Meeting Mediterranean conservation targets through systematic conservation planning

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Abstract

The ocean is increasingly being used by new human activities, fueled by an expansion of the “blue-economy” adding new pressures to the marine environment. These changes are happening fast, and balancing biodiversity conservation and present and future uses of the marine space needs to be done in an equitable way for human and ecological communities. Here, we used a systematic conservation planning approach to generate five different scenarios to inform the extension of marine protected areas using the Balearic Sea as a case study of a region with conflicting high fishing activity and new human uses. These scenarios were designed to (1) maximize biodiversity protection, (2) balance biodiversity and socio-economic costs, and (3-5) ensure fishing fleet equity for 10%, 20% and 30% of area extent. Our results show protecting 30% of the Balearic Sea in line with European commitments of 30x30 (i.e., 10% of fully no-take MPAs and 20% demersal no-take MPAs) through our ‘Equitable’ scenario would require an overall cost of 13% of annual fishing revenue in the area. However, scenarios differ in the final areas selected and the total costs of protection; supporting flexibility in the marine spatial planning process. These differences underscore the importance of evaluating multiple scenarios and objectives to reach biodiversity conservation targets while limiting socio-economic and inequitable costs. Regionally informed systematic conservation planning is key to accommodate human uses and biodiversity conservation in the marine environment. We show a transferable and equitable approach that could be implemented to achieve 30x30 throughout European marine waters.

Keywords: biodiversity; fisheries; trawling; purse seine; marine protected areas; marine spatial planning

Introduction

Coastal ecosystems are exploited by human activity at a global-scale (Halpern et al., 2008) and the “blue economy”, economic activities that are marine-based and marine-related, is increasing in diversity and need for space (European Commission, 2025a). At the same time, current international treaties and policies are aiming for 30% of land and waters to be protected by 2030 (commonly referred to as ‘30x30’), sometimes removing them from economic uses incompatible with nature conservation. Target 3 of the Kunming-Montreal Global Biodiversity Framework (GBF) (CBD, 2022) and the European Union’s Biodiversity Strategy (European Commission, 2020) are two such agreements aiming to avoid further biodiversity loss and ecosystem destruction; through the expansion of protected areas (e.g., Marine Protected Areas – MPAs, Other Effective Area-based Conservation Measures – OECMs), a set of targets (e.g., area coverage, representativity), and a deadline for their achievement. However, these agreements do not explicitly offer solutions for how these should be achieved, due to the complexity of spatial planning, regional heterogeneity (both in terms of ecology and stressors), and socio-economic systems at the international scale, which require a regionally-specific approach to support successful implementation.

Achieving a balance between human uses of the marine space (resource extraction, infrastructure, energy production, and long-term scientific monitoring) and conservation (MPAs, OECMs), efficient Marine Spatial Planning (MSP) is more required than ever (Target 1 CBD, 2022; Boussarie et al., 2023). To inform optimal MSP design, systematic conservation planning (SCP) and decision-support tools are commonly used to explore different planning scenarios and give advice to decision-makers and relevant stakeholders in a transparent and interactive manner (Neubert et al., 2025). SCP allows, among other things, the maximization of conservation outcomes of the limited targets set by international conventions while minimizing the impacts of spatial management measures such as closures, would have on local communities and their economies (Chapman et al., 2025).

Currently, misleading figures of both surface coverage and actual protection from existing spatial conservation measures are the norm, and there is a general agreement that "paper parks" (i.e., established MPAs that have no conservation benefits) have resulted in ineffective conservation of the marine environment (Relano and Pauly, 2023; Pike et al., 2024). To achieve meaningful conservation, restrictions (in the case of no-take MPAs), and uses and co-management (in the case of OECMs) need to be straightforward, a task that is particularly complicated in the current context of differing terminology, complex regulatory frameworks and jurisdictions, multi-zone MPAs, and a plethora of existing levels of protection even within the same country (e.g., Castro-Cadenas et al., 2025). Moreover, total coverage under protection is not the only meaningful metric which determines effective conservation. Ensuring ecological representation of the communities or biodiversity to be protected is a key component of the GBF's Target 3 and future MPAs should aim to cover at least an adequate representation of existing bioregions whenever said data is available (Ceccarelli et al., 2021).

Although the 2030 deadline is quickly approaching, there are still many gaps to be filled in the conservation of marine ecosystems. In this study, we identify optimal areas to reach 30% protection in the Balearic Sea while minimizing economic costs and avoiding disproportionate impacts on fishing communities. To achieve this, we obtained spatial data on existing and planned uses of the marine environment from European databases (EMODnet, European Commission), existing conservation measures from national legislation (Spanish Government), and species and bioregion distribution data from previous studies (López et al., 2025, 2026). We then used these data to generate a set of prioritizations based on different scenarios. Briefly, these scenarios involved achieving the 30x30 target under a set of conditions that progressively integrate socio-economic complexity: (i) only considering maximizing biodiversity protection to delineate a baseline of the 'simplest' conservation solution, (ii) including fishing revenues to obtain the 'cheapest' solution, (iii) incorporating the spatial distribution of the fishing fleet, and (iv-v) exploring two more protection area targets (10% and 20%) to assess how more gradual conservation management measures could be spatially distributed. A multi zone setup of the conservation scenarios allowed defining of a set of two types of no-take MPAs – i.e., fully no-take or full prohibition of all fishing activities, and demersal no-take or prohibition of only demersal and bottom-contacting extracting activities, in line with current European targets. The resulting scenarios offer readily available information of priority areas to achieve 30x30 conservation targets while ensuring minimal impacts to the fishing communities and avoiding conflicts with existing uses.

2. Materials and methods

2.1. Study system

The Mediterranean Sea, like many other parts of the globe, has been degraded by centuries of human activities. Conservation management measures are required to protect, and where possible, recover biodiversity. Using data-informed approaches, conservation gaps can be filled in a representative way that could support effective conservation of targets and future ecosystem recovery. In the Mediterranean region, where over 67% of the fish stocks are overfished (FAO, 2024) and where landings are on a steady decline since their peak in the mid-90s (FAO, 2023), marine ecosystem recovery is not only a necessity for conservation, but also a likely support to the economic recovery of the fishery sector and to future food security.

The Balearic Sea, a sub-basin within the northwestern Mediterranean Sea formally delimited by the International Hydrographic Organization (IHO, 1953) (Fig. 1), is an ecologically and commercially important area which has been under strong fishing pressure for hundreds of years (Osio, 2012). It roughly encompasses the area between the Balearic Islands and mainland Spain. However, in the context of this study, we refer to the Balearic Sea hereafter as our study area extent located within latitude 38.3º – 42.6ºN and longitude -0.5º – 4.7ºE (Figure 1). The Balearic Sea, as defined by the IHO covers an area of 79,894 km^2, while the extended Balearic Sea here considered covers an area of 143,519 km^2. While several MPAs are already under some form of protection from bottom trawling in the area (Ministerio de Medio Ambiente, y Medio Rural y Marino, 2008; Ministerio para la Transición Ecológica, 2019; Ministerio de Agricultura, Pesca y Alimentación, 2020), these currently amount to 1769 km² (1.23% of the Balearic Sea) and, for the most part, offer no protection to the pelagic zone.

In 2023, a marine spatial planning framework was established for all Spanish waters, including the study area (Ministerio para la Transición Ecológica y el Reto Demográfico, 2023). A wide variety of uses of the marine space was defined in the marine spatial planning framework, including raw material extraction (such as sand for coastal erosion recovery), aquaculture, wind-farms and hydrocarbon extraction. These were included in the present study, with the exception of (a) the areas of priority use for national defense due to their extension and non-specific activities/impacts on the marine environment, and (b) the areas of priority use for the protection of biodiversity (e.g., Natura 2000 protected area network) due to their little to no actual protection to the bentho-demersal and pelagic communities. Other relevant uses of the marine space included in the current study and present in Figure 1 that were not mapped in the Spanish marine spatial planning framework of 2023 are: (a) the existence of marine telecommunication cables and other submarine connections, and (b) routine scientific surveys (i.e., demersal trawl surveys from the Mediterranean Trawling Survey – MEDITS (European Commission, 2025b)) (Figure 1).

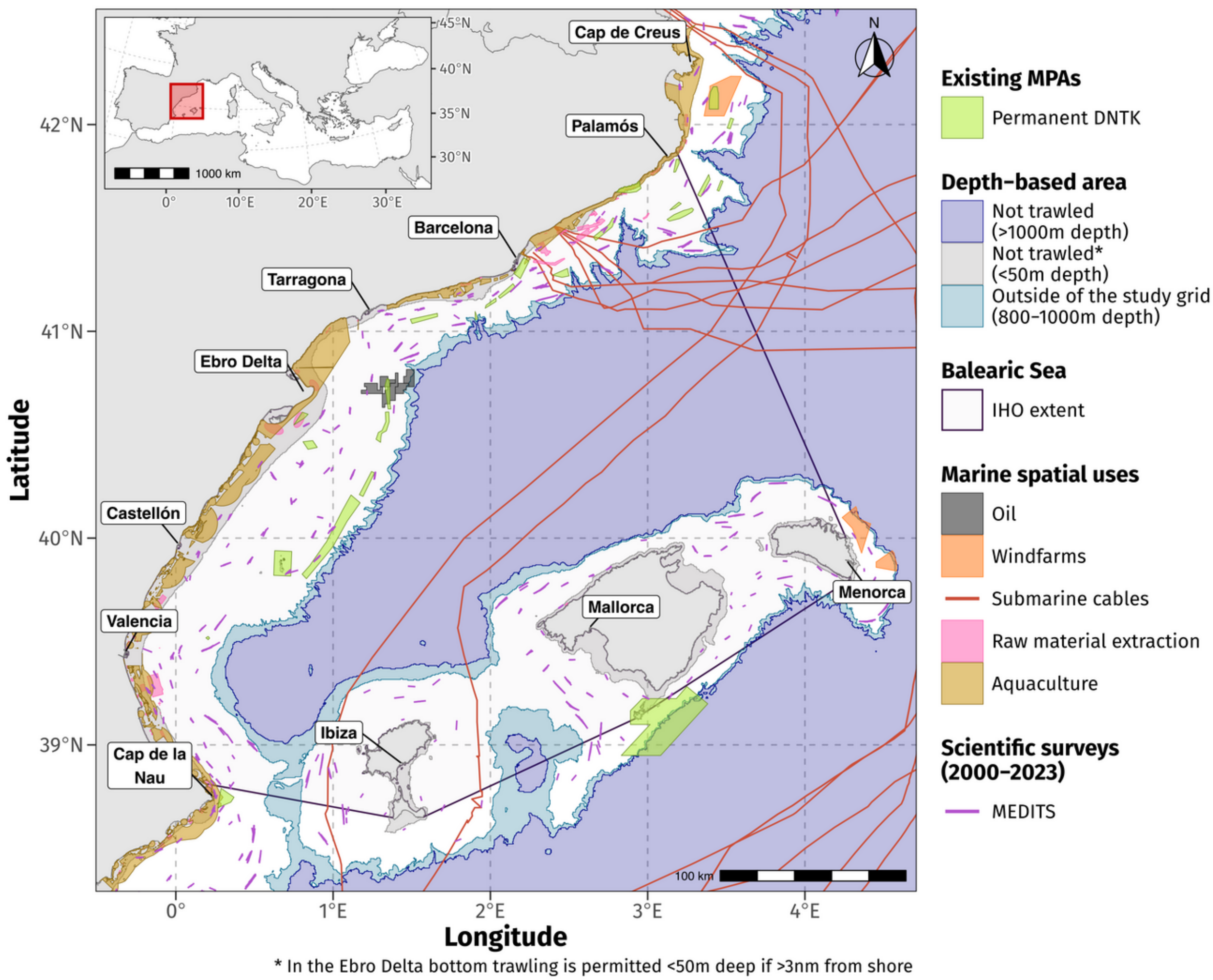

Figure 1. Balearic Sea planning area and current uses of the marine space. Marine spatial uses come from POEM 2023 and EMODnet. MPAs (Permanent DNTK) come from three Spanish legislation orders: ARM/3841/2008, BOE-A-2019-2215 and APA/423/2020. Not shown here: areas for military use and other “important areas for conservation” such as the Natura 2000 protected area network.

2.2. Conservation problem design

Systematic conservation planning scenarios (problems) were set and solved using the R package *prioritizr* v8.0.6 (Hanson et al., 2024) with the open-source solver HiGHS v1.10 (Huangfu and Hall, 2018) and the default optimality gap. All analyses were performed with the R statistical computing environment (v 4.5.2) (R Core Team, 2023) and RStudio (Posit team, 2025). Geospatial analyses were completed with the *terra* (Hijmans, 2024) and *sf* (Pebesma, 2018) packages. Data processing and visualization was completed with the *tidyverse* family of packages (Wickham et al., 2019).

2.2.1. Grid selection and zoning

Prioritization targets were set based on the area extent between 0-1,000m depth of the study system, as all waters deeper than 1,000m in the Mediterranean Sea have been closed to bottom trawl fishing since approximately 2005 following the recommendation of the General Fisheries Commission for the Mediterranean (GFCM, 2005). Then, to set the conservation planning problem, we defined a hexagonal grid of 3.46 km² per cell (except for cropped cells along the borders) throughout the study area between 50-800m depth (white area in Figure 1). This resulted in a total of 12,592 planning units across 43,452 km² of ocean. The depths between 800-1,000m were not included in the study grid due to constraints of the species distributions used as an input in the prioritization analyses. To incorporate the EU Biodiversity Strategy 2030 conservation targets into the problem, we set the conservation problem into two management zones: (1) Fully no-take MPAs (FNTK MPAs) represents what the strategy refers as ‘strict protection’, of 10% of the Balearic Sea; and (2) Demersal no-take MPAs (DNTK MPAs) represents what the strategy refers as ‘protection’ of an additional 20% of the Balearic Sea. While fishing activities other than bottom trawling and purse seine fishing are not included in the analysis, the rationale behind the zoning is to: (a) close FNTK MPA planning units to all fishing activities including every other fishing gear in addition to bottom trawling and purse seining (trammel nets, longlines, recreational and sport fishing, etc.); and (b) closing DNTK MPA planning units only to fishing activities that impact the bentho-demersal fraction of the water column (i.e., no contact with the seafloor or within its proximity).

2.2.2. Biodiversity data

Biodiversity data in *prioritzr* conservation problems have the objective of characterizing the spatial distribution of biodiversity features, which in the current work were a set of species distributions and bioregions predicted over the study grid. We included the occurrence probability of 129 bentho-demersal species (77 fishes, 33 crustaceans and 19 cephalopods) using a previously developed Joint Species Distribution Model based on bottom trawling data (López et al., 2026). The continuous values of the species’ occurrence probability values were then converted into presence-absence values using the receiving operator characteristic (ROC) curve threshold. Each species’ threshold was obtained by maximizing the relationship of true positives (sensitivity) and true negatives (specificity), using the pROC R package (Robin et al., 2011). For FNTK MPAs all 129 species were considered, while for DNTK MPAs 9 species commonly caught or bycaught by the purse seine fleet (*Boops boops*, *Engraulis* *encrasicolus*, *Illex coindetii*, *Sardina pilchardus*, *Scomber colias*, *Scomber scombrus*, *Trachurus mediterraneus*, *Trachurus picturatus*, *Trachurus trachurus*) (ICATMAR, 2025a) were excluded as they would not be completely covered by demersal protection measures.

We also assigned the grid planning units to three previously identified bioregions namely Shelf, Upper Slope, and Middle slope (López et al., 2026), serving as a proxy of wider biodiversity and ecosystem patterns. These bioregions are mainly characterized by their depth and average bottom temperatures, which are of median 92m and median 14.38ºC for the Shelf bioregion, of 340m and 13.59ºC for the Upper slope bioregion, and of 632m and 13.34ºC for the Middle slope bioregion. The presence of small-spotted catshark (*Scyliorhinus canicula*) egg nursery habitat (López et al., 2025) was also included as its own feature, i.e., for the conservation of demersal oviparous sharks, but also as a relative proxy of habitat-forming sessile organisms that are used by the species to lay eggs. The bioregions and small-spotted catshark egg-nursery habitat distribution were equally included for both FNTK and DNTK MPAs.

2.2.3. Socio-economic data

Socio-economic data was included in the conservation problem both as costs and as features. Since spatial closures for conservation means closing the areas to fishing activities, costs were included as the revenue by both the bottom trawl and purse seine fishing fleets in €/year over the area (Fig. 2). The spatial distribution of fishing revenues was calculated using VMS and landings data following the methodology described in Sala-Coromina et al. (2021) within ICATMAR's database management system (Ribera-Altimir et al., 2023). The economic revenue of each planning unit was extracted as a weighted average of the landings of the five-year period 2020-2024. For FNTK MPAs, the total cost of the revenues by both the bottom trawling and purse seine fishing fleets were considered when calculating an optimal solution. For DNTK MPAs, however, only the revenues of the bottom trawl fleet were included as they would not be closed to the pelagic fishing fleet.

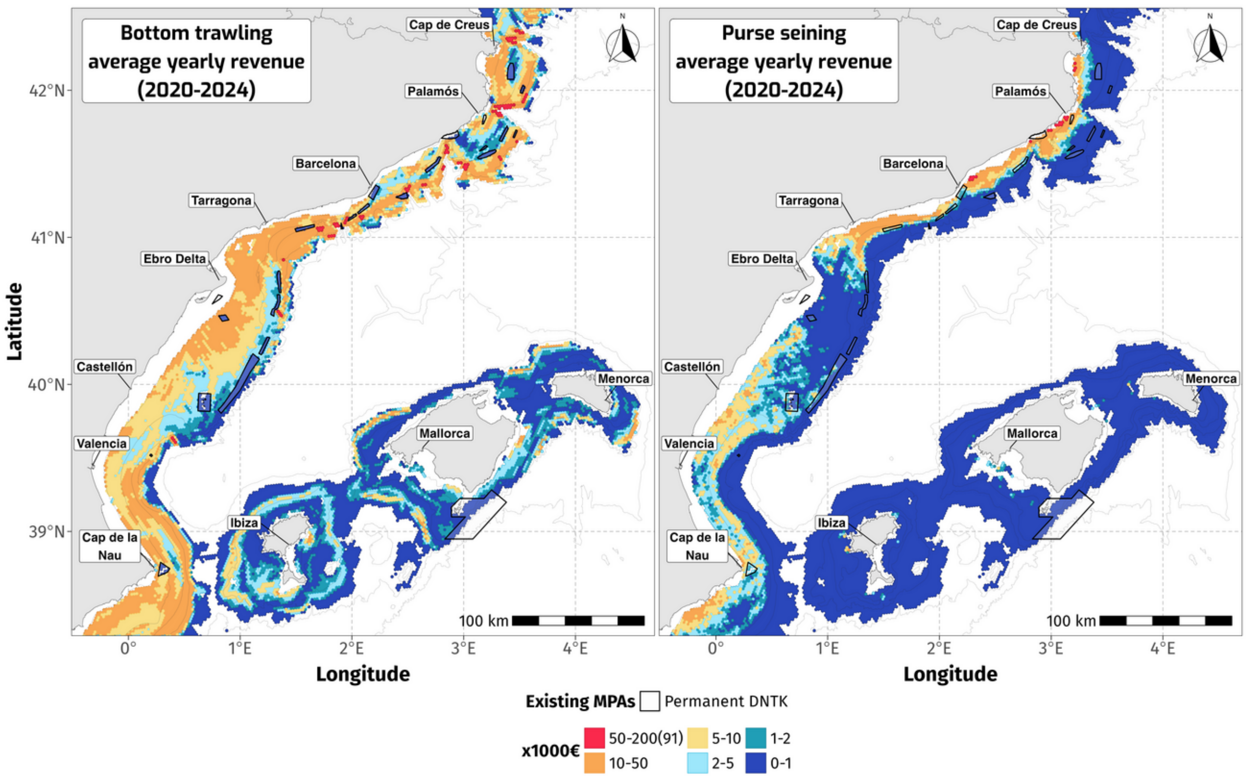

Figure 2. Yearly average fishing revenue (2020-2024) of the two main fishing fleets that operate in the Balearic Sea, the bottom trawling fleet (left panel) and the purse seining fleet (right panel). Bottom trawling revenues were used as the cost layer for the DNTK MPAs area selection, while the FNTK MPAs area selection used the sum of revenues from both fleets. The values in red range from €50-200 thousand for the bottom trawling fleet, and from €50-91 thousand for the purse seining fleet.

In the Balearic Sea, fishing is for the most part a local activity, with fishers returning to port on the same day, with an enforced maximum of 12 hours at sea (Carreton et al., 2025). Fishing activities are usually structured spatially around each vessel's home port and that is reflected in their area of influence of the trawling fleet which is mostly responsible of the fishing sector socio-economic structure in the area (Supplementary Figure 1A). In practice this means that to achieve a hypothetical 30% of protection, if we only included costs and biodiversity features, closures might disproportionately affect fishing communities with lower fishing means, smaller fleets and/or economic revenue. To avoid this, we mapped the fishing activity of the fleet from each of the existing ports in the area (n = 85) using VMS data, which were then aggregated by regions (n = 27, Supplementary Figure 1A). Their areas of influence (where they tend to fish) were then manually divided into each fishing area (n = 9), which included more than one home port and had some regional overlap (Supplementary Figure 1B).

2.2.4. Representation target selection and generating the prioritizations

The European Union's Biodiversity Framework states that 30% of European marine waters have to be 'protected' (e.g., DNTK MPAs), and that a third of it (10% of the total) has to be 'strictly protected' (e.g., FNTK MPAs) by 2030 (European Commission, 2020). A similar target is given by the CBD's Kunming-Montreal agreement on the protection of biodiversity (CBD, 2022). Taking the included depths extent (between 0-1000m depth) into consideration, the study area (Extended Balearic Sea) amounts to 61,422 km², of which 70.6% are covered by our study grid (depths shallower than 50m and deeper than 800m being excluded from the grid) (Supplementary Table 1). In order to reach a 10% of FNTK MPA area, the grid coverage needed would be ~14.2%, while the additional 20% of DNTK MPAs would require an additional ~24.8% of the grid (42.6% total) (Supplementary Figure 2, Supplementary Table 1).

To achieve the conservation targets for 2030 (i.e., 30% protection of biodiversity features), we set prioritzr to a '*minimum set problem*' with the aim of maximizing biodiversity protection while minimizing socio-economic costs (fishing revenue). All features were set to the same relative targets. To reduce spatial fragmentation in the prioritizations we used a boundary length penalty value of 3. This penalty value was selected through the completion of a calibration procedure, wherein we generated preliminary prioritizations with a range of different boundary penalties (i.e., ranging from 0 to 3, in increments of 0.5).

The conservation problem was also constrained in two ways to account for existing protection and the different uses of the marine space: (1) existing demersal no-take MPAs (green polygons, Fig. 1) were locked into the final solution as DNTK planning units; (2) planning units that covered partially or fully any marine use (oil extraction, wind-farm, submarine cables, raw material extraction, aquaculture and scientific surveys) were locked out of the solution (Figure 3). We accounted for existing spatial conflicts present in the study area by mapping them (Supplementary Figure 4) and, in the presence of conflicts between the marine spatial planning framework and current areas of protection, full priority was given to existing MPAs. Planning units covered by the demersal no-take MPAs were locked in the solution even if also covered by proposed areas for e.g., an offshore wind-farm, while surrounding planning units covered by other uses were locked out.

Table 1. Description of the prioritization problem and decision rules of the five prioritization scenarios. Demersal no-take MPA zoning did not include the distribution of pelagic species commonly caught by the purse seine fishing fleet. The grid is located over the study area 50-800m depths.

Scenario	MPA type	Balearic Sea coverage target excluding depths >1000m (%)	Grid coverage target (%)	Costs (€/planning unit)	Bioregions	Species	Fishing areas
Biodiversity (i)	Demersal no-take	20	28.4	None	3 bioregions (Shelf, Upper slope, Middle slope)	129 bentho-demersal species (120 for the DNTK) and 1 shark egg-laying habitat	None
	Fully no-take	10	14.2				
	Both	30	42.6				
Balanced (ii)	Demersal no-take	20	28.4	Bottom trawl fleet yearly revenue from landings	3 bioregions (Shelf, Upper slope, Middle slope)	129 bentho-demersal species (120 for the DNTK) and 1 shark egg-laying habitat	None
	Fully no-take	10	14.2	Bottom trawl and purse seine fleet yearly revenue from landings			
	Both	30	42.6				
Equitable (iii) (Equitable 20% (iv), Equitable 10% (v))	Demersal no-take	20 (10, 5)	28.4 (14.2, 7.1)	Bottom trawl fleet yearly revenue from landings	3 bioregions (Shelf, Upper slope, Middle slope)	129 bentho-demersal species (120 for the DNTK) and 1 shark egg-laying habitat	9 fishing areas
	Fully no-take	10 (10, 5)	14.2	Bottom trawl and			

			(14.2, 7.1)	purse seine fleet yearly revenue from landings
	Both	30 (20, 10)	42.6 (28.4, 14.2)	

We generated prioritizations based on five different scenarios: (i) a ‘Biodiversity’ scenario (our baseline scenario), (ii) a ‘Balanced’ scenario, (iii-iv) an ‘Equitable’ scenario (our main scenario) and two further versions of the Equitable scenario, namely the ‘Equitable 20%’ and ‘Equitable 10%’ scenarios. The shared conservation targets for the first three (our main scenarios) were 14.2% of the grid for FNTK MPAs and 28.4% of the grid for DNTK MPAs (10% and 20% of the Balearic Sea excluding waters deeper than 1000m respectively), while the Equitable 20% scenario had a target of 14.2% and the Equitable 10% scenario had a target 7.1% for both FNTK MPA and DNTK MPA. Each scenario had a combination of the 142 biodiversity and socio-economic features included in the prioritization analyses as described in Table 1. For the Biodiversity scenario, only the biodiversity-related features (species distributions and bioregions) were included, while costs of planning units were set to 0 for the ‘locked-in’ planning units, and to almost 0 (0.01) for the rest of the planning units. The Balanced scenario shared the same biodiversity features than the Biodiversity scenario, but this time planning units were assigned two types of costs: for the FNTK MPAs, the yearly revenues averaged for the period 2020-2024 of both the bottom trawling fleet and the purse seine fleet; while for the DNTK MPAs, only the revenues of the bottom trawling fleet were kept. Lastly, the three Equitable scenarios added an additional socio-economic dimension (i.e., fishing areas) as nine extra features.

We evaluated the solution importance of the main Equitable scenario (30% of protection) based on the replacement cost metric (Cabeza and Moilanen, 2006). This metric is calculated separately for each planning unit selected by a prioritization and informs on how much more expensive it would be for the prioritization to achieve the representation targets if the planning unit was no longer available for selection. After calculating replacement cost values, we linearly rescaled them to range between zero and one. Thus, planning units associated with a greater replacement cost value are more irreplaceable, and those with a value of zero can be replaced for no increase in cost.

3. Results

3.1. Priority areas for conserving biodiversity

The baseline ‘Biodiversity’ scenario resulted in the lowest amount of area (km^2) selected out of the three main scenarios (Table 2). As fishing area data was absent and cost data was equal for all planning units, the solution had a high degree of spatial clustering of the selected planning units (Fig. 3). The optimal DNTK MPA planning units, totaling 16,964km^2 were aggregated into five distinct areas with some smaller ones associated to existing DNTK MPAs. Only two small FNTK MPA groups were selected (527km^2), both located in the northern Balearic Sea between Palamós and Cap de Creus. This scenario resulted in the waters surrounding the islands of Ibiza and Formentera being almost completely selected to be closed off to demersal fisheries. Similarly, highly profitable waters around the Palamós canyons and almost all of the Castellón shelf waters between Valencia and the Ebro delta were also selected.

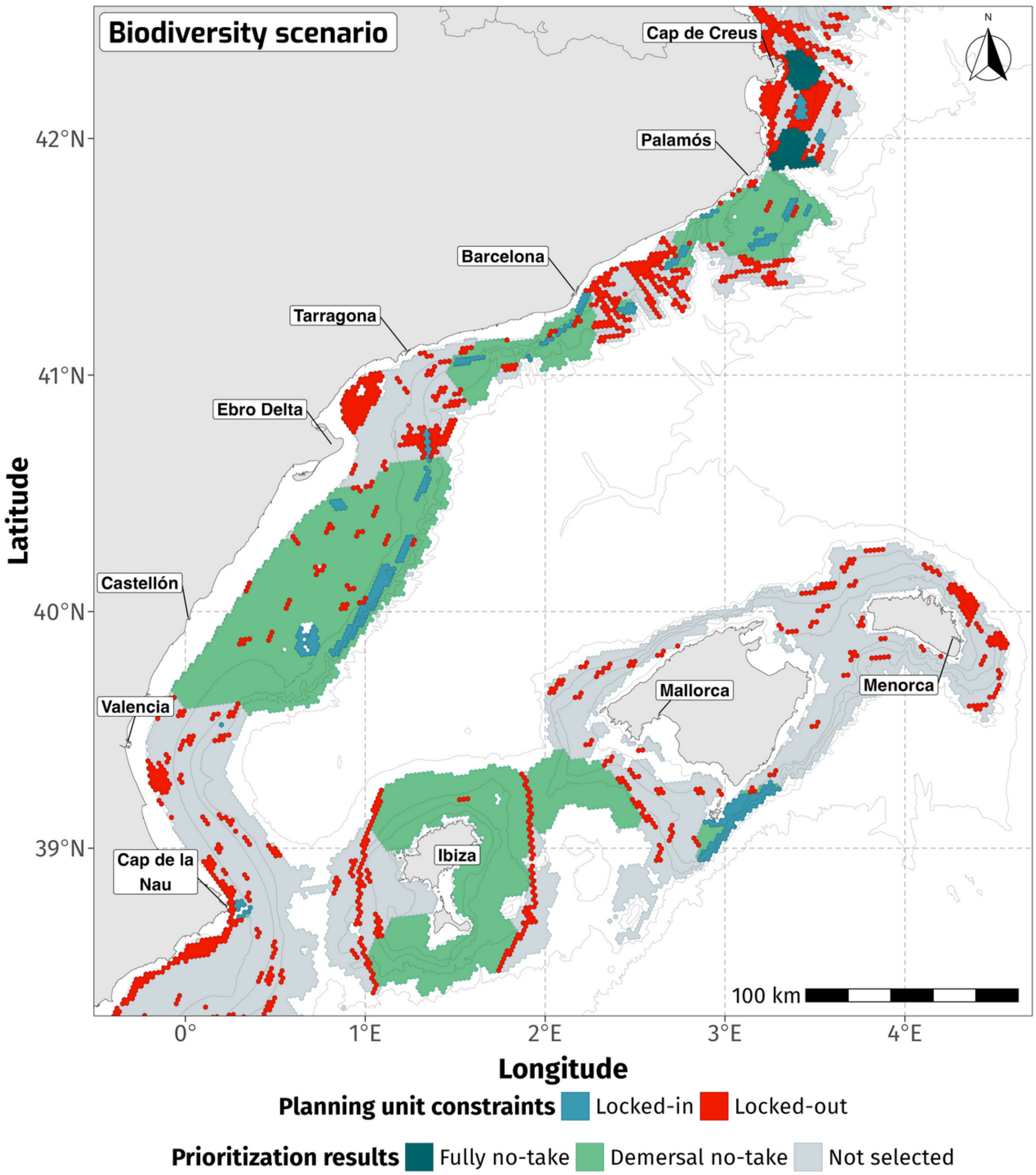

Figure 3. Optimal conservation planning solution for the Balearic Sea for the 'Biodiversity' or baseline scenario and planning units that were locked-in (light blue) and locked-out (red) of the conservation problem for all scenarios. The origin of the constraints for each planning unit corresponds to Figure 1.

The prioritizations based on the Balanced and Equitable scenarios indicate the areas with the highest conservation potential and minimum socio-economic cost of spatial closures to the fishery sector, without interfering with existing or planned uses of the marine space (Fig. 4). The Balanced scenario resulted in 5,271 selected planning units or 29.57% of the Balearic Sea (18,160 km^2) excluding depths >1000m. In this scenario, the solution had a more or less even representation of planning units for both zones. Out of a 10% target, 9.28% (5,699 km^2) of the Balearic Sea is allocated to FNTK MPAs, while 20.29% (12,461 km^2) was allocated to DNTK MPAs (Table 2).

In our main scenario of interest, the Equitable scenario, a total of 5,444 planning units were selected, covering 30.52% of the Balearic Sea (18,747km^2) excluding depths >1000m. Of these, 7.28% of the Balearic Sea (4,469km^2) was allocated to FNTK MPAs, while 23.24% (14,278km^2) was allocated to DNTK MPAs (Fig. 4A, Table 2). Including the fishing fleet structure resulted in a spatial redistribution of priority areas, preventing the concentration of selected planning units within individual fishing grounds and promoting a more even allocation across the study area.

The prioritization for both the Equitable and Balanced scenarios selected areas with lower fishing revenues and high biodiversity, and generally avoided highly profitable areas compared to the Biodiversity scenario. These highly profitable grounds include the deep canyons in the northern region of the study area, the easternmost part of Menorca fishing grounds, the northwestern part of Mallorca fishing grounds, the area around the Ebro Delta and other areas along the northern coast of the Spanish Mediterranean north of Tarragona, and the 300-500m depths along the Gulf of Valencia and the Cap de la Nau (Fig. 2, Fig. 4A). In contrast, areas of low fishing revenue for the bottom trawling fleet such as the deeper areas of the shelf between Castellón and the Ebro Delta, the shelf south of Palamós, the waters east of Ibiza and those between Mallorca and Menorca were always selected in scenarios that took costs into account. In both the Balanced and Equitable scenarios, accounting for costs and fishing areas on top of biodiversity resulted in more evenly distributed selection of FNTK MPAs and DNTK MPAs planning units than with the Biodiversity scenario.

In all scenarios, existing uses of the marine space also influenced planning unit selection. The waters around Barcelona are densely covered by a wide range of activities/uses including submarine telecommunication cables, resource extraction areas, aquaculture, and scientific monitoring (Fig. 1, Fig. 3). This resulted in higher fragmentation of aggregated planning units compared to other areas in the Balearic Sea (Fig. 4). In areas south of the Ebro Delta and around the Balearic Islands, a lack of other spatial uses resulted in less fragmentation and a large size of aggregated planning units. Due to the locked-in constraints applied, many of the existing figures of protection are cluster centers of DNTK MPA planning units, particularly in the scenarios with 30% protection target (Fig. 4). The clustering was more moderate in the Equitable and Balanced scenarios compared to the Biodiversity scenario, with clustering observed in both scenarios between the Castellon-Ebro Delta and Barcelona-Cap de Creus existing MPAs, as well as south of Mallorca Island.

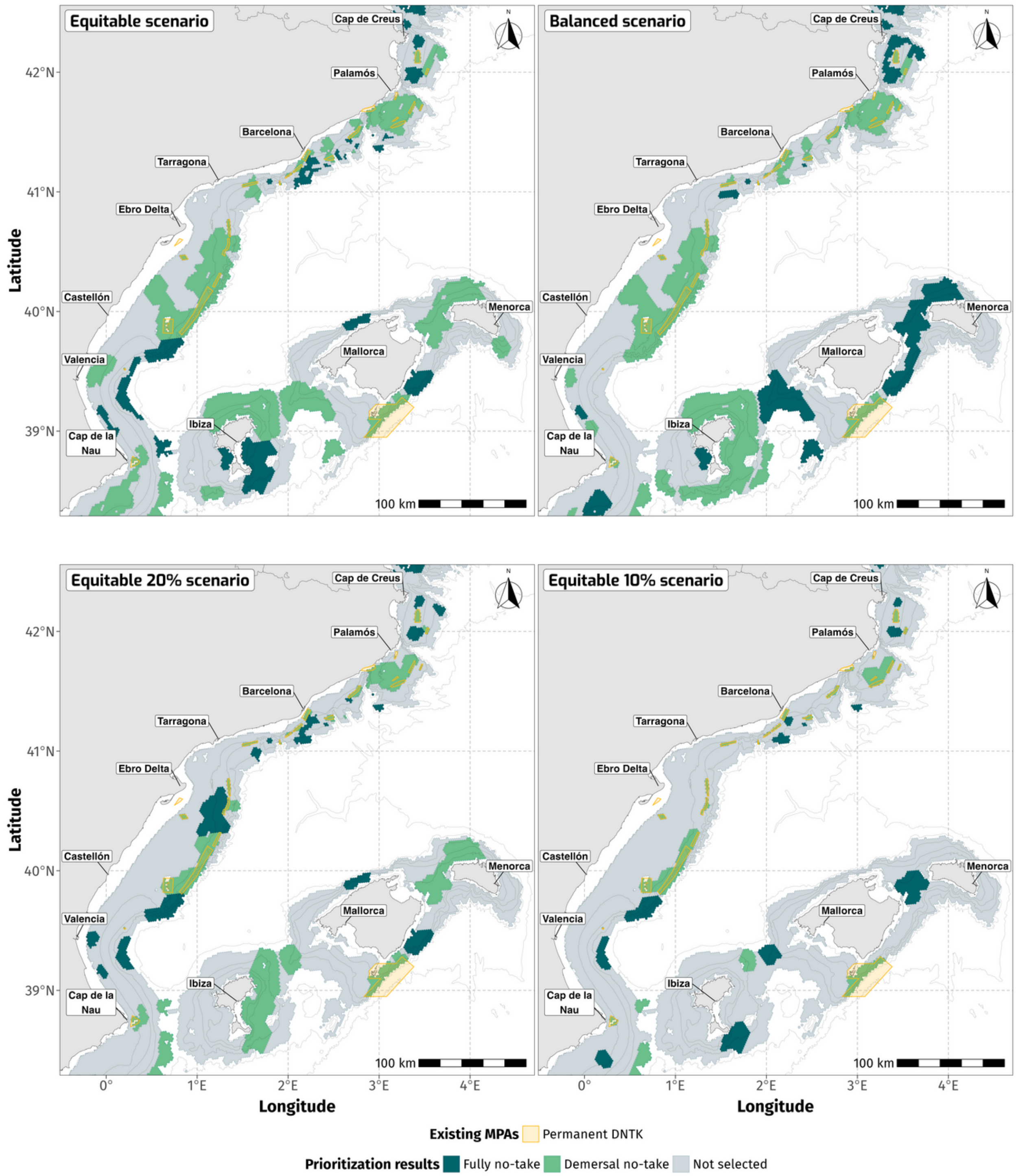

Figure 4. Optimal conservation planning solutions for the Balearic Sea for the 'Equitable' (top left), 'Balanced' (top right), 'Equitable 20%' (bottom left) and 'Equitable 10%' (bottom right) scenarios. The Equitable, Equitable 20% and Equitable 10% scenarios take both the structure of the local fishing fleets and fishing revenue into account. The Balanced scenario only accounts for fishing revenue. All scenarios include all biodiversity features. The optimal planning units selected for 'strict protection' or FNTK MPAs are shown in dark green, while the extended planning units selected for 'protection' or DNTK MPAs are shown in light green. Existing DNTK MPAs are shown as light yellow polygons.

Table 2. Results of the area selection for the five scenarios and both MPA types. Balearic Sea coverage is relative to the study area open to fishing (0-1000m depth). Fishing area targets are not applicable to the "Balanced" and "Biodiversity" scenarios, as they are not included as features. Biodiversity targets for the DNTK MPAs for the nine species caught by purse seine fishing vessels are always met. *While no cost was set when solving the prioritization for the 'Biodiversity' scenario, cost was extracted from the selected planning units.

Scenario	**MPA type**	**Planning units**	**Area selected (km2)**	**Balearic Sea coverage (%)**	**Average cost (€/year)***	**Biodiversity targets met (out of 130)**	**Bioregion targets met (out of 3)**	**Fishing areas targets met (out of 9)**
Biodiversity	Fully no-take	153	527	0.86	3,643,197	0	0	-
	Demersal no-take	4900	16,964	27.62	26,029,488	130	3	-
	Both	5053	17,490	28.48	29,672,685	0	0	-
Balanced	Fully no-take	1666	5,699	9.28	5,383,055	26	0	-
	Demersal no-take	3605	12,461	20.29	10,933,825	69	2	-
	Both	5271	18,160	29.57	16,316,881	0	0	-
Equitable	Fully no-take	1303	4,469	7.28	3,991,428	15	1	3
	Demersal no-take	4141	14,278	23.24	13,426,706	129	3	7
	Both	5444	18,747	30.52	17,418,133	0	0	0
Equitable 20%	Fully no-take	1046	3,568	5.81	4,463,404	0	0	1

	Demersal no-take	2296	7,918	12.89	3,124,102	127	3	4
	Both	3342	11,486	18.70	7,587,506	0	0	0
Equitable 10%	Fully no-take	842	2,873	4.68	1,696,576	55	2	4
	Demersal no-take	857	2,944	4.79	686,157	45	2	3
	Both	1699	5,817	9.47	2,382,733	0	0	0

Overall, no scenario could simultaneously reach all biodiversity targets for both FNTK and DNTK MPAs together (Table 2), emphasizing the trade-offs of implementing 30x30 in a multi-use marine system. A target was considered as met if the number of planning units (i.e. area surface) retained in the solution for each feature were equal or bigger than their set coverage target (Table 1). However, both the Biodiversity and Equitable scenarios reached virtually all of the targets of demersal protection (20% of the Balearic Sea) for the individual species, the bioregions and the fishing areas (for the Equitable scenario), while the Balanced scenario fell short (Table 2). Full protection (FNTK) targets (10% of the Balearic Sea) were not reached in any of the scenarios, with the Balanced scenario performing best out of the three. With regards to fishing areas, only included in the Equitable scenarios, coverage ranged from 18.9% to 27.2% of overall coverage (both demersal and full protection), with no single fishing area reaching the 30% target. DNTK MPAs reached a far lower number of targets in the Equitable sub-scenarios (i.e., Equitable 20%, Equitable 10%) as existing MPAs locked-in areas represented a larger amount of selected planning units. These are unavailable to be redistributed throughout the solution as they are included into the solution.

3.2. Economic impact of priority areas

Explicitly accounting for economic impacts during the prioritization process substantially reduced the amount of fishing revenue that would be expected to be lost due to establishment of marine protected areas. The total cost of protecting 30.52% of the Balearic Sea in the Equitable scenario would be expected to result in lost revenue of €17,418,133/year, based on the average values of the bottom trawling and purse seine fleets landings for the period 2020-2024 (Fig. 2). This represents 12.99% of the total average yearly revenue of €134,048,917 for the same period (Table 2). Of the two zones, FNTK MPAs would have a direct cost from lost revenue of €3,991,428 or 2.98% of the total revenue in the area from both the bottom trawl and purse seine fleets. DNTK MPAs would have a higher cost from average annual lost revenue of €13,426,706 or 12.98% of the total yearly revenue of the bottom trawl fishing fleet in the area (€103,372,594). The Balanced scenario solution would have a slightly lower cost of €16,316,881, but also a 587km^2 smaller selected area. Expected from the absence of cost information when obtaining a solution, the Biodiversity scenario would have the highest cost out of the three scenarios even when having the lowest amount of area protected of around 28.5%, with a total of €29,672,685/year or 22.14% of the yearly average revenue of the fishing fleets.

For the Equitable scenario the costs were, however, distributed throughout the different fishing areas and vary according to their total area, fishing fleets and target fisheries (Table 3). These results show that incorporating fishing areas redistributes the socio-economic costs of conservation more evenly across human communities. There was a notable difference between the costs of achieving the conservation targets for mainland Spain (Palamós-Creus, Barcelona, Ebro-Castellón, Valencia-Denia and Alicante fishing areas) compared to the Balearic Island archipelago (Inner and Outer Pitiusas, East Mallorca and Menorca fishing areas). The fishing fleet of mainland Spain has both a higher number of vessels and total horsepower than the insular fleet (Supplementary Figure 4), and their fishing revenues are much larger (Fig. 2), which is directly reflected in the higher costs for selected planning units of both MPA types as well as overall costs of reaching the set protection targets.

Table 3. Costs of priority areas (potential closures) in lost revenue for the bottom trawl and purse seine fleets by fishing area for the three scenarios. Bottom trawl fleet costs are included in both DNTK MPA and FNTK MPA zones, purse seine fleet costs are only included in the FNTK MPA zone. Area data are all relative to the study grid (Figure 1). Actual fishing area and revenue are bigger than shown here, as they include areas outside of the study grid.

Fishing area	Scenario	DNTK costs (€/year)	FNTK costs (€/year)	Total costs (€/year)	DNTK area (km²)	FNTK area (km²)	Area revenue (€)	Fishing area (km²)	Cost per area (€/km²)
Palamós-Creus	**Equitable**	1,604,204	987,841	2,592,045	1285	543	16,266,440	4286	605
	Equitable 20%	495,823	787,779	1,283,602	835	498			299
	Equitable 10%	192,554	343,831	536,385	544	215			125
Barcelona	**Equitable**	1,275,004	1,182,528	2,457,532	869	533	17,527,891	3208	766
	Equitable 20%	389,846	858,607	1,248,453	450	440			389
	Equitable 10%	6,980	281,334	288,314	197	236			90
Ebro-Castellón	**Equitable**	4,879,438	215,237	5,094,675	3672	530	32,078,388	10160	501
	Equitable 20%	669,986	1,817,043	2,487,029	1289	1448			245
	Equitable 10%	322,625	154,014	476,639	1067	464			47

Valencia-Denia	**Equitable**	2,930,474	916,824	3,847,298	1761	818	21,985,655	6371	604
	Equitable 20%	393,536	766,928	1,160,464	814	541			182
	Equitable 10%	59,132	570,259	629,391	480	485			99
Alicante	**Equitable**	864,866	6,429	871,295	354	1	4,442,464	821	1,061
	Equitable 20%	5,960	1,804	7,764	3	1			9
	Equitable 10%	1,979	2,438	4,417	1	1			5
Inner Pitiusas	**Equitable**	201,338	201,145	402,483	769	592	1,339,790	2505	161
	Equitable 20%	254,516	0	254,516	741	0			102
	Equitable 10%	0	21,962	21,962	0	104			9
Outer Pitiusas	**Equitable**	789,165	249,985	1,039,150	1884	807	2,618,929	5411	192
	Equitable 20%	573,796	0	573,796	1604	0			106
	Equitable 10%	94,666	154,756	249,422	256	447			46
East Mallorca	**Equitable**	549,390	231,414	780,804	1826	644	2,780,857	5778	135
	Equitable 20%	152,936	231,222	384,158	814	641			66

	Equitable 10%	8,216	97,690	105,906	398	284			18
Menorca	**Equitable**	332,789	0	332,789	1857	0	2,509,814	4912	68
	Equitable 20%	187,683	0	187,683	1368	0			38
	Equitable 10%	0	70,277	70,277	0	637			14

3.3. Replacement costs and flexibility of prioritization solutions

The irreplaceability or importance of the planning units in the area (replacement cost values) calculated without penalties for both DNTK and FNTK MPAs are more widely fragmented around the study area than the scenario solutions. Despite this increased spatial fragmentation, the spatial pattern of the replacement cost values is broadly consistent with the planning units selected under the Equitable scenario from which it was based (Fig. 4). Areas of high economic value such as the deeper area of the plateau off the coast and canyons of Palamós, the southwest area of Ibiza, the most offshore areas of Mallorca and Menorca, and around the 200-500m bathymetric ranges off the Cap de la Nau and the Gulf of Valencia remain unselected. Furthermore, a total of 1,136 planning units of DNTK MPA (3,922km^2) and 451 planning units of FNTK MPA (1,551km^2) shown in the replacement cost map (Fig. 5) are not present in the main solution. These add an additional 6.38% and 2.53% of Balearic Sea surface area not included in the main solution that has both high conservation potential and relatively low associated costs, and indicates that multiple MPA configurations could achieve similar conservation outcomes.

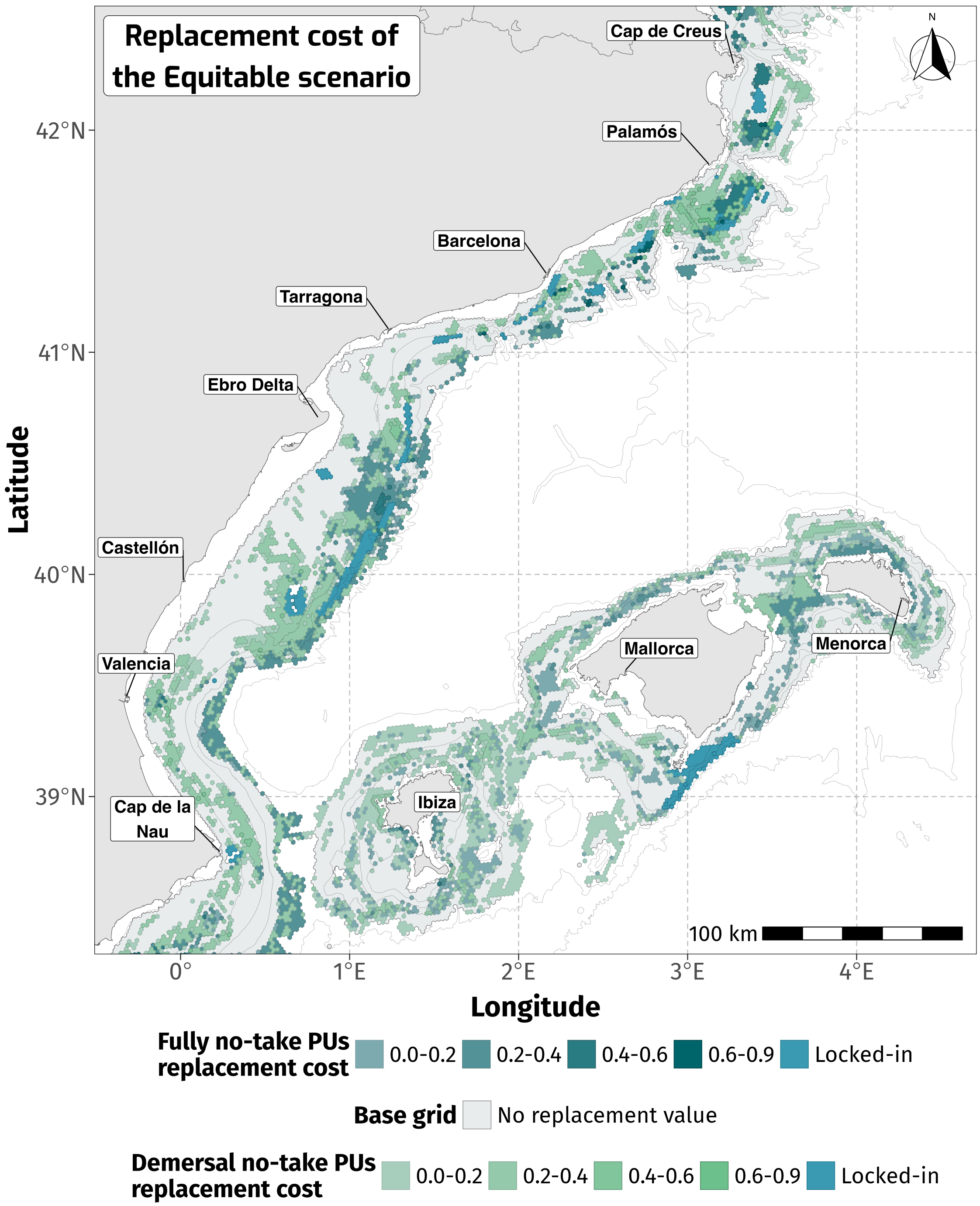

Figure 5. Replacement cost index values of each planning unit (PU) in the 'Equitable' scenario for the DNTK MPAs (light green) and the FNTK MPAs (dark green). The replacement cost informs on the impact that locking a planning unit out of the problem would have in the final solution. Higher valued planning units are more important to achieve the conservation targets, while planning units with a value of 0 are fully replaceable for another planning unit.

4. Discussion

In areas where human impacts are pervasive, current international targets of 30% of protection by 2030 are ambitious, and will require regionally based and informed marine spatial planning approaches to navigate trade-offs between biodiversity protection, human communities and economic interests. In particular, the use of data-informed systematic conservation measures to design efficient solutions that reconcile maximizing biodiversity protection with socio-economic costs are key in future expansions of current spatial conservation measures such as MPA networks (Zurell et al., 2025). Spatial conservation measures in already impacted ecosystems rely on ecosystem recovery in order to deliver beneficial and improved outputs. This recovery happens at varying speeds, sometimes slow, and newly protected areas will require societal acceptance before tangible recovery materializes (Franceschini et al., 2024). This begins with considering existing stakeholders when developing spatial prioritization solutions, without compromising the end goal of environmental protection and resource recovery, to achieve equitable and socio-economically feasible solutions.

4.1. Achieving conservation targets in an increasingly complex marine environment

Designing spatially and socio-economically informed MPAs happens in an increasingly crowded marine environment where the various uses and users need to find balance and be accommodated to the limited available space. There are already multiple existing conflicts between current MPAs and other active or planned uses of the marine space within the Balearic Sea. One of the most notable is the Offshore Wind Development Area that was placed within a previously established demersal no-take

MPA between Palamós and Cap de Creus. The impacts and interactions between these two classifications have already been discussed by Lloret et al. (2025). This is a clear example of how spatial planning in the marine environment is still carried out in a way where existing conservation management measures are not fully included in the decision process. It is also an example of how the many different terminologies of spatially delimited figures of protection render assessing the total surface under protection challenging. For the present work, the planning units that were located within the implemented DNTK MPA were locked into the solution (i.e., were always selected to be protected), while the surrounding planning units outside of the area of conflict were locked out (i.e., were never selected to be protected). Moving forward, a marine windfarm being established on top of the DNTK MPA would require a relocation of the planning units selected in our results.

Some uses and classifications were not considered in the present study. Shipping corridors and vessel density were excluded as the input biodiversity data did not include marine megafauna species more impacted by these activities, such as cetaceans or sea turtles (Joint Research Centre, 2025). Shipping routes and vessel traffic are a necessary consideration for the wider marine spatial and conservation planning and should be considered when including marine taxa known to be significantly impacted by their activity (Mestre et al., 2025) Areas available for military use or 'national defense' are a type of marine spatial planning use that normally include very wide areas where activities are carried out sporadically and without a clearly defined area. The lack of defined activities or clear impacts together with their wide footprint (Ministerio para la

Transición Ecológica y el Reto Demográfico, 2023) would make it difficult to reach planned conservation targets in an equitable way if they were to be locked out of the solution. Lastly, a planned 400km hydrogen pipeline connecting Barcelona (Spain) to Fos-sur-Mer (France) through the upper continental shelf (‘BarMar’, https://h2medproject.com/barmar/) was not included in as the exact route is not yet publicly available. If available, planning units over the planned pipeline route would have been locked out of the current prioritization solutions; as a result, any currently selected planning units that fall over it will need to be replaced with others with available replacement cost information. Despite the many existing and planned uses of the marine environment in the area and their influence in finding the best possible prioritization solutions, our results show there is enough available space to achieve conservation targets within the area in an equitable way for human communities and local stakeholders.

Systematic conservation planning should make use of already existing protected areas to extend regional networks and strengthen future conservation efforts. Even though almost no full protection exists in the Balearic Sea and practically anywhere in the Mediterranean Sea (Claudet et al., 2020), particularly in less coastal waters, existing demersal no-take MPAs are not being trawled anymore (ICATMAR, 2025b). In the Balearic Sea, early responses of habitat-forming benthic fauna to protection appear to be positive, although passive ecosystem recovery remains slow (Biel-Cabanelas et al., 2026). Many of these areas are also of importance to stakeholders at the local and national scale as they include long-established and well-known areas such as

Columbretes Islands or the Cabrera Archipelago National Park, or because they have been developed together with local stakeholders. All of them were included in the present study as locked-in areas in the final solution and priority area selection was, to some extent, directly influenced by them. The effect was more pronounced in areas of higher DNTK MPA density together with relatively lower costs, such as the plateau south of Palamós and the Ebro Delta continental shelf. These locations are straightforward solutions to increasing the surface under protection in the area. Yet, their large size, together with planning units around Ibiza and Formentera islands, could represent points of conflict with the fishery sector.

Importantly, understanding the distribution of planning unit replacement value in the study area provides useful information on which planning units have high conservation value and relatively low economic cost to protect. This highlights that multiple spatial configurations of the MPA network could achieve similar conservation outcomes. In turn, it allows for higher flexibility in the no-take MPA network expansion and design process, as future uses and stakeholders' interests in the area could be taken into account by switching optimal planning units with others that also have positive replacement costs. Moreover, by having these planning units unconstrained by boundary penalties can help design MPAs in shapes that are more easily manageable in terms of enforcement, but also importantly easier for users such as fishers to understand and comply with their regulations (Lundquist et al., 2015).

4.2. Conservation costs and considering different scenarios to make meaningful decisions

The Biodiversity scenario shows the effect of not including costs or the distribution of human features such as fishing areas into the solutions, which results in the spatial prioritization solutions selecting a lower number of larger priority areas. While this may be the most efficient solution in terms of achieving the set biodiversity targets and ‘ease of management’ (low number of MPAs and smaller boundaries by total area), such a solution and closure sizes may not be enforceable or accepted near densely inhabited areas. It is also the most expensive scenario out of the main three considered, and would not be a viable solution for fishing fleets and local fishing economies in many localities. Adding socio-economic features such as the distribution of the fishing fleet activity helps distribute the impact that spatial closures would have for local stakeholders. While doing so, it ‘forces’ the distribution of priority areas for conservation throughout the whole system as seen in our Balanced and Equitable scenarios, leading to more applicable even if less ‘efficient’ conservation solutions.

The importance of including fishing revenue when running spatial prioritization analyses is clearly reflected on the overall lost revenue difference for the fishing fleets, with over €12 Million/year (9% of the total yearly revenues) of cost differences between the Biodiversity and the Balanced/Equitable scenarios. Cost informed scenarios are cheaper and leave key fishing areas such as certain canyons (e.g., near Palamós) and the combination of some bathymetric ranges nearby important ports (e.g., Gulf of Valencia), open to fishing. Opposed to this, seemingly less relevant areas to fishing but still relevant for biodiversity conservation in the area are selected for spatial closures. Keeping economically important fishing grounds open would reduce the impact that overall closures would have in the fishing sector and in the local economy where some fishery products are an important part of the overall economy of the area.

Reaching conservation targets will have multiple costs, but our Equitable scenario results show that spatial prioritization analyses that account for local human communities when assessing future priority areas result in lower revenue losses of future spatial closure implementations. Our results show an estimated direct revenue loss of just under 13% of yearly fishing revenue for the bottom trawl and the purse seine fishing fleets in the area. Contextualized to the location, a yearly cost of lost revenue of around €17,4 Million/year for the fishing fleet is about 1.1% of the 2021-2027 Spanish budget of the European Maritime Fisheries and Aquaculture Fund, of which one of its main priorities is to directly support the increase in MPA coverage to 30% by 2030. While it is not within the scope of the work to assess the feasibility of such costs, having estimates of costs allows for practical comparisons and solutions as funding can be allocated by local, national and European governments to reach their conservation targets, providing a quantitative basis for evaluating the feasibility of conservation targets. Scenarios with lower protection targets (e.g., Equitable 10% and 20%) may provide more acceptable solutions that can be implemented in a shorter term as they are much more affordable in terms of lost revenue and cover smaller areas, many of which are located around existing DNTK MPAs.

The expectations of closing a large proportion of the fishable areas from demonstrated MPA benefits suggest that ecosystem and resource recovery could eventually lead to a higher number of catches and benefit human communities in the long term, as generally reported in both meta-analyses (M. D. Castro-Cadenas et al., 2026) and individual case studies (Dimarchopoulou et al., 2018). Including sampling sites of monitoring surveys such as MEDITS (which already spans 30+ years) as a locked-out constraint and as an intrinsic spatial use to be included in future marine spatial planning would ensure short to long-term monitoring would be possible to scientifically assess eventual ecosystem recoveries. Furthermore, ecosystem-based models could be used to predict the potential responses of the areas defined by systematic conservation planning once specific fleets stop their activities in the different zones (e.g. María D. Castro-Cadenas et al., (2026)). In the meantime, mapping scenarios with lower protection targets (10% and 20%) informs which areas are especially important and relatively ‘cheap’ to implement so that work can be focused in those areas in the short term.

4.3. Considerations and where to go from here

As with any other modeling exercise, the results presented here are the outcome of the specific inputs and decisions used to structure and inform our spatial prioritization analysis. While no solution is perfect, the current exercise sets a precedent for informed scenario-based conservation planning in the Mediterranean Sea. We included the egg-laying habitat suitability of small-spotted catshark as a proxy of some habitat-forming sessile organisms the area (López et al., 2025), but future work should include vulnerable and fragile biogenic habitat distributions in the area (e.g. González-Irusta et al., (2022)). Taking into account all existing biodiversity is a difficult if not impossible task, due to the thousands of species that inhabit either continuously or sporadically at any given location within marine ecosystems. None of our scenarios reached the full set of targets we set in the analyses, but in order to do so without compromising existing human uses of the marine environment or inequitably impacting human communities larger protected area surface might be needed. Despite not reaching the general biodiversity targets, the inclusion of bioregions and multi-species data in our spatial prioritization outputs ensure that wider ecological and community patterns are included and that the MPA network presented in the solution is comprehensive and representative (Possingham et al., 2006).

The current work excludes the shallower and more coastal section of the waters between 0-50m depth. The coastal fraction of the marine environment has a much more diverse and complex range of uses and stakeholder diversity that should also be included and considered, separate from the ones studied here. In these waters, the main fishing activity is performed by small-scale fishing fleets that are poorly satellite-monitored. Without information on the fishing effort distribution, it can be difficult to include the smaller fraction of the fishing fleet in systematic conservation planning analyses. Depths open to fishing within the 800-1000m bathymetric range were also not covered in the study grid. In the Balearic Sea, fisheries below 800m represent a very small fraction of the total revenue, with fishing vessels hardly working those depths (ICATMAR, 2023a). Future work should be carried out in both the shallower (< 50m) and deeper (>800m) fractions of the area open to fishing if a full and comprehensive conservation of the area is to be achieved. Including these bathymetric ranges in future analyses would mean a wider area open for protection, which could help include all species within the coverage of e.g., FNTK MPAs.

Size, shape and spacing are key factors to consider when developing a successful MPA network; and while MPAs should aim to be large enough to cover the entirety of a species' home- range, MPA size is constrained by socio-economical values (Lundquist et al., 2015). Having a network of MPAs, rather than a few large-sized ones, might be more costly to manage. Despite this, our results show it is cheaper at least in direct costs from revenue loss to the fishing sector. One of the main caveats of MPA network fragmentation is related to species with high mobility spilling over the MPA boundaries (Lundquist et al., 2015). Despite this, moderate spillover of species with high commercial value may lead to increased catches outside MPA boundaries and buffer the initial economic losses for the fishery sector (ICATMAR, 2023b). In the context of increasing allocation of marine space to new uses and a shrinking extent of fishable areas, flexible MPA design, supported by regionally informed prioritization and planning unit replacement cost data, could help achieve biodiversity conservation goals while reducing conflicts with relevant stakeholders.

Many fishing stocks in the Mediterranean Sea have long been overfished and most stakeholders are trying to revert the situation (FAO, 2023), as ultimately a healthier and more abundant marine ecosystem will be beneficial for both biodiversity conservation and fisheries. As the uses of the marine space increase and regulation grows, a future where fisheries such as bottom trawling and purse seining are accommodated within the countries marine spatial plans may require directly including fishing activities into the wider marine spatial planning, with the design and implementation of bottom trawl corridors or areas left open to fishing as opposed to defining areas closed to it. Currently uncommon, a bottom trawl corridor is a specific area where, as opposed to conservation, fishers are permitted to carry out their activities in a way that avoids widespread damage to the environment and potentially offers good fishing catch and revenues from a surrounding healthy environment (Bennion et al., 2023). By explicitly integrating biodiversity, economic costs, and fishing fleet equity within a single optimization framework, our results show achieving 30x30 is feasible and applicable in a relatively affordable way through systematic conservation planning. The urgency to protect the world’s oceans and human activities in the marine ecosystem will only be effective and consensual if the displacement of existing activities in said areas, mainly fishing, and the impact this will have on local communities is well taken into consideration.

5. Conclusion

Marine protected areas are the best tool available to restore ecosystems and fishery resources. A significant increase in both the surface of the ocean that is under protection and the actual protection these areas offer is needed. Our results show that ambitious marine conservation targets by national and international governments such as 30x30 can be achieved in a relatively cost-effective but equitable way when taking into account both biodiversity and socio-economic aspects of the wider system. Yet, these are inherently constrained by trade-offs between biodiversity protection and economic costs, existing and planned uses of the marine environment and sectorial equity. We present a set of spatial prioritization scenarios, their direct implementation costs for the main stakeholders involved (the fishery sector), and a wide range of planning units to choose from. These solutions provide decision makers with ample choice when designing promised increases of protected area surfaces in the area, while offering a reproducible framework applicable in other areas. While this study does provide a robust set of solutions for managers to consider with respect to the Balearic Sea, expanding this work in deeper and shallower waters, and including a range of other costs, impacts, and information on future species distributions under global change scenarios would further enhance and support robust future marine spatial plans for the region.

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Supplementary Materials for

Meeting Mediterranean conservation targets through systematic conservation planning

This file includes:

Figs. S1 to S4

Table S1

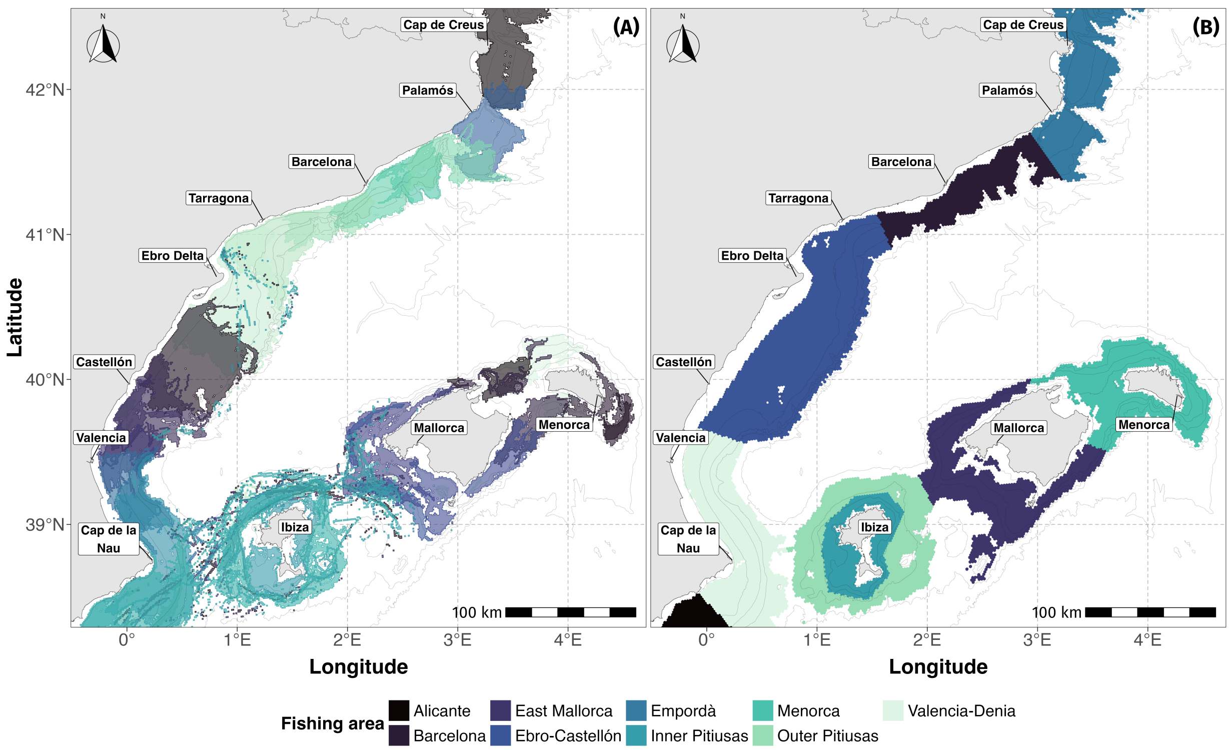
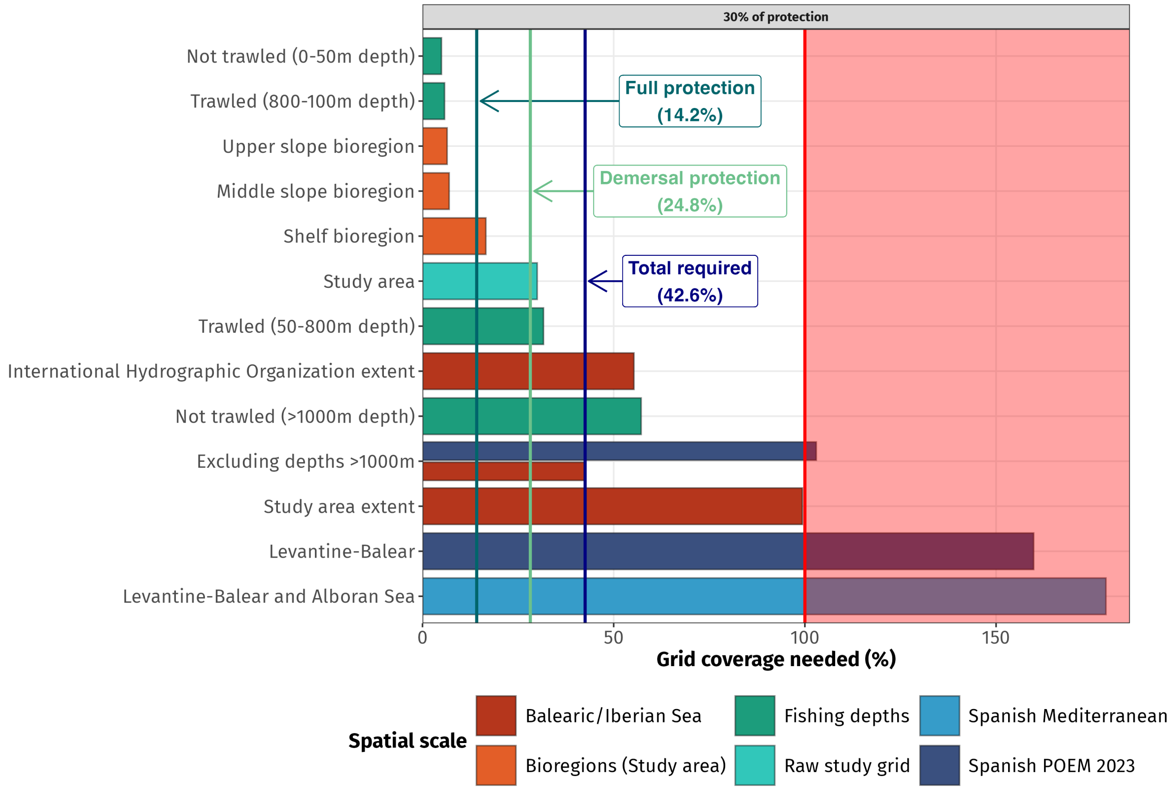


Fig. S1.

Regional fishing activity of the bottom trawling fleet in the Balearic Sea (A), and division of the study grid into grouped fishing areas for this study (B). Legend is only applicable to the right (B) panel.



670 **Fig. S2.**

671 **Grid coverage needed to reach the 30% target values for the prioritization**
672 **problem for the different spatial extents relevant in the area.** The red part of the
673 figure represents unachievable protection targets based on the study grid used. The
674 different coloured lines represent the required proportion of the grid needed to achieve
675 10%, 20% and 30% of the Extended Balearic Sea area excluding depths >1000m.

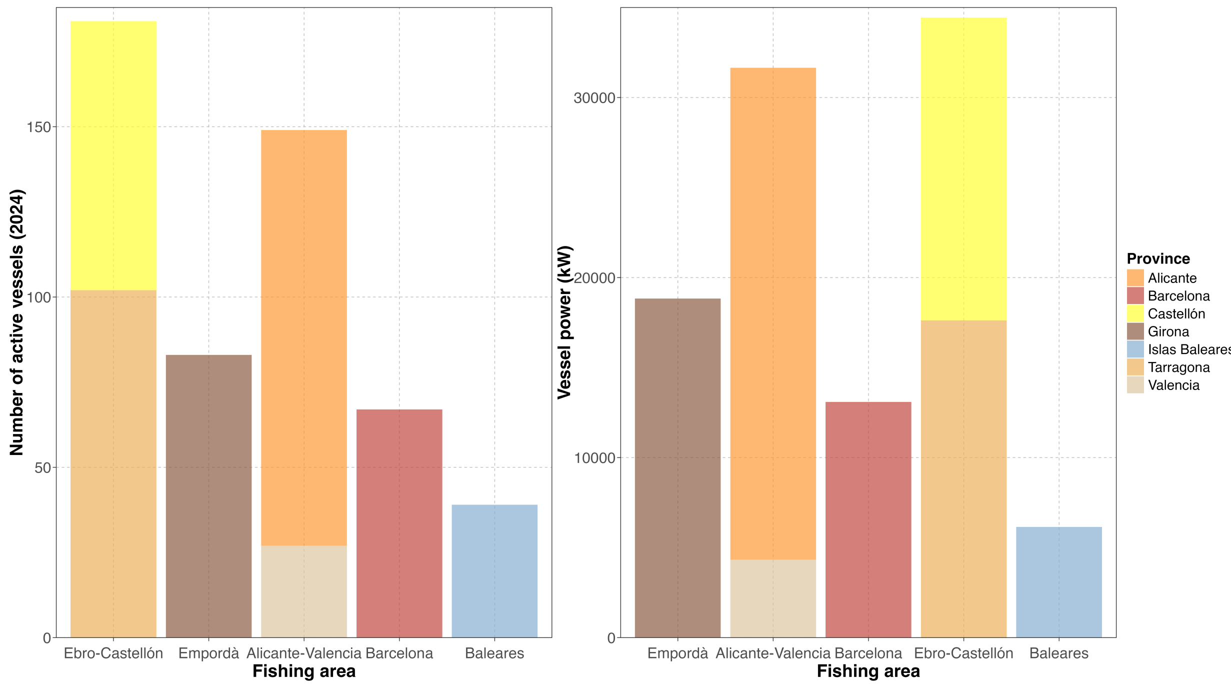
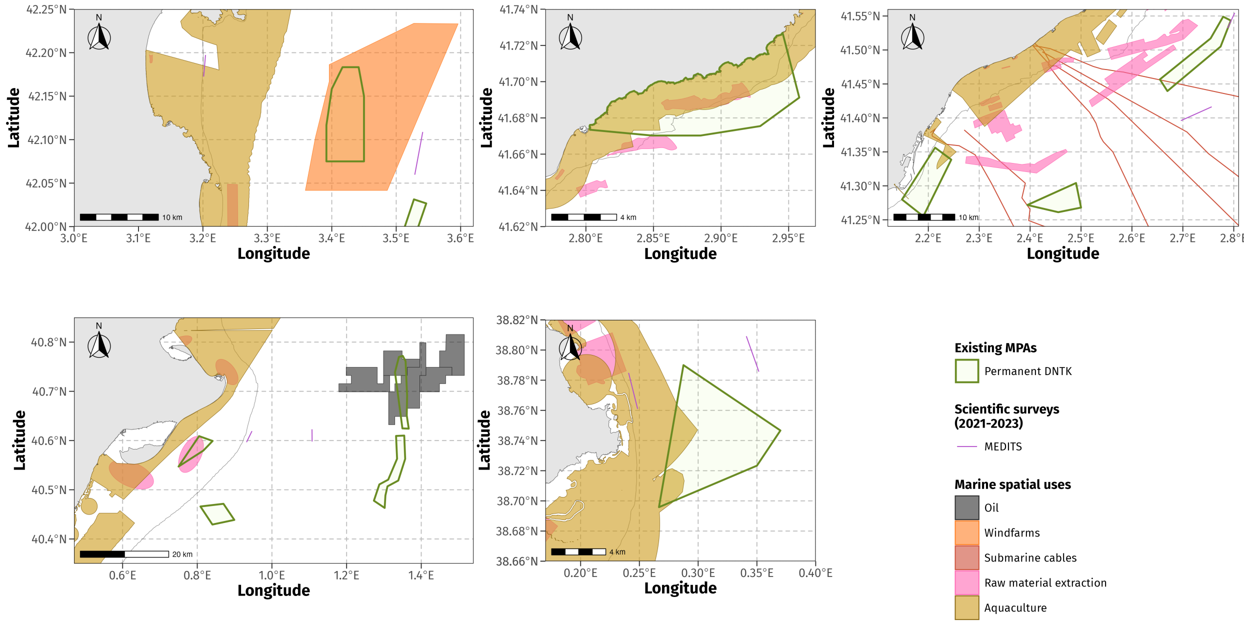


Fig. S3.

Bottom trawling and purse seining fleet structure: fishing vessels (left panel) and horsepower in kW (right panel) in the Spanish Mediterranean Sea for the provinces within the study area. Data obtained from the Fleet Registry of the Ministry of Agriculture, Fisheries and Food (dowloaded in October 2025 from https://www.mapa.gob.es/es/pesca/temas/registro-flota).



682 **Fig. S4.**

683 **Spatial conflicts between MPAs and other uses of the marine space in the**
684 **Balearic Sea.**

Table S1.

Area calculations to select grid target values for the prioritization problems to achieve 30% of protection at the different spatial scales. The one used for all scenarios in the current study was the grid coverage of the Balearic/Iberian Sea Extended excluding depths >1000m.

Spatial scale	**Name**	**Area (km^2)**	**Area within the study grid (km^2)**	**Protection target (km^2)**	**Grid coverage (%)**	**Grid needed (%)**
Spanish Mediterranean EEZ	Levantine-Balear and Alboran Sea	258,168	43,142	77,450	16.71	178.73
Spanish POEM 2023	Levantine-Balear	230,871	43,003	69,261	18.63	159.83
Balearic/Iberian Sea	IHO	79,872	31,494	23,962	39.43	55.30
	Extended	143,519	43,334	43,056	30.19	99.36
Bioregions	Shelf	23,943	23,943	7,183	100.00	16.58
	Upper slope	9,311	9,311	2,793	100.00	6.45
	Middle slope	10,079	10,079	3,024	100.00	6.98
Fishing depths within Balearic Sea extended (Trawled: 0-1000m; Not trawled: >1000m)	0-50m depth	7,173	247	2,152	3.44	4.97
	50-800m depth	45,718	42,655	13,715	93.30	31.65
	800-100m depth	8,339	432	2,502	5.18	5.77
	>1000m depth	82,599	0	24,780	0.00	57.18

Balearic/Iberian Sea Extended	**Excluding depths >1000m**	**61,422**	**43,334**	**18,426**	**70.55**	**42.52**
Spanish POEM 2023	Excluding depths >1000m	148,751	43,002	44,625	28.91	102.98