diversity

MDPI

Article

Cetacean Conservation in the Pelagos Sanctuary: Status and Proposal for Its Improvement

Erica Stoppa [1,2], Francesca Grossi [1,3], Léa David [4], Nathalie Di-Meglio [4], Marine Roul [4], Antonella Arcangeli [5], Eugenia Pasanisi [5,6], Ilaria Campana [7,8], Miriam Paraboschi [7], Alberto Castelli [9], Eleonora Pignata [8], Massimiliano Rosso [1,10], Aurelie Moulins [1,10] and Paola Tepsich [1,10,*]

1 CIMA Research Foundation, Via Armando Magliotto 2, 17100 Savona, Italy; ericastoppa99@gmail.com (E.S.); francesca.grossi@cimafoundation.org (F.G.); massimiliano.rosso@cimafoundation.org (M.R.); aurelie.moulins@cimafoundation.org (A.M.)
2 Department of Environmental and Earth Sciences, University of Milano-Bicocca, Piazza della Scienza 1, 20126 Milan, Italy
3 DIBRIS, University of Genova, Viale Causa 13, 16145 Genova, Italy
4 EcoOcéan Institut, 18 rue des Hospices, 34090 Montpellier, France; lea.david2@wanadoo.fr (L.D.); nathalie.di-meglio@wanadoo.fr (N.D.-M.); roul.marine@gmail.com (M.R.)
5 ISPRA, Department for Biodiversity Conservation and Monitoring, Via Brancati 48, 00143 Rome, Italy; antonella.arcangeli@isprambiente.it (A.A.); pasanisieugenia@gmail.com (E.P.)
6 Department of Environmental Biology, Sapienza University of Rome, 00185 Rome, Italy
7 Accademia del LeviatanoAPS, Via dell'Ospedaletto 53, 00054 Maccarese, Italy; ilariacampana@yahoo.it (I.C.); mimipara@hotmail.it (M.P.)
8 CONISMA, Piazzale Flaminio 9, 00196 Rome, Italy; eleonora.pignata.95@gmail.com
9 Department of Biology, University of Pisa, 56126 Pisa, Italy; alberto.castelli@unipi.it
10 NBFC, National Biodiversity Future Center, 90133 Palermo, Italy
* Correspondence: paola.tepsich@cimafoundation.org

Abstract: The Pelagos Sanctuary hosts eight resident cetacean species. Genetically different from Atlantic populations, their conservation is essential to preserve the whole biodiversity of the Ligurian Sea. The NATURA 2000 network is currently identified as one of the most efficient conservation tools due to its legally binding nature; however, its effectiveness for cetacean preservation is still unclear. The study used data systematically collected within the Pelagos Sanctuary from 2008 to 2021 by the FLT Med Net and the LIFE Conceptu Maris projects to investigate cetaceans distribution, Richness and diversity related to the existing protected areas. Of the 423 hexagons considered, only 21.28% of the study area was covered by French NATURA 2000 sites and 9.22% by Italian sites. French NATURA 2000 sites had the highest coverage of weighted Encounter Rate (ER_w) and biodiversity values. Only three species showed statistically significant differences between the French and Italian protected and non-protected hexagons, and biodiversity showed no significant difference. Only *T. truncatus* had higher median over Italian protected hexagons. The Pelagos Sanctuary still lacks offshore NATURA 2000 sites, especially in Italian waters. For this reason, areas to amplify the Network aimed at increasing cetacean and biodiversity conservation were highlighted in the results of this study.

Keywords: marine mammals; conservation; Pelagos Sanctuary; Ligurian Sea; FLT Network; NATURA 2000

Academic Editors: Guido Pietroluongo, Tommaso Gerussi and Cinzia Centelleghe

Received: 29 January 2025
Revised: 23 February 2025
Accepted: 25 February 2025
Published: 28 February 2025

Citation: Stoppa, E.; Grossi, F.; David, L.; Di-Meglio, N.; Roul, M.; Arcangeli, A.; Pasanisi, E.; Campana, I.; Paraboschi, M.; Castelli, A.; et al. Cetacean Conservation in the Pelagos Sanctuary: Status and Proposal for Its Improvement. *Diversity* **2025**, *17*, 174. https://doi.org/10.3390/d17030174

1. Introduction

Designated as flag species and bioindicators and being at the top of the food web [1–3], cetaceans are essential for marine environmental health. Within the Pelagos Sanctuary, eight resident species can be encountered: *B. physalus* (Linnaeus, 1758), *P. macrocephalus*

(Linnaeus, 1758), *S. coeruleoalba* (Meyen, 1833), *T. truncatus* (Montagu, 1821), *Z. cavirostris* (Cuvier, 1823), *D. delphis* (Linnaeus, 1758), *G. griseus* (Cuvier, 1812), and *G. melas* (Traill, 1809) [2,4–7]. Their uniqueness lies in the genetic differences recorded in the Atlantic populations, which is why they can be referred to as subpopulations [2,3,8–11].

As of today, the Mediterranean IUCN classification is Endangered for five of the eight cetacean resident species (*B. physalus*, *P. macrocephalus*, *D. delphis*, *G. griseus*, and *G. melas*), Vulnerable for one (*Z. cavirostris*), and Least Concert for just two (*S. coeruleoalba*, *T. truncatus*) [12–19]. As umbrella species, the conservation of cetaceans contributes to the conservation of marine biodiversity in general. This is particularly important considering the loss of biodiversity registered in the Mediterranean Sea (41% of top predators lost from 1950 to 2011) [20].

During the last decades, several biodiversity conservation tools have been established in the Mediterranean Sea [21–53], including the Barcelona Convention. According to its protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD), Specially Protected Areas of Mediterranean Importance (SPAMIs) have been established within the Mediterranean Sea, such as the Pelagos Sanctuary, in order to promote the conservation of these zones [54].

Among the more binding instruments are those of the European Union. In 1992, one of the most powerful tools for promoting the maintenance of biodiversity was issued: the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and wild fauna and flora, also known as the Habitats Directive [45]. Through the creation of a European ecological network of Sites of Community Importance (SCIs), the NATURA 2000 network [55], this Directive aims to maintain or restore biological diversity, and more specifically, species listed in Annex II, such as *T. truncatus*, which is the only species among the eight cetacean resident species in the Mediterranean Sea listed in this Annex. The other seven species listed in Annex IV of the Directive can still be included as "Other important species" belonging to the SCIs. According to Annex III of the Habitats Directive ("Criteria for selecting sites eligible for identification as Sites of Community Importance and designation as special areas of conservation"), Member States assess a national sites' list eligible for identification as SCIs for species belonging to Annex II based on different criteria, such as the "size and density of the population of the species present on the site in relation to the populations present within national territory" and the "degree of conservation of the features of the habitat which are important for the species concerned and restoration possibilities" [45].

The need to protect areas designated by the Habitat Directive was enhanced by Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive—MSFD). Under this strategy, at least 20% of the sea should have been protected by 2020 in the EU, increasing to 30% by 2030, according to the EU Biodiversity Strategy [46,56,57].

Despite these and other conservation tools established within the Mediterranean Sea, cetaceans are still influenced by several threats, such as climate disruption, prey depletion, epizootics, noise and direct disturbance, pollution, ship strikes and vessel traffic [2,3,58–70].

The objective of this study was to analyse the eight resident cetacean species and biodiversity values over the current conservation tools within the Pelagos Sanctuary. In particular, considering the legally binding condition of the NATURA 2000 network and cetaceans position in the food web, the designation of new NATURA 2000 sites within the Ligurian Sea could be an efficient tool not only for the conservation of these species but also for the protection of the whole biodiversity.

2. Materials and Methods

2.1. Study Area

The study area was identified as the Pelagos Sanctuary, an area covering 87,500 km^2 for the protection of marine mammals in the Mediterranean Sea. High geomorphologic heterogeneity characterises this area: a narrow continental shelf on the north-western side of the Pelagos Sanctuary, while wider on the eastern side, steep continental slope reaching more than 1000 m depth, and abyssal plain reaching 2500–2700 m deep on the western portion of the Pelagos Sanctuary, while shallower (1600–1700 m) on the eastern side [65]. In the basin, there are submarine canyons and sea mountains, whose presence causes a complex system of currents, upwelling, and downwelling [64,67].

Three main water masses characterise the Pelagos Sanctuary hydrology: the Modified Atlantic Water (MAW) in the surface layer, the Levantine Intermediate Water (LIW) in the intermediate layer, and the Western Mediterranean Deep Water (WMDW) in the bottom layer [71]. Three main currents are also present within this basin: the Western Corsica Current (WCC), flowing north-eastward on the west side of Corsica, the Eastern Corsica Current (ECC), flowing north-westward on the east side of Corsica, and the Liguro-Provenzal-Catalan Current (LPCC), which flows westward following the coast [72].

Due to these geomorphological and hydrological characteristics of the Pelagos Sanctuary, high primary and secondary productivity is recorded within this area despite the Mediterranean Sea classification as an oligotrophic basin [4,7,65,71,73–77], and the consequent presence of marine habitats suitable for cetaceans [64,67].

2.2. Data Collection

The data collection was conducted from 2008 to 2021 under the Fixed Line Transect Mediterranean monitoring Network (FLT Med Net); 18 routes, connecting Barcelona (Spain), Toulon and Nice (France), Savona, Livorno and Civitavecchia (Italy), Ajaccio, Calvi, Ile Rousse and Bastia (Corsica Island—France), Porto Torres and Golfo Aranci (Sardinia—Italy), were considered.

A team of a minimum of two Marine Mammal Observers (MMOs) collected data from the main deck of the ferries; one MMO on the right side and one on the left side scanned their respective areas within a 180° angle in front of the vessel, using both binoculars and the naked eye. Before the start of the "On effort" phase (when MMOs actively looked for cetaceans), weather conditions (wind, sea state, visibility, and rain) were collected. Weather conditions were then collected every time they changed. Vessel traffic was recorded from the beginning of the survey randomly every hour in the absence of cetaceans and during every sighting.

During the occurrence of sightings, animal(s) distance and angle were measured using a graduated scale (from 0 to 7), rangefinder stick, and compass (from 0° to 360°) of the binocular. Other collected data were the side of the sighting (left or right), MMO names, species, number (minimum, maximum, best), heading (taken with the compass of the binocular), and behaviour (approach, indifferent, or avoiding respect to the vessel).

2.3. Data Analysis

The study area was subdivided into hexagons of 115.47 km^2. The Pelagos Sanctuary covers an area of 87,500 km^2, with a mean maximum vertical (north-south) and horizontal (east-west) length of around 360 km. Due to the wide dimensions of the study area, the choice of the 115.47 km^2 hexagons was made on the basis of the need to subdivide such a wide area into polygons and at the same time not to lose a certain precision in data distribution. The top-bottom and left-right mean distance of 12.43 km inside the designated hexagons approximately represents 1/29 of the Pelagos Sanctuary lengths. In this way, the

data distribution was avoided being analysed in a too generalised way. Moreover, the use of a hexagonal grid was chosen because of the advantage of spatial data visualisation in comparison to the traditional square cells. Moreover, due to the same distance between a hexagon central point and all other hexagons' central points, better connectivity could be visualised in this kind of spatial representation [78].

A total of 423 hexagons, where at least one survey crossed them during the study period, were isolated. All the following analyses were conducted considering only surveyed hexagons.

32 NATURA 2000 sites designated for at least one of the eight Ligurian Sea resident species, or which have one of these listed as "Other important species", were considered within the Pelagos Sanctuary. In Table S1, the NATURA 2000 site codes and names are reported, with reference to the number of hexagons they covered; in the "Sitename" column, there are more sites together, which means that the number of hexagons indicated is covered by all of them [55,79].

Hexagons with more than 20% of their area covered by NATURA 2000 sites were indicated as "Protected".

All GIS analyses were performed using QGIS version 3.30.

2.4. Cetacean Presence and Biodiversity

Cetacean presence was measured by the definition of the Encounter Rate (ER), computed separately for each hexagon

$$ER = \frac{n}{S}$$

where n is the number of sightings per hexagon and S is the number of surveys in the same hexagon. In order to take into account uneven coverage over the study period, the weighted Encounter Rate was also computed

$$ER_w = ER * weight,$$

where

$$weight = \frac{S}{S_{max}}$$

with S_{max} indicating the maximum number of surveys among all hexagons.

Cetacean Biodiversity was analysed by applying different biodiversity indices: Shannon index [80], Simpson index [81], Evenness, and Richness. All analyses were performed in R studio version 4.3.0 software [82] using the package Vegan [83].

Shannon Diversity index used formula was

$$H = -p_i * ln(p_i),$$

where p_i is the proportion of species *i*, within the entire community [61]. The Shannon index typically ranges from 1.5 to 3.4, with higher values corresponding to more diverse sites. In addition, individual taxon spread (Evenness), and the overall abundance of individual species classifications (Richness) were calculated for each hexagon [70].

Simpson Diversity index was calculated as

$$D = 1 - \left(\frac{n(n-1)}{N(N-1)} \right)$$

where n is the total number of individuals of the same species in a hexagon and N is the total number of individuals in the same hexagon, regardless of species [84]. The Simpson index varies from 1 to 0, where 1 indicates greater diversity and 0 indicates lower diversity.

Evenness was calculated as

$$E = \frac{H}{H_{max}}$$

where H is the Shannon Diversity index, and H_{max} is the natural logarithm of the number of categories/types of species in the sampled ecosystem [85].

Species Richness was obtained by summing the number of species sighted within a hexagon.

The Wilcoxon test was used to inspect differences between both species' presence and biodiversity, considering the different protection status of hexagons over the study area. The Kruskal–Wallis test was then used to investigate these differences also taking into account the different coverage of French and Italian protected and not protected hexagons.

3. Results

3.1. General Results

A total of 1898 surveys were conducted from 2008 to 2021 (Figure 1).

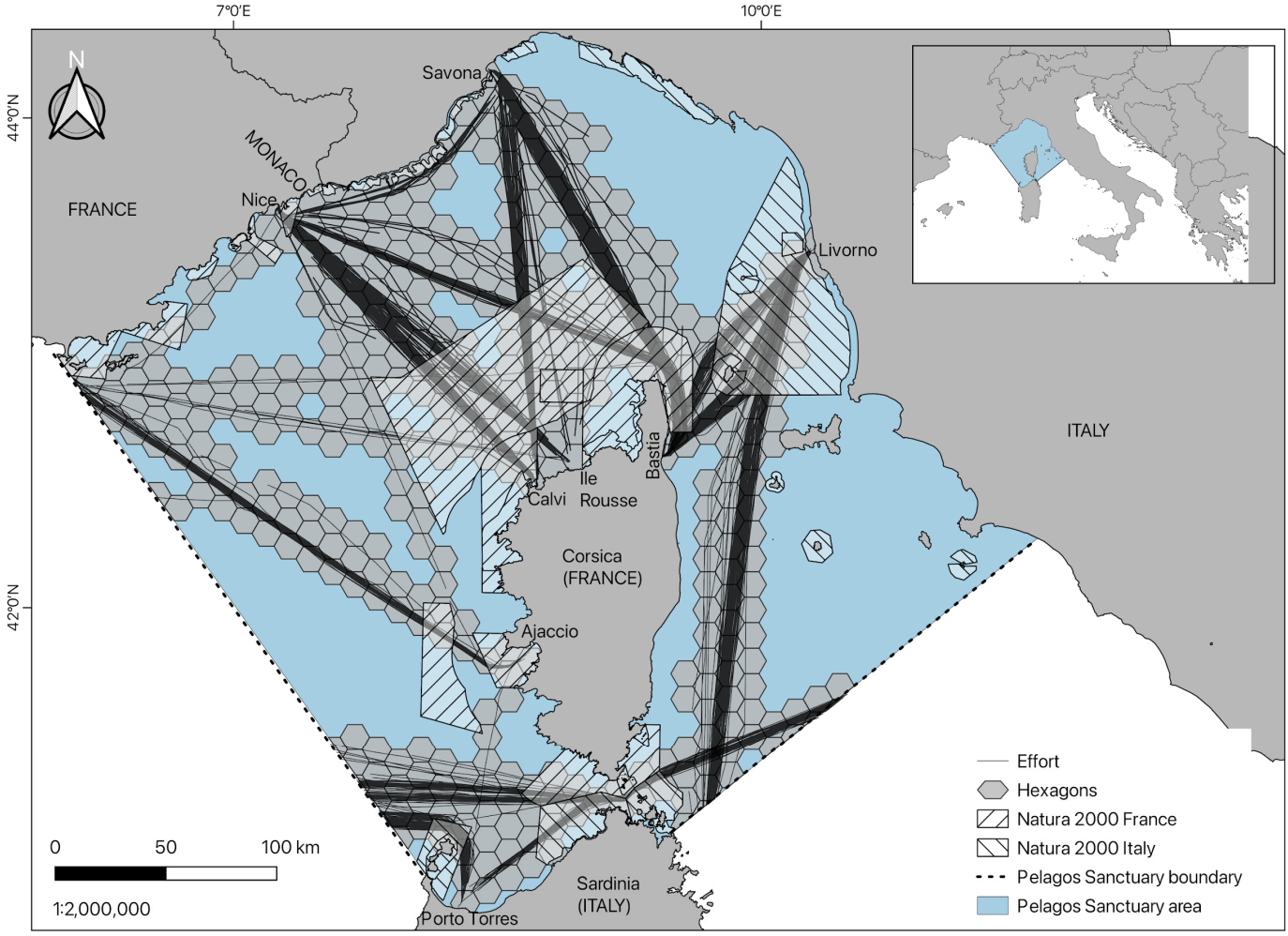


Figure 1. Map of the 1898 surveys conducted from 2008 to 2021 within the Pelagos Sanctuary. A total of 423 crossed hexagons and NATURA 2000 sites are also reported on the map.

Surveys were conducted from January to December almost every year, but 73.29% of the surveys were conducted during the summer seasons (from May to October).

Overall, 5893 sightings were recorded during these surveys: 1925 *B. physalus*, 225 *P. macrocephalus*, 3186 *S. coeruleoalba*, 327 *T. truncatus*, 149 *Z. cavirostris*, 24 *D. delphis*, 28 *G. griseus*, and 29 *G. melas*.

On average, the number of surveys in each hexagon was 66.6, with a maximum S of 655 and a minimum S of 1, while the number of sightings in each hexagon (n) was, on average, 13.93, with a maximum n of 148 and a minimum n of 0.

Within the 423 hexagons over the study area, 294 (69.50%) were identified as out of protection and 129 (30.50%) as protected (21.28% covered by French NATURA 2000 sites and 9.22% by Italian sites). Hexagons with at least one sighting were covered by French and Italian NATURA 2000 sites with the following percentages: *B. physalus*, 29.94% and 7.07%; *P. macrocephalus*, 27.72% and 1.98%; *S. coeruleoalba*, 25% and 7.92%; *T. truncatus*, 20.88% and 27.47%; *Z. cavirostris*, 25% and 0%; *D. delphis*, 25% and 15%; *G. griseus*, 21.74% and 0%; and *G. melas*, 22.73% and 0%, respectively (Table 1).

Table 1. Number of hexagons (and percentages) for cetacean presence and biodiversity values covered by French (FR-1) and Italian (IT-1) NATURA 2000 sites. Hexagons with values > 0 (Hexagons > 0) were taken into account.

	Hexagons > 0	**FR-1**	**IT-1**
B. physalus	212	55 (29.94%)	15 (7.07%)
P. macrocephalus	101	28 (27.72%)	2 (1.98%)
S. coeruleoalba	240	60 (25%)	19 (7.92%)
T. truncatus	91	19 (20.88%)	25 (27.47%)
Z. cavirostris	52	13 (25%)	0 (0%)
D. delphis	20	5 (25%)	3 (15%)
G. griseus	23	5 (21.74%)	0 (0%)
G. melas	22	5 (22.73%)	0 (0%)
Shannon index	213	53 (24.88%)	23 (10.80%)
Simpson index	213	53 (24.88%)	23 (10.80%)
Evenness	213	53 (24.88%)	23 (10.80%)
Richness	289	72 (24.91%)	27 (9.34%)

Biodiversity also showed differences in the percentage of hexagons covered by French and Italian NATURA 2000 sites: Shannon index, Simpson index, and Evenness 24.88% and 10.80%, and Richness 24.91% and 9.34%, respectively (Table 1).

3.2. ER_w

The ER_w calculated for each of the eight cetacean species was then classified through Jenks natural breaks [86] classification into absent, low, medium, and high. This classification was applied to *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, *Z. cavirostris*, and *T. truncatus* (Figure 2). Excluding hexagons with absent ER_w, all five species showed the highest percentages of low-valued hexagons (35.22%, 16.07%, 42.56%, 13.95%, and 8.27%, respectively), followed by medium (10.87%, 7.10%, 8.98%, 4.96%, and 2.13%, respectively) and high ones (4.02%, 0.71%, 5.20%, 2.60%, and 1.89% respectively) (Table S2).

For *D. delphis*, *G. griseus*, and *G. melas* absence/presence reference was preferred because the low ER_w values range prevented the Jenks classification (Figure 3). Only 4.73%, 5.44%, and 5.20% of the total hexagons registered at least one sighting of these three species, respectively (Table S2).

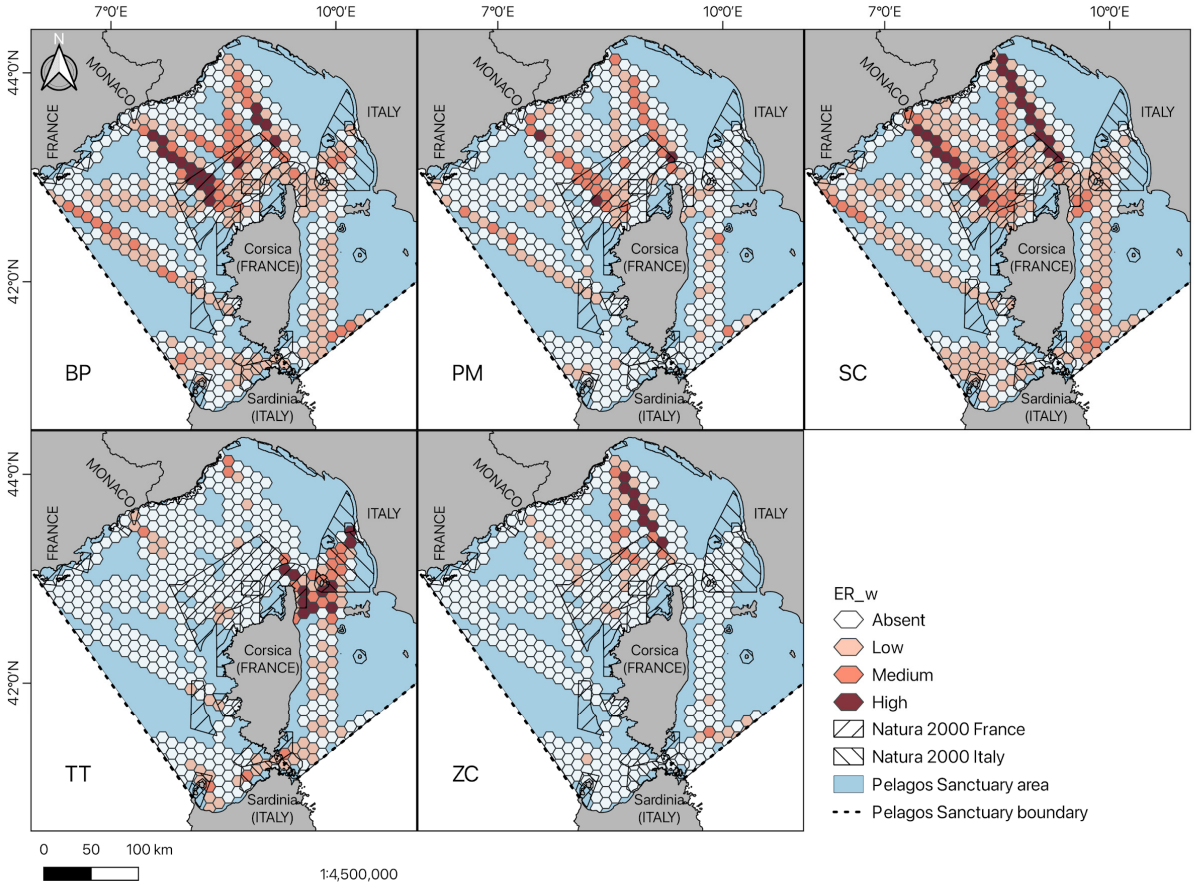


Figure 2. ER_w for *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, *T. truncatus*, and *Z. cavirostris*. NATURA 2000 sites are reported too. Jenks classification was used to define absent, low, medium, and high classes; the value range is different for each species. *B. physalus*: 0.002–0.014 (low), 0.014–0.047 (medium), 0.047–0.118 (high); *P. macrocephalus*: 0.001–0.003 (low), 0.003–0.007 (medium), 0.007–0.018 (high); *S. coeruleoalba*: 0.002–0.021 (low), 0.021–0.06 (medium), 0.06–0.14 (high); *T. truncatus*: 0.001–0.004 (low), 0.004–0.012 (medium), 0.012–0.023 (high); *Z. cavirostris*: 0.001–0.003 (low), 0.003–0.009 (medium), 0.009–0.017 (high). The absent class corresponds to ER_w = 0 for each species.

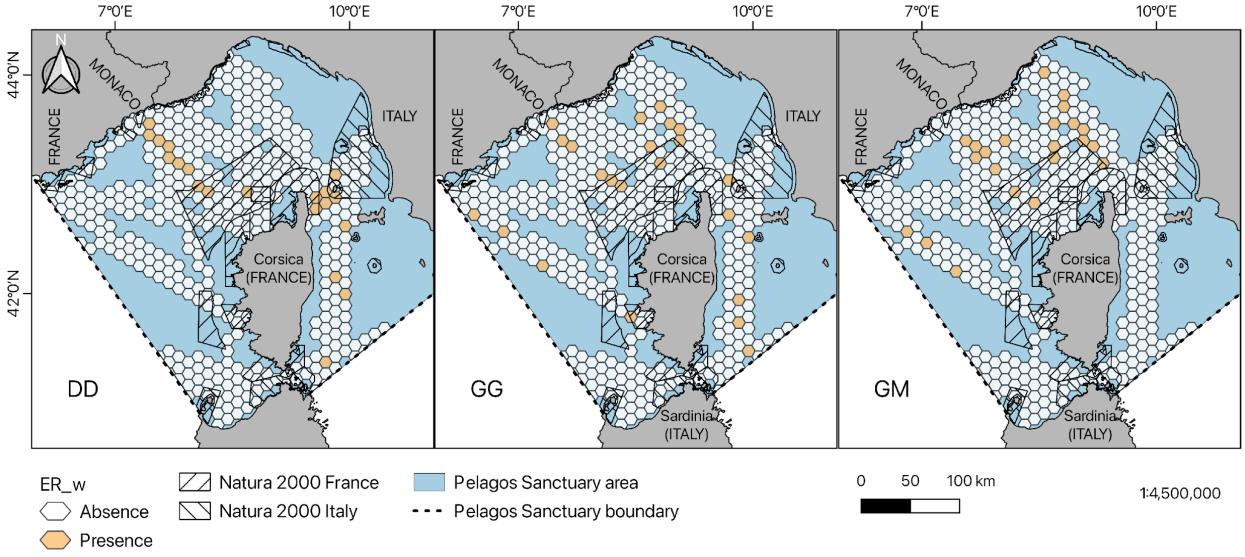


Figure 3. ER_w for *D. delphis*, *G. griseus*, and *G. melas*. NATURA 2000 sites are reported too. Jenks classification was used to define the absence and presence classes.

3.3. Biodiversity

The accumulation curves were first computed, in order to visualise the expected species Richness over the 280 hexagons where at least one sighting occurred and they were crossed by at least two surveys. Despite not all hexagons reaching an asymptote after the number of efforts they were crossed, the majority did. On average, asymptotes were reached from two to five species, and only one hexagon was reached at eight species. Moreover, in the first part of the accumulation curve, few hexagons reached the asymptote at Richness 1 after around (or less) 200 effort, representing the coastal areas.

As the asymptotes were reached in almost all the studied samples, the accumulation curve confirmed that the dataset was reliable for studying the biodiversity within it (for almost all hexagons, increasing the number of surveys and sightings would not change the overall number of species sighted).

The Shannon index, Simpson index, Evenness, and Richness were then calculated over the 289 hexagons where at least one sighting occurred (Figure 4).

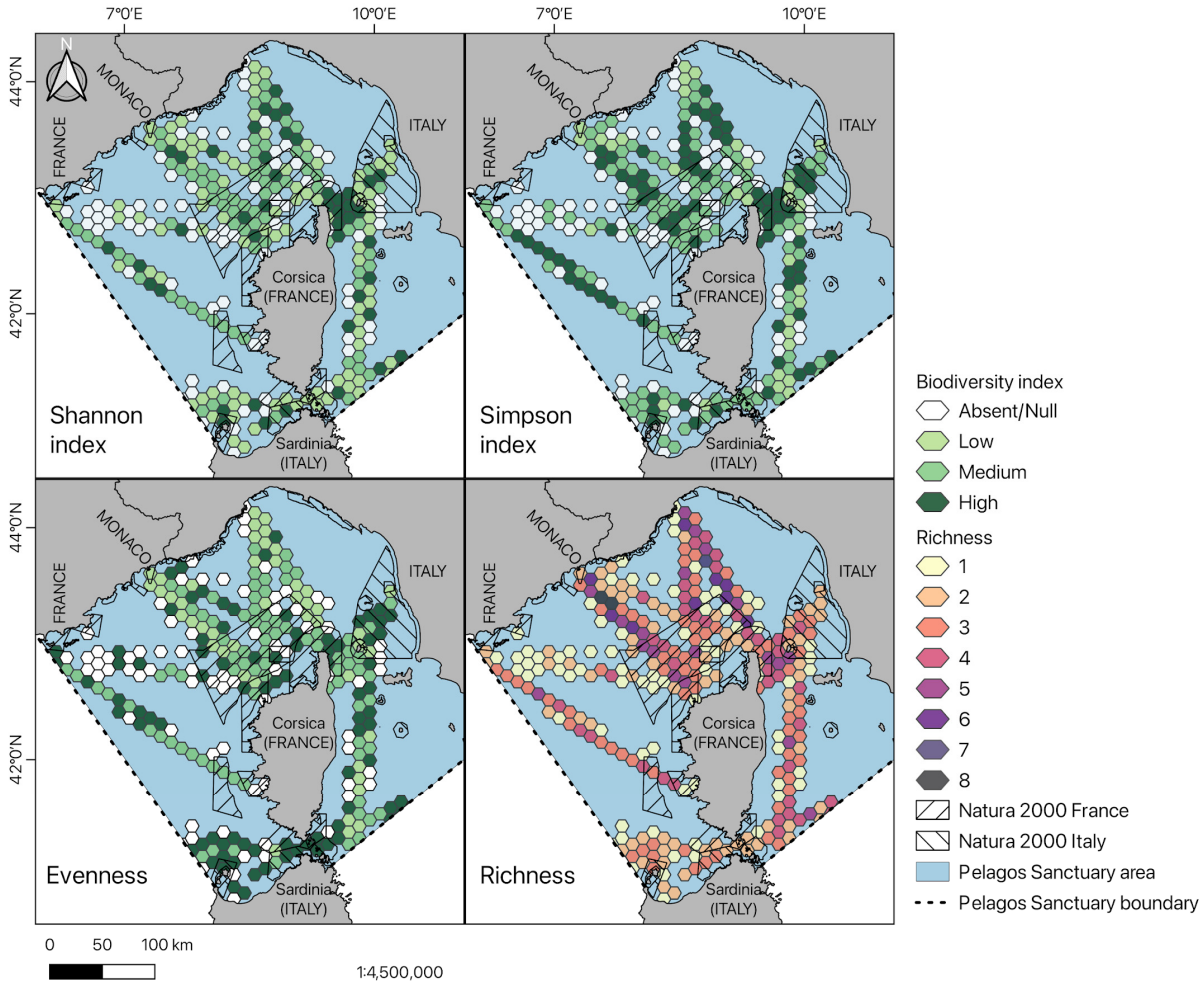
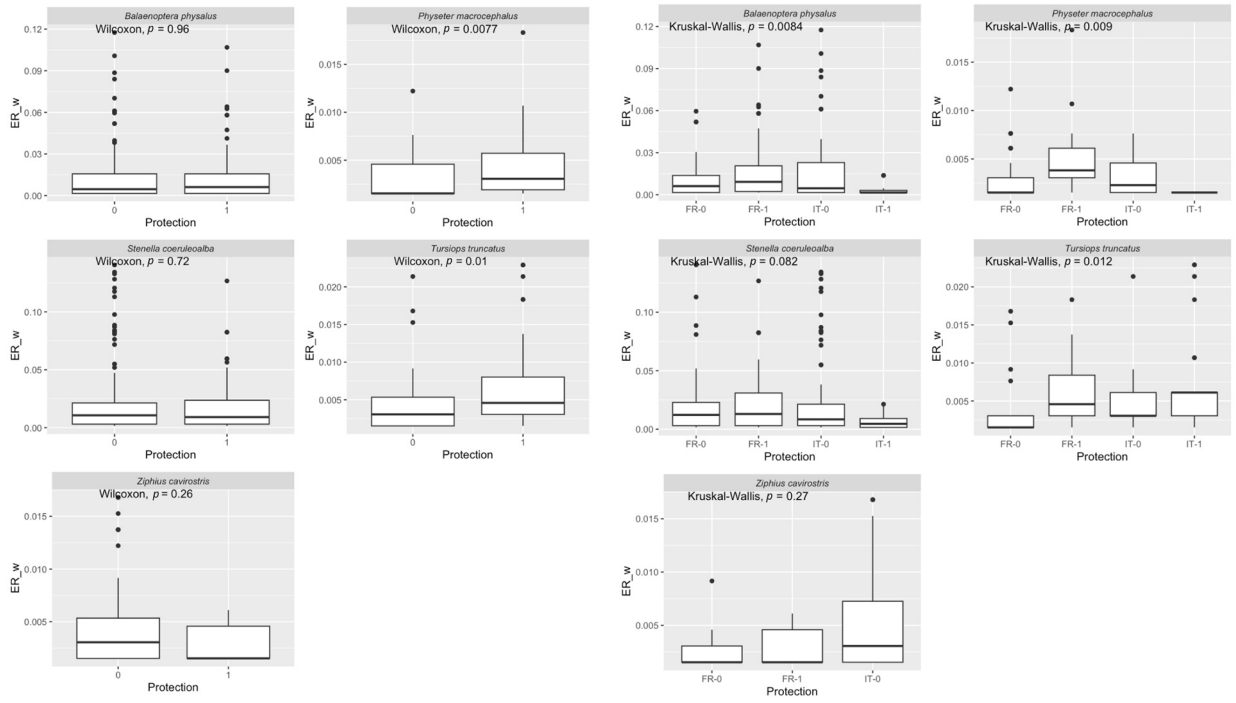


Figure 4. Shannon index, Simpson index, Evenness, and Richness plotted over the 289 hexagons where at least one sighting was recorded. NATURA 2000 sites are reported too. Jenks classification was used to define absent, low, medium, and high classes for Shannon index, Simpson index, and Evenness, while Richness classes ranged from 1 to 8; the value range is different for each biodiversity index. Shannon index: 0.23–0.75 (low), 0.75–1.01 (medium), 1.01–1.33 (high); Simpson index: 0.12–0.38 (low), 0.38–0.53 (medium), 0.53–0.72 (high); Evenness: 0.34–0.64 (low), 0.64–0.83 (medium), 0.83–1 (high). The absent class corresponds to Shannon and Simpson indices = 0, and Evenness = NULL.

Excluding hexagons with absent/null values, the Shannon index showed the highest percentage in low-valued hexagons (31.14%), followed by medium-valued (26.64%) and high-valued hexagons (15.92%). In contrast, the Simpson index showed the highest percentage in medium-valued hexagons (35.64%), followed by high (26.99%) and low (11.07%) hexagons, while Evenness showed the highest percentage in high valued-hexagons (29.06%), followed by medium (28.82%) and low (15.92%) hexagons. Richness 1 was the most recorded (26.30%), followed by Richness 2 (24.91%), Richness 3 (24.57%), Richness 4 (13.50%), Richness 5 (6.57%), Richness 6 (3.11%), Richness 8 (0.69%), and Richness 7 (0.35%) (Table S2).

3.4. Wilcoxon Test

Differences between the ER_w for *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, *T. truncatus*, and *Z. cavirostris*, and considering the different protection status of each hexagon, were computed using the Wilcoxon statistical test (Figure 5a).



(**a**) (**b**)

Figure 5. (**a**) Wilcoxon tests between the ER_w of *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, *T. truncatus*, and *Z. cavirostris* considering the different protection status of each hexagon. *D. delphis*, *G. griseus*, and *G. melas* were excluded from the Wilcoxon test because of the low number of sightings for these species. *P. macrocephalus* and *T. truncatus* were the only species with a statistical significant difference (Wilcoxon, $p = 0.0077$ and $p = 0.01$, respectively); (**b**) Wilcoxon tests between the ER_w of *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, *T. truncatus*, and *Z. cavirostris* considering the different protection status of hexagon, with Italian and French subdivision. *D. delphis*, *G. griseus*, and *G. melas* were excluded from the Wilcoxon test because of the low number of sightings for these species. *B. physalus*, *P. macrocephalus* and *T. truncatus* showed a statistical significant difference (Kruskal-Wallis, $p = 0.0084$, $p = 0.009$, and $p = 0.012$ respectively).

D. delphis, *G. griseus*, and *G. melas* were excluded because of the low number of sightings of these species.

S. coeruleoalba and *Z. cavirostris* showed higher ER_w median within not protected than within protected hexagons (0.011 vs. 0.009 and 0.003 vs. 0.002, respectively). The other four species showed the opposite situation, with higher ER_w median values within the

protected hexagons: 0.005 vs. 0.006 for *B. physalus*, 0.002 vs. 0.003 for *P. macrocephalus*, and 0.003 vs. 0.005 for *T. truncatus*.

P. macrocephalus and *T. truncatus* showed a statistically significant difference between ER_w and the conservation status of the hexagons to which these values belonged, with higher median within protected hexagons.

B. physalus and *S. coeruleoalba* showed more than two outliers within protected and not protected areas, and did not show evidence of ER_w statistical significant difference between protected and not protected hexagons. Therefore, they were analysed using a second Wilcoxon test, where outliers were excluded. The ER_w median of the identified inliers within the not protected and protected hexagons was 0.005 in both cases for *B. physalus* and 0.008 vs. 0.006 for *S. coeruleoalba*, respectively. However, this analysis did not show a significant difference for these two species between ER_w detected within protected and not protected areas.

The second step was the analysis of the ER_w distribution, focusing on the differences between protected and not protected Italian and French hexagons.

B. physalus, *P. macrocephalus*, and *S. coeruleoalba* showed higher median ER_w values over French protected hexagons: 0.009 vs. 0.006 in French not protected hexagons, 0.002 in Italian protected hexagons, and 0.005 in Italian not protected hexagons for *B. physalus*; 0.004 vs. 0.002 in all French not protected hexagons, Italian protected hexagons, and Italian not protected hexagons for *P. macrocephalus*; and 0.013 vs. 0.012 in French not protected hexagons, 0.005 in Italian protected hexagons, and 0.008 in Italian not protected hexagons for *S. coeruleoalba*.

T. truncatus was the only species showing higher median values within Italian protected hexagons: 0.006 vs. 0.003 in Italian not protected hexagons, 0.005 in French protected hexagons, and 0.002 in French not protected hexagons.

Z. cavirostris was never sighted within Italian protected hexagons; it showed higher median values within Italian not protected hexagons: 0.003 vs. 0.002 in both protected and not protected French hexagons.

In this case, the inlier Wilcoxon test was not necessary, since all five species did not show more than two inliers in each class.

B. physalus, *P. macrocephalus* and *T. truncatus* had a statistical difference between ER_w and the conservation status of the hexagons to which these values belonged, referring to higher median within French protected hexagons for the first two species and higher median within Italian protected hexagons for the last one (Figure 5b).

For these three species, Dunn's post-hoc test was performed to determine any statistically significant difference between ER_w values within FR_0, FR_1, IT_0, and IT_1. This was observed between FR-1 and IT-1 (p-value = 0.00386702) and between IT-0 and IT-1 (p-value = 0.03127796) for ER_w values for *B. physalus*, between FR-0 and FR-1 ER_w values for *P. macrocephalus* (p-value = 0.01698313), and between FR-0 and IT-1 ER_w values for *T. truncatus* (p-value = 0.01292665).

The Wilcoxon test showed that the recorded median values were higher within the protected than those in the not protected hexagons (0.693 vs. 0.688 for Shannon's index, 0.495 vs. 0.444 for Simpson's index, and 0.789 vs. 0.783 for Evenness), except for Richness, which had a median value of 2 in both conditions (Figure 6a).

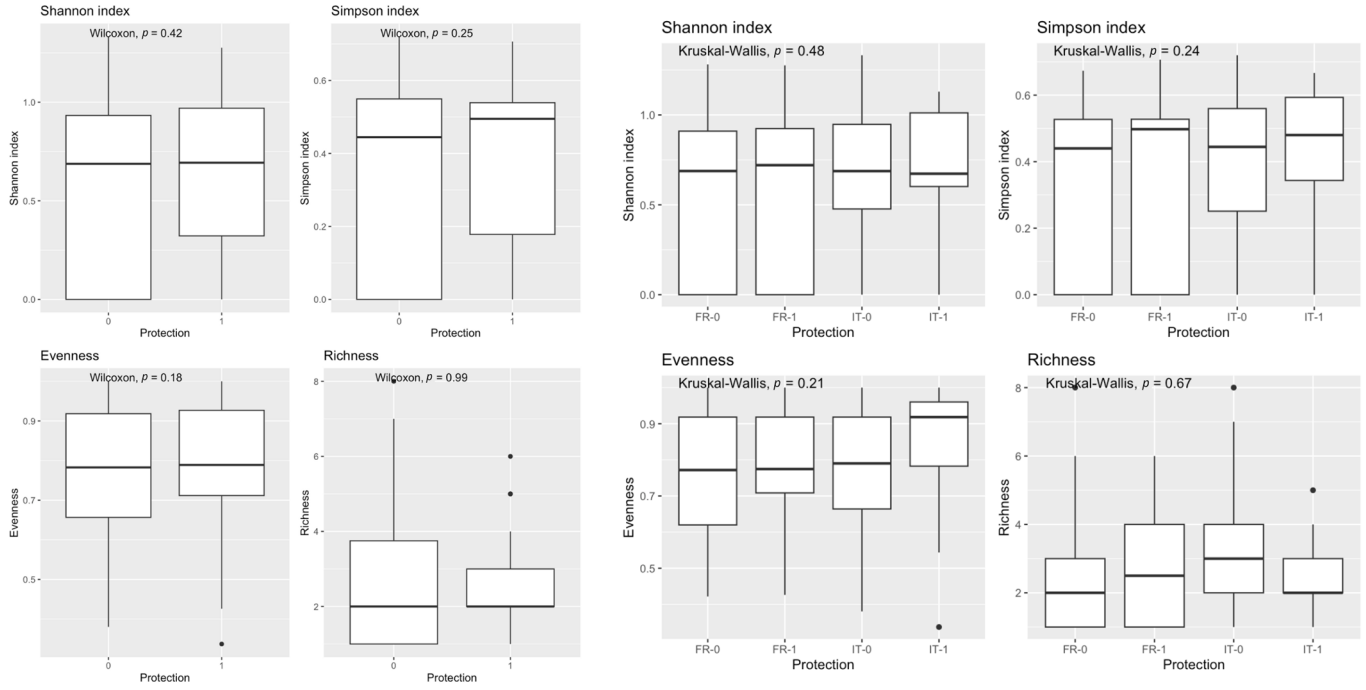


Figure 6. (**a**) Wilcoxon tests between the Shannon index, Simpson index, Evenness and Richness, considering the different protection status of each hexagon. None of these differences were had a statistically significant between protected and not protected hexagons. (**b**) Wilcoxon tests between the Shannon index, Simpson index, Evenness, and Richness, considering the different protection status of each hexagon, with Italian and French subdivisions. None of these showed a statistically significant difference between protected and not protected hexagons.

By focusing on the differences between protected and not protected Italian and French hexagons, the Kruskal-Wallis statistical test was conducted on the distribution of the Shannon index, Simpson index, Evenness, and Richness over hexagons.

The Shannon and Simpson indices showed higher values over French protected hexagons: 0.721 vs. 0.688 in French not protected hexagons, 0.673 in Italian protected hexagons, and 0.688 in Italian not protected hexagons for the Shannon index; 0.498 vs. 0.44 in French not protected hexagons, 0.48 in Italian protected hexagons, and 0.444 in Italian not protected hexagons for the Simpson index.

Evenness showed higher values over Italian protected hexagons (0.918 vs. 0.79 in Italian not protected hexagons, 0.775 in French protected hexagons, and 0.772 in French not protected hexagons); Richness showed higher values over Italian not protected hexagons (3 vs. 2 in French not protected and Italian protected hexagons, and 2.5 in French protected hexagons) (Figure 6b).

4. Discussion

4.1. Cetacean Conservation Status

All countries should perceive maritime ecosystem conservation as a common goal [87]. As of today, several tools have been identified for the conservation of cetaceans within the Ligurian Sea; however, the eight cetacean species are still threatened by several anthropogenic pressures such as maritime traffic, climate disruption, and chemical and acoustic pollution [3,60,66].

The Endangered (EN) or Vulnerable (VU) IUCN classification of six of the eight North-Western Mediterranean Sea cetacean resident species could be considered as evidence of this. Furthermore, in the Mediterranean Sea, from 2010 to 2021, *B. physalus* changed its

status from VU to EN, *G. melas* and *G. griseus* from Data Deficient (DD) to EN, while *Z. cavirostris* changed it from DD in 2006 to VU in 2021. *D. delphis* and *P. macrocephalus* are EN from 2003 and 2006; just *S. coeruleoalba* and *T. truncatus* increased it from VU, respectively in 2010 and 2009, to LC in 2021 [12–19].

The first evidence of conservation tool' efficiency could be demonstrated by the conservation status rise of this species. Within the NATURA 2000 sites considered for the previous analysis, *T. truncatus* was identified as the only species for which the NATURA 2000 sites aimed at cetacean conservation were designated within the Ligurian Sea, while the other seven (if stated) were classified as "Other important species" [55]. Consequently, threats, pressures, and activities with impacts on a site were identified, especially those with potential consequences (also) on *T. truncatus* (Table 2).

Table 2. Threats, pressures and activities with impacts identified within the 32 NATURA 2000 sites considered for this study; just those which could lead to an impact on cetaceans are reported. The number of French (FR-1) and Italian (IT-1) NATURA 2000 sites where these threats, pressures, and activities were identified are reported. Most relevant conservation measures identified within the 32 NATURA 2000 sites are reported too [55,88–92].

Threats, Pressures and Activities with Impacts on the Site	FR-1	IT-1	Conservation Measures
Motorised vehicles	3	1	
Shipping lanes	7	1	Continue monitoring of recreational vessel traffic
Death or injury by collision	1	8	
Accidental capture	0	4	
Illegal taking/removal of marine fauna	0	6	Development of an action plan against accidental pollution at the level of all municipalities in the NATURA 2000 site
Noise nuisance, noise pollution	4	6	
Diffuse or permanent noise pollution	0	2	
Point source or irregular noise pollution	0	2	
Exploration and extraction of oil or gas	3	0	Combating pollution and deterioration of the general water quality
Seismic exploration/explosions	3	0	
Military manouvres	1	1	
Marine water pollution	4	9	Monitoring the chemical and bacteriological quality of seawater, sediments, upstream water courses
Pollution to surface waters (limnic, terrestrial, marine and brackish)	1	5	
Marine macro-pollution (i.e., plastic bags, styrofoam)	1	0	Intensification of control activities to prevent illegal fishing
Toxic chemical discharge from material dumped at sea	1	0	
Garbage and solid waste	0	2	Improving knowledge of habitats and species of community and heritage interest
Introduction of other substances (e.g., liquid, gas)	0	1	
Synthetic compound contamination	0	2	
Oil spills in the sea	1	2	Training courses to raise awareness of the presence of different marine mammal species
Professional active fishing	7	1	
Leisure fishing	2	4	
Pelagic trawling	0	1	Encourage the information and awareness of the local population and the major users of the area on the NATURA 2000 network
Temperature changes (e.g., rise of temperature and extremes)	0	1	
Nautical sports	11	3	
Motorized nautical sports	0	1	Continue to acquire knowledge to improve site management
(Other) human intrusions and disturbances	0	8	
Not specified	1	0	

The strengthening of conservation tools should be taken into account in order to grant or increase the conservation status of the other cetacean species within the Ligurian Sea, ruled by their role in the marine environment, being apex species and bioindicators [2].

The recent proposal of the "Tutela del Tursiope—Mar Ligure" Site of Common Interest [79] would be a good example to do so. Currently, only 33.9% of the Pelagos Sanctuary area is covered by the NATURA 2000 network [55], and a previous study highlighted the low inclusion of the most suitable habitat for several cetacean species within protected areas [70].

For this reason, the extension or addition of new NATURA 2000 sites to the actual network is necessary. For Italy, this scenario would be enhanced by the implementation of the Italian EEZ [93,94], over which Article 65 of the UNCLOS [21] could be applied, granting cetacean conservation over this area. The designation of new NATURA 2000 sites within this area could be led by the already present North-Western Mediterranean Pelagic Ecosystems EBSA, North-Western Mediterranean Sea, Slope and Canyon System IMMA, and Western Ligurian Sea and Genoa Canyon IMMA, specifically designated for the conservation status of the eight North-Western Mediterranean Sea cetacean resident species [30,31,53].

4.2. Cetacean Presence in the Sampled Area

A total of 5893 cetacean sightings were collected from 2008 to 2021 from 1898 surveys. The dataset we used has a large spatial and temporal scale, which strengthens our results by identifying recurrent and stable areas with high Richness. The use of a homogeneous dataset also strengthens the results against possible biases arising from merging datasets collected using different methodologies and different spatial/temporal scales.

The ER_w distribution of the eight species over the 423 hexagons in which the study area was subdivided could first be explained by their different habitat fruition. *T. truncatus* was the only exclusively coastal species [7], while all the others were predominantly pelagic, with a high occurrence, especially in the northern part of the study area, where canyons and seamounts are present [62,64,67].

Through the Wilcoxon test, it was possible to point out that *S. coeruleoalba* and *Z. cavirostris* had higher ER_w median values in hexagons outside protected areas, while *B. physalus*, *P. macrocephalus* and *T. truncatus* showed higher median ER_w within protected hexagons (*D. delphis*, *G. melas*, and *G. griseus* were excluded due to their low number of sightings). However, only *P. macrocephalus* and *T. truncatus* showed a statistically significant difference in the Wilcoxon test between the ER_w values and the protection status of the considered hexagons.

A second Wilcoxon test was run on cetaceans' ER_w distribution over Italian/French protected/not protected hexagons. *B. physalus*, *P. macrocephalus*, and *S. coeruleoalba* showed higher median ER_w values over French protected hexagons, *T. truncatus* was the only specie showing higher median values within Italian protected hexagons, while *Z. cavirostris* showed higher median values within Italian not protected hexagons. A statistically significant difference between ER_w and the conservation status of the hexagons was found only for *B. physalus*, *P. macrocephalus* (with a higher median within French protected hexagons), and *T. truncatus* (with a higher median over Italian protected hexagons).

Considering the NATURA 2000 site distribution, the results obtained with the Wilcoxon test between ER_w values occurring in protected and not protected hexagons could be considered affected by the bias of a non-homogeneous coverage over different habitats. Within the Pelagos Sanctuary, the NATURA 2000 Network covers most of the coastal regions, granting effective conservation for coastal species such as *T. truncatus*, but a less efficient one for *B. physalus*, *S. coeruleoalba*, and *Z. cavirostris*, which favour a prevalently pelagic habitat. This was also demonstrated by the ER_w map (Figure 2), where 57.14% of the medium and 72.73% of the high-valued hexagons for *T. truncatus* were covered by NATURA 2000 sites (Table S2).

For the other three species, hexagons with medium and high ER_w values distributed over the NATURA 2000 network were different; 32.61% of medium and 41.18% of high-valued hexagons for *B. physalus*, 39.47% of medium and 27.27% of high-valued hexagons for *S. coeruleoalba*, and 44.44% of medium and 0% of high-valued hexagons for *Z. cavirostris* were covered by the NATURA 2000 network. The only exception within the pelagic species was represented by *P. macrocephalus*, which had 40% of medium, but 66.67% of high-valued hexagons covered by NATURA 2000 network.

In particular, French NATURA 2000 site coverage over medium- and high-valued hexagons was 28.26% and 41.18 for *B. physalus*, 40% and 66.67% for *P. macrocephalus*, 39.47% and 27.27% for *S. coeruleoalba*, 14.29% and 36.36% for *T. truncatus*, and 44.45% and 0% for *Z. cavirostris*, respectively, while Italian NATURA 2000 site coverage over medium- and high-valued hexagons was 4.35% and 0% for *B. physalus*, 0% in both cases for *P. macrocephalus* and *S. coeruleoalba*, 42.86% and 36.36% for *T. truncatus*, and both 0% for *Z. cavirostris*, respectively (Table S2).

The importance of this percentage was proven by the statistically significant difference obtained with the Wilcoxon test for these species. These results could explain the decrease in the IUCN classification for six of the eight species, except for *T. truncatus* and *S. coeruleoalba*. At the same time, this could underscore the necessity of enhancing area coverage to guarantee the effective conservation of all cetacean species.

4.3. Biodiversity Presence in the Sampled Area

Considering the 289 hexagons where at least one sighting occurred, biodiversity showed good percentages of medium and high values. These values were spread not only in the northern part of the study area, as occurred with cetacean presence, but all over the study area; this was important for considering this zone as generally characterised by moderate/high biodiversity.

Higher median values were recorded within NATURA 2000 sites for Shannon index, Simpson index, and Evenness; the first two were higher under French protected hexagons, while the last was higher under Italian protected hexagons. Richness showed higher values over Italian, not protected hexagons. However, none of the four biodiversity indices showed statistically significant differences between the protected and not protected hexagons.

Considering the NATURA 2000 site distribution, the network covered 37.66% of medium and 34.78% of high-valued hexagons for the Shannon index, 41.75% of medium and 32.05% of high-valued hexagons for the Simpson index, 36.14% of medium and 38.10% of high-value hexagons for Evenness, and 33.33% of Richness 4, 36.84% of Richness 5, 22.22% of Richness 6, and 0% of Richness 7 and 8. In particular, French NATURA 2000 site coverage over medium- and high-valued hexagons was 33.77% and 19.56% for the Shannon index, 32.04% and 20.51% for the Simpson index, and 30.12% and 21.43% for Evenness, respectively, while Italian NATURA 2000 site coverage over medium- and high-valued hexagons was 3.89% and 15.22% for the Shannon index, 7.77% and 11.54% for the Simpson index, and 6.02% and 16.67% for Evenness. The corresponding values covered by French and Italian NATURA 2000 sites were 28.21% and 5.13% for Richness 4, 31.58% and 5.26% for Richness 5, 22.22% and 0% for Richness 6, and 0% for Richness 7 and 8 (Table S2).

4.4. Proposal for Cetacean Conservation Improvement

According to the definition of the Site of Common Interest (SCI) in Article 1, par. 1k, of the Habitats Directive, the designation of a new site corresponds to its contribution to maintaining or restoring the conservation status of species listed in Annex II of the Directive and/or biological diversity, also considering its role in maintaining a coherent European ecological network. *T. truncatus*, listed in Annex II of the Habitats Directive,

could be identified as one of the main species for which a new NATURA 2000 site would be designated. *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, *Z. cavirostris*, *G. griseus*, and *G. melas* could be named just as "Other important species", listed in Annex IV of the Habitats Directive [45]. Moreover, the proposal of a new area could also be important for the conservation of biological diversity [70], as demonstrated by the spatial distribution of Shannon and Simpson indices, Evenness, and Richness.

Within the Pelagos Sanctuary, 11 areas were highlighted as suitable zones for proposing new NATURA 2000 sites, starting from the hexagons where the ER_w for *T. truncatus* was positive. The ER_w of the other seven species and the biodiversity values were taken into account for each of these hexagons. The perimeter did not always follow that of the hexagons, but it could partially include surrounding zones to increase the continuity of conservation over areas hosting other species with ER_w and biodiversity values > 0, even if the ER_w for *T. truncatus* was null. Four proposed sites fell under Italian waters, three under French waters, and four under both Italian and French waters. Since the purpose of this study was to highlight potential areas where cetacean conservation could be increased, the proposed sites crossing both French and Italian waters were not delimited according to political boundaries. However, in the case of a proposal for a NATURA 2000 site within one of these four areas, this action would be necessary (Figure 7).

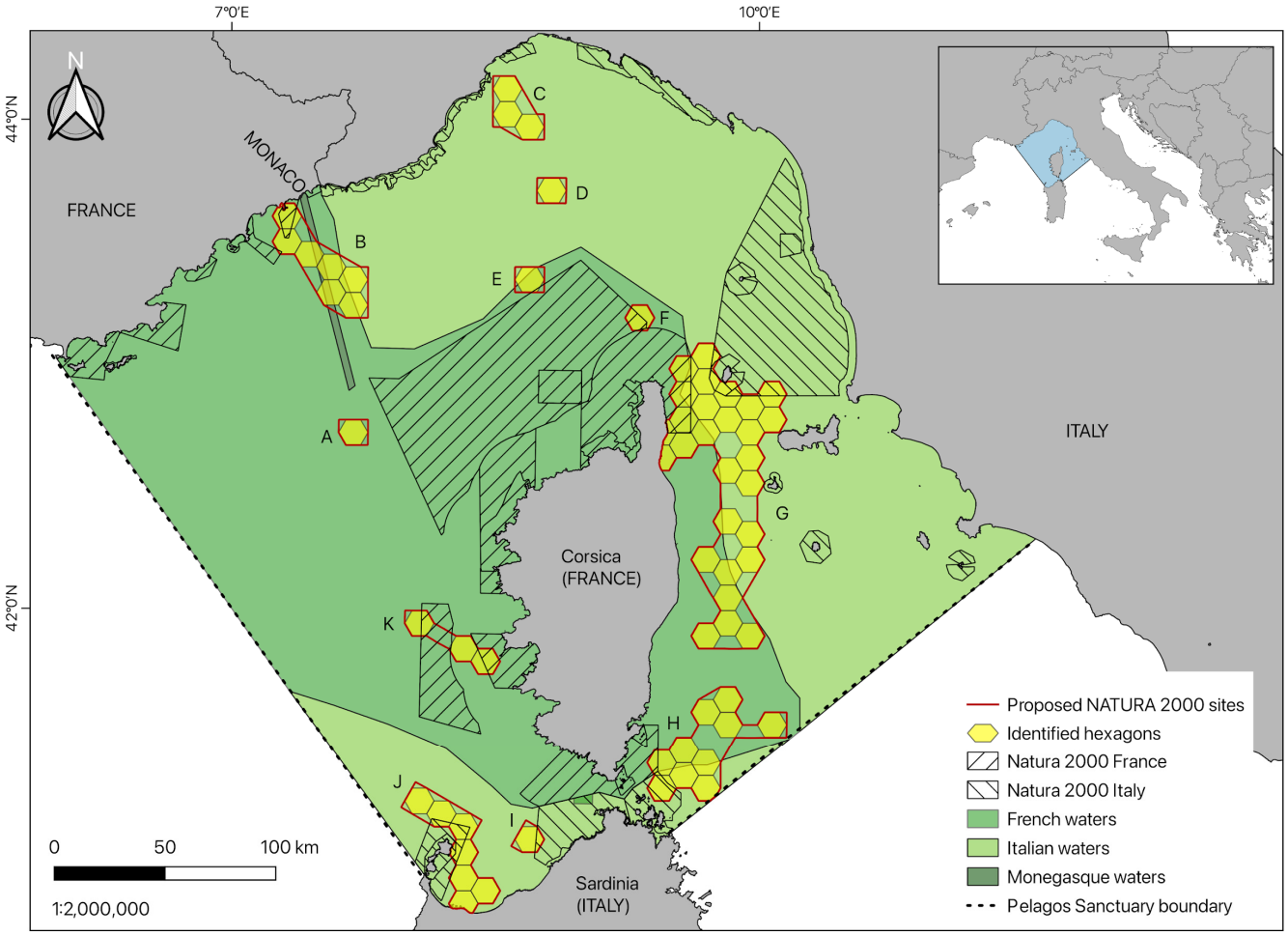


Figure 7. Proposed NATURA 2000 sites. Hexagons where *T. truncatus* ER_w was > 0 are highlighted in yellow. Red lines defined the proposed sites: A—14,373 ha, B—101,603, C—47,985 ha, D and E—15,329, F—11,547 ha, G—37,5781 ha, H—144,214 ha, I—13,503 ha, J—86,839 ha, K—43,404 ha.

At least one hexagon with medium or high biodiversity values was recorded within the perimeter of every proposed site; however, the same cetacean species were not always listed as "Other important species" within each proposed site.

Low ER_w for *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, and *T. truncatus*, medium and high Shannon and Simpson indices, medium Evenness, and Richness 1, 3, and 4 were recorded in A (14,373 ha). Low ER_w for *Z. cavirostris*, low and medium ER_w for *T. truncatus*, low, medium and high ER_w for *B. physalus*, *P. macrocephalus* and *S. coeruleoalba*, *D. delphis*, *G. griseus* and *G. melas* presence, low, medium and high Shannon, Simpson indices and Evenness, and Richness 1, 2, 3, 5, 6, 8 were recorded in B (101,603 ha); this site comprehended the only two hexagons with Richness 8 within the study area. Low and medium ER_w for *B. physalus* and *P. macrocephalus*, low and high ER_w for *S. coeruleoalba*, low ER_w for *T. truncatus*, low, medium and high ER_w for *Z. cavirostris*, *G. melas* presence, low, medium, high Shannon and Simpson indices, low and high Evenness, and Richness 3, 5, 6 were recorded in C (47,985 ha). Low, medium and high ER_w for *B. physalus*, low and medium ER_w for *P. macrocephalus*, low and high ER_w for *S. coeruleoalba* and *Z. cavirostris*, low ER_w for *T. truncatus*, *G. griseus* and *G. melas* presence, medium and high Shannon index, high Simpson index, low, medium and high Evenness, and Richness 1, 3, 4, 7 were recorded in D (15,329 ha); this site comprehended the only hexagon with Richness 7 within the study area. Low and medium ER_w for *B. physalus*, *S. coeruleoalba* and *Z. cavirostris*, medium ER_w for *T. truncatus*, low ER_w for *P. macrocephalus*, *G. griseus* and *G. melas* presence, medium and high Shannon index, high Simpson index, low and medium Evenness, and Richness 1, 4, 6 were recorded in E (15,329 ha). Medium ER_w for *B. physalus*, high ER_w for *P. macrocephalus* and *S. coeruleoalba*, low, medium, and high ER_w for *T. truncatus*, low ER_w for *Z. cavirostris*, *G. melas* presence, medium Shannon and Simpson indices, low Evenness, and Richness 6 were recorded in F (11,547 ha). Low ER_w for *B. physalus*, *T. truncatus*, and *Z. cavirostris*, low and medium ER_w for *P. macrocephalus* and *S. coeruleoalba*, *D. delphis*, and *G. griseus* presence, low, medium, and high Shannon index and Evenness, medium Simpson index, and Richness 1, 2, 3, 4, and 5 were recorded in G (375,781 ha). Low and medium ER_w for *B. physalus*, *P. macrocephalus*, *S. coeruleoalba* and *Z. cavirostris*, low ER_w for *T. truncatus*, *D. delphis* and *G. griseus* presence, low, medium and high Shannon, Simpson indices and Evenness, and Richness 1, 2, 3, 4, 5 were recorded in H (144,214 ha). Low ER_w for *B. physalus*, *S. coeruleoalba*, and *T. truncatus*, low and high Shannon index, medium and high Simpson index, high Evenness, and Richness 1, 2, and 3 were recorded in I (13,503 ha). Low ER_w for *B. physalus*, *P. macrocephalus*, *S. coeruleoalba*, and *Z. cavirostris*, low and medium for *T. truncatus*, low, medium, and high Shannon and Simpson indices, medium and high Evenness, and Richness 1, 2, and 3 were recorded in J (86,839 ha). Low *B. physalus*, *P. macrocephalus*, *S. coeruleoalba* and *T. truncatus*, *G. griseus* presence, medium Shannon index, and Evenness, medium and high Simpson index, and Richness 1, 3, 4 were recorded in K (43,404 ha).

Site B was the only one where all the eight cetacean species showed ER_w > 0 in at least one of the considered hexagons; all the other sites did not include at least one specie: *D. delphis* in D and E, *G. melas* in G and H, *D. delphis* and *G. griseus* in C and F, *D. delphis*, *G. griseus* and *G. melas* in J, *D. delphis*, *G. melas* and *Z. cavirostris* in K. Only two "Other important species" (*B. physalus* and *S. coeruleoalba*) were included in I and three (*B. physalus*, *P. macrocephalus* and *S. coeruleoalba*) in A.

The statistically significant difference obtained with the Wilcoxon test for *P. macrocephalus* and *T. truncatus*, both with higher medians within the NATURA 2000 network, could be used as a valid justification for the proposal of the new sites to ensure the effective conservation of the eight cetacean species. The proposed coverage of areas where medium and high ER_w and biodiversity were recorded could maintain these values, leading to an

increase in the conservation status of these marine mammals. Moreover, eight of the 11 proposed NATURA 2000 sites are fully or partially included within Italian waters, supporting the need to improve the Italian NATURA 2000 network, as demonstrated by the second Wilcoxon test. Only *T. truncatus* showed a higher median within Italian NATURA 2000 sites, while the other three species showed a higher median within French NATURA 2000 sites, with *P. macrocephalus* being the only species that showed a statistically significant difference.

Despite some of the proposed sites covering a huge area, the already existing French NATURA 2000 sites could be taken as examples for the coverage expansion, especially the "Grands dauphins de l'Agriate" site with its extension of 624,075 ha.

Due to their spatial coverage and position over important habitats for cetaceans, such as canyons and submarine mountains [62,64,67], and their partial overlap with the already existing NATURA 2000 network, the proposed sites could enhance the conservation of the eight considered species. This would be particularly important for zones that are still few covered by the NATURA 2000 network, such as the Castelsardo Canyon [70] and the northern and eastern parts of the Pelagos Sanctuary.

Among the threats and pressures for cetaceans which could be identified within the proposed NATURA 2000 sites, one of the most evident would be maritime traffic. Due to its high presence throughout the Pelagos Sanctuary, this could be considered one of the most evident pressures for cetaceans, due to the leading of several threats such as the risk of collisions and acoustic pollution. By considering the maritime traffic recorded during a single year (2019), the overlap between the proposed sites and maritime traffic is evident. In particular, site G, on the eastern side of the Pelagos Sanctuary, is proposed as a NATURA 2000 site most crossed by maritime traffic, also due to its dimensions. This evidence raises awareness that one of the conservative measures adopted within the proposed sites would be the monitoring of vessel traffic (Figure 8).

According to Article 6 of the Habitats Directive, "For special areas of conservation, Member States shall establish the necessary conservation measure" and "take appropriate steps to avoid [. . .] the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated" [45], which in this case, as said before, it would be *T. truncatus*.

Generic conservation measures, such as monitoring vessel traffic, controlling and preventing any kind of pollution, and raising awareness of the existence of the NATURA 2000 network and habitat/species of community interest, could be proposed for each of the 11 areas. Since almost all the proposed sites would be partially overlapped to the already existing NATURA 2000 network (except for A, C and D), more specific conservation measures could be proposed within certain sites based on the closest NATURA 2000 site(s): use the fishing logbooks of federations and associations of recreational sea and underwater fisheries in B (from FR9301573—Baie et cap d'Antibes—îles de Lerins), tackling macro-waster in B (from FR9301573—Baie et cap d'Antibes—îles de Lerins), sustainable control of frequentation and operations on the sea and coastline, in order to make human activities compatible with the conservation of habitats and species in B (from FR9301996—Cap Ferrat), enhancement and coherence of existing actions for the preservation of the marine environment in B (from FR9301996—Cap Ferrat), contact national authorities in case of marine mammal found stranded in E, F and G (from FR9402019—Grands dauphins de l'Agriate and FR9402013—Plateau du Cap Corse), participate in good practices to reduce the impact of activities on the environment in E, F and G (from FR9402019—Grands dauphins de l'Agriate and FR9402013—Plateau du Cap Corse), collect the waste encountered and report to the NATURA 2000 facilitator the presence of macrowastes and lost fishing gear in E, F and G (from FR9402019—Grands dauphins de l'Agriate and FR9402013—Plateau du Cap Corse), be discreet and follow recommendations for observing marine mammals in

E, F and G (from FR9402019—Grands dauphins de l'Agriate and FR9402013—Plateau du Cap Corse), promotion of the Pelagos partnership charter in G (from IT5160021—Tutela del *Tursiops truncatus* and IT5160006—Isola di Capraia—area terrestre e marina), monitoring of cetacean by-catch in G (from IT5160021—Tutela del *Tursiops truncatus* and IT5160006—Isola di Capraia—area terrestre e marina), training courses to raise awareness of the presence of different marine mammal species in G (from IT5160021—Tutela del *Tursiops truncatus* and IT5160006—Isola di Capraia—area terrestre e marina), monitoring of habitats and species of high conservation interest in G (from IT5160006—Isola di Capraia—area terrestre e marina), intensification of control activities to prevent illegal fishing in G (from IT5160006—Isola di Capraia—area terrestre e marina), promotion and implementation of local initiatives for the recovery of abandoned nets and cleaning up seabed in G (from IT5160006—Isola di Capraia—area terrestre e marina), fishing permitted subject to certain constraints in H (from FR9402015—Bouches de Bonifacio, Iles des Moines), establish a continuous monitoring and recognition by photo identification in order to maintain and increase the number of *T. truncatus* species (involving also the private ones like operators that carry out tourist fishing activities, the boaters, the professional and amateur fishermen) in H (from ITB010008—Arcipelago La Maddalena), prohibit to remove, damage or disturb wild fauna species, especially those of community interest or conservation, present at any stage of their development, or directly or indirectly damage the habitats of those species in H (from ITB010008—Arcipelago La Maddalena), prohibit the abandonment, release and spillage of any type of waste, potentially polluting product and water not treated, both on land and at sea in H (from ITB010008—Arcipelago La Maddalena), collection operations for the removal of lost fishing gear and marine litter, monitoring of by-catch of bottlenose, incentives for compensation for damage to fish catches caused by bottlenose dolphins, incentives for systems that protect fishing gear and catches from bottlenose fish, regulation of the activity of the dolphin whatching, regulation on the behaviour to be carried out in case of sightings of bottlenose dolphins [88,96–100].

Moreover, according to Article 11 of the Habitats Directive, "1. Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV in their natural range, prohibiting: (a) all forms of deliberate capture or killing of specimens of these species in the wild; (b) deliberate disturbance of these species [. . .], (d) deterioration or destruction of breeding sites or resting places" and "shall establish a system to monitor the incidental capture and killing" [45].

In conclusion, in all the proposed sites, future monitoring seasons within the FLT Med Net in the Pelagos Sanctuary could contribute to the evaluation of the progress achieved and contribution of the site to the conservation of identified cetacean species (according to Article 17 of the Habitats Directive). In addition, the identified areas could serve as a reference to organise dedicated surveys to implement data collection using different sources (i.e., acoustic and satellite data), in order to further inspect species presence and habitat use. Considering Article 18 of the Habitats Directive, "Particular attention shall be paid to scientific work [. . .] and transboundary cooperative research between Member States shall be encouraged" [45]. A pilot study conducted by Arcangeli et al., 2021 within the "Tutela del *Tursiops truncatus*" site demonstrated the validity of a consistent systematic research protocol for long-term monitoring to evaluate the importance of NATURA 2000 sites [101].

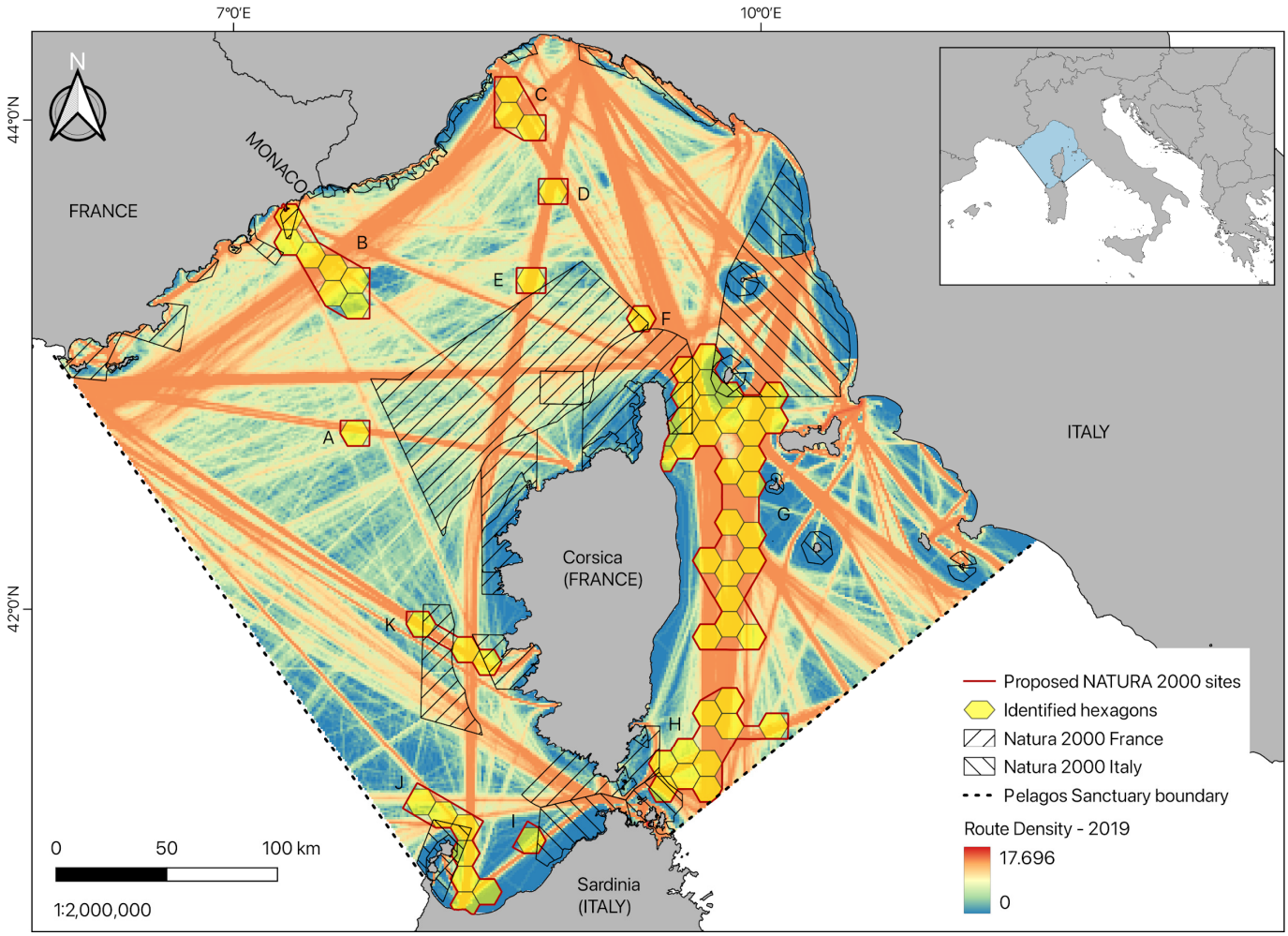


Figure 8. Overlap between the proposed NATURA 2000 sites and route density in 2019. Route density was calculated as the shipping density crossing per cell [95].

5. Conclusions

The objective of this study was to analyse the eight resident cetacean species and biodiversity values over current conservation tools within the Pelagos Sanctuary. In particular, considering the legally binding condition of the NATURA 2000 network and cetaceans' position in the food web, the designation of new NATURA 2000 sites within the Ligurian Sea could be an efficient tool not only for the conservation of these species but also for the protection of the whole biodiversity.

Considering the results of this study, we confirmed a high presence of cetaceans and biodiversity within the Pelagos Sanctuary, with a statistically significant difference in the Wilcoxon test only for *P. macrocephalus* and *T. truncatus* between ER_w values and the protection status of the area, with a higher median within NATURA 2000 sites. No biodiversity indices showed a statistically significant difference.

These data highlight the need to increase the existing NATURA 2000 network to better cover cetacean presence and biodiversity, preventing pressure and threats through conservation measures and maintaining and/or raising the good conservation status of these marine mammals.

Moreover, the 11 proposed sites would grant continuity with other NATURA 2000 sites, especially over Italian waters, where there is still a lack of NATURA 2000 network coverage.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/d17030174/s1, Table S1: NATURA 2000 sites' codes and names,

with reference to the number of hexagons they cover; hexagons were selected as protected if at least the 20% of their area was covered by NATURA 2000 network, also by combination of two or more sites; Table S2: Number of hexagons (and percentages) for cetacean presence and biodiversity values over the study area.

Author Contributions: Conceptualisation, E.S. and P.T.; methodology, E.S. and P.T.; formal analysis, E.S and P.T.; data curation, F.G., L.D., N.D.-M., M.R. (Marine Roul), A.A., E.P. (Eugenia Pasanini), I.C., M.P., A.C., E.P. (Eleonora Pignata), M.R. (Massimiliano Rosso), A.M. and P.T.; writing—original draft preparation, E.S.; writing—review and editing, F.G., L.D., N.D.-M., M.R. (Marine Roul), A.A., E.P. (Eugenia Pasanini), I.C., M.P., A.C., E.P. (Eleonora Pignata), M.R. (Massimiliano Rosso), A.M. and P.T.; supervision, P.T.; project administration, P.T. and A.A. All authors have read and agreed to the published version of this manuscript.

Funding: This work was conducted within the Project LIFE20 NAT/IT/001371 CONCEPTU Maris "CONservation of CEtaceans and Pelagic sea TUrtles in Med: Managing Actions for their Recovery in Sustainability". Data collection in 2011 was funded by in 2011 by the French part of the Pelagos Sanctuary (Convention 11-011-83400); in 2018–2020, data collection was funded by the SICOMAR plus Project (INTERREG Italy-France Maritime 2014–2020). P.T, M.R and A.M are supported by the project funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.4—Call for tender No. 3138 of 16 December 2021, rectified by Decree n. 3175 of 18 December 2021 of Italian Ministry of University and Research funded by the European Union—NextGenerationEU. Project code CN_00000033, Concession Decree No. 1034 of 17 June 2022 adopted by the Italian Ministry of University and Research, CUPB57G22000750006, Project title "National Biodiversity Future Center—NBFC".

Institutional Review Board Statement: Ethical review and approval were waived for this study as the data collection activity, based on sighting from opportunistic platforms, does not involve any direct contact with the animals and has no significant impact.

Data Availability Statement: Data used in this research are available upon request.

Acknowledgments: This work would not have been possible without the collaboration of navigation companies that hosted researchers on board for data collection. We would like to thank all the interns, thesis students, volunteers, and researchers who collaborated in data collection for the MEDSEALITTER, FLT Network, and LIFE Conceptu Maris projects.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Azzellino, A.; Airoldi, S.; Lanfredi, C.; Podestà, M.; Zanardelli, M. Cetacean response to environmental and anthropogenic drivers of change: Results of a 25-year distribution study in the northwestern Mediterranean Sea. *Deep-Sea Res. Pt II* **2017**, *146*, 104–117. [CrossRef]
2. Pace, D.S.; Tizzi, R.; Mussi, B. Cetaceans Value and Conservation in the Mediterranean Sea. *J. Biodivers. Endanger. Species* **2015**, *1*, 1–24. [CrossRef]
3. Notarbartolo di Sciara, G.; Tonay, A.M. *Conserving Whales, Dolphins and Porpoises in the Mediterranean Sea, Black Sea and Adjacent Areas an ACCOBAMS Status Report*; ACCOBAMS: Monaco, Monaco, 2021.
4. Marini, C.; Fossa, F.; Paoli, C.; Bellingeri, M.; Gnone, G.; Vassallo, P. Predicting bottlenose dolphin distribution along Liguria coast (northwestern Mediterranean Sea) through different modeling techniques and indirect predictors. *J. Environ. Manag.* **2015**, *150*, 9–20. [CrossRef] [PubMed]
5. Laran, S.; Pettex, E.; Authier, M.; Blanck, A.; David, L.; Dorémus, G.; Falchetto, H.; Monestiez, P.; Van Canneyt, O.; Ridoux, V. Seasonal distribution and abundance of cetaceans within French waters—Part I: The North-Western Mediterranean, including the Pelagos sanctuary. *Deep-Sea Res. Pt II* **2017**, *141*, 20–30. [CrossRef]
6. Tepsich, P.; Borroni, A.; Zorgno, M.; Rosso, M.; Moulins, A. Whale Watching in the Pelagos Sanctuary: Status and Quality Assessment. *Front. Mar. Sci.* **2020**, *7*, 596848. [CrossRef]
7. Vassallo, P.; Marini, C.; Paoli, C.; Bellingeri, M.; Dhermain, F.; Nuti, S.; Airoldi, S.; Bonelli, P.; Laran, S.; Santoni, M.C.; et al. Species-specific distribution model may be not enough: The case study of bottlenose dolphin (*Tursiops truncatus*) habitat distribution in Pelagos Sanctuary. *Aquat. Conserv. Mar. Freshw. Ecosyst.* **2020**, *30*, 1689–1701. [CrossRef]

8. Carpinelli, E.; Gauffier, P.; Verborgh, P.; Airoldi, S.; David, L.; Di-Méglio, N.; Cañadas, A.; Frantzis, A.; Rendell, L.; Lewis, T.; et al. Assessing sperm whale (*Physeter macrocephalus*) movements within the western mediterranean sea through photo-identification. *Aquat. Conserv. Mar. Freshw. Ecosyst.* **2014**, *24*, 23–30. [CrossRef]
9. Geijer, C.K.A.; Notarbartolo di Sciara, G.; Panigada, S. Mysticete migration revisited: Are Mediterranean fin whales an anomaly? *Mammal Rev.* **2016**, *46*, 284–296. [CrossRef]
10. Violi, B.; de Jong, M.J.; Frantzis, A.; Alexiadou, P.; Tardy, C.; Ody, D.; de Stephanis, R.; Giménez, J.; Lucifora, G.; e Silva, M.A.; et al. Genomics reveals the role of admixture in the evolution of structure among sperm whale populations within the Mediterranean Sea. *Mol. Ecol.* **2023**, *32*, 2715–2731. [CrossRef]
11. WoRMS—World Register of Marine Species. Available online: https://www.marinespecies.org/index.php (accessed on 23 January 2025).
12. Panigada, S.; Gauffier, P.; Notarbartolo di Sciara, G. Balaenoptera physalus (Mediterranean subpopulation). *IUCN Red List Threat. Species* **2021**. [CrossRef]
13. Bearzi, G.; Genov, T.; Natoli, A.; Gonzalvo, J.; Pierce, G.J. Delphinus delphis (Inner Mediterranean subpopulation). *IUCN Red List Threat. Species* **2022**. [CrossRef]
14. Gauffier, P.; Verborgh, P. Globicephala melas (Inner Mediterranean subpopulation). *IUCN Red List Threat. Species* **2021**. [CrossRef]
15. Lanfredi, C.; Arcangeli, A.; David, L.; Holcer, D.; Rosso, M.; Natoli, N. Grampus griseus (Mediterranean subpopulation). *IUCN Red List Threat. Species* **2022**. [CrossRef]
16. Pirotta, E.; Carpinelli, E.; Frantzis, A.; Gauffier, P.; Lanfredi, C.; Rendell, L.; Pace, D.S. Physeter macrocephalus (Mediterranean subpopulation). *IUCN Red List Threat. Species* **2021**. [CrossRef]
17. Lauriano, G. *Stenella coeruleoalba* (Mediterranean subpopulation). *IUCN Red List. Threat. Species* **2022**. Available online: https://www.iucnredlist.org/species/16674437/210833690 (accessed on 24 June 2024).
18. Natoli, A.; Genov, T.; Kerem, D.; Gonzalvo, J.; Lauriano, G.L.; Holcer, D.; Labach, H.; Marsili, L.; Mazzariol, S.; Moura, A.; et al. Tursiops truncatus (Mediterranean subpopulation). *IUCN Red List Threat. Species* **2021**. Available online: https://www.iucnredlist.org/species/16369383/215248781 (accessed on 24 June 2024).
19. Cañadas, A.; Notarbartolo di Sciara, G. Ziphius cavirostris (Mediterranean subpopulation). *IUCN Red List Threat. Species* **2018**. [CrossRef]
20. Biological Diversity in the Mediterranean | UNEP/MAP. Available online: https://www.unep.org/unepmap/resources/factsheets/biological-diversity (accessed on 8 January 2025).
21. United Nations Convention on the Law of the Sea. Available online: https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf (accessed on 21 June 2024).
22. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Available online: https://cites.org/sites/default/files/eng/disc/CITES-Convention-EN.pdf (accessed on 21 June 2024).
23. UNEP. *Convention on the Conservation of Migratory Species of Wild Animal (CMS)*; UNEP: Antalya, Turkey, 1983.
24. Convention on Biological Diversity (CBD). Available online: https://www.cbd.int/doc/legal/cbd-en.pdf (accessed on 21 June 2024).
25. Day, J.; Dudley, N.; Hockings, M.; Holmes, G.; Laffoley, D.; Stolton, S.; Wells, S.; Wenzel, L. *Guidelines for Applying the IUCN Protected Area Management Categories to Marine Protected Areas*, 2nd ed.; IUCN: Gland, Switzerland, 2019.
26. Kelleher, G. *Guidelines for Marine Protected Areas*; IUCN: Gland, Switzerland; Cambridge, UK, 1999.
27. WCPA/IUCN. *Establishing Networks of Marine Protected Areas: A Guide for Developing National and Regional Capacity for Building MPA Networks*; Non-Technical Summary Report; World Commission on Protected Areas (WCPA): Gland, Switzerland, 2007.
28. WCPA/IUCN. *Applying IUCN's Global Conservation Standards to Marine Protected Areas (MPA). Delivering Effective Conservation Action Through MPAs, to Secure Ocean Health & Sustainable Development*; World Commission on Protected Areas (WCPA): Gland, Switzerland, 2018.
29. Lòpez Ornat, A. (Ed.) *Guidelines for the Establishment and Management of Mediterranean Marine and Coastal Protected Areas*; MedMPA Project; UNEP-MAP RAC\SPA: Tunis, Tunisia, 2006.
30. Ecologically or Biologically Significant Areas (EBSAs)—North-Western Mediterranean Benthic Ecosystems. Available online: https://chm.cbd.int/pdf/documents/marineEbsa/204124/2 (accessed on 21 June 2024).
31. Ecologically or Biologically Significant Areas (EBSAs)—North-Western Mediterranean Pelagic Ecosystems. Available online: https://chm.cbd.int/pdf/documents/marineEbsa/204125/2 (accessed on 21 June 2024).
32. IMO. Resolution A.720(17). Guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas. In Proceedings of the ASSEMBLY 17th Session, Agenda Item 12, London, UK, 6 November 1991; IMO: London, UK, 1992.
33. IMO. Resolution A.982(24). Revised guidelines for the identification and designation of particularly sensitive sea areas. In Proceedings of the ASSEMBLY 24th Session, Agenda Item 11, London, UK, 1 December 2005; IMO: London, UK, 2006.

34. IMO. Resolution MEPC.204(62). Designation of the Strait of Bonifacio as a Particularly Sensitive Sea Area. In Proceedings of the Marine Environment Protection Committee on Its Sixty-Second Session, London, UK, 15 July 2011; IMO: London, UK, 2011; Volume Annex II.
35. IMO. Resolution MEPC.380(80). Designation of the North-Western Mediterranean Sea as a Particularly Sensitive Sea Area. In Proceedings of the Marine Environment Protection Committee (MEPC 80), London, UK, 7 July 2023; IMO: London, UK, 2023; Volume Annex 20.
36. So Yeon, K. Problems and Processes of Restricting Navigation in Particularly Sensitive Sea Areas. *Int. J. Mar. Coast. Law* **2021**, *36*, 438–463.
37. ACCOBAMS. *Report of the Seventh Meeting of the Parties to ACCOBAMS*; ACCOBAMS: Istanbul, Turkey, 2019.
38. IWC. *Strategic Plan to Mitigate the Impacts of Ship Strikes on Cetacean Populations: 2022–2032*; IWC: Cambridge, UK, 2022.
39. Scott, K.N. Sound and Cetaceans: A Regional Response to Regulating Acoustic Marine Pollution. *J. Int. Wildl. Law Policy* **2007**, *10*, 175–199. [CrossRef]
40. UN Environment/MAP. *Action Plan for the Conservation of Cetaceans in the Mediterranean Sea*; UN Environment/MAP: Athens, Greece, 2017.
41. UNEP. *Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and Its Protocols*; UNEP: Nairobi, Kenya, 2019.
42. UNEP. *Decision IG.25/1—UNEP/MAP Medium-Term Strategy 2022–2027*; UNEP: Antalya, Turkey, 2021; pp. 110–164.
43. Council of Europe. Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). European Treaty Series, 104; Bern, 19 September 1979. Available online: https://rm.coe.int/1680078aff (accessed on 21 June 2024).
44. Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area. 1996. Available online: https://www.accobams.org/wp-content/uploads/2017/01/ACCOBAMS_Text_Agreement_English.pdf (accessed on 21 June 2024).
45. DIRECTIVE 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitat Directive). *Off. J. Eur. Union* **1992**, *L206*, 7–50.
46. DIRECTIVE 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). *Off. J. Eur. Union* **2008**, *164*, 19–40.
47. DIRECTIVE 2014/89/EU of the European Parliament and of the council of 23 July 2014 establishing a framework for maritime spatial planning. *Off. J. Eur. Union* **2014**, *257*, 135–145.
48. Grbec, M.; Scovazzi, T.; Tani, I. *The Legal Basis for the Establishment and Further Development of Marine Protected Areas in the 'European Union Strategy for the Adriatic and Ionian Region' (EUSAIR) with Particular Emphasis on Transboundary Marine Protected Areas*; EUSAIR Facility Point: Ljubljana, Slovenia, 2021.
49. *Campagne d'Exploration des Zones Profondes—Campagna d'Esplorazione delle Zone Profonde*; RAMOGE Agreement: Monaco, Monaco, 2015.
50. Pelagos Agreement. Pelagos Agreement Management Plan (2022–2027). In Proceedings of the 8th Meeting of the Parties to the Pelagos Agreement, Rome, Italy, 15–16 December 2021.
51. Principality of Monaco. *Accordo Relativo alla Creazione nel Mediterraneo di un Santuario per i Mammiferi Marini*; Ministry of Justice: Rome, Italy, 1999.
52. UNEP. Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity at Its Ninth Meeting—IX/20. Marine and Coastal Biodiversity. Agenda Item 4.9,Bonn, Germany, 19–30 May 2008. Available online: https://www.cbd.int/doc/decisions/cop-09/cop-09-dec-19-en.pdf (accessed on 21 June 2024).
53. IMMA e-Atlas. Available online: https://www.marinemammalhabitat.org/imma-eatlas/ (accessed on 21 June 2024).
54. SPAMIs | Regional Activity Centre for Specially Protected Areas. Available online: https://www.rac-spa.org/spami (accessed on 8 January 2025).
55. NATURA 2000 Viewer. Available online: https://natura2000.eea.europa.eu/ (accessed on 12 August 2024).
56. European Commission. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A European Strategy for Data*; European Commission: Brussels, Belgium, 2020.
57. European Commission. Biodiversity Strategy for 2030. Available online: https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en (accessed on 21 June 2024).
58. Bearzi, G.; Reeves, R.R.; Remonato, E.; Pierantonio, N.; Airoldi, S. Risso's dolphin *Grampus griseus* in the Mediterranean Sea. *Mamm. Biol.* **2011**, *76*, 385–400. [CrossRef]
59. Cagnolaro, L.; Cozzi, B.; Notarbartolo di Sciara, G.; Podestà, M. *Fauna d'Italia*, 1st ed.; Calderini: Milano, Italy, 2015; Volume Mammalia IV, Cetacea.
60. Campana, I.; Crosti, R.; Angeletti, D.; Carosso, L.; David, L.; Di-Méglio, N.; Moulins, A.; Rosso, M.; Tepsich, P.; Arcangeli, A. Cetacean response to summer maritime traffic in the Western Mediterranean Sea. *Mar. Environ. Res.* **2015**, *109*, 1–8. [CrossRef]

61. Gnone, G.; Bellingeri, M.; Airoldi, S.; Gonzalvo, J.; David, L.; Di-Méglio, N.; Cañadas, A.M.; Akkaya, A.; Awbery, T.; Mussi, B.; et al. Cetaceans in the Mediterranean Sea: Encounter Rate, Dominant Species, and Diversity Hotspots. *Diversity* **2023**, *15*, 321. [CrossRef]
62. Grossi, F.; Lahaye, E.; Moulins, A.; Borroni, A.; Rosso, M.; Tepsich, P. Locating ship strike risk hotspots for fin whale (*Balaenoptera physalus*) and sperm whale (*Physeter macrocephalus*) along main shipping lanes in the North-Western Mediterranean Sea. *Ocean Coast. Manag.* **2021**, *212*, 105820. [CrossRef]
63. IUCN. *Marine Mammals and Sea Turtles of the Mediterranean and Black Seas*, 1st ed.; IUCN: Gland, Switzerland; Malaga, Spain, 2012.
64. Moulins, A.; Rosso, M.; Ballardini, M.; Würtz, M. Partitioning of the Pelagos Sanctuary (north-western Mediterranean Sea) into hotspots and coldspots of cetacean distributions. *J. Mar. Biol. Assoc.* **2008**, *88*, 1273–1281. [CrossRef]
65. Notarbartolo di Sciara, G.; Agardy, T.; Hyrenbach, D.; Scovazzi, T.; Van Klaveren, P. The Pelagos Sanctuary for Mediterranean marine mammals. *Aquat. Conserv. Mar. Freshw. Ecosyst.* **2008**, *18*, 367–391. [CrossRef]
66. Pennino, M.G.; Arcangeli, A.; Fonseca, V.P.; Campana, I.; Pierce, G.J.; Rotta, A.; Bellido, J.M. A spatially explicit risk assessment approach: Cetaceans and marine traffic in the Pelagos Sanctuary (Mediterranean Sea). *PLoS ONE* **2017**, *12*, e0179686. [CrossRef]
67. Tepsich, P.; Rosso, M.; Halpin, P.N.; Moulins, A. Habitat preferences of two deep-diving cetacean species in the northern Ligurian Sea. *Mar. Ecol. Prog. Ser.* **2014**, *508*, 247–260. [CrossRef]
68. Torreblanca, E.; Camiñas, J.A.; Macías, D.; García-Barcelona, S.; Real, R.; Báez, J.C. Using opportunistic sightings to infer differential spatio-temporal use of western Mediterranean waters by the fin whale. *PeerJ* **2019**, *7*, e6673. [CrossRef] [PubMed]
69. Verborgh, P.; Gauffier, P.; Esteban, R.; Giménez, J.; Cañadas, A.; Salazar-Sierra, J.M.; de Stephanis, R. Conservation Status of Long-Finned Pilot Whales, *Globicephala melas*, in the Mediterranean Sea. *Adv. Mar. Biol.* **2016**, *75*, 173–203. [CrossRef] [PubMed]
70. Campana, I.; Angeletti, D.; Giovani, G.; Paraboschi, M.; Arcangeli, A. Cetacean sensitivity and threats analysis to assess effectiveness of protection measures: An example of integrated approach for cetacean conservation in the Bonifacio Bouches. *Biodivers. Conserv.* **2022**, *31*, 517–541. [CrossRef]
71. Celussi, M.; Quero, G.M.; Zoccarato, L.; Franzo, A.; Corinaldesi, C.; Rastelli, E.; Lo Martire, M.; Galand, P.E.; Ghiglione, J.-F.; Chiggiato, J.; et al. Planktonic prokaryote and protist communities in a submarine canyon system in the Ligurian Sea (NW Mediterranean). *Prog. Oceanogr.* **2018**, *168*, 210–221. [CrossRef]
72. Pinardi, N.; Zavatarelli, M.; Adani, M.; Coppini, G.; Fratianni, C.; Oddo, P.; Simoncelli, S.; Tonani, M.; Lyubartsev, V.; Dobricic, S.; et al. Mediterranean Sea large-scale low-frequency ocean variability and water mass formation rates from 1987 to 2007: A retrospective analysis. *Prog. Oceanogr.* **2015**, *132*, 318–332. [CrossRef]
73. Bo, M.; Coppari, M.; Betti, F.; Massa, F.; Gay, G.; Cattaneo-Vietti, R.; Bavestrello, G. Unveiling the deep biodiversity of the Janua Seamount (Ligurian Sea): First Mediterranean sighting of the rare Atlantic bamboo coral *Chelidonisis aurantiaca* Studer, 1890. *Deep Sea Res. Part Oceanogr. Res. Pap.* **2020**, *156*, 103186. [CrossRef]
74. Bosse, A.; Testor, P.; Damien, P.; Estournel, C.; Marsaleix, P.; Mortier, L.; Prieur, L.; Taillandier, V. Wind-Forced Submesoscale Symmetric Instability around Deep Convection in the Northwestern Mediterranean Sea. *Fluids* **2021**, *6*, 123. [CrossRef]
75. Conan, P.; Testor, P.; Estournel, C.; D'Ortenzio, F.; Pujo-Pay, M.; Durrieu de Madron, X. Preface to the Special Section: Dense Water Formations in the Northwestern Mediterranean: From the Physical Forcings to the Biogeochemical Consequences. *J. Geophys. Res. Oceans* **2018**, *123*, 6983–6995. [CrossRef]
76. Fossi, M.C.; Panti, C.; Marsili, L.; Maltese, S.; Spinsanti, G.; Casini, S.; Caliani, I.; Gaspari, S.; Muñoz-Arnanz, J.; Jimenez, B.; et al. The Pelagos Sanctuary for Mediterranean marine mammals: Marine Protected Area (MPA) or marine polluted area? The case study of the striped dolphin (*Stenella coeruleoalba*). *Mar. Pollut. Bull.* **2013**, *70*, 64–72. [CrossRef]
77. Severin, T.; Kessouri, F.; Rembauville, M.; Sánchez-Pérez, E.D.; Oriol, L.; Caparros, J.; Pujo-Pay, M.; Ghiglione, J.-F.; D'Ortenzio, F.; Taillandier, V.; et al. Open-ocean convection process: A driver of the winter nutrient supply and the spring phytoplankton distribution in the Northwestern Mediterranean Sea. *J. Geophys. Res. Oceans* **2017**, *122*, 4587–4601. [CrossRef]
78. Awbery, T.; Akkaya, A.; Lyne, P.; Rudd, L.; Hoogenstrijd, G.; Nedelcu, M.; Kniha, D.; Erdoğan, M.A.; Persad, C.; Amaha Öztürk, A.; et al. Spatial Distribution and Encounter Rates of Delphinids and Deep Diving Cetaceans in the Eastern Mediterranean Sea of Turkey and the Extent of Overlap with Areas of Dense Marine Traffic. *Front. Mar. Sci.* **2022**, *9*, 860242. [CrossRef]
79. PNR-PNRR 2024. Contributo delle Regioni e delle Province autonome al Programma Nazionale di Riforma (PNR). Available online: https://new.regione.vda.it/Media/Regione/2024-06-13/5%20CR.pdf (accessed on 12 August 2024).
80. Shannon, C.E. A mathematical theory of communication. *Bell Syst. Tech. J.* **1948**, *27*, 379–423. [CrossRef]
81. Simpson, E.H. Measurement of Diversity. *Nature* **1949**, *163*, 688. [CrossRef]
82. R Core Team. R: The R Project for Statistical Computing. Available online: https://www.r-project.org/ (accessed on 23 January 2025).

83. Oksanen, J.; Simpson, G.L.; Blanchet, F.G.; Kindt, R.; Legendre, P.; Minchin, P.R.; O'Hara, R.B.; Solymos, P.; Stevens, M.H.H.; Szoecs, E.; et al. *Vegan: Community Ecology Package*; Comprehensive R Archive Network (CRAN): Vienna, Austria, 2024.
84. Matear, L.; Robbins, J.R.; Hale, M.; Potts, J. Cetacean biodiversity in the Bay of Biscay: Suggestions for environmental protection derived from citizen science data. *Mar. Policy* **2019**, *109*, 103672. [CrossRef]
85. Omayio, D.; Mzungu, E. Modification of Shannon-Wiener Diversity Index towards Quantitative Estimation of Environmental Wellness and Biodiversity Levels under a Non-comparative Scenario. *J. Environ. Earth Sci.* **2019**, *9*, 46–57. [CrossRef]
86. Jenks, G.F. *Optimal Data Classification for Choropleth Maps*, 2nd ed.; University of Kansas: Lawrence, KS, USA, 1977.
87. Belsky, M. Management of Large Marine Ecosystems: Developing a New Rule of Customary International Law. *San Diego Law Rev.* **1985**, *22*, 733.
88. Ville d'Antibes Juan-les-Pins, Document d'objectifs du site Natura 2000 FR 9301573 « Baie et Cap d'Antibes—Iles de Lérins»—Tomes 1 et 2 «Note de synthèse». Document final (janvier 2014). 2014; 44p. Available online: https://side.developpement-durable.gouv.fr/search.aspx?SC=CATALOGUE&QUERY=FR9301613&QUERY_LABEL=#/Detail/(query:(Id:%E2%80%994_OFFSET_0%E2%80%99,Index:5,NBResults:8,PageRange:3,SearchQuery:(CloudTerms:!(),FacetFilter:%7B%7D,ForceSearch:!t,InitialSearch:!f,Page:0,PageRange:3,QueryGuid:%E2%80%9955a88c9b-7c15-4cd0-b747-035e73a9b509%E2%80%99,QueryString:FR9301573,ResultSize:10,ScenarioCode:CATALOGUE,ScenarioDisplayMode:display-standard,SearchGridFieldsShownOnResultsDTO:!((Id:548,Label:Num%C3%A9rique),(Id:576,Label:Nouveaut%C3%A9)),SearchLabel:%E2%80%99%E2%80%99,SearchTerms:FR9301573,SortField:YearOfPublication_int_sort,SortOrder:0,TemplateParams:(Scenario:%E2%80%99%E2%80%99,Scope:Default,Size:!n,Source:%E2%80%99%E2%80%99,Support:%E2%80%99%E2%80%99,UseCompact:!f),UseSpellChecking:!n))) (accessed on 18 February 2025).
89. Communauté d'Agglomération de la Riviera Française—MONVILLE I. Note de synthèse—Document d'objectifs du site Natura 2000 FR 9301995 « Cap Martin ». 2014; 30p. Available online: https://side.developpement-durable.gouv.fr/search.aspx?SC=CATALOGUE&QUERY=FR9301613&QUERY_LABEL=#/Detail/(query:(Id:%E2%80%991_OFFSET_0%E2%80%99,Index:2,NBResults:4,PageRange:3,SearchQuery:(CloudTerms:!(),FacetFilter:%7B%7D,ForceSearch:!t,InitialSearch:!f,Page:0,PageRange:3,QueryGuid:%E2%80%9914834a10-9634-4b58-b081-41a5b354cda2%E2%80%99,QueryString:FR9301995,ResultSize:10,ScenarioCode:CATALOGUE,ScenarioDisplayMode:display-standard,SearchGridFieldsShownOnResultsDTO:!((Id:548,Label:Num%C3%A9rique),(Id:576,Label:Nouveaut%C3%A9)),SearchLabel:%E2%80%99%E2%80%99,SearchTerms:FR9301995,SortField:YearOfPublication_int_sort,SortOrder:0,TemplateParams:(Scenario:%E2%80%99%E2%80%99,Scope:Default,Size:!n,Source:%E2%80%99%E2%80%99,Support:%E2%80%99%E2%80%99,UseCompact:!f),UseSpellChecking:!n))) (accessed on 18 February 2025).
90. Sylla, G. *Note de synthèse. Document d'objectifs du site Natura 2000 FR9301624 « Corniche varoise ». Convention cadre Etat/Sivom du Littoral des Maures du 24 novembre 2010. Observatoire marin de la Communauté de commune du Golfe de Saint-Tropez publ. 2013; 31p*; Available online: https://side.developpement-durable.gouv.fr/search.aspx?SC=CATALOGUE&QUERY=FR9301613&QUERY_LABEL=#/Detail/(query:(Id:%E2%80%994_OFFSET_0%E2%80%99,Index:5,NBResults:14,PageRange:3,SearchQuery:(CloudTerms:!(),FacetFilter:%7B%7D,ForceSearch:!t,InitialSearch:!f,Page:0,PageRange:3,QueryGuid:acbb03ba-cd9d-4232-acef-6c3102eb2b86,QueryString:FR9301624,ResultSize:10,ScenarioCode:CATALOGUE,ScenarioDisplayMode:display-standard,SearchGridFieldsShownOnResultsDTO:!((Id:548,Label:Num%C3%A9rique),(Id:576,Label:Nouveaut%C3%A9)),SearchLabel:%E2%80%99%E2%80%99,SearchTerms:FR9301624,SortField:YearOfPublication_int_sort,SortOrder:0,TemplateParams:(Scenario:%E2%80%99%E2%80%99,Scope:Default,Size:!n,Source:%E2%80%99%E2%80%99,Support:%E2%80%99%E2%80%99,UseCompact:!f),UseSpellChecking:!n))) (accessed on 18 February 2025).
91. Piano di Gestione della ZSC/ZPS IT51A0024 Isola di Giannutri Area Terrestre e Marina. Available online: https://asp.urbi.it/urbi/progs/urp/fecore02.sto?DOCORE_testata=837733&DOCORE_versione=1&FNSTR=CJU_WKZKOJMRI_BCVJLGGAC_MV_WM_GS_TNBTOPWNOQ.PUG.X7H&DB_NAME=n1201416&ContestoChk=DE&P7M=S (accessed on 18 February 2025).
92. Piano di Gestione della ZSC/ZPS IT5160002 Isola di Gorgona Area Terrestre e Marina. Available online: https://www.islepark.it/normativa/piani-di-gestione-dei-siti-rete-natura-2000/piano-di-gestione-gorgona-isola/ (accessed on 18 February 2025).
93. Cataldi, G. The Italian Law Authorizing the Creation of an Exclusive Economic Zone. *Ital. Yearb. Int. Law Online* **2022**, *31*, 29–47. [CrossRef]
94. Caffio, F. Quali confini per la nostra Zona Economica Esclusiva. In *La ZEE Italiana: Ragioni, Ambito Delimitazioni e Sfide*; Leandro, A., Ed.; Cacucci Editore: Bari, Italy, 2021.
95. European Marine Observation and Data Network (EMODnet). Available online: https://emodnet.ec.europa.eu/en (accessed on 18 February 2025).

96. Métropole Nice Côte d'Azur Document d'objectifs du site Natura 2000 FR9301996 «Cap Ferrat»—Note de synthèse. Convention Etat/Métropole Nice Côte d'Azur. 2015; 30p. Available online: https://side.developpement-durable.gouv.fr/search.aspx?SC=CATALOGUE&QUERY=FR9301613&QUERY_LABEL=#/Detail/(query:(Id:%E2%80%990_OFFSET_0%E2%80%99,Index:1,NBResults:4,PageRange:3,SearchQuery:(CloudTerms:!(),FacetFilter:%7B%7D,ForceSearch:!t,InitialSearch:!f,Page:0,PageRange:3,QueryGuid:%E2%80%9930f3fdc9-fc32-40b1-a3b8-26e9fcf6125b%E2%80%99,QueryString:FR9301995,ResultSize:10,ScenarioCode:CATALOGUE,ScenarioDisplayMode:display-standard,SearchGridFieldsShownOnResultsDTO:!((Id:548,Label:Num%C3%A9rique),(Id:576,Label:Nouveaut%C3%A9)),SearchLabel:%E2%80%99%E2%80%99,SearchTerms:FR9301995,SortField:YearOfPublication_int_sort,SortOrder:0,TemplateParams:(Scenario:%E2%80%99%E2%80%99,Scope:Default,Size:!n,Source:%E2%80%99%E2%80%99,Support:%E2%80%99%E2%80%99,UseCompact:!f),UseSpellChecking:!n))) (accessed on 18 February 2025).
97. Plan de Gestion Parc Naturel Marin du Cap Corse et de l'Agriate. 493p. Available online: https://corse.n2000.fr/sites/corse.n2000.fr/files/documents/page/pdf/plan_de_gestion_pnmca_-_partie_1_-_plan_de_gestion.pdf (accessed on 18 February 2025).
98. DGR 1223-2015. Bollettino Ufficiale della Regione Toscana. Parte Seconda n.52 del 30.12.2015. pp. 15–16. Available online: https://download.mase.gov.it/Natura2000/Materiale%20Designazione%20ZSC/Toscana/04_Misure_Conservazione/DGR%201223-2015.pdf (accessed on 18 February 2025).
99. Piano di Gestione della ZSC IT5160006 e della ZPS IT516007 Isola di Capraia Area Terrestre e Marina. 578p. Available online: https://asp.urbi.it/urbi/progs/urp/fecore02.sto?DOCORE_testata=915884&DOCORE_versione=1&FNSTR=RPV_IHPQBYA_BXGMDRAAH_UV_GF_FF.UDS.C7Z&DB_NAME=n1201416&ContestoChk=DE&P7M=S (accessed on 18 February 2025).
100. Corona, F. Analisi comparatistica fra la legislazione italiana e la legislazione francese in materia di aree marine protette. In *Progetto GIREPAM—Gestione Integrata delle Reti Ecologiche attraverso i Parchi e le Aree Marine*; Rapporto Tecnico Fondazione IMC—Centro Marino Internazionale ONLUS, 9; International Marine Centre (IMC) Foundation: Oristano, Italy, 2019; 73p.
101. Arcangeli, A.; Crosti, R.; Campana, I.; Carosso, L.; Gregorietti, M.; Mainardi, G.; Mazzucato, V.; Castelli, A. Long-term monitoring for the surveillance of the conservation status of *Tursiops truncatus* in an EU Natura2000 site in the Mediterranean Sea. A pilot study in the Tuscan Archipelago. *Mediterr. Mar. Sci.* **2021**, *22*, 340–346. [CrossRef]