/or incentives that promote environmental commitments of the sector.<br>Promotion of good practices. |
| If they exist, it is essential that the information reaches the competent authorities (participation and fluid inter-administrative coordination, so that the different plans are adjusted to the true realities and existing advances. |
| Adapt production to the environment. Do not oversize structures. |
| Yes, and it is important that the EMPs and the monitoring of the installations should lead to good practices to reduce these impacts. |
| Implementation of technology for monitoring and control in concessions. |
| Establish not only zones but also global and local maximum production capacities. |
| At present I do not know them, and they are incompatible uses in the same area.<br>Investment in R+D+I and scientific studies is necessary to advance knowledge on how to reduce/avoid impacts. |
| Research is needed in both sectors.<br>Possible coexistence after research and implementation of aquaculture techniques that do not deteriorate the surrounding habitats. |
| New offshore farming projects (approximately 180 metres deep). This way, maerl would be avoided. |
| Aquaculture must continue to monitor and adequately manage interactions with habitats and species in the environment or potential risks associated with the introduction of exotic species and point sources of pollution, eutrophication and marine litter, localized reductions in benthic biodiversity or physical modification of the terrain. |

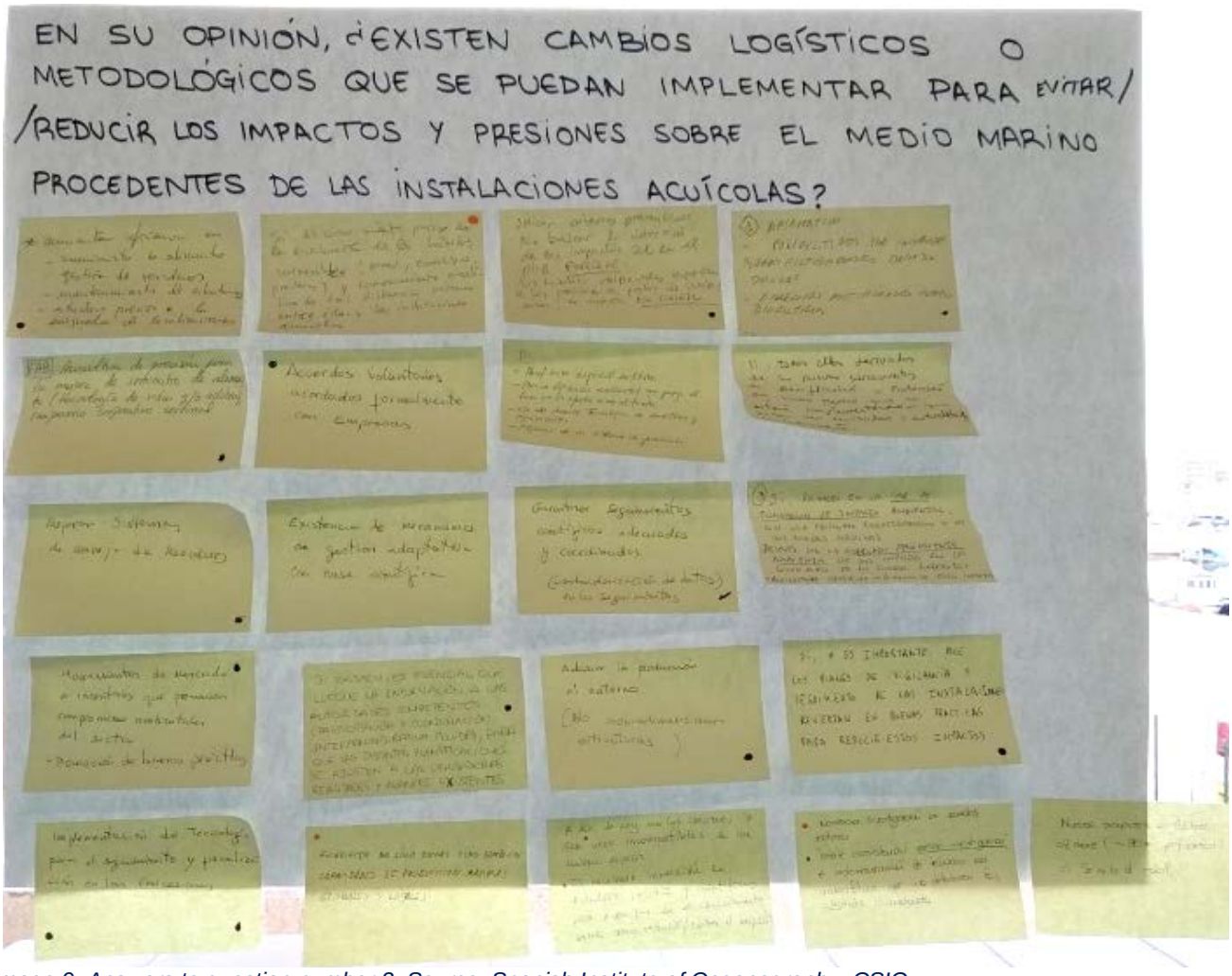


*Image 9: Answers to question number 3. Source: Spanish Institute of Oceanography, CSIC.*

All participants agreed that there is a general lack of information on this topic.

**Question 4: Could there be a sustainable coexistence between aquaculture farming and the survival of the mäerl beds?**

| OBTAINED ANSWERS |
|---|
| Yes, based on knowledge of the distribution of maerl communities and their tolerance to aquaculture impacts. |
| Yes, but impacts must be determined "in situ", as they depend on numerous factors: hydrodynamism, depth, distances, mäerl development, etc. |
| Yes, they can coexist as long as the dispersion of discharges and the distance to that community are considered. |
| Depends on the distance of the areas to the maerl beds (at least 500 m distance). |

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| Yes, depending on production model. |
| Prior comprehensive EIA, but with the current aquaculture production system this is not possible. Farms should not be located directly above the distribution area of mäerl. |
| No, it is impossible for conflict to coexist in the same area. |
| Yes, by guaranteeing buffers to protect the maerl's distribution. |
| I understand that up to a certain carrying capacity it would be possible, with spatial planning that avoids overlapping and maintains a distance threshold between the two uses based on scientific criteria. |
| I believe it is possible with an adequate location of the cages (avoiding their proximity to rhodolithic patches) and subsequently incorporating environmental monitoring and surveillance of the cages' impact on these seabed areas. |
| Of course, but well distanced from each other. |
| In the case of areas with the presence of habitats of community interest, the location of the new facilities on said habitats will be avoided as far as possible and based on the best information available.<br>Likewise, in the analysis of interactions addressed in the WG-Spatial planning of marine aquaculture, within the framework of JACUMAR, it is considered that aquaculture facilities should be avoided (exclusive criteria) on: Habitats and protected/sensitive species according to the applicable regional and national regulations.<br>In the particular case of Murcia, for the declaration of areas of interest for marine farming, and in the identification of preferred areas, suitable areas are considered to be those that are at a bathymetry of 30-35 m are at a distance >200 m. from the lower limit of distribution sensitive communities: *Cymodea nodosa*, *Posidonia oceanica* and *maërl*.<br>At sea, once the farm is operational, within the Environmental Surveillance Plan, communities of high ecological value must be monitored in the area of influence of the aquaculture facilities, such as *Posidonia* meadows or coral communities. |





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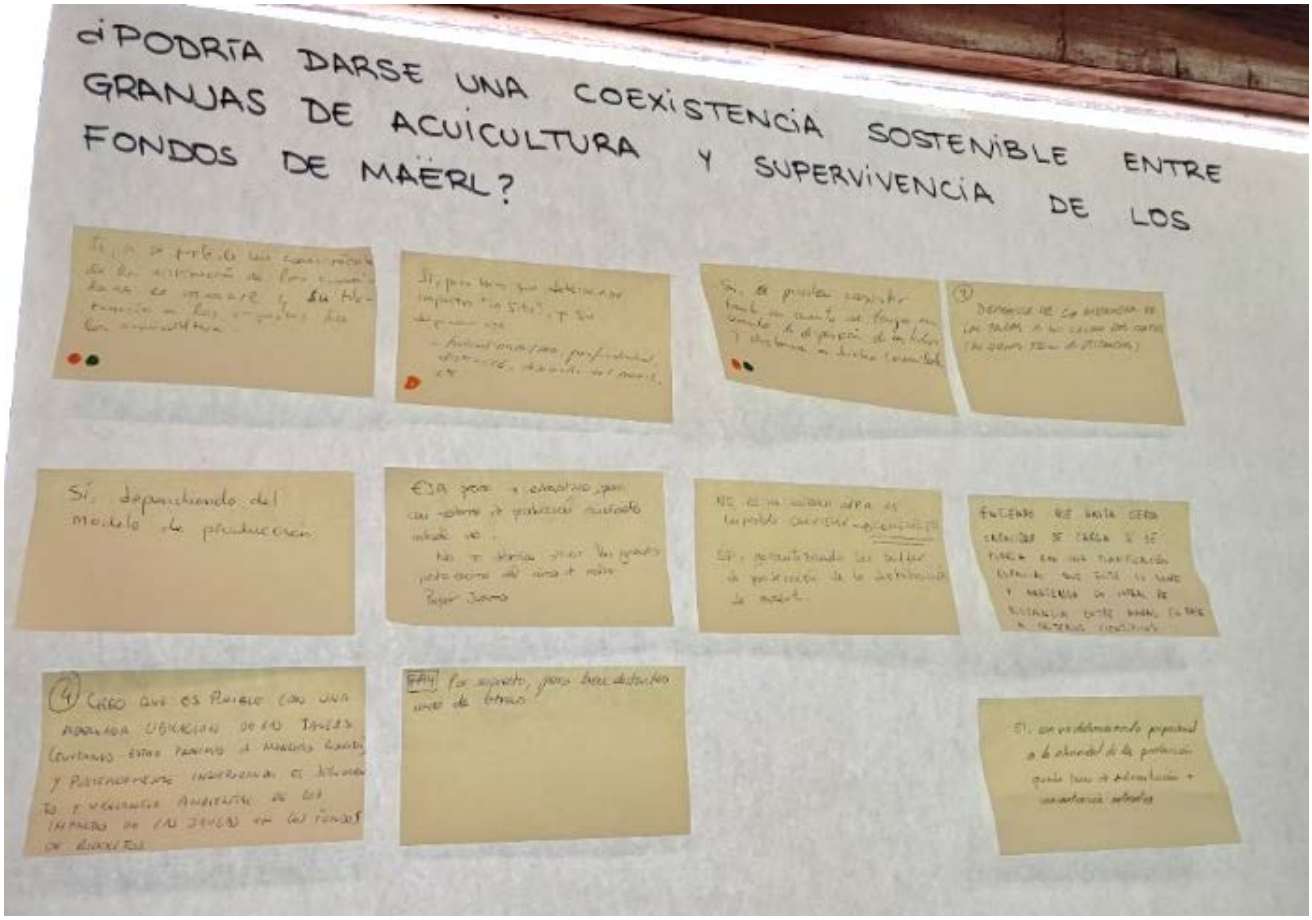


*Image 10: Answers to question number 4. Source: Spanish Institute of Oceanography,*

There was a fairly general consensus among the participants on the impossibility of spatial overlapping, but if adequate information and mapping exists, coexistence in the same area could be envisaged, always without exact spatial overlap.

Antonio Belmonte (FARM) was of the opinion that major studies need to be carried out. He argued that Environmental Monitoring Programmes (EMPs) have concluded that maerl is not affected beyond 100 m, but it varies from site to site, depending on hydrodynamics. Therefore, different criteria should be applied for each area,

Carlos García Alonso (Autonomous Community, Region of Murcia, CARM) explained that he understands that establishing a minimum distance is useful to have a common rule to apply.

María Gómez (IEO, CSIC) agreed with Carlos and advocated the precautionary principle, although she stressed that more research is needed.

Alberto Perán (FARM) agreed with Antonio Belmonte that the buffer should be evaluated for each installation. He gave the example of the Canary Islands where, for each *Cymodocea nodosa* meadow, the appropriate buffer is being studied.

**Question 5: Is the current system of aquaculture production economically and environmentally viable in the long term?**

| OBTAINED ANSWERS |
|---|
| The production system is continuously evolving to increase its sustainability. These are not radical changes, but necessary improvements that make it more sustainable. |
| Not environmentally, if its impact on the environment and biodiversity is considered. Economically, I do not know. |
| No, growth trends must set clear limits. |
| It can be feasible if measures are taken to reduce environmental impact (no antibiotics). |
| Not feasible because there is no mapping of marine habitats and their location is not appropriate to these ecosystems. Research needs in both fields: habitats and aquaculture improvements. |
| Yes, if it is guaranteed in the necessary preliminary studies that the location of the farms is compatible with the existing communities. |
| Yes, if the location is in areas that do not affect habitats at risk. This requires detailed mapping and scientific knowledge about the functioning of these habitats. |
| Everything can be improved, but there is no reason to demonise the sector. Perhaps we should insist on new species (sea bass, milt, etc.) that allow other market niches to be covered and allow processing (filleting, marinating). |
| I think so, as long as environmental monitoring of their impacts is effective and the impacts detected are corrected, either with changes and rotation of cages and a reduction or adjustment of production. |
| It must be, in order to ensure a necessary food source in the face of world population growth and at the same time protect the oceans as a source and origin of life. |
| With regard to environmental viability, it is the monitoring plans for the installations and the studies and monitoring of the marine environment that should make it possible to answer this question. |
| The planned development of the activity may improve the access to the most suitable areas, which would allow greater efficiency in the dimensioning and management of the farms; productivity and performance improvements; in animal welfare; in access to common services; and resilience and adaptation to changes in the environment.<br>The MSP Proposal for aquaculture is a key tool to promote and channel aquaculture initiatives, and for its compatibility with the rest of the uses and activities within the POEMs.<br>The incorporation of new technologies, the transfer of knowledge from technology centers and the growing incorporation of GIS tools are facilitating site identification and selection studies. |

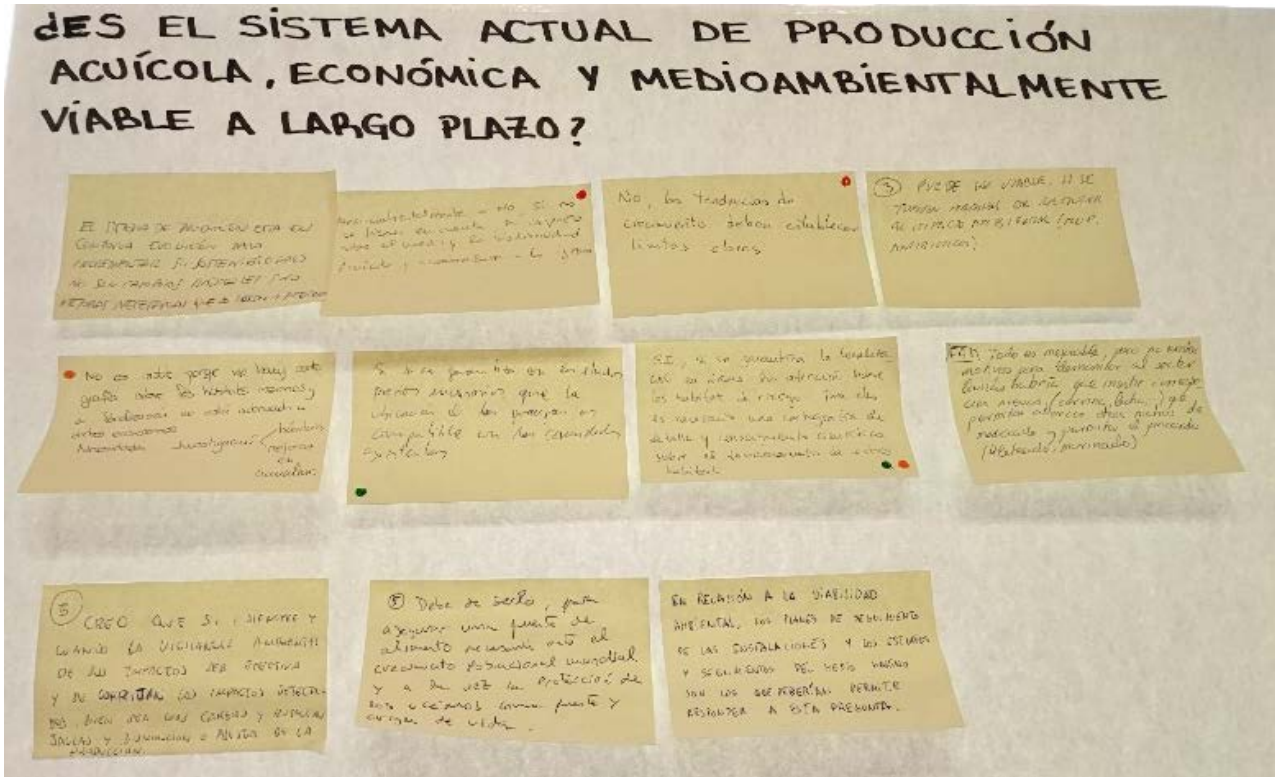


*Image 11: Answers to question number 5. Source: Spanish Institute of Oceanography, CSIC.*

Alberto Perán (FARM) explained that, if studies are carried out on the distance between cages so that waste from one cage does not affect an adjacent cage, production increases even if the density of fish is reduced; at the same time, the budget required for feeding is reduced and less management is required.

The industry is aware that if the ecosystem is deteriorated, productivity goes down. In recent years, production has improved a lot. Production managers study the quantities of feed required, they know that carcasses should not be thrown under the cages, and so on.

Alfonso Ramos (UA) said that the seabed is fundamental for aquaculture production.

Antonio Belmonte (FARM) agreed that the physiology of the bottom should not be changed, but that the types of seabed in each place should be respected.

**Question 6: How would an increase of aquaculture farms affect the surrounding marine ecosystems?**

| OBTAINED ANSWERS |
|---|
| It would negatively affect marine biodiversity, its structure and ecosystem services, especially the most vulnerable habitats (if developed excessively or without adequate regulation). |
| Aquaculture development must be based on previous studies that generate comprehensive and reliable mapping of the distribution of habitats of Community importance. |
| As with anything else, any increase in impact can lead to a deterioration in marine habitats (environmental impact studies). |
| Well, it depends on what is in those surrounding areas. What is clear is that aquaculture is needed and wherever there is a farm, there will be an impact, so we will have to sacrifice areas to locate aquaculture; but we will have to select the sites very well. |
| The diffusion of nutrients through own production of organic waste and feeding diets is detrimental to the good conservation status of habitats such as maerl. |
| That's a "trick question". Of course, it has an impact. What needs to be determined is the degree to which the ecosystem is affected and how important it is. |
| It depends on planning studies, which must be based on serious and truthful information, on the basis of which scientifically argued decisions can be taken. |
| If there is no management and better knowledge of the habitat, the activity may continue to affect the habitat. |
| It depends on prior planning. This is made very difficult by the lack of cartographic information and the need to establish tolerance thresholds. |
| It depends on the ecosystems surrounding these cages. In any case, such increases must be properly assessed so that they are environmentally acceptable and do not imply environmental degradation. |
| Without proper planning and environmental management, their growth will increase the deterioration of the water and seabed. |
| There will be more conflicts over the access to resources and space. More widespread impacts. Synergies with other pressures. |
| Carrying out environmental studies, including the carrying capacity of the areas, and the design of the corresponding "Exploitation Plans", will allow the development of the activity compatible with the conservation of marine ecosystems. |



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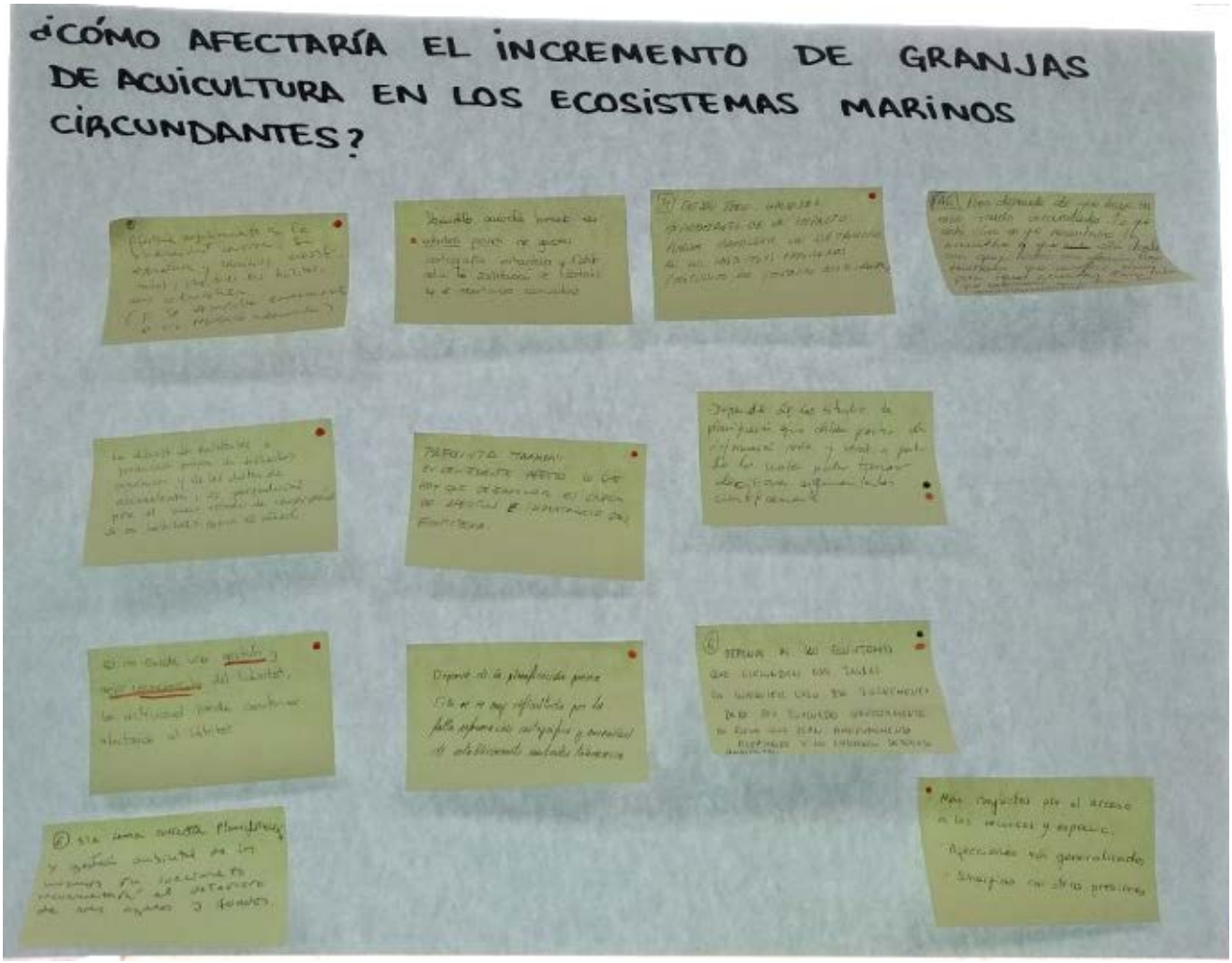


*Image 12: Answers to question number 6. Source: Spanish Institute of Oceanography, CSIC.*

There was a broad consensus among the participants on the need to carry out prior studies. If a habitat is neither within the Natura 2000 network nor under any other form of protection within 500 metres, no EIA is required for production of less than 500 tonnes per year.

Alberto Belmonte (FARM) indicated that no company asks for permits to produce less than 500 tonnes, because it is not economically viable.

With this last intervention, the debate on key questions was concluded *(image 13*).

*Image 13: Discussion of key questions in participatory session 1: Spanish Institute of Oceanography, CSIC.*

## *Discussion and identification of conflicts, synergies and information gaps*

In this second part of participatory session 1, the information obtained from the answers to the key questions and the subsequent discussion was extracted in order to identify potential conflicts, synergies and information gaps with regard to the interaction between the marine aquaculture sector and the conservation of maerl beds.

For this purpose, the post-it notes from the previous session were pre-sorted, similar answers were grouped together and put on cardboards labelled with the titles: conflicts, synergies and information gaps, as shown in *images 14, 15 and 16*.

The conflicts, synergies and knowledge gaps obtained from the key questions are shown below:

| CONFLICTS |
|---|
| The conflict is spatial. |
| Impacts are not isolated, but cumulative. |
| The impact also depends on the management. |
| There is not a unique criterion for regulating aquaculture (e.g. between Autonomous Regions). |

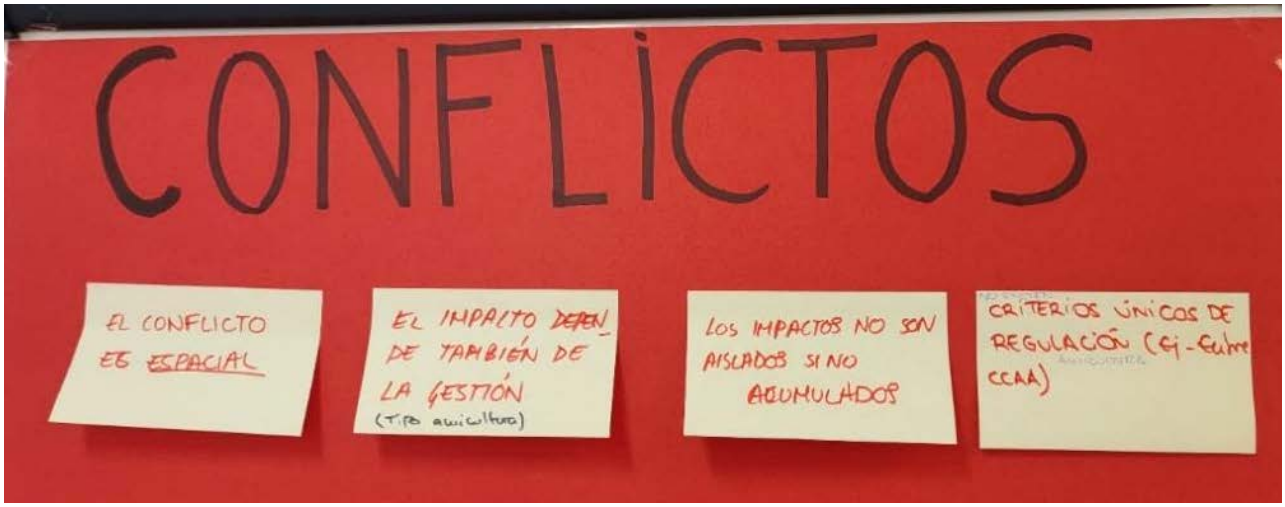


*Image 14: Conflicts. Source: Spanish Institute of Oceanography, CSIC.*

| SINERGIES |
| --- |
| The sector is aware that the non-conservation of the sea bottoms has negative repercussions for them. |
| Pooling the information of the promoters in the studies, in addition to the scientific part. |
| Monitoring also benefits the sector (efficiency). |

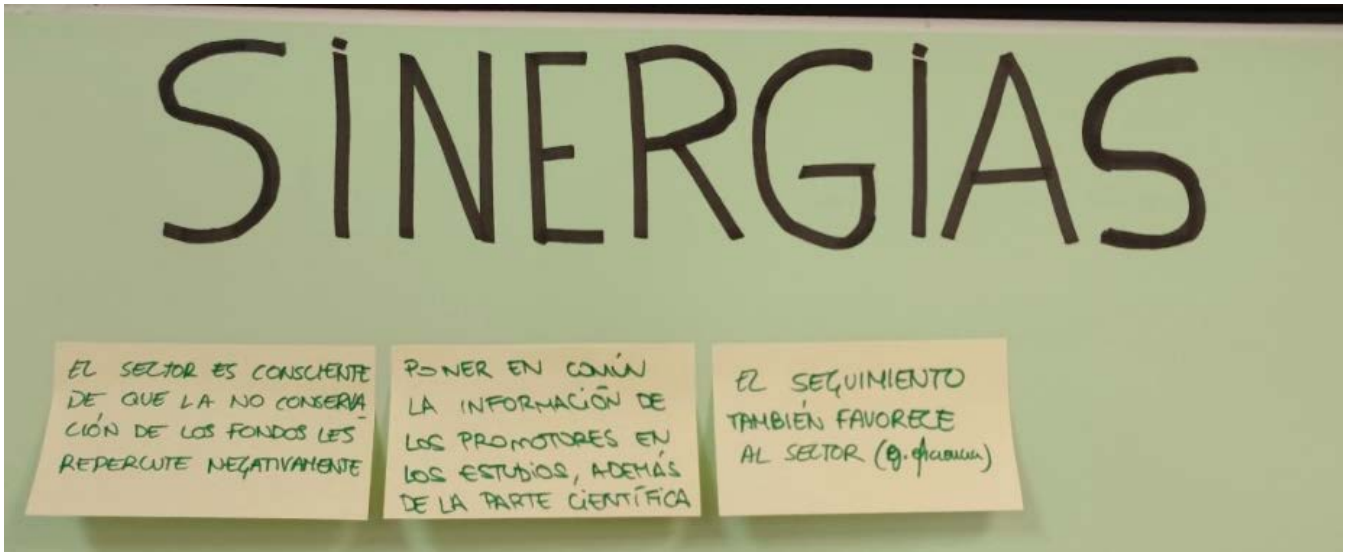


*Image 15: Synergies. Source: Spanish Institute of Oceanography, CSIC.*

| INFORMATION GAPS |
|---|
| Detailed distribution of habitats. |
| Active coordination between administrations at different levels. |
| Lack of knowledge regarding the concept and definition of "maerl". |
| Lack of awareness of the importance of maerl. |
| Carrying capacities and threshold values to establish adequate buffer zones. |
| The need of considering cumulative impacts. |
| Hydrodynamic conditions |

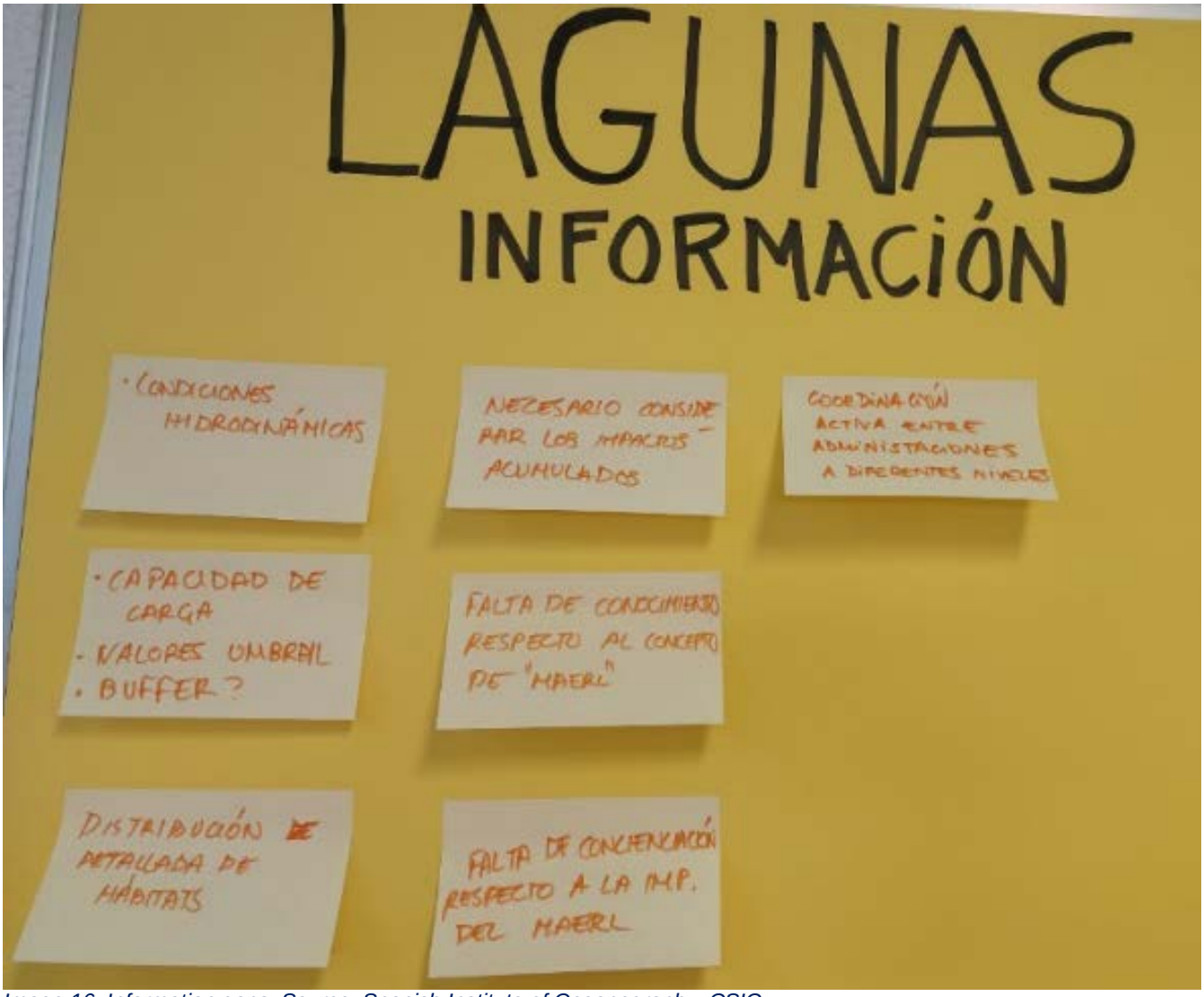


*Image 16: Information gaps. Source: Spanish Institute of Oceanography, CSIC.*

In addition, in order to graphically enrich the section of information gaps, several maps of the study area were made available so that the participants could transfer information that was missing, as it can be seen in *image 17*.


*Image 17: Participants mapping information gaps in the study area. Source: Spanish Institute of Oceanography, CSIC.*

In these maps, information relevant to the case study was added, such as the presence of several aquaculture facilities in the process of approval by the CARM, including an area close to the bay of San Pedro del Pinatar whose location had to be modified due to the presence of maerl beds. These areas are included in the POEM, in the definition of the inventory of future uses, within the potentially suitable areas defined by the Autonomous Community, and which include the extension of polygons and concessions in process in the Region of Murcia. Carlos García (CARM) informed us that the shellfish production areas categorised as "in operation" are under closure, so they are not currently producing (*image 18*).

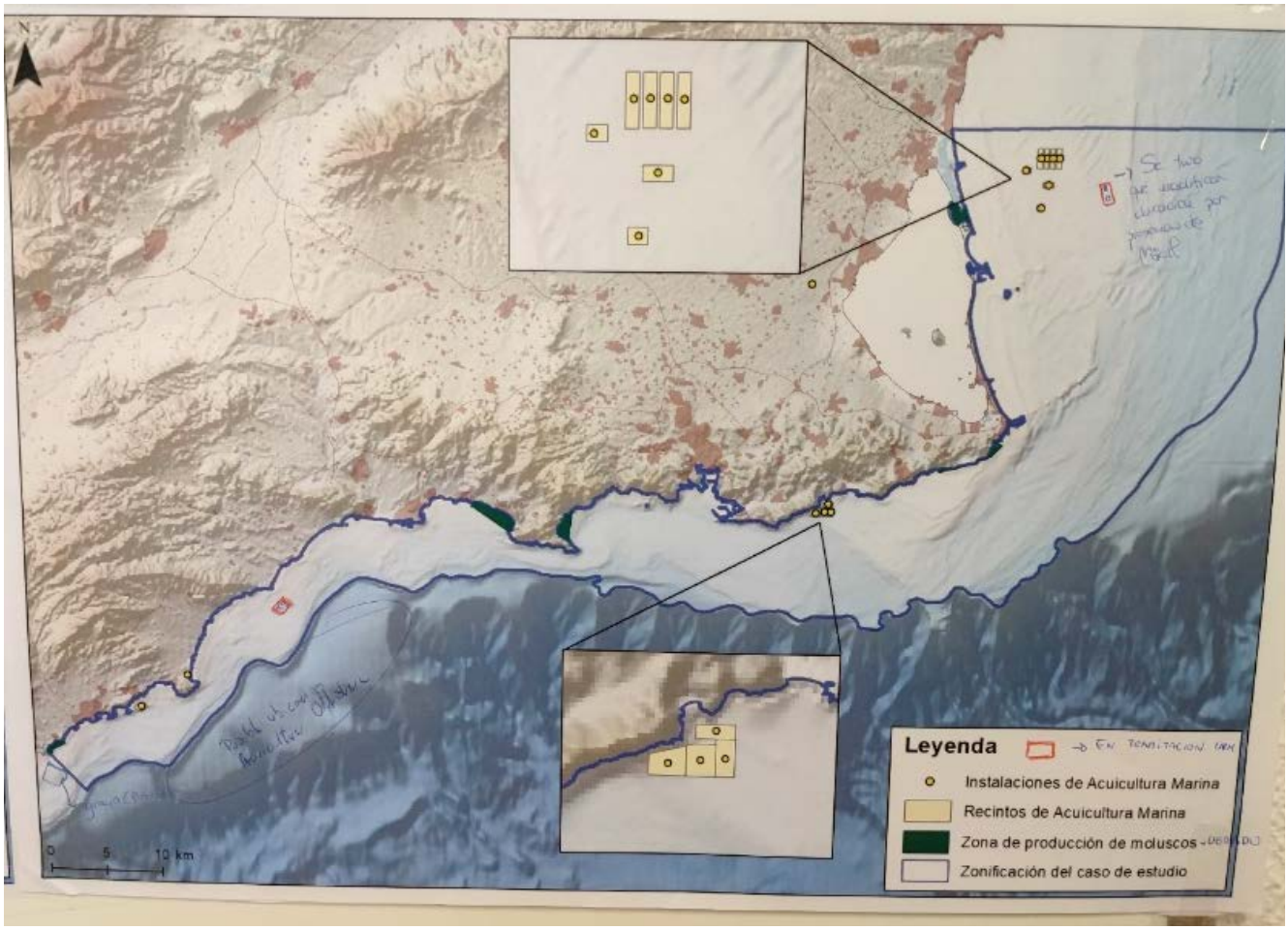


*Image 18: Information on new facilities in progress drawn freehand on the map of aquaculture facilities and shellfish production areas in our study area. Source: Spanish Institute of Oceanography, CSIC.*

On the other hand, in the *image 19* it can be observed, drawn freehand, polygons with evidence of the presence of unmapped mäerl beds, another information gap that must be resolved as soon as possible.

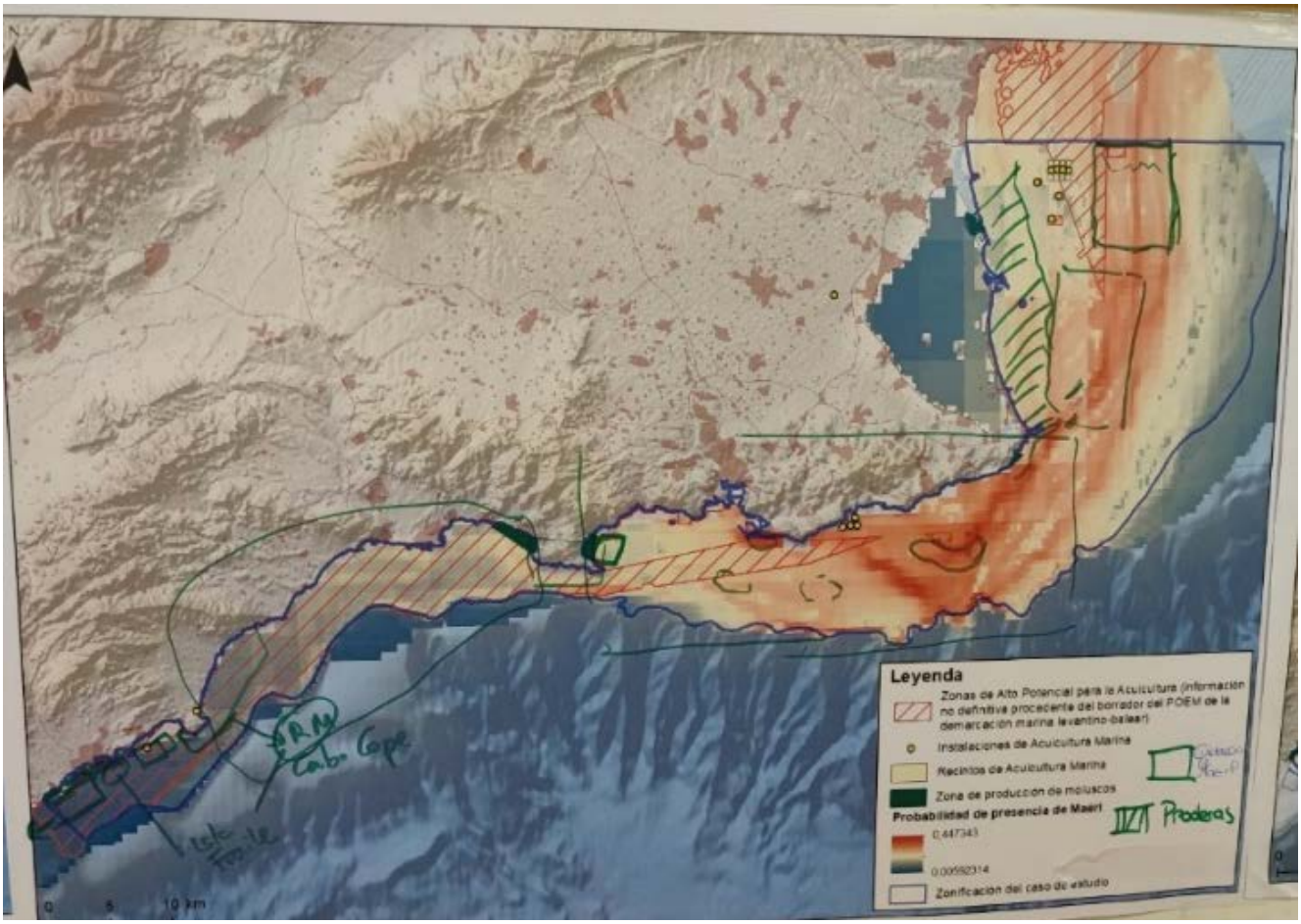


*Image 19: Polygons with evidence of maerl beds and phanerogam meadows in the study area, drawn freehand on the map showing aquaculture facilities, shellfish production areas, ZAPACs and potential mapping of maerl in the study area. Source: Spanish Institute of Oceanography, CSIC.*

Álvaro Alonso (DGBBD, MITERD) expressed the need for active coordination with all sectors so that the Ministry can take appropriate decisions, having all the information from each sector at its disposal.

María Gómez (IEO, CSIC) reflected about the necessity of improving the coordination and the communication channels so that it is really active and effective between all the administrations and sectors. It is important to carry out communication workshops and exchanges of information and to meet the different people in charge of each issue in each sector in order to know who to contact at any given moment and to ensure that information does not get lost along the way because it is addressed to the wrong person.

Aurora Mesa (DGCM, MITERD) stated that the public administration needs to obtain real information from the sectors, so that there is effective inter-ministerial and inter-community coordination.

Alberto Belmonte (FARM) stressed that the EIA information is there and, in fact, there are years in which production has been reduced on certain farms due to the EIA; in other words, the information exists, but there is no fluidity of communication.

Alberto Perán (FARM) insisted on the need to establish unitary criteria in aquaculture for all the autonomous communities.

Additional comment added via email, after the workshop by the SGP, MAPA:

"Aquaculture farms are subject to the obligations derived from the environmental authorization and for this they continuously monitor the environment, to avoid possible effects. Aquaculturists play the role of "sentinels" in the surroundings of their farms, as the main stakeholders that natural conditions are not affected in order to continue their activity; and they are usually the first agents to detect problems, especially in the quality of the water, something essential for the safety of their animals."

Additional comment added via email, after the workshop by the SGP, MAPA:

Within the framework of the "*Contribution of Spain to the strategic guidelines for a more sustainable and competitive EU aquaculture 2021-2030*"[1], work is planned on this:
At the national level, within the framework of the Environmental Aspects Working Group (WG), work will be done on the development of common criteria for the integration of aquaculture in the marine Natura 2000 Network; and also, in the scope and contents of the Environmental Impact Studies (EIA) and the Environmental Surveillance Plans (PVA) of aquaculture. In addition, work will be done to improve the "*Methodological proposal for carrying out the Environmental Surveillance Plans for marine cultures in floating cages*". Work will also be done on the design of compatibility criteria with Marine Strategies, for each crop and each geographical location.
·At a regional scale, work will be done on different aspects related to environmental surveillance and monitoring, such as the definition of the contents of environmental surveillance programs, and their updating with the best available scientific information and their integration into collection and analysis platforms. data from the marine environment. Work will also be done on the preparation of protocols and internal instructions for reviewing the environmental requirements demanded of companies.

To end this section and begin with the recommendations, Mónica Campillos (IEO, CSIC) summarised the conflicts, synergies and information gaps obtained (image 20).



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*Image 20: Mónica Campillos (IEO, CSIC) summarising the conflicts, synergies and information gaps obtained in the session. Source: Spanish Institute of Oceanography, CSIC*

# 7. Participatory session 2

The goal of this workshop was to develop recommendations aimed at improving the interaction between marine aquaculture production and biodiversity conservation, in order to facilitate their coexistence in the short, medium and long term.

During participatory session 1, recommendations already emerged and were added to the panel designed for this purpose (*image 21*). During participatory session 2, two processes were carried out: firstly, the discussion and opportunity to contribute further recommendations was opened and, secondly, these recommendations were assessed in terms of their feasibility and appropriateness.

## *Proposal of Recommendations*

During this first part, additional recommendations were collected that did not emerge during the first participatory session. This was followed by a discussion of all the recommendations obtained.


*Image 21: Cristina Cervera (IEO, CSIC) sharing the recommendations already set out, before opening the floor for participation. Source: Spanish Institute of Oceanography, CSIC.*

Alberto Perán (FARM) regretted that the information regarding the cartography of the ZAPAC distribution maps had not reached the sector. Both Aurora Mesa (DGCM, MITERD) and María

Gómez (IEO, CSIC) indicated that this information was in the process of public participation and, therefore, it was accessible to anyone who wished to make allegations and that, in effect, deficiencies and missing information had been notified to be added to the POEMs.

Carlos García (CARM) offered detailed cartography available in the CARM, both on aquaculture facilities in progress and on other issues; this information could be used both in this case study and in the POEMs.

Additional comment added via email, after the workshop by the SGP, MAPA:

The SGP, MAPA wanted to specify that the information on the aquaculture facilities in process is already included in the preferential areas of the marine spatial planning proposal for aquaculture and that it has been integrated into the POEMs within the preliminary proposal of ZAPAC.

Antonio Belmonte (FARM) returned to the issue of the need to experimentally test both, habitat presence models and dispersal models. All the models used must be calibrated, through research and tools already in operation such as environmental monitoring.

María Gómez (IEO, CSIC) stated that, as the aquaculture sector is the best organised sector in all these matters, given that it is the only one that has done detailed spatial planning, it is vitally important that communication between administrations and sectors is improved, so that everyone has the most detailed and up-to-date information.

A few extra minutes were left for the participants to provide final recommendations, before proceeding to the last part of the workshop, dedicated to the validation of the recommendations.

Below you can read all the recommendations collected during the session, classified in different categories.

| RECOMMENDATIONS |
| --- |
| MONITORING AND SURVEILLANCE PLANS<br>• Monitoring and surveillance plans for installations that lead to good practices to reduce impacts.<br>• To incorporate monitoring of rhodolith/mäerl/pre-coralligenous beds in aquaculture EMPs → Methodological proposal for the implementation of EMPs.<br>• To agree on a methodology for monitoring mäerl communities, similar to what is being done with the marine phanerogams guidelines, to ensure that the promoters' monitoring is valid.<br>• It is important to complement these plans with other management tools. |
| PRECAUTIONARY PRINCIPLE<br>• To apply preventive criteria. Do not base the detection of impacts solely on the EMPs because vulnerable habitats respond to pressures above certain thresholds, in a non- |



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| |
|---|
| linear way.<br>• To use the precautionary principle with caution. If taken to extremes, nothing would be done at sea. Sometimes it can be replaced by the principle of vigilance.<br>• To unify criteria between CCAA.<br>• To increase resources to research species.<br>• To avoid setting up installations in Marine Protected Areas (MPAs) and their vicinity, as well as in areas of vulnerable habitats. |
| TAXATION<br>• In concessions and authorisations, forcing the implementation of the latest technologies for environmental monitoring. |
| GOOD PRACTICES<br>• Precision aquaculture to improve food supply. Sectoral corporate commitment.<br>• Polycultures of filter-feeding invertebrates under cages.<br>• Artificial reefs as biofilters.<br>• New environmental practices in corporate management systems.<br>• To avoid cultivation and breeding of exotic species.<br>• To adapt production to the environment and do not oversize structures.<br>• Increase efficiency in:<br>- Feed supply<br>- Waste management<br>- Structures maintenance<br>- Searching for locations. |
| FISCAL MEASURES<br>• Market tools and incentives to promote environmental commitments of the sector.<br>• Incentives for the promotion of good practices.<br>• Voluntary agreements formally adopted with companies.<br>• To control imbalances between supply and demand so that companies are not forced to sell specimens of unprofitable sizes (aggressive commercial promotions). |
| IMPROVING COORDINATION AND DIALOGUE BETWEEN ADMINISTRATIONS AND PRODUCTIVE SECTORS[8].<br>• Active communication between sectors and administrations.<br>• Need for single criteria in aquaculture (e.g. between Autonomous Regions), Strategy for the aquaculture sector.<br>• Fluid inter-administrative participation and coordination so that information from the sectors reaches the competent authorities so that the different plans are adjusted to the realities and existing advances.<br>• To maintain spaces for participation and dialogue, such as this workshop to facilitate adaptive management and governance.<br>• Coordination between MITERD and MAPA.<br>• Collaboration between scientific bodies and companies: IEO (CSIC), universities, |

[8]The SGP, MAPA, stated that this is one of the actions planned in the "*Contribution of Spain to the strategic guidelines for a more sustainable and competitive EU aquaculture 2021-2030*".

| |
|---|
| research centres and companies. |
| INVESTMENT IN TECHNOLOGY IN THE SECTOR<br>• Improvement of the waste management system. |
| INVESTMENT IN SCIENCE AND RESEARCH<br>• Cartography with high spatial resolution and common criteria for rhodolith beds.<br>• Carrying capacity distribution.<br>• To locate and map rhodolith beds, study their mobility and stop at once the location of cages and other pressures close to biocenoses of this value.<br>• To study the physiological response of these communities to increased sedimentation, turbidity and hyper-nutrification.<br>• To implement appropriate indicators to assess the ecological status and monitor these communities.<br>• To maintain the precautionary principle until accurate information is available, without stifling development possibilities.<br>• To establish a threshold for the minimum distance at which the effect occurs and a variable range in which it has been detected, based on various parameters.<br>• Updating of knowledge about the maerl beds and their interaction with aquaculture and making this information available to the sector and the administrations, in a freely accessible and permanently updated space.<br>• To reach a consensus on the buffer around the known rhodoliths and study new projects on a case-by-case basis.<br>• To reach a consensus on the % of surface area occupied by living talus in order to declare a habitat as “maerl” in all maritime waters |
| PROTECTION/CATALOGUING OF HABITATS AND SPECIES<br>• Rhodolith beds<br>• Precursors of maerl<br>• Coralligenous, etc. |
| JOINT MANAGEMENT OF CORALLIGENOUS AND RHODOLITHS<br>• Including coralligenous beds in the cataloguing of rhodolith chains due to the close relationship and interrelationship between them. Coralligenous blocks give rise to rhodoliths and vice versa and are found at the same depths. |
| POEM<br>• To differentiate in INFOMAR viewer between preferential and potential areas for aquaculture development[9].<br>• To make it clear in the POEMs, especially with regard to the ZAPACs, that the disaggregated zones can be seen in the descriptive mapping of future uses. |
| CREATION OF AN ACCESSIBLE DATABASE:<br>• Environmental Impact Studies of floating cages |

[9] The SGP, MAPA stated that the correct terminology is: Preferred Areas and Potential Areas, and can be viewed in INFOMAR, in the section on INFORMATIVE CARTOGRAPHY: inventory of future uses. In addition, all the cartography of AQUACULTURE can be viewed in ACUIVISOR. Aquaculture viewer (mapama.es)

- Technical reports
- Final degree projects, Master's and doctoral theses on the impact of floating cages on benthic habitats).

## *Evaluation and validation of recommendations*

To end up, a last session was held to evaluate the recommendations that the participants had provided throughout the workshop. For this purpose, participants were given stickers to validate them. There was no limited number of stickers, so each participant could choose the recommendations they considered to validate. Green stickers were for those recommendations whose implementation is highly advisable, orange stickers were for those recommendations that could be appropriate but are not a priority, and finally, red stickers were for those recommendations that the participant would not implement.

*Image 22* shows how this process was developed, while *image 23* shows the final result of this session.


*Image 22: Participants rating the recommendations. Source: Spanish Institute of Oceanography, CSIC.*

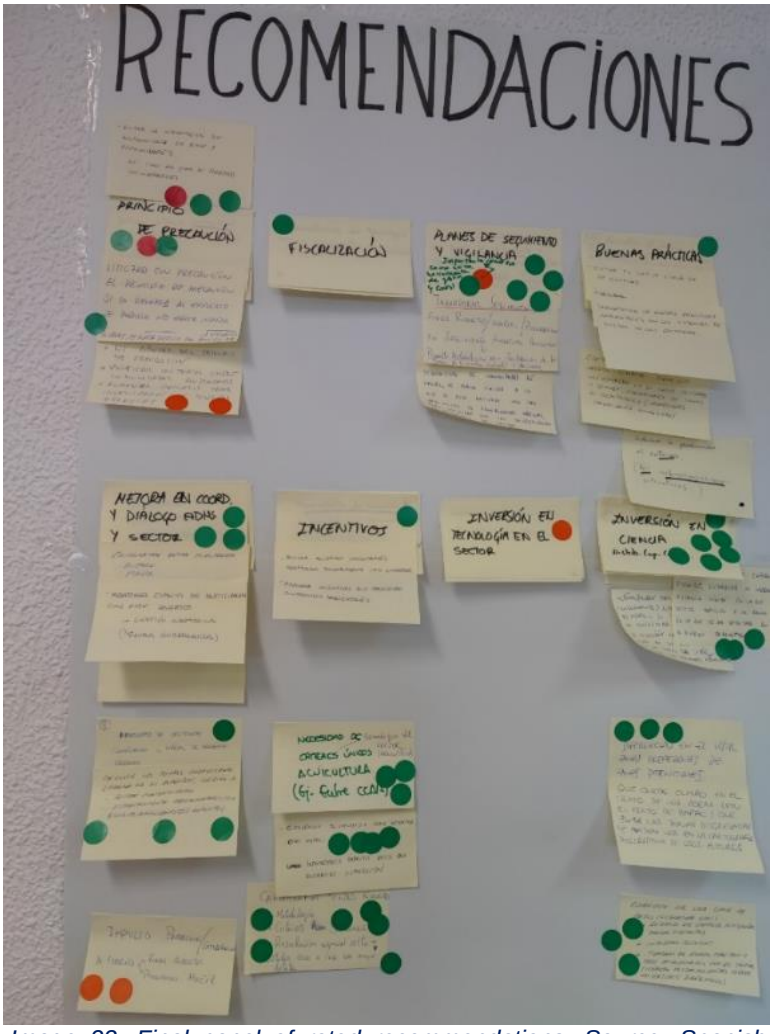


*Image 23: Final panel of rated recommendations. Source: Spanish Institute of Oceanography, CSIC.*

Once the assessment had been carried out, the final reading of the validated recommendations was made, from which different conclusions were drawn.

The **investment in science** became the most voted recommendation. There was absolute consensus on the need of having accurate and contrasted information on the distribution of habitats and their vulnerability, which would allow the establishment of a minimum distance threshold for aquaculture to affect rhodolith beds and allow the coexistence between both uses.

The acquisition of **high-resolution cartography** is another priority for all participants, as well as the establishment of common criteria for the delimitation of habitats by % coverage and the study of each case independently in order to consider variables such as the hydrodynamics of each area.

The **coordination and communication between administrations and sectors** was another of the highlighted recommendations. It is necessary to establish single criteria for aquaculture at the national level, as well as to improve communication between administrations and sectors, in order to favour accessibility to more detailed and updated information. In this regard, the **creation of a database** containing such information was recommended. There was a reflection about the need of improving this communication (among administrations as well as between the administration and the sectors) for the POEMs to reflect a realistic and agreed planning taking into account the criteria and the time frame considered. It was also highlighted the need to differentiate in the POEMs and in the INFOMAR cartographic viewer between preferential areas and potential areas for the development of different uses and activities.

Additional comment added via email after the workshop:

The SGP, MAPA wanted to add a comment clarifying that within the POEMs, areas are not declared as ZAPACs, but rather those areas of high potential for aquaculture are identified in which criteria of coexistence/synergy with other activities are incorporated and in which associated measures are defined to continue advancing in the definition process.
The cartography is considered as a support tool, but what is really operative are the consensual criteria that have been reached between the sectors and administrations for their consideration/integration in the POEMs addressed in the analysis of interactions between uses and activities.

The category of **good practices** only received one vote as a priority, as these votes were for more specific proposals for good practices, such as the need for **joining the management of coralligenous and rhodolith beds** or the **monitoring of concessions and authorisations**, such as the establishment of certain conditions to access to a concession or authorisation.

The establishment of **incentives** received only one top priority vote, as most of the participants did not consider it as a priority action, as well as **investment in technology** for the sector.

Regarding **monitoring plans**, it is noteworthy that only two participants highlighted it as a priority, as most of them consider that it should not be the only management tool.

Finally, it is worth noting the diversity of opinions regarding the **precautionary principle**, the only category that collected green, orange and red stickers. This fact, as it was discussed during the session, is due to the fact that many participants consider that this principle should be applied with caution, as it is useful, but it can limit the potential of the sector if it is abused. Its correlation with the need for **investment in science** in order to apply it correctly was highlighted

# 8. Conclusions and farewell

María Gómez (IEO, CSIC) recapitulated the results obtained during the workshop. On the one hand, she summarised the conflicts, synergies and information gaps that had been obtained during participatory session 1, and, on the other hand, she commented on the most voted recommendations resulting from participatory session 2.

She stressed the need of a **sensible use of the precautionary principle**, fuelled by more **investment in science** to facilitate its implementation. She placed **standardisation in methodology and knowledge** as a key aspect in order to speak under the same criteria and limits.

She underlined the importance of **technological development** in the sector, so that it becomes a more sustainable sector and the importance of **surveillance of the activities** and **monitoring of real models** contrasted at an experimental level.

Finally, she thanked all the participants (*image 24*) for their attendance and invited them to continue collaborating.

*Image 24: Participants attending the face-to-face workshop of the interaction between aquaculture and maerl beds in the Region of Murcia. Source: Spanish Institute of Oceanography, CSIC.*

# *ANNEX I: Workshop Agenda*

| | |
|---|---|
| **9:30 - 9:45** | **Welcome and introduction of the guests** |
| **PART 1** | **PRESENTATIONS AND ROUND TABLE** |
| **9:45 - 11:00** | **PRESENTATIONS (10' presentation + 5' questions)**<br>• MSP in Spain and POEMs - Aurora Mesa Fraile (General Directorate of the Coast and the Sea (DGCM), Ministry for the Ecological Transition and the Demographic Challenge (MITERD))<br>• Presentation of the MSPMED Project and the topic to be addressed - Elena Gutiérrez Ruiz (IEO, CSIC)<br>• Maerl beds, importance and vulnerability – Juan Manuel Ruiz Fernández (IEO, CSIC)<br>• Aquaculture and productive sector – Paloma Carballo Tejero, JACUMAR- General Directorate for fisheries and aquaculture (DGOPA), Ministry of Agriculture, Fisheries and Food (MAPA) - REMOTE<br>• Rhodolith beds – Alfonso Ramos Esplá (University of Alicante) |
| **11:00 – 11:30** | **Coffee break** |
| | **PARTICIPATORY SESSION 1** |
| **11:30 - 12:30** | ***Post-it* session on key questions** |
| **12:30 – 13:30** | **Discussion and selection of conflicts, synergies and information gaps** |
| **13:30 – 15:00** | **Lunch** |
| **PART 2** | **PARTICIPATORY SESSION 2** |
| **15:00 – 16:00** | **Post-it session: proposal of recommendations** |
| **16:00 – 17:00** | **Evaluation and validation of recommendations** |
| **17:00** | **End of the event and farewell** |



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# *ANNEX II: Participants*

This workshop, in a face-to-face format, was attended by a total of 17 participants, 14 in face-to-face format and 3 remotely.

| Nombre | Institución |
|---|---|
| *2 Paloma Carballo Tejero | SG. for Aquaculture, Fisheries Marketing and Structural Actions. DG Fisheries Management and Aquaculture, MAPA. |
| *2 Victoria Palacios | TRAGSATEC technical assistance to the SG. of Aquaculture, Fisheries Marketing and Structural Actions Fisheries Management and Aquaculture. MAPA. |
| *2 Felipe Aguado | IEO, CSIC |
| Aurelio Ortega García | IEO, CSIC |
| Carlos José García Alonso | DG livestock, fisheries and aquaculture, CARM |
| Jose María Unzurrunzaga Campoy | Coastal demarcation of Murcia – DGCM, MITERD |
| Aurora Mesa Fraile | DGCM, MITERD |
| Álvaro Alonso León | DGBBD, MITERD |
| Alfonso Ramos Esplá | Teacher of Marine Sciences, University of Alicante |
| Óscar Esparza | WWF |
| Antonio Belmonte Ríos | FARM assistant |
| Alberto Perán Rex | FARM assistant |
| *Maria Gómez Ballesteros | IEO, CSIC |
| *Juan Manuel Ruiz Fernández | IEO, CSIC Murcia |
| *Elena Gutiérrez Ruiz | IEO, CSIC |
| *Monica Campillos Llanos | IEO, CSIC |
| *Cristina Cervera Núñez | IEO, CSIC |

*Table 1: Participants of the workshop on the interaction between aquaculture and maerl beds in the Region of Murcia, celebrated on the 27th April, 2022. Source: Spanish Institute of Oceanography, CSIC.*

* MSPMED organising team (IEO, CSIC)
*2 Remote participants





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# *ANNEX III: Satisfaction surveys*

First of all, the model satisfaction survey that was given to the participants in order to collect their opinion about the workshop is attached.

Subsequently, an analysis of the responses received was made.

## Satisfaction survey model

**MSP-MED: Hacia la implementación operacional de la OEM en el mar Mediterráneo**
***Caso de estudio Región de Murcia***

Taller de agentes interesados y usuarios marinos de la región de Murcia
**ENCUESTA DE SATISFACCIÓN**

1. Indique del 1 al 10 su nivel de satisfacción general con el Taller realizado (siendo 1 un bajo nivel de satisfacción y 10 alto grado de satisfacción):

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

2. Evalúe del 1 al 10 su nivel de satisfacción en relación con los siguientes aspectos:

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Objetivos del taller** | | | | | | | | | | |
| **Desarrollo de los grupos de trabajo** | | | | | | | | | | |
| **Resultados obtenidos** | | | | | | | | | | |
| **Material utilizado** | | | | | | | | | | |
| **Lugar de celebración** | | | | | | | | | | |
| **Duración del taller** | | | | | | | | | | |
| **Organización del taller** | | | | | | | | | | |

3. Indique, por favor, si mejoraría algún aspecto del taller:

| |
|---|
| |

4. Detalle, por favor, cualquier otro comentario que pueda resultar de interés:

| |
|---|
| |





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## Results of Satisfaction Survey

# Aquaculture vs Maerl beds

1. **Indicate from 1 to 10 your level of general satisfaction with the Workshop carried out (1 being a low level of satisfaction and 10 being a high degree of satisfaction):**

The average of the votes is 8,75

2. **Evaluate from 1 to 10 your level of satisfaction in relation to the following aspects:**

The average of each section is collected below.

| | |
|---|---|
| **Workshop Objectives** | **8,25** |
| **Development of working groups** | **8,65** |
| **Results obtained** | **8,25** |
| **Used material** | **8,38** |
| **Place of celebration** | **8,89** |
| **Workshop duration** | **8,5** |
| **Workshop organization** | **9** |

Both, the general assessment of the workshop and the evaluation of each of the aspects mentioned in question 2, have been assessed very positively. It is noteworthy the great reception that this participatory workshop has had.

3. **Please indicate if you would improve any aspect of the workshop:**

Regarding possible aspects to improve, there have been three comments.

In the first place, the possibility of talking about the different models (dispersion, load capacity, etc.), as well as talking about environmental monitoring, is indicated as an improvement. With regard to this topic, it should be clarified that delving into this type of issues is far from the objectives of MSP. However, it is collected as a possible topic of discussion for future meetings.

Another aspect to improve is the duration of the workshop. One of the participants believes that the recommendations section was limited by the time factor.

Finally, the lack of representatives from various sectors and institutions is commented on. It should be noted that, in this case, different sections of CARM, environmental associations and personnel dedicated to research have been invited, even though they were unable to attend.

4. **Detail, please, any other comment that may be of interest:**



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Several of the participants valued positively the celebration of this type of events in a face-to-face format, since it favours the debate and active participation of the actors involved.

Only one of the participants requested in writing the holding of a workshop in which the conclusions of this workshop can be further developed, although there was a general attitude during the workshop to participate in an additional workshop, if it were possible to do it.

# ANNEX III- REPORT OF THE TECHNICAL WORKSHOP ON THE INTERACTION BETWEEN UNREGULATED ANCHORAGES, BIODIVERSITY CONSERVATION AND UNDERWATER CULTURAL HERITAGE

# INDEX

# Acronyms

| | |
|---|---|
| ACI | Asset of Cultural Interest |
| AGE | General State Administration |
| AMP | Marine Protected Areas |
| ANSE | Naturalists Association of the Southeast |
| ARQVA | National Museum of Underwater Archaeology |
| CARM | Autonomous Community Region of Murcia |
| CCAA | Autonomous Regions/Communities |
| CSIC | Spanish National Research Council |
| DC | Coastal Demarcation (MITERD) |
| DGBBD | General Directorate of Biodiversity, Forests and Desertification |
| DGCM | General Directorate for the Coast and the Sea |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Monitoring Plan |
| EU | European Union |
| GES | Good Environmental Status |
| IEO | Spanish Institute of Oceanography |
| IMEDEA | Mediterranean Institute of Advanced Studies |
| MAPA | Ministry of Agriculture, Fisheries and Food |
| MITERD | Ministry for the Ecological Transition and the Demographic Challenge |
| MR | Marin Reserve |
| MSP | Maritime/Marine Spatial Planning |
| MSPD | MSP Directive |
| PER | Recreational Vessel Skipper's Licence |
| PNB | Basic Navigation Skipper Practical Course |
| POEM | MSP Plan (Spain) |
| R+D+I | Research + Development + Innovation |
| RMIP | Marine Reserve of Fishing Interest |
| ROVs | Remotely Operated Vehicles |
| UA | University of Alicante |
| UCH | Underwater Cultural Heritage |
| UM | University of Murcia |
| UNESCO | United Nations Educational Scientific and Cultural Organization |
| WWF | World Wildlife Fund |
| ZUP | Priority Use Zones |



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# REPORT OF THE TECHNICAL WORKSHOP ON THE INTERACTION BETWEEN UNREGULATED ANCHORAGES, BIODIVERSITY CONSERVATION AND UNDERWATER CULTURA HERITAGE– Case study in the Region of Murcia

Thursday, 28th April, 2022 – 9:30 am – 17:00 pm

In the context of the MSPMED project, a participatory workshop was held with stakeholders to address the interaction between unregulated anchoring, marine biodiversity conservation and Underwater Cultural Heritage (UCH), as an analysis of the pilot case being developed in the Region of Murcia. Within this case study, an analysis of the current and future impacts caused by irregular anchoring of recreational vessels in non-designated areas and its interaction with the biodiversity conservation and the UCH in the region is being carried out. The aim was to involve stakeholders from different sectors in the development of useful recommendations for the process of Maritime Spatial Planning (MSP) in the Levantine-Balearic marine sub-region, which includes the Region of Murcia.

In order to tackle this problem, 19 participants from the sectors with possible interests in the study area were brought together: (1) Conservation, (2) Public Research Institutions/Universities, (3) Nautical-recreational sector (in the end did not attend the workshop) and (4) Public Administration. The workshop consisted of several presentations on the topics to be addressed and two participatory sessions dedicated to the identification of possible synergies, conflicts and information gaps, in order to obtain final recommendations.

The participatory sessions enabled the establishment of contact between sectors, highlighting the need for dialogue with a view to improving the monitoring and surveillance of unregulated anchorages, the possibility of drawing up a management plan for anchorages, and the application of new technologies for the monitoring and protection of marine biodiversity and underwater cultural heritage.

# 1. Context

The Region of Murcia is home to an important biodiversity and a rich underwater cultural heritage which, in some cases, may interact with other human activities. In relation to marine biodiversity, there is awareness of the presence of habitats of Community interest (in accordance with Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive) such as coralligenous and maerl beds or seagrass meadows. The latter can be profoundly affected by unregulated anchoring of recreational vessels. *Posidonia oceanica* meadows (endemic species in the Mediterranean Sea) are highly affected due to their wide distribution in the Region of Murcia. The need to protect seagrass meadows is very high due to the large number of ecosystem services they provide, such as controlling coastal erosion, regulating water turbidity or acting as a refuge and nursery area for numerous species of commercial interest. However, a great deal of research effort is still required to obtain detailed information and mapping of the habitats and species present in our study area; therefore, it is difficult to assess the real impacts and pressures caused by marine uses and activities on them.

In addition to marine biodiversity, the Region of Murcia treasures an important number of Assets of Cultural Interest (ACI) in its marine waters, which must be conserved and protected. Many of the ACIs present in its maritime waters have become an essential attraction for underwater tourism. Wrecks are one of the most sought-after treasures in the diving industry all over the world because, in addition to the history that surrounds them, they are home to numerous species of flora and fauna that find here a refuge where they can shelter and/or create their habitat. In 2001, UNESCO celebrated a convention for the protection of Underwater Cultural Heritage (UCH). This convention defines UCH as *"all traces of human existence having a cultural, historical or archaeological character, which have been partially or totally under water, periodically or continuously, for at least 100 years*".

For its part, the recreational nautical sector in the Region of Murcia is in continuous growth, due to the excellent climatic and oceanographic conditions that make the Coast of Murcia an attractive enclave for this type of tourism throughout the year, although it is in the summer months when an exponential increase in the presence of this type of vessels is detected in the most sheltered areas of the coast. In spite of the increasingly substantial income generated by this sector, it is necessary to manage this type of vessel activity in an appropriate manner, which allows its viability in the medium to long term and enables it to coexist with the rest of the maritime uses and activities carried out in this area.

# 2. Case study of the Region of Murcia

The case study in the Region of Murcia is framed within the MSPMED Project (*Towards the operational implementation of Maritime Spatial Planning in our common Mediterranean Sea*), co-financed by the European Commission, and aimed at the implementation of the Maritime Spatial Planning Directive (MSPD) in the Mediterranean Sea.

In order to achieve the proper implementation of the Maritime Spatial Planning (MSP) in the Mediterranean Sea, the project develops case studies to address different issues that help to improve the implementation of MSP in specific areas of the Western Mediterranean. The IEO (CSIC) is carrying out a case study in the Region of Murcia to evaluate the interactions, synergies and conflicts between some activities and uses with the marine environment in order to establish recommendations that can be used to feed the national MSP process, whose final objective is the drafting of a Maritime Spatial Management Plan (POEM) for each of the existing Spanish marine sub-regions. This case study is framed within the Levantine-Balearic marine sub-region and analyses the waters of the Region of Murcia in a study area defined from the coastline to the level where the continental shelf ends (*figure 1*).

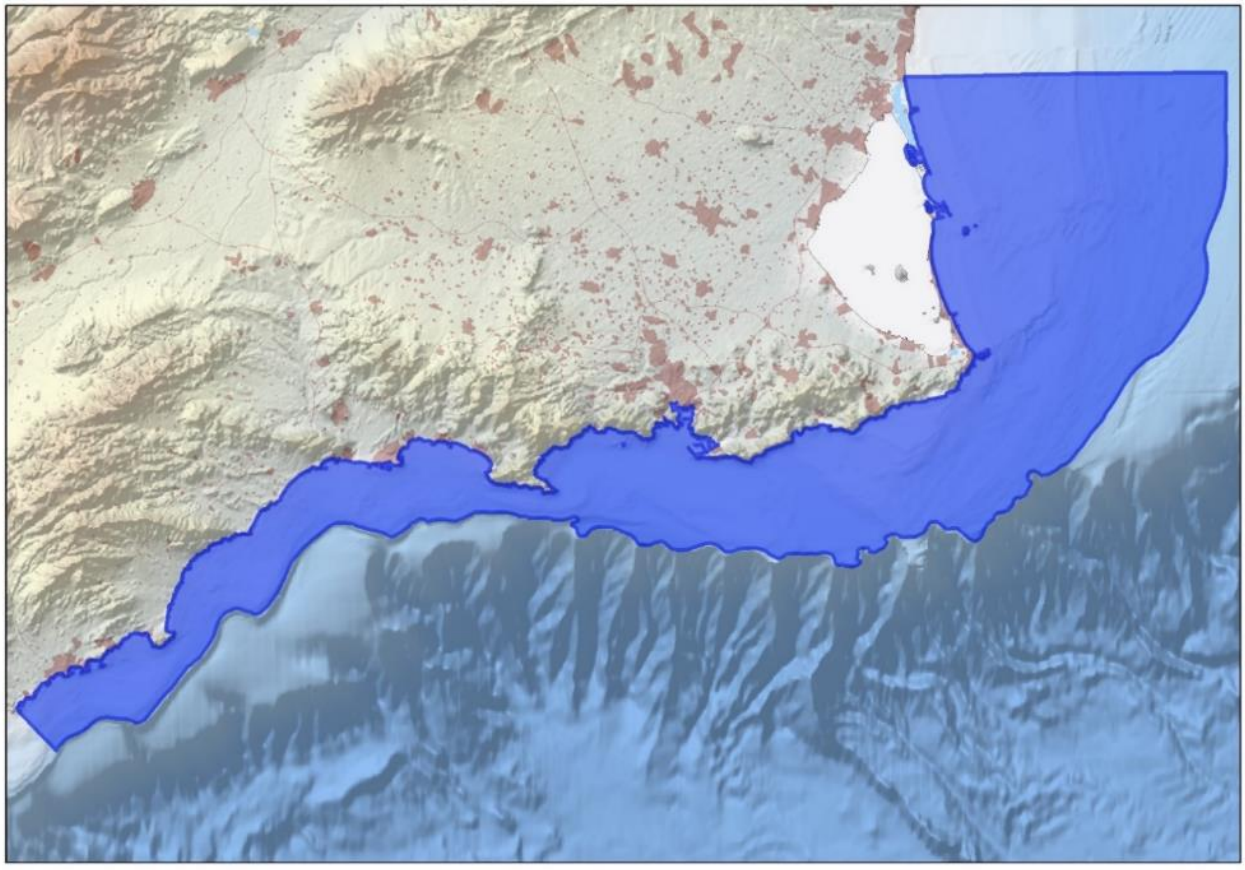

*Figure 1: Zoning of the Murcia Region case study in the MSPMED project. Source: Own elaboration, Spanish Institute of Oceanography, CSIC.*

## 3. Aim of the workshop

The aim of the workshop was to establish a dialogue between the sectors involved in the themes addressed in order to identify possible conflicts, synergies and lack of information (during a first participatory session) and, with this information, to obtain a series of recommendations (second participatory session) with the aim of, on the one hand, favouring a better spatial and temporal use of this study area, favour a better spatial and temporal use of this study area, which in turn

allows for the short, medium and long-term coexistence of all these uses and, on the other hand, establish recommendations that could be useful in the Maritime Space Management Plan for the Levantine-Balearic marine demarcation, should the competent authority deem it appropriate.

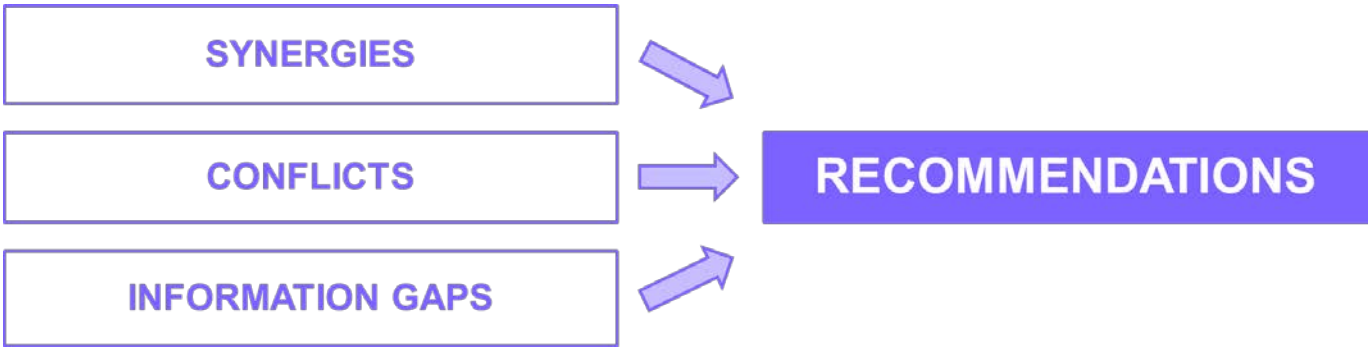


*Figure 2: Objectives of the Murcia Region case study workshop in the MSPMED project. Source: Own elaboration, Spanish Institute of Oceanography, CSIC.*

## 4. Welcome and introduction of the guests

María Gómez Ballesteros (IEO, CSIC) welcomed the guests to the workshop and explained the agenda of the event (annex I). It was emphasised that this was not a decision-making process, but a participatory workshop in which the aim was to end up with a series of recommendations favourable to all the sectors, which would be passed on to the competent authorities, who would evaluate their consideration during the process of drawing up and updating the Maritime Spatial Plans.

The video MSP in a nutshell was played to facilitate the understanding of the concept of Maritime Spatial Planning by all attendees.

In addition, there was a brief presentation of the participants listed in *table 1* of *annex II.*

## 5. Presentations

In the first part of the workshop, different presentations were given in order to put all the attendees in context about the final objective of the workshop final objective of the workshop, the project within which it is framed, the process of maritime spatial planning in Spain and the current situation of the sectors participating in the workshop.

A total of five presentations were given, 4 in person and 1 remotely.

## *Presentation of the MSPMED Project and the topic to be addressed - Elena Gutiérrez Ruiz (IEO, CSIC)*

Elena Gutiérrez Ruiz, member of the MSPMED project team of the IEO (CSIC) and organiser of the workshop, detailed the scope of the MSPMED project and briefly presented the MSP case study in the Region of Murcia with respect to habitats conservation, within which the present workshop on the interaction between unregulated anchorages, biodiversity conservation and underwater cultural heritage is framed. She justified the choice of the themes selected within the case study and focused on how the workshop would be developed.

She explained that aquaculture has a high prospect for the future in the Region of Murcia, where it has been growing over the years, since the 1990s. The sustained growth of this sector has brought numerous socio-economic benefits to this region, which has become one of the major producers of marine fish at a European level. For its part, Murcia's maritime waters are home to an important natural heritage and a high level of biodiversity. One of the most valuable habitats in these waters are the mäerl beds, which provide numerous ecosystem services of incalculable value. The spatial-temporal planning of both activities is necessary to favour the coexistence between aquaculture activity and marine biodiversity conservation in the short, medium and long term.

Elena also briefly detailed the main objective of the workshop, which was dedicated to obtain favourable recommendations for all the sectors involved, identifying conflicts, synergies and information gaps beforehand. She stressed that this was not a decision-making process, but rather a process of suggestions to improve coexistence between the two uses over time.

### QUESTIONS

There were no questions.

## *MSP in Spain and POEMs - Aurora Mesa Fraile (General Directorate of the Coast and the Sea (DGCM), Ministry for the Ecological Transition and the Demographic Challenge (MITERD))*

Aurora Mesa Fraile, representing the Directorate General for the Coast and the Sea (DGCM) of the Ministry for Ecological Transition and Demographic Challenge (MITERD) presented the status of Maritime Spatial Planning. She explained the legal basis of this process, which is part of the Integrated Maritime Policy of the European Union and is set out in Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning. This directive has been transposed into our legal system through Royal Decree 363/2017, of 8 April, establishing a framework for maritime spatial planning.

She also explained the process that has been followed for the elaboration of the POEMs, the chronology of working and their processing status, which are expected to be approved before the end of the year 2022. She indicated that the POEMs were in the phase of analysis and integration

of the allegations from the public participation process required for the approval of these plans. The MITERD is aware of the fact that public participation had been lower than expected and planned at the time.

Aurora indicated the need of MSP for the coexistence of uses and activities in the marine environment, which allows the maintenance of the Good Environmental Status (GES) of the marine environment in accordance with Law 41/2010, of 29 December, on the protection of the marine environment. She explained that, for certain uses, specifically those considered to be priority uses and of general interest, Priority Use Zones (ZUP) are established. For those uses and activities that require a specific spatial location, High Potential Zones (HPZ) are established.

The structure of the POEMs was developed, which include five blocks:

- Block I: Context and scope of application.
- Block II: Guiding principles and management objectives.
- Block III: Diagnosis of the spatial distribution of uses, activities and interests. The diagnosis is specific to each of the five marine sub-regions.
- Block IV: Maritime Spatial Planning.
- Block V: Monitoring of the Management Plans.

She also talked about INFOMAR, a geoportal to consult provisional cartography until the final approval of the POEMs.

The issue of anchorages is covered in Block III: Diagnosis, both in the section of tourism and recreational activities and in the interactions with other uses and activities. Two ad-hoc working groups were also set up for Underwater Cultural Heritage and Nautical anchorages. Recreational activities and effects on benthic habitats.

With regard to zoning, the descriptive cartography shows both anchorages and beaches with anchoring areas and a series of management criteria and provisions, a series of indicators and measures. In turn, Priority Use Zones (ZUP) are designated for the UCH.

## QUESTIONS

There were no questions.

## *Ecological anchorages – Jordi Sánchez (SUBMON) (Remote)*

Jordi Sánchez, head of biodiversity conservation projects at Submon and legal expert specialized in marine biodiversity at the Ministry of the Interior, focused his presentation on the diagnosis of anchoring areas: Reality and alternatives.

Jordi began his presentation by providing quantitative data on the regression of seagrass meadows. He specifically mentioned that "*the surface area of Posidonia oceanica has decreased*

*by 5 to 20% in the last century*[1]", that "*50% of the Posidonia meadows on the Spanish coast are in regression*[2]" and he quoted an article demonstrating the damage caused by anchoring with anchors in shallow coastal sea beds[3].

There are anchoring systems consisting of dead weights, which, located outside areas of high biodiversity, can be a good conservation tool, although they need to be properly designed to avoid damage. In fact, there are regulated anchoring areas with anchoring systems that are unsuitable for the type of substrate, or poorly installed, which cause irreparable damage to phanerogam meadows. It should be emphasised that the proper removal of these systems is just as important as their installation.

There are different types of environmentally friendly moorings with different anchoring systems to the bottom. It is necessary to study the conditions of each area in order to install the ideal system, as well as to establish the type of vessel, tonnage, length, etc., that can use them.

The Royal Decree 79/2019, of 22 February, which regulates the compatibility report and establishes the criteria for compatibility with marine strategies, sets out the conditions to be met by regulated anchoring sites.

In addition to the installation and/or removal of these devices, it is necessary to establish how and by whom they will be managed, used, maintained and evaluated or monitored.

Submon carries out assessments of anchoring field areas to see if the elements that form them need to be removed from the sea or if they should be left as fixing elements because they are well installed.

It is possible to install ecological or low-impact anchorages in sensitive areas, such as *Posidonia* meadows *(image 1*), like, for example, those installed in La Azohía (Cerrada cove, Murcia), which are providing very good results.

[1] Boudouresque, C. F.; Bernard, G.; Pergent, G.; Shili, A. y Verlaque M. (2009). Regression of Mediterranean seagrasses caused by natural processes and anthropogenic disturbances and stress: a critical review. Botanica Marina 52:391–418.
[2] Marbà, N., Duarte, C. M., Cebrián, J., Gallegos, M. E., Olesen, B., & Sand-Jensen, K. (1996). Growth and population dynamics of Posidonia oceanica on the Spanish Mediterranean coast: elucidating seagrass decline. Marine Ecology Progress Series, 137, 203-213.
[3] Montefalcone, M., Chiantore, M., Lanzone, A., Morri, C., Albertelli, G., & Bianchi, C. N. (2008). BACI design reveals the decline of the seagrass Posidonia oceanica induced by anchoring. Marine Pollution Bulletin, 56(9), 1637-1645.

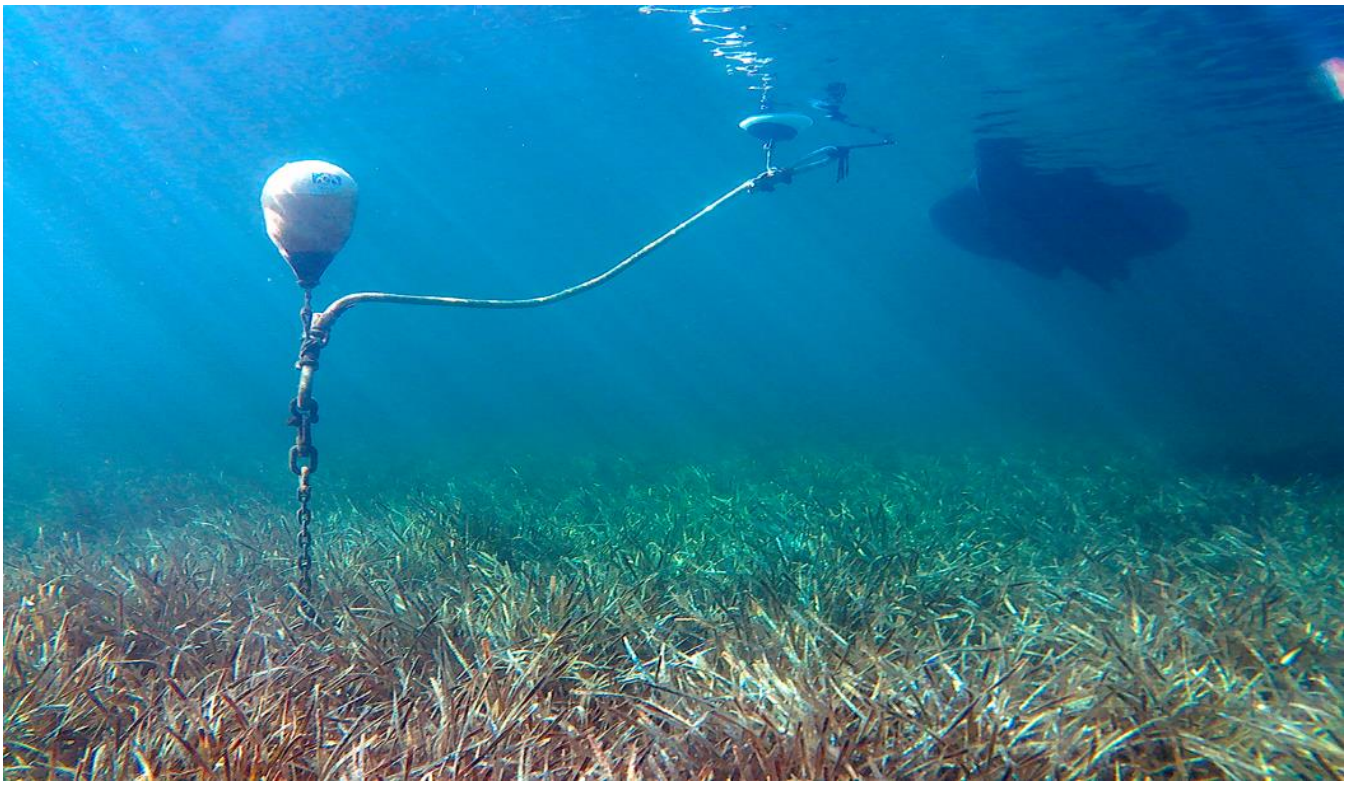

*Image 1: Low impact anchorage installed in Posidonia oceanica meadow. Source: Submon.*

Anchorages are dimensioned according to several factors to determine the length of the bar, the diameter of the discs, etc. When dimensioning any element that is going to be anchored to the bottom, an engineering study must be carried out and adapted to the length and tonnage of the boat and the climatic conditions of the area, to see if the anchorage is the correct one. If this is not the case, there may be well installed ecological anchorages, which, due to weather conditions, may be pulled up because they cannot withstand the drifting of the boat.

## QUESTIONS

Questions time cannot be opened due to lack of time. It was proposed that any doubts that may had arisen, could be resolved during the discussion of the following section.

### *Underwater Cultural Heritage – Rocío Castillo (ARQVA)*

Rocío Castillo, head of archaeology at the National Museum of Underwater Archaeology (ARQVA) began her presentation by defining the legal framework that protects the UCH. First of all, she pointed out the UNESCO recommendation of defining a joint protection of cultural and natural heritage, since the disturbance of the seabed has a negative influence on both heritages. She also cited the definition given in the 2001 UNESCO Convention for the protection of the UCH, which stated that *"underwater cultural heritage means all traces of human existence having a cultural, historical or archaeological character, which have been partially or totally under water, periodically or continuously, for at least 100 years*".

In Spain, the UCH is included in art. 40 of Law 16/1985 on Spanish Historical Heritage as "*any property that can be studied with archaeological methodology*". In turn, the Autonomous Communities (CCAA) have their own regulations, as they have assumed the legal competences, although not all of them have advanced equally in the declaration of assets of cultural interest (ACI) in the marine environment.

The Autonomous Community of the Region of Murcia (CARM) classifies the UCH according to the type of site and location (continental or maritime waters). In terms of chronology, it should be noted that most of the artefacts found in this Autonomous Region are classified as Roman or modern.

Rocío explained how the UCH is investigated, the need for specific methods for research in the marine environment and the complexity that this entails.

The UCH is exposed to natural threats, such as storms, or anthropogenic threats, both uncontrolled legal activities such as trawling, anchor-launching, works that alter the coastal dynamics and illegal activities, both unintentional and intentional, such as poaching. As an example of a legal activity that can affect the UCH, it was not until the 1990s that the effects of port dredging on the UCH began to be considered through the Environmental Impact Assessment (EIA). In fact, there is a documented case in the Region of Murcia where the route of an underwater outfall was changed so as not to completely excavate a wreck.

There are different solutions to protect the UWH:

Legal solutions to protect it, which are minimal in the CARM. The most advanced Autonomous Community in the declaration of underwater ACI and its protection is Andalusia, with archaeological easement areas within its legislation.

Physical Solutions: These are usually temporary or punctual. Sometimes physical protection is chosen, with meshes, mounds, protection boxes or the planting of artificial *Posidonia oceanica*, and other elements. In addition, navigation and anchoring may be excluded on a temporary basis during excavation campaigns.

Social and political solutions: These are usually quite effective. These are mainly awareness-raising campaigns, dissemination and collaborations with other agents and institutions.

It is interesting to know that the UCH on the continental shelf is managed by the CCAA. It is surprising that, even for the location of regulated anchorages, the location of wrecks and other ACI, has not been considered.

## QUESTIONS

Alicia Montano (GD Natural Environment, CARM) asked if detailed mapping of the UCH locations in the Region of Murcia was available. Rocío Castillo (ARQVA) replied that when the UCH plan

was implemented in the CCAA, one of the recommendations was that the UCH mapping should not be detailed to avoid spoliation, but more general, non-detailed mapping is available. Therefore, effective communication between administrations is of vital importance, in order to consider and share essential information for the management, in this case, of the marine environment.

Aurora Mesa (DGCM, MITERD) indicated that, for the preparation of the POEMs, this information was taken from underwater cartography of the Region of Murcia, but it is not reflected in public maps for its protection. María Gómez (IEO, CSIC) added that in the inter-ministerial meetings it is indicated that these are sensitive areas, so the exact location is not given and each Autonomous Region can establish its own sensitive areas with more or less delimitation. The same situation applies to defence zones. Although the information is not public, there must be communication and consensus among the CCAA on certain issues.

Óscar Esparza (WWF) asked whether the CCAA have competences in the continental shelf UCH. Rocío Castillo (ARQVA) clarified that regional competences extend up to the 12 nautical miles of the "*de facto consensus on the seabed*[4]", for UCH. Even so, the development of the archaeological chart in each CCAA is very uneven, mainly due to a lack of resources. In any case, there is no legislative clarity regarding these competences. Andalusia lodged a complaint to the Constitutional Court and the competence mentioned in the "*de facto consensus on the seabed"* remained, even though it is not legally established as such. Archipelagic CCAA, in fact, lack legal frameworks for UCHs; they are just starting now. There are many differences between the CCAA with regard to the UCH.

María Gómez (IEO, CSIC) mentioned the meeting held in 2019 between the CCAA, the Civil Guard and the IEO (CSIC), to see how they could collaborate to solve this problem. The CCAA were interested and very willing, but more precise locations of the UCH are needed to be able to assess the work and to be able to take advantage of the oceanographic campaigns that are carried out in certain areas to study the UCH. In many cases there is a lack of personnel resources, not only financial resources. It is necessary to know what needs to be protected and monitored (anthropic and natural affections). Joint biology and archaeology campaigns should be carried out.

Juan Guillén (Institut d Ecologia Litoral) emphasised the importance of capturing archaeological knowledge in cartography, not only for dialogue between administrations, but also to be accessible to consult it, as there are many companies that want to carry out projects and, due to not having access to this information, they propose projects (with the consequent waste of resources) in areas where they are unaware of the existence of archaeological remains. Rocío Castillo (ARQVA) indicated that the CCAA are usually very cautious with regard to the publication of this information, but that there is the possibility for companies to make such consultations, and the EIA is also there for this purpose.

[4] "De facto consensus on the seabed" is an agreement between the AGE and the CCAA where they arranged the UCH management by the CCAA in all the maritime waters up to 12 nm.

Juan Guillén (Institut d Ecologia Litoral) presented the case of an aquaculture company that made such consultations because they were aware of the existence of UCH in the project area, they considered the location of these archaeological remains and received numerous allegations either way, given that they were told that there were more remains in the surrounding area that should be studied with sonar and a tape recorder, although in the end nothing was found. This is another example of the fact that the knowledge should be captured and shared because it can be useful in certain situations.

## *Impact of anchorages on marine biodiversity – José Antonio García Charton (University of Murcia)*

José Antonio García Charton, lecturer at the University of Murcia (UM), began his presentation on the effect of boat anchoring on the seabed by showing a graph showing the effect of anchoring and mooring of recreational and merchant vessels on the different benthic habitats. It showed how seagrass meadows are the most affected habitats, both by anchoring and anchoring of recreational vessels, while coral reefs are the most affected by anchoring of merchant vessels[5].

Most of the studies on anchoring concerns recreational anchoring, especially on marine phanerogams and coralligenous beds. The studies are based on comparisons between anchoring and non-anchoring areas, mainly in shallow waters (<20m depth).

The impact of anchorages on *Posidonia* was already mentioned in 1970. José Antonio explained the analyses carried out in Port Cros National Park (France)[6] where anchoring areas were compared with non-anchoring areas. Subsequent studies in the same area showed the bald spots left not only by anchors, but also by the chains and the dead bodies of recreational boats[7,8]. Subsequent studies confirmed the vulnerability of *Posidonia* to boat anchoring. These areas that end up uncovered are easily colonised by invasive species and the volume of hydrogen sulphide in them increases, with the consequent worsening of the glades themselves[9]. Other endemic Mediterranean species associated with *Posidonia* have also been seriously affected by this problem, as is the case of the mollusc *Pinna nobilis*[10].

[5] Allison Broad, Matthew J. Rees, Andrew R. Davis, Anchor and chain scour as disturbance agents in benthic environments: trends in the literature and charting a course to more sustainable boating and shipping, Marine Pollution Bulletin, Volume 161, Part A, 2020.
[6] Augier, H. & Boudouresque, Charles. (1970). Végetation marine de l'ile de Port-Cros (Park National). V. La baie de Port-Man et le problème de la régression de l'herbier de Posidonies. Bull. Mus. Hist. Nat. Marseille. 30. 145-164.
[7] Robert, P., 1983. Dégradation de l'herbier de posidonies dans la zone de mouillage organisé de la baie de Port-Cros. Tra6aux scientifiques du Parc national de Port-Cros, 9, pp.195-197.
[8] García Charton, J. A., Bayle-Sempere, J. T., Sánchez-Lizaso, J. L., Chiesa, P., Llaurado, F., Pérez, C., & Djian, H. (1993). Respuesta de la pradera de Posidonia oceanica y su ictiofauna asociada al anclaje de embarcaciones en el Parque Nacional de Port-Cros (Francia).
[9] Arnaud Abadie, Sylvie Gobert, Marina Bonacorsi, Pierre Lejeune, Gérard Pergent, Christine Pergent-Martini, Marine space ecology and seagrasses. Does patch type matter in Posidonia oceanica seascapes? Ecological Indicators, Volume 57, 2015, Pages 435-446,
[10] Hendriks, I. E., Tenan, S., Tavecchia, G., Marbà, N., Jordà, G., Deudero, S., ... & Duarte, C. M. (2013). Boat anchoring impacts coastal populations of the pen shell, the largest bivalve in the Mediterranean. Biological Conservation, 160, 105-113.

Other recent studies have shown that different types of anchors and anchoring systems, such as mooring lines[11], could produce a much lesser affection on habitats.

On the other hand, there are palliative measures such as environmental education, payment of anchoring fees, limitations on anchoring time, etc., which could greatly reduce the problem.

Finally, as a curious detail, it is worth mentioning that some studies[12] include scientific research as a risk-generating activity in Marine Protected Areas (MPAs).

## QUESTIONS

Cristina Cervera (IEO, CSIC) wondered why existing many different ecological anchoring systems available, such as those presented today by Jordi Sánchez (Submon), are not used.

José A.G. Charton (UM) and Jordi Sánchez (Submon) agreed that the problem is economic.

Alicia Montano (CARM) replied, by allusion, that it is not an economic issue. The problem is the substratum. There are two different scenarios, the Mar Menor, and the coastal area. For the anchorages in the Mar Menor, they found the disadvantage that the rock underneath is volcanic and that, with pressure, when the chemical block is put in, the rock breaks. In this case, the only sustainable anchoring method left would be biotopes (meaning an artificial reef-type structure), but they are not valid in the Mar Menor due to the insufficient depth. She argued that the CARM was interested in using the least impacting anchoring method, but due to the amount of mud and the substrate, there is no other option than concrete, but there may also be problems of breakage of the blocks and, when a large ship comes, the block in question may be dragged towards areas where *P. oceanica* is present. In order to study this issue, she indicated that they are going to carry out a study on the effect on the phanerogam meadows caused by the dragging of concrete blocks on Isla Grossa. Alicia insisted that it is not an economic issue, but that everything they have tried to put in place so far has not worked, at least in the Mar Menor.

Álvaro Alonso (General Directorate for Biodiversity, Forests and Desertification (DGBBD), MITERD) indicated that the management plans of the MPAs, which are a focus of attraction for recreational boats, include measures for anchoring in their management plans, although this issue is already de facto regulated by Law 42/2007, on Natural Heritage and Biodiversity. At the time, letters were sent to the CCAA to identify popular anchoring areas, but few replies were received. At present, in collaboration with the Merchant Navy, Tragsatec has been commissioned to identify these areas, in which close collaboration with the CCAA is envisaged.

[11] S. Venturini, F. Massa, M. Castellano, G. Fanciulli, P. Povero, 2021, Recreational boating in the Portofino Marine Protected Area (MPA), Italy: Characterization and analysis in the last decade (2006–2016) and some considerations on management, Marine Policy, Volume 127.

[12] Ruth H. Thurstan, Julie P. Hawkins, Luiza Neves, Callum M. Roberts, 2012. Are marine reserves and non-consumptive activities compatible? A global analysis of marine reserve regulations, Marine Policy, Volume 36, Issue 5, pages 1096-1104.

José María Unzurrunzaga Campoy (Coastal Demarcation in Murcia (DC, MITERD) indicated that the coastal demarcations/sub-regions know perfectly well where the unregulated anchorages are, without using Sentinel[13].

Inés Castejón Silvo (Mediterranean Centre for Advanced Studies (IMEDEA), CSIC) asked whether unregulated anchoring is considered to be private individuals who drop the anchor for the day (not the use of homemade deads) and what is meant by non-designated anchoring sites. This definition of unregulated anchoring was confirmed and it was pointed out that undesignated places are those where it is not regulated, but it is not declared illegal either.

Álvaro Alonso (DGBBD, MITERD) indicated that there had been a workshop for the analysis of phanerogams and mitigation and restoration measures. He hoped that guidelines would be approved this year, for which the CCAA would be consulted.

Inés Castejón Silvo (IMEDEA, CSIC) indicated that some CCAA, such as the Balearic Islands, are already implementing measures to mitigate unregulated anchoring. For example, in the Balearic Islands they have created an app to check whether or not you are anchoring on *Posidonia*.

Óscar Esparza (WWF) asked whether the guidelines to be published are recommendations or will be prescriptive. Álvaro Alonso (MITERD) replied that they are recommendations at the national level, with the establishment of common criteria, such as those for the management of algae sprouts.

Alicia Montano (CARM) asked whether algae had been included in these guidelines. Álvaro Alonso (MITERD) replied that no, they have not; only marine phanerogams have been considered.

Juan Guillén (Institut d Ecologia Litoral) commented that a workshop was held on this subject with different managers and the issue of including algae came up, as they could be considered for composting.

José Antonio García Charton (UM) made a comment, before starting the participatory session, indicating that he, like many others, he had not heard about the period of allegations of the POEMs. It would be necessary to wonder why.

Juan Guillén (Institut d Ecologia Litoral) pointed out that there are places where anchoring has been prohibited on *Posidonia*, but not on *Cymodocea nodosa*.

*Alicia Montano* (CARM) indicated that the CARM administration has already commissioned a project to identify unregulated anchorages in the Region of Murcia, in order to establish priority areas and establish criteria for the granting of authorisations. A preliminary study already exists and will be updated. Within the CARM they aim to classify the areas according to the need for

[13] https://sentinels.copernicus.eu/web/sentinel/home

action, to prioritise according to the state of *Posidonia*, interaction with other uses, etc. This project will be carried out by by a specialised company.

# 6. Participatory sesión 1

## *Post-it session on key questions and discussion*

During this section, participants were invited to respond to the key questions included in the working material, sent via email prior to the workshop. The questions posed were the following:

1. Why do some recreational boaters anchor their vessels in places that are not designated for anchoring?
2. In your opinion, if the coast of Murcia was provided with sufficient regulated anchoring places, would this phenomenon cease to occur? Do you think it would be advisable to draw up an anchoring plan in the Region of Murcia?
3. If a fee needs to be paid, do you think that recreational boaters would accept the payment of such a fee or would they continue to anchor in an unregulated manner?
4. What do you think of the idea of linking ecotourism and UCH? As an example, excursions could be organised in recreational boats with strategic stops in places with the presence of some element of UCH and even a camera so that the participants can see it in real time.
5. What do you think about the idea of combining ecotourism in recreational boats and biodiversity conservation? Do you consider it a good initiative? An example could be to offer excursions in recreational boats with stops in areas of high biodiversity and to explain the reasons why the boat is not anchoring on the sea bottom.
6. Do you think that if boaters were aware of the effects of unregulated anchoring on the UCH, would they continue to do so?

The participatory session was carried out through a post-it session (*image 2*) where each participant wrote its answers to the questions posed, in order to establish a subsequent dialogue, and also to identify possible conflicts, synergies or lack of information with respect to the issue raised in each question.

After allowing time for each of the key questions to be answered, the answers provided by the participants to each of the questions were read out and discussed (*image 9*).

*Image 2: Participatory session 1. Answering to key questions through post-it notes. Source: Spanish Institute of Oceanography, CSIC.*

Below the answers obtained for each of the key questions are transcribed. The pictures of the cardboards where all the answers were posted are found below each of the questions (*images 3, 4, 5, 6, 7 and 8*).

**Question 1: Why do some recreational boaters anchor their vessels in places that are not designated for anchoring?**

| OBTAINED ANSWERS |
|---|
| Lack of knowledge and monitoring. |
| Lack of clear planning and regulation.<br>Lack of monitoring and sanctioning measures. |
| “We have been doing it all our lives”. "I have no information". Little (or no) environmental awareness. |
| Boaters against regulation: "The sea is a space of freedom". |
| Insufficient number of designated anchorage sites in summer. |
| Lack of a recreational boating strategy with planning of mooring areas, definition of sensitive habitat areas, design of low-impact authorised mooring areas |
| Due to lack of knowledge or lack of information. Also due to lack of environmental sensitivity. |
| Lack of basic cartography or/and easily accessible to navigators. |

| |
|---|
| Because they do not mind not respecting the established limits, even if they know them, as long as they enjoy it for their own benefit, added to lack of knowledge in some cases. |
| Lack of knowledge, or when it exists, the idea that "the sea belongs to everyone".<br>Lack of information on the subject.<br>Lack of education and awareness of the damage caused by anchoring.<br>Lack of surveillance and sanctions. |
| Lack of environmental education and awareness. |
| Possible lack of knowledge of the impacts.<br>Lack of sufficient mooring places. |
| Lack of knowledge, lack of alternatives, sensitivity. |
| Lack of knowledge (lack of information). |

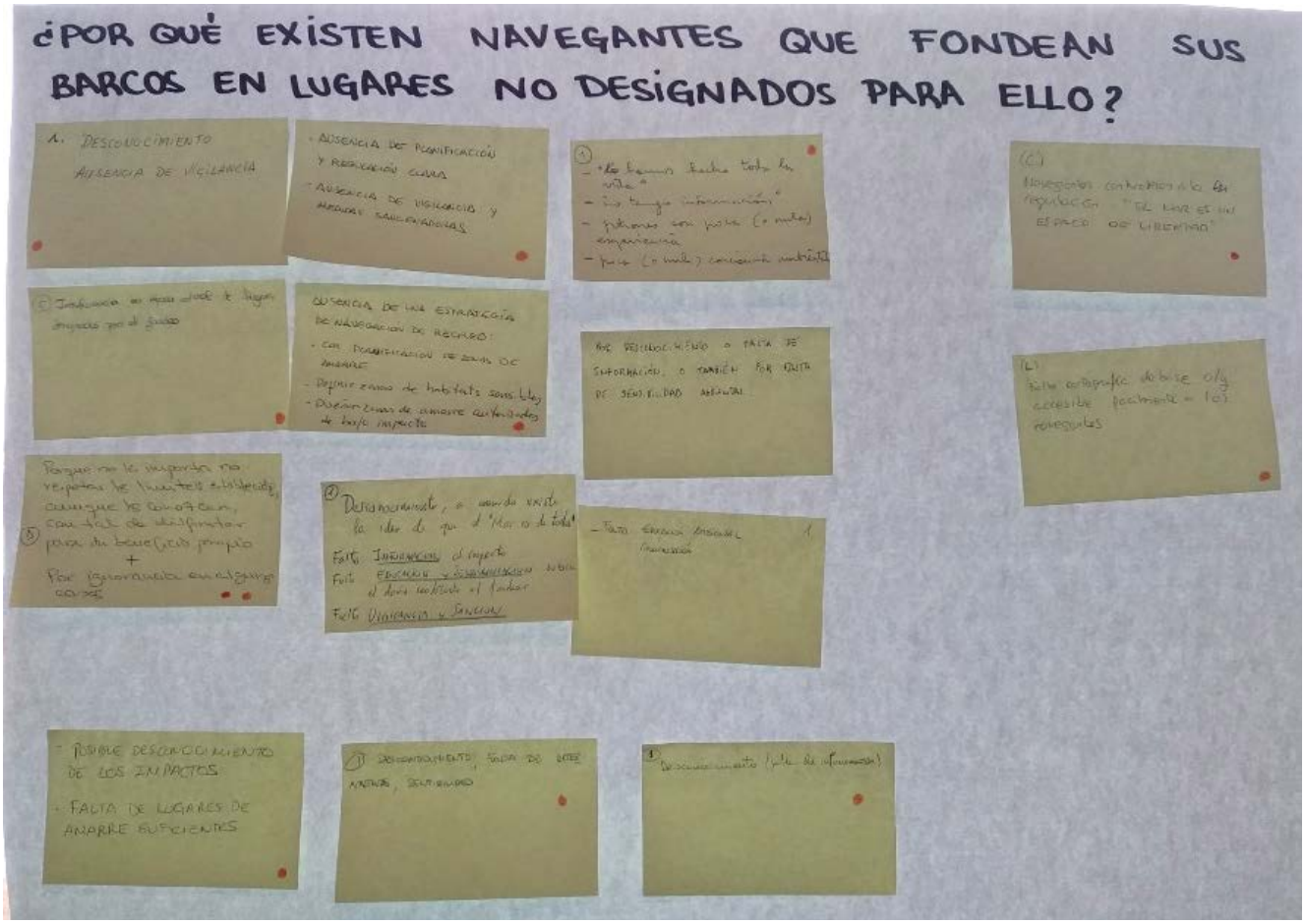


*Image 3: Answers to question 1. Source: Spanish Institute of Oceanography, CSIC.*

There was practically a general consensus in the response to this question, especially considering the lack of cartographic information, surveillance and public information.

Juan Guillén (Institut d Ecologia Litoral) stressed the lack of surveillance, because most of those who anchor in these areas know them well, i.e. it is not a lack of knowledge, but a lack of consequences.

José Antonio García Charton (UM) indicated that he believes that there are people who do it because they have been doing it all their lives, they reaffirm that it has no impact and they will continue to do so.

**Question 2: In your opinion, if the coast of Murcia was provided with sufficient regulated anchoring places, would this phenomenon cease to occur? Do you think it would be advisable to draw up an anchoring plan in the Region of Murcia?**

| OBTAINED ANSWERS |
|---|
| No. Yes, it would be necessary. |
| The plan should be accompanied by coercive measures (sanctions). Importance of surveillance. |
| It would help to solve the problem, but it must be accompanied by appropriate measures to publicise or show in the cartography these places and the importance of their use. |
| It would help to provide anchoring sites, but this must be accompanied by an information campaign for the sector and surveillance to penalise offenders. |
| Buoy fields release pressure from the site, but it is displaced to adjacent areas. Without associated permanent surveillance, the problem won't be solved. |
| Recreational boating environmental monitoring programmes should be established. To define a spatial planning/strategy for recreational boating:<br>• Define suitable areas<br>• Promote surveillance |
| No, but it would be minimised and, therefore, its impact on the seabed would also be minimised. |
| Unfortunately, not; it would decrease, but in order to completely avoid these illegal anchorages, measures need to be put in place:<br>• Awareness raising and education<br>• Surveillance and sanctioning<br>• To include conservation concepts, evaluable and eliminatory in obtaining nautical qualifications (PNB, PER, etc.). |
| I believe that an anchoring plan is necessary as a first step. It should include the quantification of the pressure/demand of sailors. |
| It would not stop, because of how uncivic most people are. Yes, it would be highly recommendable to design a plan for anchorages in the "Costa Cálida". |
| Illegal anchorages would not cease to occur, but they would be reduced.<br>Yes, it is essential. |
| A regulated anchoring scheme in the region is essential. Its proper design and good management, including surveillance. |
| If there were enough anchoring places, this would partly reduce the number of unregulated anchorages. |

Yes, it would be interesting to have an anchoring plan in the CARM.

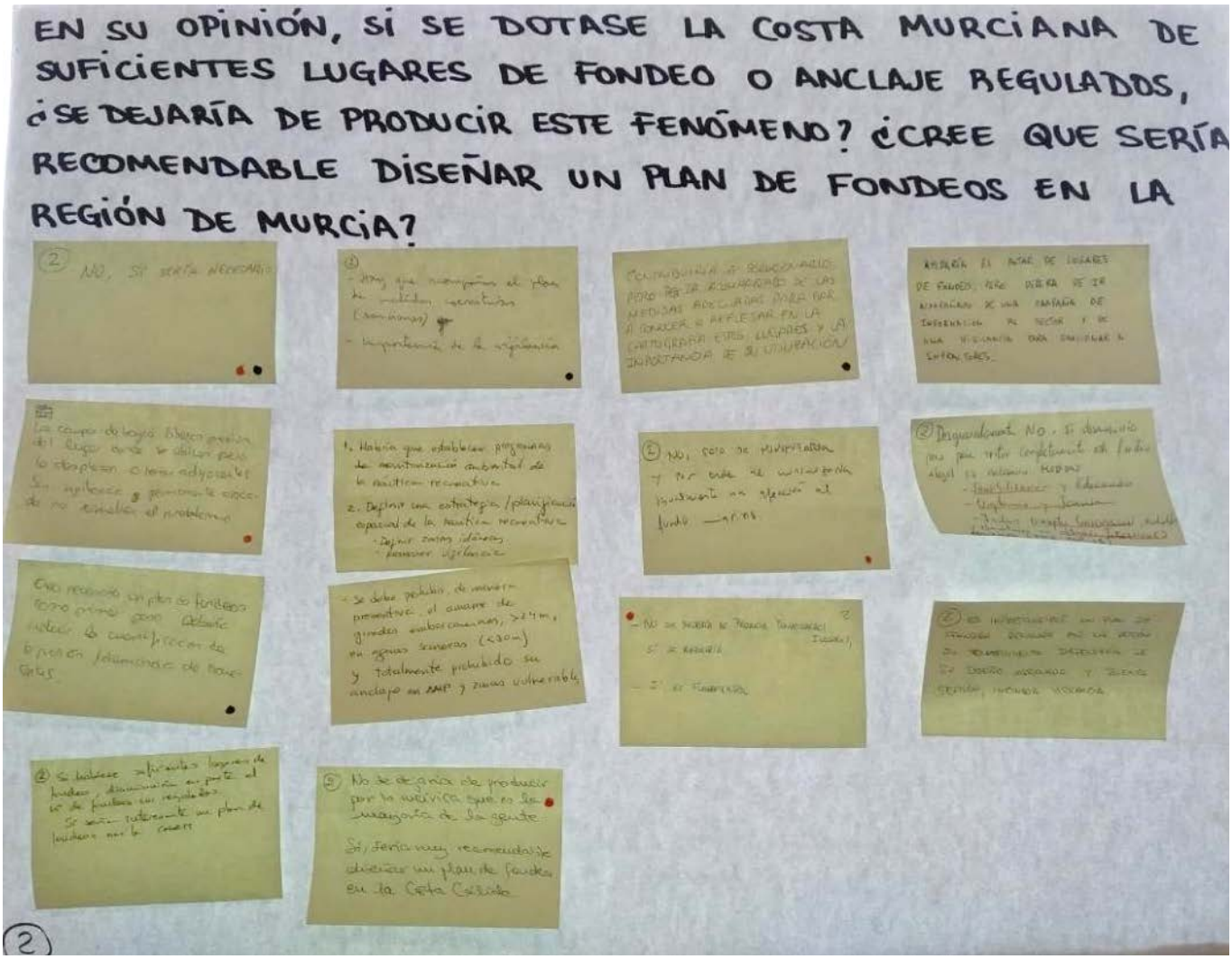


*Image 4: Answers to question 2. Source: Spanish Institute of Oceanography, CSIC.*

In this case, more varied responses were obtained, but there is a general feeling that, when anchoring is limited or forbidden in a specific area, sailors continue to do so, but in other areas where it is no longer forbidden.

Alicia Montano (CARM) indicated that the CARM has already implemented an anchoring plan for the Region of Murcia. One of the main concerns for the CARM is how the buoys are going to be maintained. They are considering various possibilities, such as, for example, changing large buoys for small buoys in winter so that they do not disappear in storms.

José María Unzurrunzaga Campoy (DC, MITERD) was of the opinion that it is necessary for the central administration to offer support in relation to this type of need.

Inés Castejón Silvo (IMEDEA, CSIC) explained that in the Balearic Islands there is an agreement with the recreational nautical sector which was carried out to avoid conflicts and which consists in the fact that they can charge for the use of the buoys, but they maintain the service. If this service is to be offered for free, someone has to bear with the cost of maintenance.

José María Unzurrunzaga Campoy (DC, MITERD) confirmed that many people are willing to pay a small fee in exchange for a safe anchorage, especially in places with a large influx of people. One idea could be to subcontract a company to collect this fee.

Pedro García (Naturalists Association of the Southeast, ANSE) said that he believes there are many alternatives, such as including certain conditions in the concessions that are granted; for example, making the licensing of buoys for diving centres conditional on them maintaining these buoys. As another example, with a buoy field that is located near a marina, a clause could be included in the concession that implies that the marina has to maintain the buoy course. In any case, it is essential to include an awareness and communication campaign to accompany the payment of the fee.

Inés Castejón Silvo (IMEDEA, CSIC) indicated that she thinks that it must be considered that there is a percentage of people who will continue to do what they want. This is why monitoring with sanctions is essential. If a plan is not monitored, the impact is further diluted.

José Antonio García Charton (UM) said that we were talking about governance in an activity. We have the experience of Marine Reserves (MR), where the participation of all sectors is key; another issue is that they do not participate, as we are seeing (referring to the nautical sector that was not present, that could not attend the workshop in the end). Then, there is the issue of incentives of all kinds: representation, experiences, feeling listened to and considered, etc. It has taken 25 years in the MRs to understand that the sectors have to be involved. Let's not do it again.

Aurora Mesa Fraile (DGCM, MITERD) added that the CARM had given them a plan for anchorages in the Mar Menor.

Alicia Montano (CARM) stated that this plan had already been drawn up, indicating that they had been asked to draw up a plan for the entire coastline of Murcia.

Óscar Esparza (WWF) said that the spatial strategy for recreational boating should be more ambitious and cover more issues, not just anchorages.

**Question 3: If a fee needs to be paid, do you think that recreational boaters would accept the payment of such a fee or would they continue to anchor in an unregulated manner?**

| OBTAINED ANSWERS |
|---|
| No, or only a very small minority. |
| Yes, there would be a significant percentage of vessels anchoring illegally, especially smaller vessels and especially rental vessels. |
| Payment of fees must be accompanied by education/awareness campaigns.<br>Possibility to reinvest revenues in specific measures (not going to a common fund). |
| Most boaters would ignore paying, although I believe that a fee should be imposed to raise awareness among those who do "listen" and respect the sea. |
| I believe that such a fee should be accompanied by enforcement and sanctions. |
| It will probably depend on the profile of the sailor, level of knowledge, awareness, etc. |
| It depends on the profile of the boater. Charter boats may be more prone to the measure. |
| Initially there would be rejection, but if informed and sensitised, I think they might accept it. |
| They would not accept it, but there would be no other option.<br>Yes, although it would be reduced with monitoring services. |
| If the fee is not disproportionate, a good part of the nautical sector would be willing to pay it, for the security of an anchorage. |
| These measures should be accompanied with other incentive-based measures. But on its own, it would not solve the problem. |
| The payment of fees would depend on the cost, payment facilities, control, etc.<br>There could be differentiated tariffs according to professional and/or sporting use, annual use "cards", complementary services such as the use of access ramps from the coast, etc. |
| Some will pay. Many would move to other areas.<br>If moorings were free, the use of regulated anchorages would be facilitated |

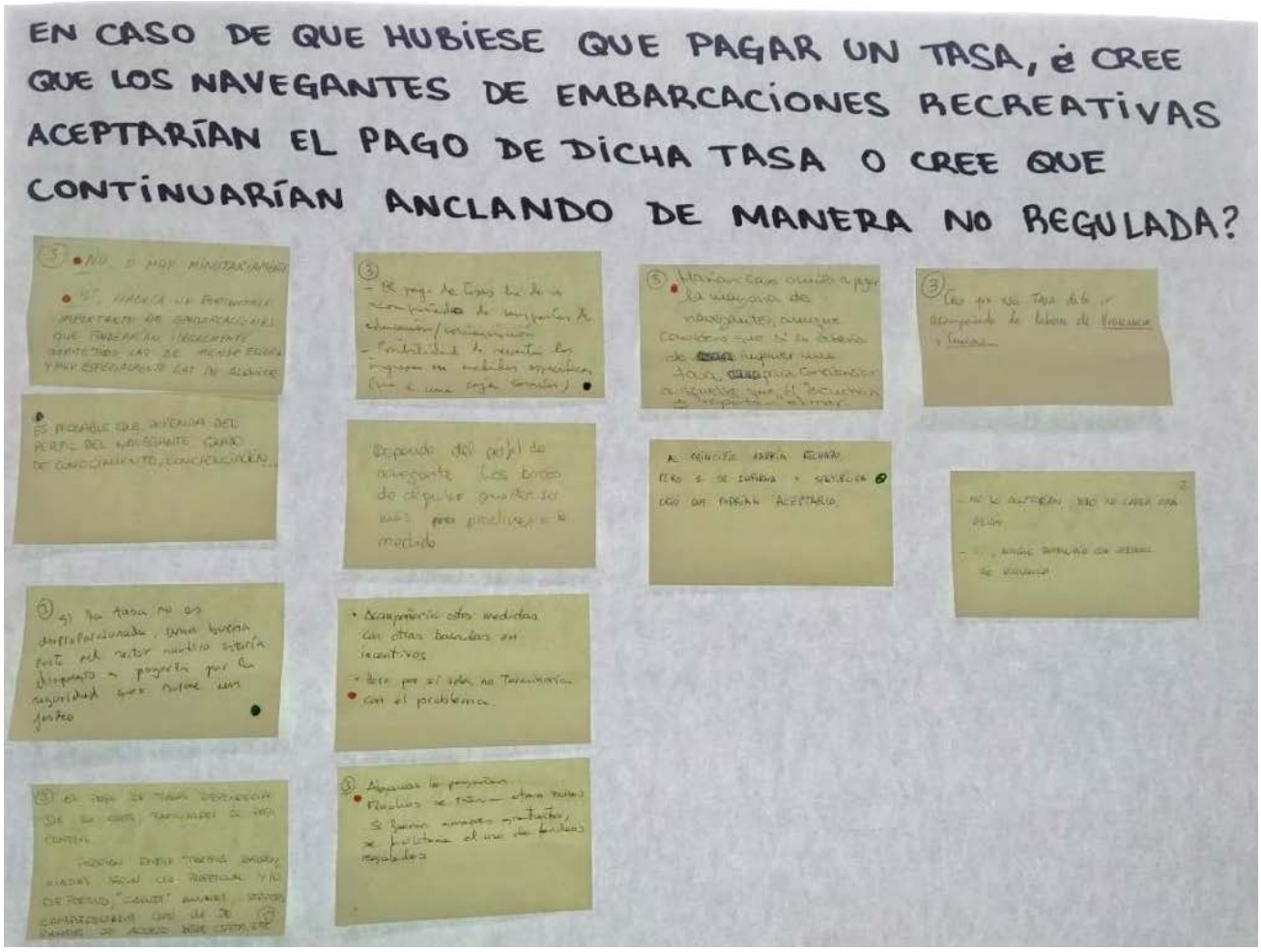


*Image 5: Answers to question 3. Source: Spanish Institute of Oceanography, CSIC.*

Most participants agreed that the fee is not the solution to the problem, but its implementation is desirable.

**Question 4: What do you think of the idea of linking ecotourism and UCH? As an example, excursions could be organised in recreational boats with strategic stops in places with the presence of some element of UCH and even a camera so that the participants can see it in real time.**

| OBTAINED ANSWERS |
|---|
| Well, it would contribute to educate and disseminate, diversifying the cultural tourist offer. |
| Another example: recreational diving with the UCG as a centre of interest. |
| Total disconnection between administrations and sectors. |
| Everything related to environmental protection and our marine heritage must clearly go hand in hand. Society needs to be made much more aware. The less access to key sites, the better. |

| |
|---|
| I consider them, as proposed here, to be incompatible. Taking tourists to the sites would mean publicising their location, which could lead to looting. An alternative could be for certain excursions to include information on the importance of this heritage and its conservation, but not visits to real wrecks, but perhaps artificial ones, like a "thematic park". |
| A good idea. It should be borne in mind that, from a boat, without diving (something not available to everyone), the perception of biodiversity and UCH is very low. In addition, experiences at sea require optimal conditions of temperature, rainfall, currents and waves, transparency or turbidity, etc. |
| This would be a welcomed proposal. |
| It is a good proposal. It is important how it is articulated, as the inclusion of "claims" on maps and everyone going their own way is a risk. |
| Except for places with good equipment and surveillance, I see it complicated and even not advisable. |
| The UNESCO 2001 convention on the protection of the UCH favours public access (divers) to the UCH in situ, as long as it does not harm its preservation. Not all underwater sites can be visited by divers (from recreational boats it would not be visible).<br>There are many European projects researching/developing strategies for the valorisation of the UCH. Many Virtual and Augmented Reality tools are being implemented to make the UCH accessible/visible to the whole public (divers and non-divers) by linking archaeologist guides and diving clubs. |
| To promote responsible recreational boating courses. |

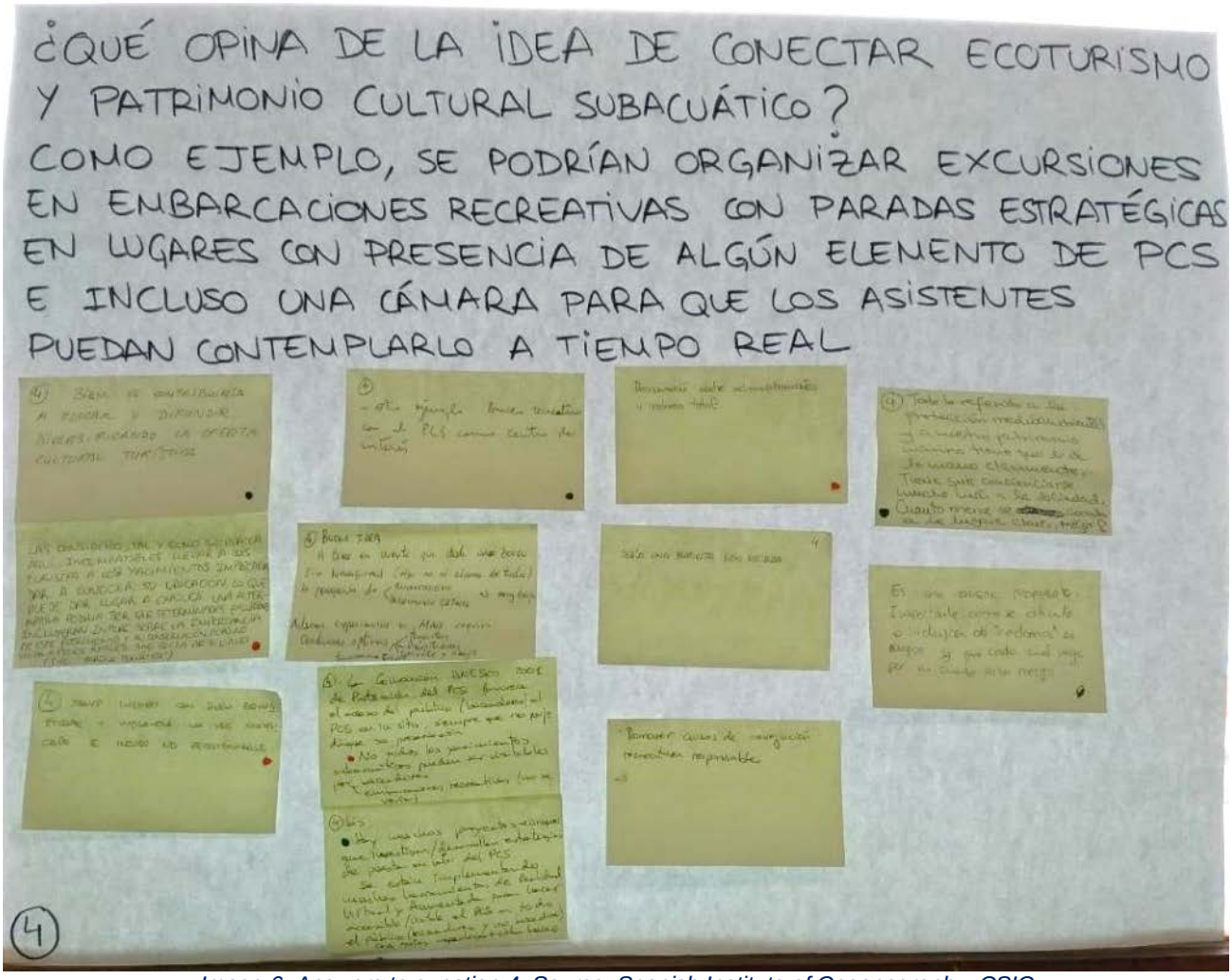


*Image 6: Answers to question 4. Source: Spanish Institute of Oceanography, CSIC.*

Whether or not it is desirable to link the UCH and the tourism sector gave rise to very diverse opinions.

Rocío Castillo (ARQVA) was in favour of in situ conservation when possible and opening the sites to the public, as long as it does not endanger their preservation. For example, she explained the case of the ACI located in Mazarrón (Murcia); if the archaeologically important property were to be uncovered and exposed, it would deteriorate. The reason for its excellent state of preservation is that it is buried. Few archaeological sites can be restored nowadays. It has been tried with some goods, but they disappear. So, other solutions should be tried, such as the installation of informative signs indicating: "here it was found..." and other measures of this type. Rocío reflected that she does not believe that there are any sites in Murcia that could be put in value, except for the wrecks from the 20th century. It is important to establish agreements between administrations, with diving clubs and others to promote awareness and knowledge about the UCH, so that regulated visits can be organised. For example, in the case of diving, informative pre-dive talks could be given.

Mónica Campillos (IEO, CSIC) indicated that she agreed with Rocío's last idea, as this would also establish synergies with other sectors.

José Antonio García Charton (UM) advocated to favour experiences between the university and diving centres in order to value biodiversity and UCH. At the same time, he questioned whether the dive centres in the region want to train their instructors to be able to provide certain information, or whether they have basic training on certain issues.

Rocío Castillo (ARQVA) stressed the lack of importance and dissemination given to the UCH, as most people do not even know what it is. In some places there are only certain dive centres that have authorisation to go to a certain site, which are the ones that have an agreement with the museum and will provide the information that is required. Rocío also insisted on the need to unite archaeological and natural contexts.

Inés Castejón Silvo (IMEDEA, CSIC) agreed with what Pedro García (ANSE) said about the idea of giving concessions under certain conditions. For example, if you want to apply for a diving licence, the application has to include a UCH protection plan. The problem is that dive clubs try to reduce the price of dives to a minimum, even if this means a reduction in quality.

**Question 5: What do you think about the idea of combining ecotourism in recreational boats and biodiversity conservation? Do you consider it a good initiative? An example could be to offer excursions in recreational boats with stops in areas of high biodiversity and to explain the reasons why the boat is not anchoring on the sea bottom.**

| OBTAINED ANSWERS |
|---|
| Well, it tends to give good results on awareness. |
| It is more complicated (what is not seen, is not appreciated). |
| Very good initiative. As long as the sea beds are not damaged, nor the UCH, but the less the better. |
| Yes, I consider it a good initiative for the dissemination and awareness of the natural values of an area. As long as it is carried out in a planned manner and with appropriate measures to prevent the activity itself from causing impacts. |
| Yes, it is important how it is articulated (as with the UCH). |
| Excursions at sea are difficult to obtain satisfactory experiences. Often the state of the sea, the weather (temperature, wind, rain), transparency and turbidity can result in unsatisfactory experiences. |
| A very good initiative. |
| It may be opportune, not only for submerged biodiversity, but also for the emerged one. Both resources should be linked, together with others, such as UCH. |
| Yes, I see that as positive. In relation to the UCH in marine protected areas, I see possible synergies, such as the inclusion of UCH in the zoning of the areas, in the management plans. |
| Promoting courses on responsible navigation. |





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Anything that raises awareness and educates about the need to protect the environment is a good practice, but the activity should not exceed the carrying capacity of the environment.

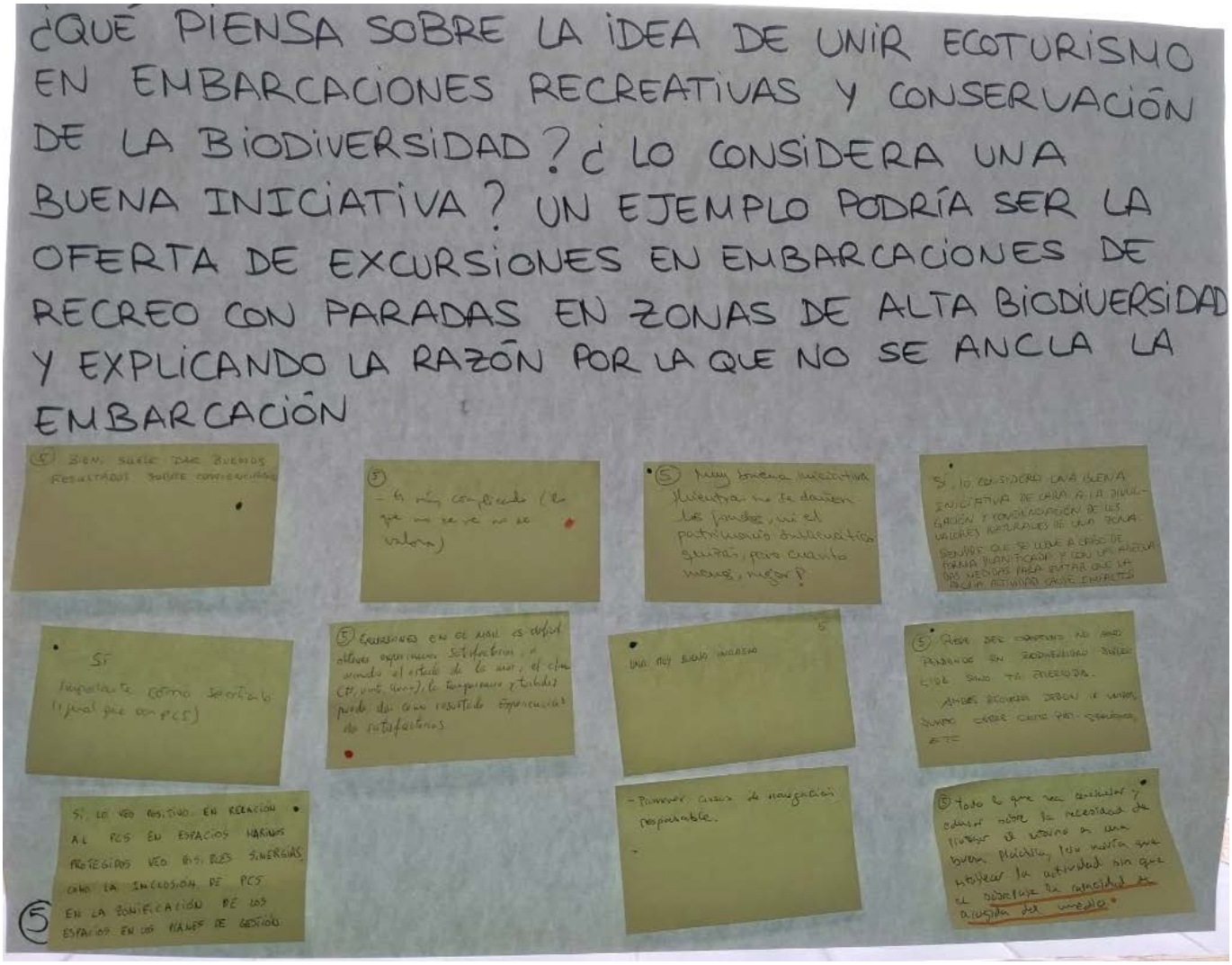


*Image 7: Answers to question 5. Source: Spanish Institute of Oceanography, CSIC.*

Pedro García (ANSE) indicated that he thinks that it is also a question of imagination on how to complement diving experiences with raising awareness on biology, geology, UCH or a combination of them.

José Antonio García Charton (UM) thought it would be interesting to introduce the subject of seabirds for non-divers, for example.

Pedro García (ANSE) recalled that, before the Mar Menor collapsed, seahorses could be seen even while snorkelling. It is a question of finding out what activities to do or promote in each place.

**Question 6: Do you think that if boaters were aware of the effects of unregulated anchoring on the UCH, would they continue to do so?**

| OBTAINED ANSWERS |
|---|
| A small percentage do. The rest would tend not to apply it in their immediate environment or daily routine. |
| Yes, there is more awareness about UCH than about natural heritage. |
| I think the majority would not, but it depends on their degree of sensitivity towards the marine environment and biodiversity. |
| The problem is that skippers are mostly unaware of UCH areas. That knowledge would help to encourage respect. |
| Many would, of course, and others would become aware. There is still a long way to go! |
| Awareness-raising would be essential. |
| I think the first thing is to know that the UCH is or may be in the area and to explain the damage. Then (the same as with the payment for anchoring) there will be a % of boaters who would comply and others who do not. |
| They would be reduced considerably. |
| Again, I think it will depend on the profile of the boater. There will be a % for whom this knowledge will clearly mean more caution, but there will be a % for whom it will not. |
| Some probably do, but the important thing is to reduce it to a minimum that does not cause a significant harm. |
| It depends on the sensitivity of each boater. |



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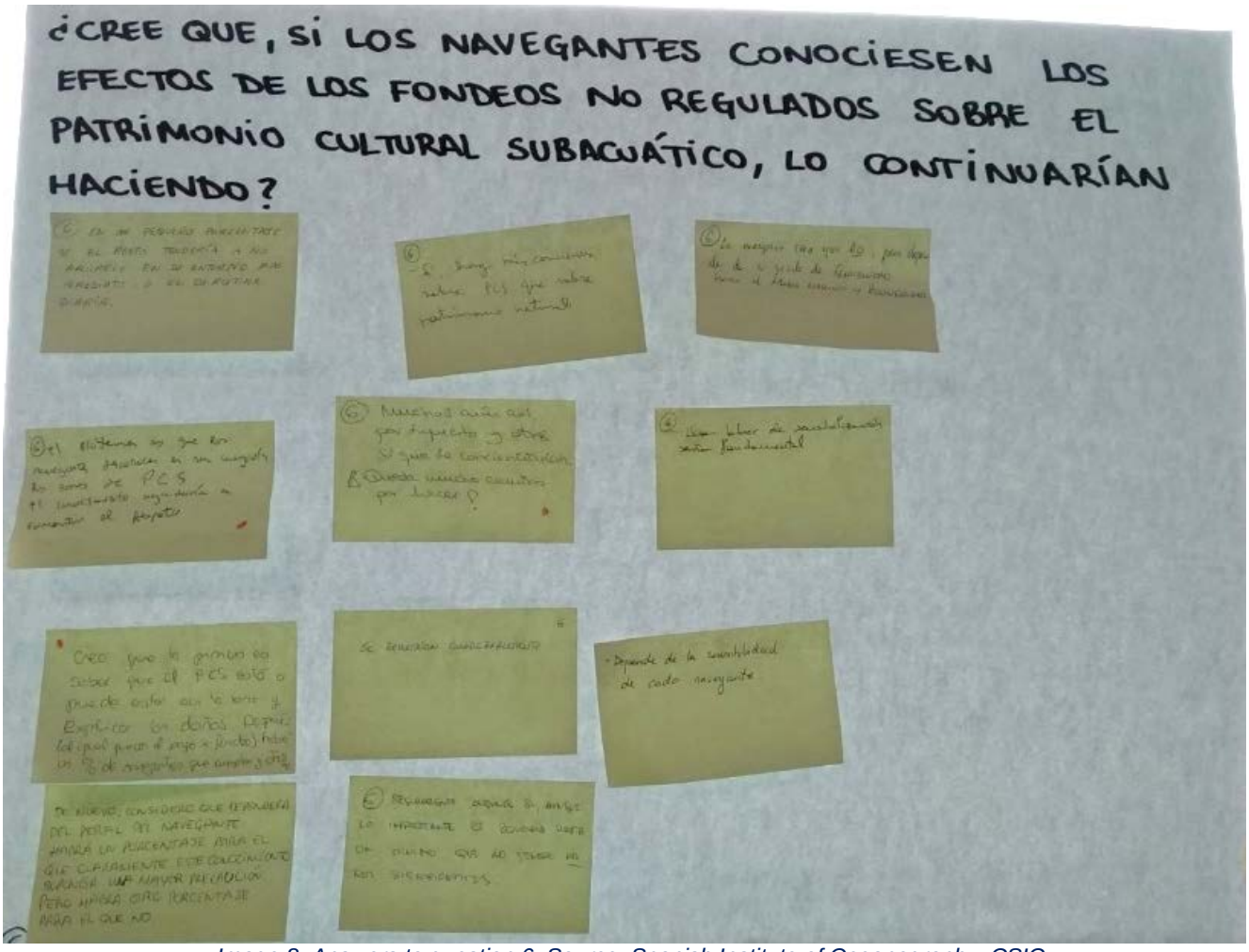


*Image 8. Answers to question 6. Source: Spanish Institute of Oceanography, CSIC.*

All the participants agreed about the general lack of knowledge and awareness of the UCH.

Juan Guillén (Institut d Ecologia Litoral) questioned whether awareness-raising really works. He believes that it depends on the case. Normally, what works is the fine/sanction. It has been documented, for example, on Grossa Island that many skippers have been informed and then they re-offend; they don't care, until they start to be denounced.

Inés Castejón Silvo (IMEDEA, CSIC) reported that in the Balearic islands a sanctioning regime was included in the navigation decree[14] depending on the damage caused, the size of the boat and a series of other factors, in order to dissuade sailors from this illegal practice.

Alicia Montano (CARM) commented that the problem was that the damage could not be proven unless the photo was taken on the spot. When there are thousands of boats, it is unfeasible. An administrative sanction is imposed, but proving the offence is very, very complicated.

[14] Decreee 25/2018 de 27 de julio, About the conservation of *Posidonia oceánica* in the balearic islands. BOIB, Butlletí Oficial de les Illes Balears.

Juan Guillén (Institut d Ecologia Litoral) proposed as a possible solution the use of small ROVs (Remotely Operated Vehicles) that could carry out surveillance tasks.

Alicia Montano (CARM) indicated that there is a debate on how to solve the verification of crime in order to issue effective sanctions and complaints. Photos are often requested to avoid allegations and appeals. These sanctions or complaints are difficult to prove if they are not documented graphically. There is also the problem of the means available. The security services are equipped with a aquactic camera, not an ROV. The legal services say that if the anchor is above a vulnerable habitat, such as a *P. oceanica* meadows, this is not a sufficient reason; it has to be proven that there is damage.

Once the discussion following the last question was over, this first part of participatory session 1 was closed, in order to identify the answers that could be classified as a possible conflict, synergy or information gap.

*Imagen 9: Reading and discussion of the answers given to the key questions. Source: Spanish Institute of Oceanography, CSIC.*

## *Discussion and selection of conflicts, synergies and information gaps*

In this second part of participatory session 1, the information obtained from the answers to the key questions and the subsequent discussion was extracted, with the aim of detecting possible conflicts, synergies and gaps of information with regard to the interaction between unregulated anchoring, UWH and biodiversity conservation.

To this end, the post-it notes from the previous session were classified, similar answers were grouped together and incorporated into the cardboards labelled as conflicts, synergies and lacks of information, as can be seen in *images 10, 11 and 12*.

Once this classification had been carried out, some extra time was given for participants in case they wanted to make any further contributions.

Conflicts, synergies and knowledge gaps obtained from the key questions are shown below:

| CONFLICTS |
|---|
| To establish limitations in one place may mean increased anchoring in another. |
| There will always be a percentage of “naysayers”. |
| Legal criteria make it difficult to deal with anchoring sanctions over seagrass meadows. |
| Archaeological research can have a negative influence on the natural environment. How to investigate/excavate a wreck covered by *Posidonia*? |
| Possible increase in requests from local councils for low-impact anchoring areas versus to tourist areas. |

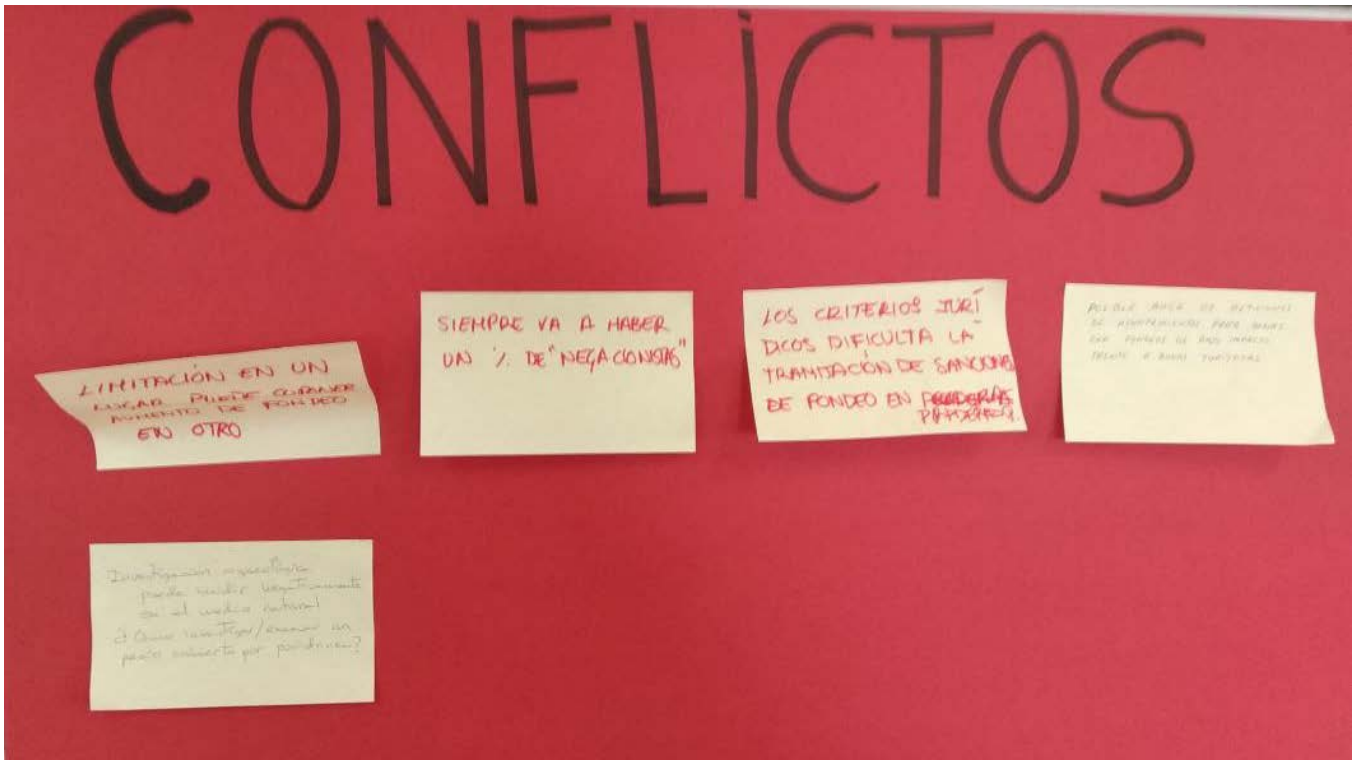


*Image 10: Conflicts. Source: Spanish Institute of Oceanography, CSIC.*

| SYNERGIES |
| --- |
| Regulated visits to PCS and diving. |
| “Win-win" collaborations with the sectors (e.g. diving-UCH). |
| Synergies with other sectors such as technology, museums, etc. |
| Synergy between UCH and AMP by establishing a zoning of uses. |

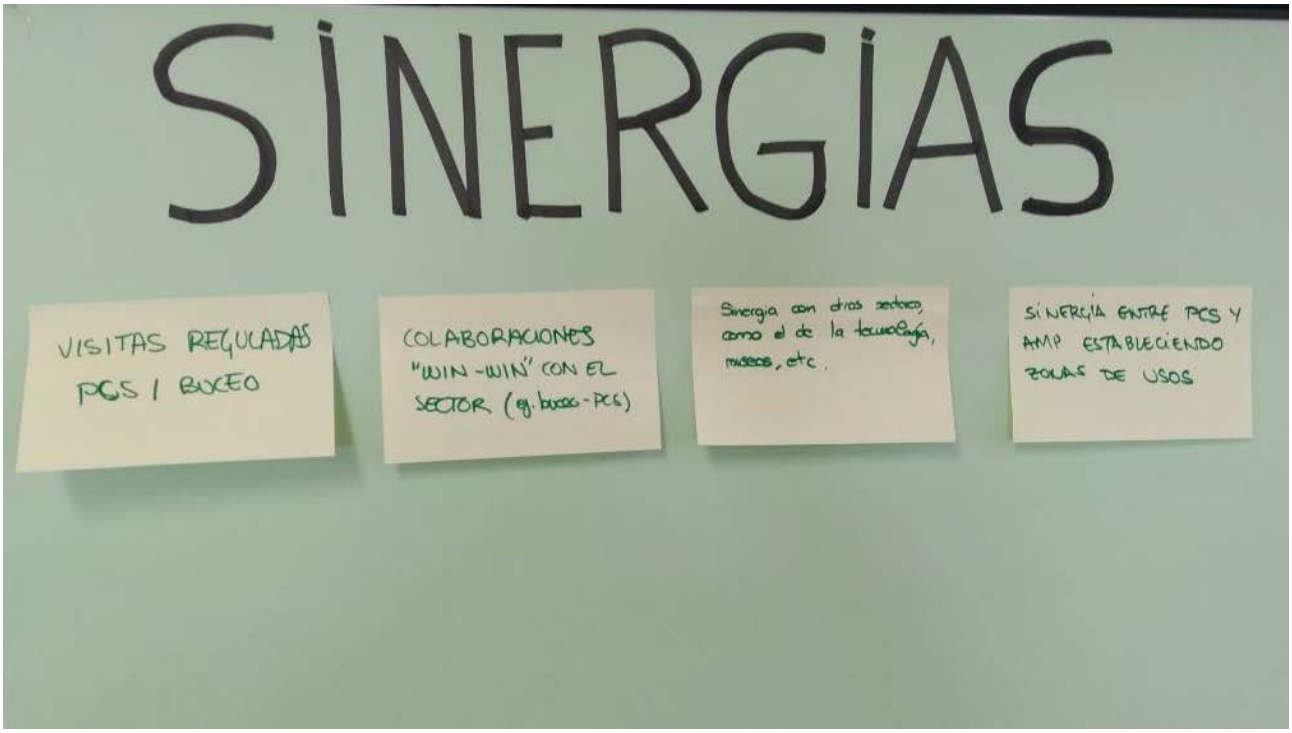


*Image 11: Synergies. Source: Spanish Institute of Oceanography, CSIC.*

| INFORMATION GAPS |
| --- |
| Lack of moorings (regulated areas). |
| Lack of appropriate technology for certain substrates. |
| Carrying capacity studies. |
| Dissemination and awareness raising (areas, impact, importance). |
| Measures, surveillance and sanctions. |
| To update cartographic information on natural heritage incorporated in INFOMAR. To improve information and communication between administrations (AGE and CCAA). |
| Clear and public planning and regulation (cartography). |
| The cartography of *Cymodocea nodosa* is difficult to pinpoint, inaccurate or variable. |

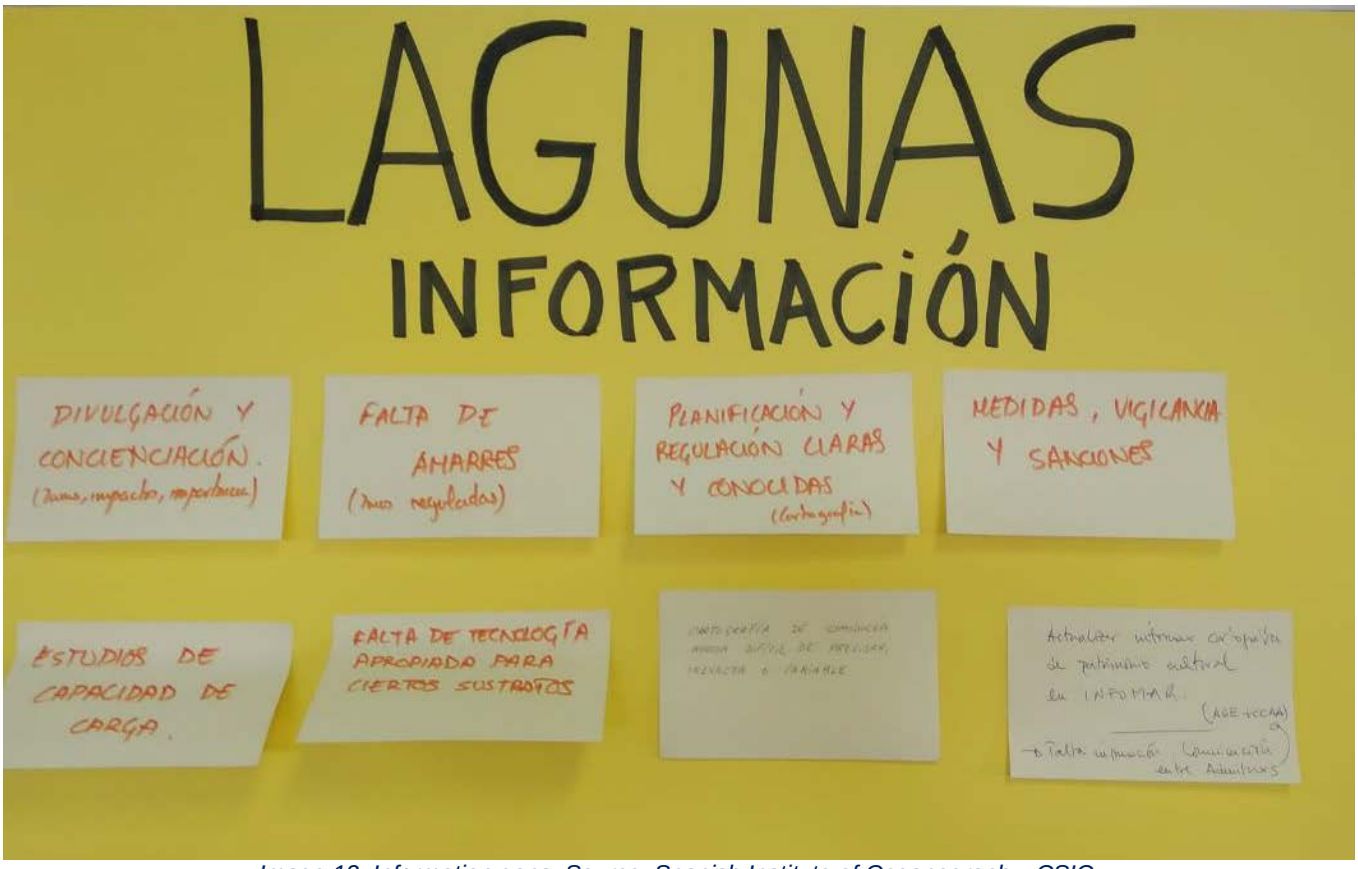


*Image 12: Information gaps. Source: Spanish Institute of Oceanography. CSIC.*

In addition, in order to graphically enrich the gaps of information section, maps of the study area were made available for the participants to include relevant information that was missing.

The following images show the maps in which relevant information to the case study that was not available before the technical workshop was incorporated freehand, such as the presence of prohibited anchoring areas, which can be seen painted in a red stripes pattern, an area of regulated anchorages in the south of the Region or the Marine Reserve of Fishing Interest (RMIP) of Cabo Cope, in processing (*image 13*) or areas of interest for the UCH (*image 14).*





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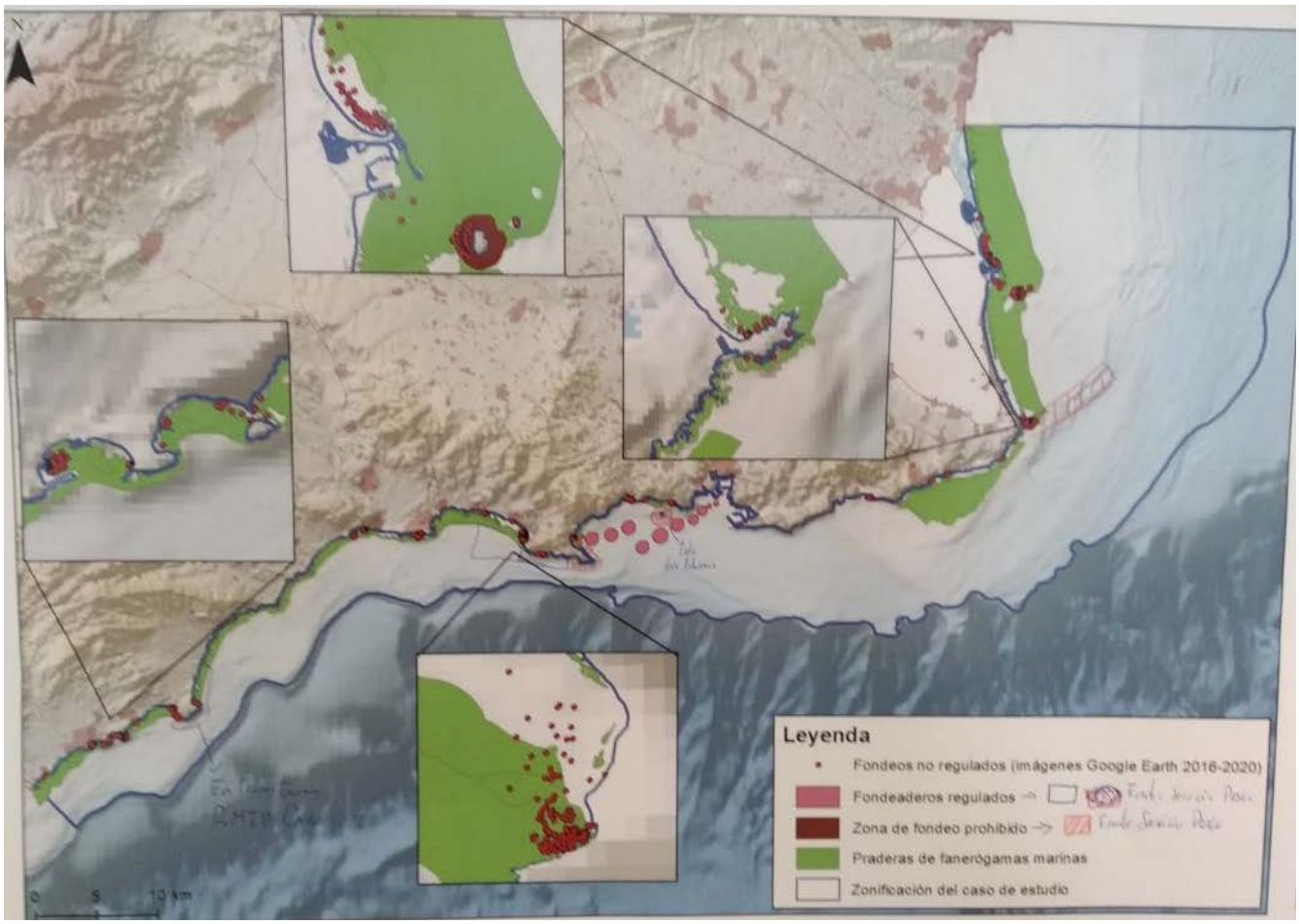


*Image 13: Map of the study area showing the points of unregulated anchorages, obtained through Google Earth images between 2016 and 2020, declared areas of prohibited anchorage, regulated anchorages and seagrass meadows with additional information added freehand during the workshop. Source: Spanish Institute of Oceanography, CSIC.*

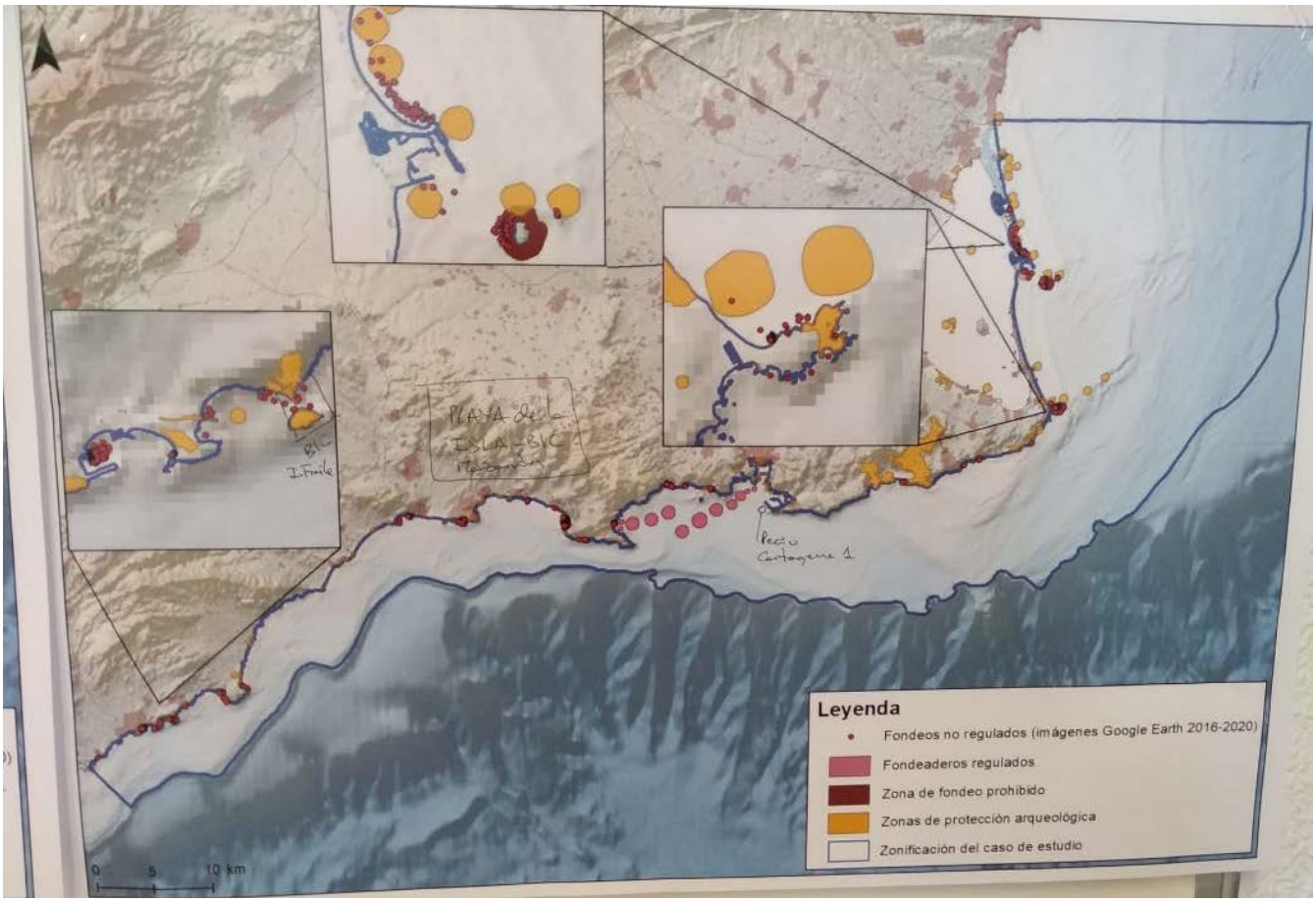


*Image 14: Map of the study area, together with unregulated anchorage points (obtained through Google Earth images between 2016 and 2020), regulated anchorages, prohibited anchorage areas and archaeological protection zones, in which the participants have captured relevant information for this case study. Source: Spanish Institute of Oceanography, CSIC.*

After reading the conflicts, synergies, and information gaps, and as no topic of discussion arose, the section was considered closed, moving on to the next participatory session.

# 7. Participatory session 2

The goal of this workshop was to develop recommendations aimed at improving the interaction between biodiversity conservation and UCH with unregulated anchorages, in order to ease the coexistence between the different uses and activities that take place in the maritime waters of the Region of Murcia in the short, medium and long term.

During participatory session 1, recommendations already emerged and were added to the panel designed for this purpose. During participatory session 2, two processes were carried out: firstly, the debate and the opportunity to propose further recommendations was opened and, secondly, these recommendations were validated in terms of their feasibility and suitability.

## *Proposal of Recommendations*

To start this first part, time was offered to collect additional recommendations that had not arisen during the first participatory session.

The recommendations obtained during this participatory session are the following:

| RECOMMENDATIONS |
|---|
| Anchoring management plan. |
| Surveillance. |
| To assess the possibility of anchorages exploitation by third parties for their maintenance. |
| To condition the licences/biddings of different sectors to the maintenance of buoy fields or similar. |
| The collection of fees and penalties dedicated to specific measures (protection, restoration, dissemination). |
| Coercive measures. |
| “Marine stewardship/custody” programs. |
| Capacity limitations associated with carrying capacity. |
| Financial and non-financial incentives (participatory governance). |
| Technological innovation: Mobile applications (e.g. seagrass distribution), "green" anchorages and anchor trains, "low-impact" anchors, augmented reality for outreach, surveillance (AIS, drones, etc.). |
| Dimensioning blocks and other anchoring methods to avoid any movement and disturbance. To limit the use of them to certain lengths. |
| Dissemination (changing minds). |
| To include biodiversity conservation and UCH criteria for obtaining nautical and diving qualifications. |

| |
|---|
| To polish surveillance methods and technology to improve enforcement. |
| The Increase in:<br>• Surveillance and sanctioning<br>• Education and awareness<br>• Environmental and UCH information |
| To create "win-win" partnerships for the interest of the sector. |
| Coordination between administrations and sectors (e.g. diving). |
| Recreational navigation strategy (considering other impacts, such as those on biodiversity and the UCH). |

## *Evaluation and validation of recommendations*

Finally, a last participatory session was held in order to evaluate the recommendations that had been provided. To this end, the participants were given stickers of different colours to carry out the evaluation. Each participant had to choose whether or not to evaluate the recommendations they considered, prioritising those with the greatest need for implementation. Because they got two stickers of each colour. The green stickers were for those recommendations whose implementation is highly advisable, the orange stickers were for those recommendations that could be appropriate but are not a priority and, finally, the red stickers were for those recommendations that the participant would not implement.

*Image 15* shows how this process unfolded, while *image 16* shows the final result of the session.


*Image 15: Participants evaluating the recommendations. Source: Spanish Institute of Oceanography, CSIC.*

During the validation of recommendations, several of the participants started a debate on the conflicts of competences between the different uses. Beacons for navigation, for example, are a state competence and come into conflict with beacons for certain activities, such as diving, which require a local concession. For this reason, communication between administrations is of vital importance for the correct spatio-temporal distribution of the uses and activities that take place at sea.

Aurora Mesa (MITERD) raised the issue of "marine custody/stewardship", as a proposed initiative to raise awareness. Marine stewardship could be interesting, due to the lack of public personnel in charge of this issue, since, through marine stewardship agreements with each sector, the maintenance and surveillance of the different areas could be promoted.

Rocío Castillo (ARQVA) reflected on what to do when scientific research may affect another activity; for example, when a wreck is discovered, but it is covered with *P. oceanica*. The implementation of inter-administrative and collaborative agreements is proposed, to carry out studies of the same point from different disciplines.

Juan Guillén (Institut d Ecologia Litoral) indicated the need for scientific advice in these cases in order to establish the ideal study methodology, which causes less impact, such as the delimitation of the cut-off limit for the *Posidonia* meadows.

Once the debate was over, the final reading of the recommendations already evaluated was made (*image 15*),

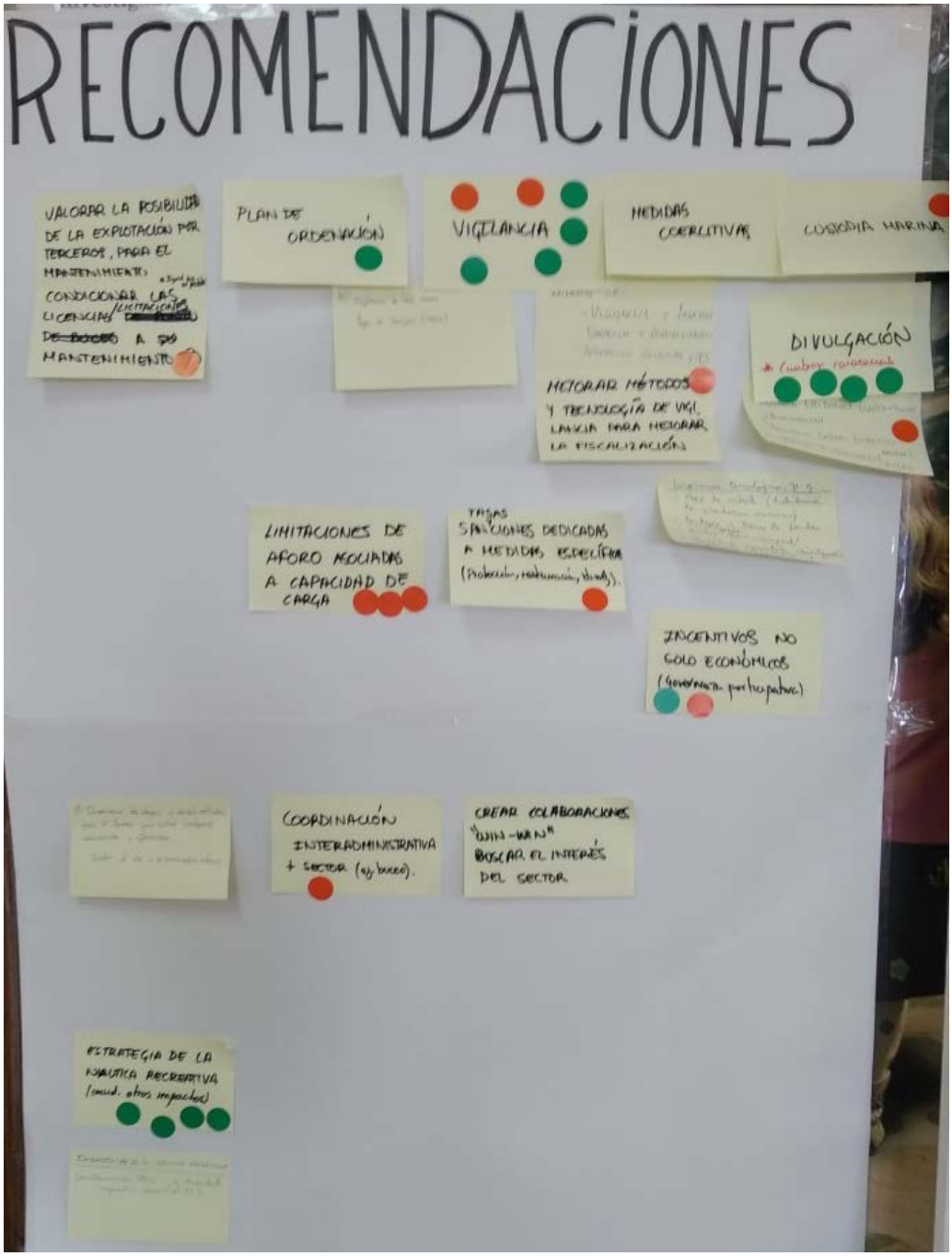


*Image 16: Validated recommendations. Source: Spanish Institute of Oceanography, CSIC.*

Firstly, it is remarkable the absence of red stickers, which means that there were no recommendations considered unsuitable for its implementation. Several recommendations were highly valued by the participants. The **surveillance** was the most voted, followed by



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**dissemination** and the need for a **strategy for the recreational nautical sector**. This was followed by the **establishment of capacity limitations associated with carrying capacity** and **participatory governance**. Finally, the need for a **management plan for anchoring** has only one high priority vote and a series of recommendations categorised as medium priority (orange stickers) such as **inter-administrative coordination and coordination with the sector**, the **conditioning of licences and biddings**, **marine stewardship/custody**, the dedication of the **amount of fees and penalties to specific measures for the care and control of the marine environment**, the improvement of **methods and technology for control** and the inclusion of **criteria for the conservation of UCS and biodiversity necessary for obtaining of different qualifications**. The remaining recommendations did not receive any votes, which does not mean that they are not recommendable, but that their priority was considered to be lower.

# 8. Lectura de conclusiones y despedida del taller

To conclude, María Gómez (IEO, CSIC) (*image 17*) made a compendium of the results obtained throughout the workshop. On the one hand, she summarized the conflicts, synergies and information gaps that had been obtained during participatory session 1, and, on the other hand, the most voted recommendations, resulting from participatory session 2.

She highlighted the **need for outreach campaigns** as a basis for the protection of our natural and cultural heritage, as well as the need for a **surveillance** plan to ensure its preservation. Likewise, she stressed the urgency of a **management plan for anchoring** and the need for **effective inter-administrative coordination and communication with the sectors**.

Finally, she thanked all the participants for attending *(image 18*) inviting them to continue collaborating.

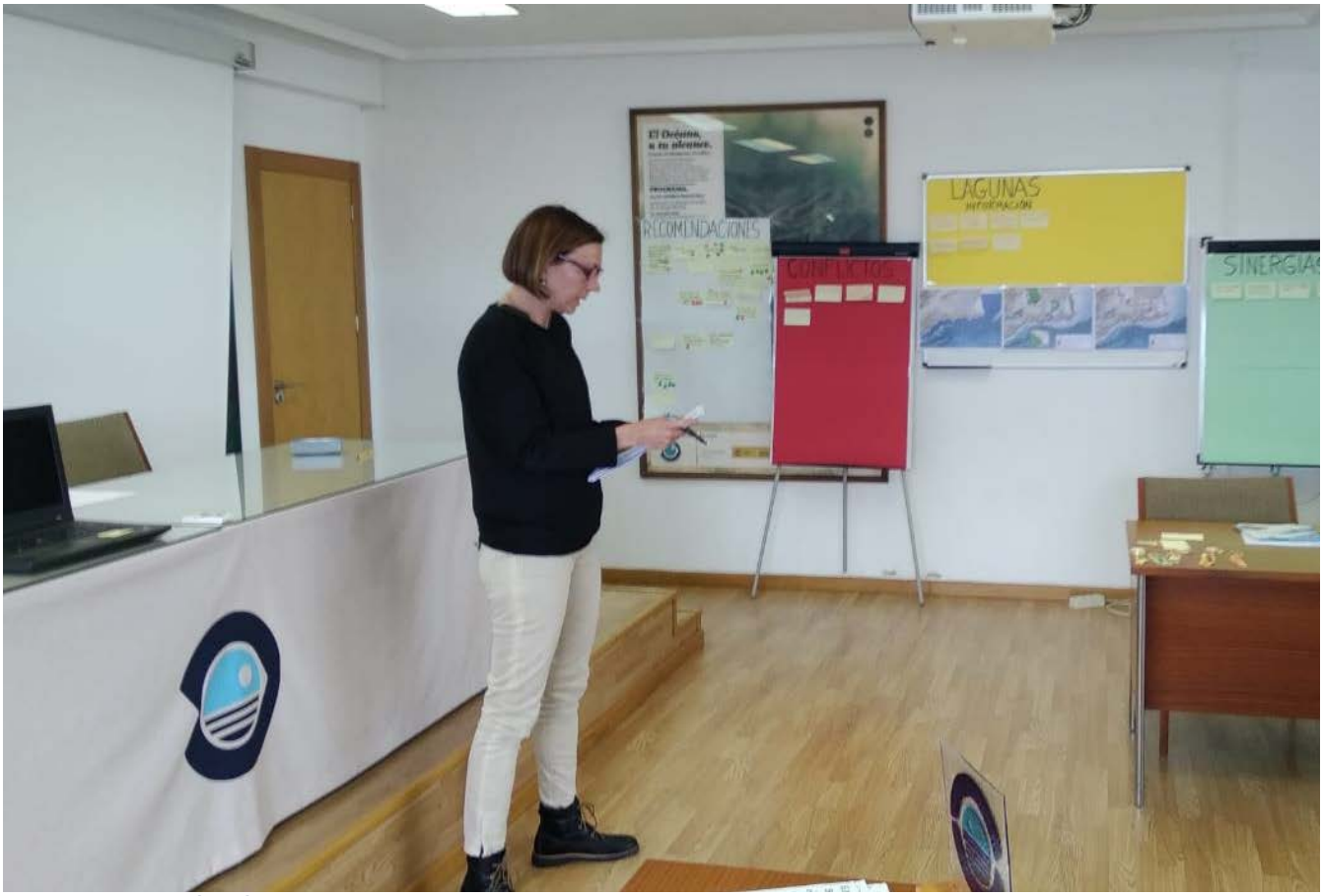


*Image 17: María Gómez (IEO, CSIC) finalised the technical workshop of the interaction of unregulated anchorages with biodiversity conservation and UCH. Source: Spanish Institute of Oceanography, CSIC.*

*Image 18: Participants of the technical workshop on the interaction between unregulated anchorages, biodiversity conservation and UCH. Source: Spanish Institute of Oceanaography, CSIC.*

# *ANNEX I: Workshop Agenda*

| | |
|---|---|
| **9:30 - 9:45** | **Welcome and introduction of the guests** |
| **PARTE 1** | **PRESENTATIONS AND ROUND TABLE** |
| **9:45 - 11:00** | **PRESENTATIONS (10' presentation + 5' questions)**<br>• Presentation of the MSPMED Project and the topic to be addressed - Elena Gutiérrez Ruiz (IEO, CSIC)<br>• MSP in Spain and POEMs - Aurora Mesa Fraile (General Directorate of the Coast and the Sea (DGCM), Ministry for the Ecological Transition and the Demographic Challenge (MITERD))<br>• Ecological anchorages - Jordi Sánchez (SUBMON) (Remote).<br>• Underwater Cultural Heritage - Rocío Castillo (ARQVA)<br>• Impacts of anchorages on marine biodiversity - José Antonio García Charton (UM) |
| **11:00 – 11:30** | **Coffee break** |
| | **PARTICIPATORY SESSION 1** |
| **11:30 - 12:30** | ***Post-it* session on key questions** |
| **12:30 – 13:30** | **Discussion and selection of conflicts, synergies and information gaps** |
| **13:30 – 15:00** | **Lunch** |
| **PARTE 2** | **PARTICIPATORY SESSION 2** |
| **15:00 – 16:00** | **Post-it session: proposal of recommendations** |
| **16:00 – 17:00** | **Evaluation and validation of recommendations** |
| **17:00** | **End of the event and farewell** |

# *ANNEX II: Participants*

This workshop, in a face-to-face format, was attended by a total of 19 participants, 18 in face-to-face format and 1 remotely.

| Nombre | Institución |
|---|---|
| *2Jordi Sánchez | SUBMON |
| Rafael Sabio | ARQVA |
| Rocio Castillo | ARQVA |
| José Antonio García Charton | University of Murcia |
| Inés Castejón Silvo | IMEDEA, CSIC |
| Alicia Montano | DG of natural environment, CARM |
| Carlos José García Alonso | DG livestock, fisheries and aquaculture, CARM |
| Esther García García | Tourism Institute, CARM |
| Juan Guillén | Institut d Ecologia Litoral |
| Óscar Esparza | WWF Spain |
| Pedro García | ANSE |
| Álvaro Alonso | DGBBD, MITERD |
| Aurora Mesa Fraile | DGCM, MITERD |
| José María Unzurrunzaga Campoy | Coastal demarcation of Murcia – DGCM, MITERD |
| *Maria Gómez Ballesteros | IEO, CSIC |
| *Juan Manuel Ruiz Fernández | IEO, CSIC |
| *Elena Gutiérrez Ruiz | IEO, CSIC |
| *Monica Campillos Llanos | IEO, CSIC |
| *Cristina Cervera Núñez | IEO, CSIC |

*Table 1: Participants of the workshop on the interaction of unregulated anchorages, biodiversity conservation and UCH celebrated in the Region of Murcia on the 28th April, 2022. Source: Spanish Institute of Oceanography, CSIC.*

* MSPMED organising team IEO, CSIC)
*2 Remote participants

# *ANNEX III: Satisfaction surveys*

First of all, the model satisfaction survey that was given to the participants in order to collect their opinion about the workshop is attached.

Subsequently, an analysis of the responses received was made.



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## Satisfaction survey model

**MSP-MED: Hacia la implementación operacional de la OEM en el mar Mediterráneo**
***Caso de estudio Región de Murcia***

Taller de agentes interesados y usuarios marinos de la región de Murcia
**ENCUESTA DE SATISFACCIÓN**

1. Indique del 1 al 10 su nivel de satisfacción general con el Taller realizado (siendo 1 un bajo nivel de satisfacción y 10 alto grado de satisfacción):

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

2. Evalúe del 1 al 10 su nivel de satisfacción en relación con los siguientes aspectos:

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Objetivos del taller** | | | | | | | | | | |
| **Desarrollo de los grupos de trabajo** | | | | | | | | | | |
| **Resultados obtenidos** | | | | | | | | | | |
| **Material utilizado** | | | | | | | | | | |
| **Lugar de celebración** | | | | | | | | | | |
| **Duración del taller** | | | | | | | | | | |
| **Organización del taller** | | | | | | | | | | |

3. Indique, por favor, si mejoraría algún aspecto del taller:

| |
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| |

4. Detalle, por favor, cualquier otro comentario que pueda resultar de interés:

| |
|---|
| |





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## Results of Satisfaction Survey

# Unregulated anchorages, Biodiversity conservation and UCH

1. **Indicate from 1 to 10 your level of general satisfaction with the Workshop carried out (1 being a low level of satisfaction and 10 being a high degree of satisfaction):**

The average of the votes is 9,10.

2. **Evaluate from 1 to 10 your level of satisfaction in relation to the following aspects:**

The average of each section is collected below.

| | |
|---|---|
| **Workshop Objectives** | **9,20** |
| **Development of working groups** | **9.20** |
| **Results obtained** | **8,82** |
| **Used material** | **8,75** |
| **Place of celebration** | **9,10** |
| **Workshop duration** | **9,33** |
| **Workshop organization** | **9,33** |

Both, the general assessment of the workshop and the evaluation of each of the aspects mentioned in question 2, have been assessed very positively. It is noteworthy the great reception that this participatory workshop has had.

3. **Please indicate if you would improve any aspect of the workshop:**

Regarding possible aspects to improve, there have been several comments.

Firstly, it was indicated as a possible improvement to ensure (as far as possible) the participation of the sectors involved (nautical, diving, etc.). This fact has been stressed in another comment as well. In relation to this issue, it should be noted that the attendance of the nautical recreational sector had been confirmed, but due to last minute incidents, it was not possible for them to attend.

Coming from another comment, in addition to the need for representation of the nautical-recreational sector, the inaccessibility of the municipality of San Pedro del Pinatar if you belong to another Autonomous Community was also mentioned. We will take this into account for future events.

Finally, another participant missed some more information (data on anchoring throughout the year and according to coastal areas) and on the characteristics of the boats. We will take note of this possible improvement and will try to expand the information provided in future workshops.

4. **Detail, please, any other comment that may be of interest:**

Several of the participants positively valued the development of this type of events in a face-to-face format, as it favours the debate and the active participation of the actors involved. They also appreciated the effort and the initiative.

Finally, the absence of representatives from the nautical sector was commented on, as it could distort the outcome of the workshop. In order to try to minimise this potential problem, this report will be sent, prior to its approval, to the nautical sector, so that they can add any conflicts, synergies, lack of information and recommendations they deem necessary.