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Natura 2000 Habitat Mapping in the Hatay-Samandağ Coast of Türkiye in the Northeast Mediterranean: An Example of Ray Field Habitat

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Abstract

This study, conducted for the first time in Turkey within the framework of the EU Natura 2000 conservation approach, aimed to map and evaluate marine habitats in the Samandağ-Hatay region of the Northeast Mediterranean, with particular emphasis on a ray field habitat characterized by the presence of diverse elasmobranch species. It was found that habitat was mainly sandy bottoms (90.53%), but in terms of structure complexity reef habitats, which are found on Natura 2000 Annex I Habitat 1170 (Reefs), only occupied 6.18% of seafloor. Despite their limited extent, these reef structures function as ecological hotspots that support multiple threatened and protected species. A total of 84 species were recorded and assessed using the IUCN Mediterranean Red List, Turkish national protection regulations, and Natura 2000 species annexes. Only five species were listed under Natura *2000: Alosa fallax* (Annex II & V), *Dicentrarchus labrax* (Annex V), and three Annex IV strictly protected megafauna; *Monachus monachus*, *Caretta caretta*, and *Chelonia mydas*. No bird species recorded in the area were listed under Birds Directive Annex I. Several elasmobranch species typical of the ray field, including *Gymnura altavela*, *Rostroraja alba*, and *Rhinobatos rhinobatos*, were categorized as threatened by the IUCN and protected nationally, despite not being included within EU annexes. In general, the results indicate that the conservation value of the Samandaag ray field is great as the small and fragmented reef microhabitats harbor a disproportionately large number of sensitive taxa in a sand-dominated environment. The research will furnish the necessary scientific data to inform future marine spatial planning and conservation policies of the area that take the form of Natura 2000.

Keywords:

Natura 2000, marine biodiversity, habitat mapping, annexes, ray field, northeast mediterranean.

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Introduction

Natura 2000 is also a coordinated and extensive network of nature conservation sites that was adopted by the European Union via the Habitats (Directive, 1992) and the general objective of which is to focus on the long-term protection and ecological integrity of the most important, rare, and endangered species and types of habitats in Europe (Guidetti et al., 2019). This network is made up of Special Areas of Conservation, designated under the Habitats Directive by Member States, and Special Protection Areas, designated under the Birds Directive, which provide an integrated network of terrestrial and marine sites to protect biodiversity on the European continent (Guidetti et al., 2019; Piwowarczyk & Wróbel, 2016). Besides the domestic policy value, the development and further growth of Natura 2000 signify the engagement of the European Union in meeting its international duties in the Republic of the United Nations Convention on Biological Diversity, especially the establishment of the protected areas, ecological coherence, and supportive and sustainable management practices (Venter et al., 2014; Watson et al., 2014; Martinis et al., 2015).

The European Union also has a legal obligation to maintain full compliance with the regulatory framework of the Natura 2000 network and as a consequence, Member States of the European Union have a legal duty to establish and execute a detailed management plan to each individual designated Natura 2000 site. When it comes to the marine environment, such plans can only be developed by having access to accurate and comprehensive information about the nature, borders, and ecological contexts of each location to enable them to accomplish effective management, meet national and international legal obligations, and ensure that human practices that can affect the covered areas are regulated accordingly (Scorza et al., 2020). The information needed to guide those management strategies could be acquired in different ways, such as geophysical mapping methods, biological surveys and sampling, or both, and, therefore, offers a factual basis of conservation planning and decision-making (Scorza et al., 2020; Rincón et al., 2021).

None of the marine sites of the Turkish territorial waters have so far been listed under the Natura 2000 network, nor are any officially recognized Natura 2000 marine habitats in Turkish territorial waters. This has been contributed by the fact that Turkiye is not a part of the European Union and thus has no legal obligation to adopt the Habitats (Directive, 1992) or Birds (Directive, 2009) which are the two laws that form the code of law of the Natura 2000 framework. Nevertheless, a lack of marine conservation areas on par with Natura 2000 means that there is a significant gap in marine conservation activities despite the ecological significance of the Turkish waters as a biogeographical barrier between the Mediterranean and the Black Sea, hosting many endemics, migratory, and threatened species (Turan & Doğdu, 2025).

Hatay Samandağ shoreline is a biologically important marine ecosystem found on the northeastern Mediterranean coast of Türkiye and serves as a critical nursery, feeding, and reproduction area of many of the elasmobranc species, especially that of rays (Myliobatiformes) and sharks (Selachimorpha) (Turan et al., 2024a; Turan & Doğdu, 2025; Turan et al., 2025a; Uyan et al., 2025). This area, even though ecologically significant and strategically central, as an ecotonic biogeographic zone between the Levantine Basin and the Mediterranean Sea in general, is poorly studied, and there is little systematic information about the habitat types, distribution of species, and anthropogenic stressors. Although Türkiye is not a member of the European Union and thus not formally integrated into the Natura 2000 network, the ecological attributes of this area is wondered to align with the conservation criteria defined under the Habitats (Directive, 1992) and the Birds (Directive, 2009).

Therefore, assessing Hatay Samandağ as a potential Natura 2000 marine site is of both scientific and policy relevance. This study, fort the first time in Türkiye, aims to identify and map key marine habitats, classify them according to Natura 2000 habitat typologies, and document the presence of species listed under Annex II and Annex IV of the Habitats Directive, using geospatial analyses, benthic habitat mapping, and biological surveys.

Materials and Methods

Study Area

The Ray Field region (Hırlavuk) off the coast of Samandağ-Hatay in the eastern Mediterranean Sea, Türkiye was located between 36°10'47.4‘N 35°52'22.0’E and 36°08' 31.6‘N 35°54'12.2’E, extending approximately 5 km in length and 1 mile offshore (Figure 1).

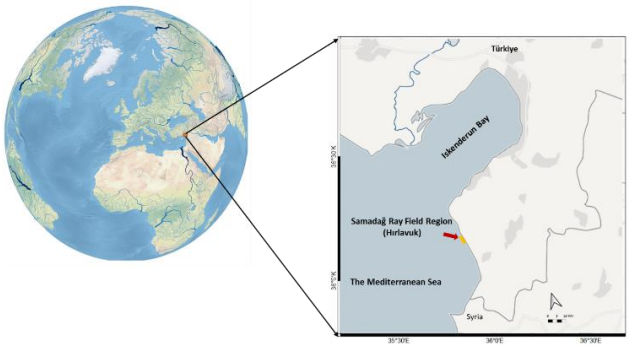

Figure 1. The study area off the samandağ–hatay coast in the northeastern mediterranean sea. the red arrow indicates ray field region as the study area

It is believed that this area can serve as the nursery and feeding ground of the specially ray species (Turan & Doğdu, 2025), where the bottom is given shallow sandy; the substrate is appropriate; and the deep-water predators are relatively away.

Sources of Data and Field Survey

In this research, the data collection will be based on two main resources: (i) field-based scuba-diving surveys undertaken in the coastal and shallow subtidal regions of the Hatay Samandaag shoreline, and (ii) archived data sources were obtained after the previous marine biodiversity and fisheries monitoring programs that were conducted in the same region.Historical monitoring datasets from previous projects (Turquoise Coast Environment Fund-Turkey (ElasmoKAP-TCEF-2024), MarIAS, Nature and Science Society Project, TAGEM projects, İskenderun Technical University BAP Project were harmonized, cleaned and georeferenced according to European Environment Agency (EEA) and Natura 2000 data standards to ensure compatibility. Alien species were catogorised according to (Turan et al., 2024).

GIS-Based Mapping and Habitat Classification

Spatial analysis and habitat mapping were conducted using ArcGIS Pro, QGIS and R Srudio. All collected GPS coordinates, dive transects, photographic records and historical data points were compiled into a geodatabase compliant with INSPIRE Directive standards and the Natura 2000 Standard Data Form structure.

Habitats were classified according to the EUNIS habitat classification system and Annex I of the Habitats Directive.

Evaluation According to Natura 2000 Criteria

The methodology aligns with the obligations and assessment structure outlined in the Habitats Directive (92/43/EEC) and Natura 2000 Standard Data Form (SDF). The criteria that will be considered include: (i) Occurrence of species listed in Annex II and IV in the Habitats Directive. (ii) Presence and ecological condition of Annex I habitat types, evaluated for representativity, conservation status, degree of naturalness and restoration potential. (iii) Site-specific ecological integrity, habitat connectivity, anthropogenic pressures (fishing, pollution, coastal development), and long-term viability.

Results

A total of 84 species were documented in the study area (Table 1), representing marine fishes, elasmobranchs, invertebrates, macrophytes, mammuls, and seabirds. Non-native species accounted for 24 % of all species in the region. All taxa were evaluated according to three major conservation frameworks: (1) IUCN Mediterranean Red List categories, (2) National protection status in Turkey, and (3) EU Natura 2000 legislation (Habitats Directive Annexes II, IV, V; Birds Directive Annex I).

Table 1. List of all species recorded in the study area (n = 84) with their IUCN mediterranean red list categories, national protection status in turkey, alien status, and occurrence within natura 2000 species annexes (annex II, IV, V for habitats directive; annex I for birds directive)

No	Class	Family	Species	IUCN Mediterranean Categories	Protected species in Turkey	Alien
1	Teleostei	Apogonidae	*Cheilodipterus novemstriatus*	-		+
2		Callionymidae	*Synchiropus phaeton*	LC		
3		Carangidae	*Seriola dumerili*	LC		
4			*Trachurus mediterraneus*	LC		
5			*Trachurus trachurus*	LC		
6			*Trachinotus ovatus*	LC		
7		Congridae	*Ariosoma balearicum*	LC		
8		Alosidae	*Alosa fallax*	LC		
9		Epinephelidae	*Epinephelus aeneus*	NT		
10			*Epinephelus costae*	DD		
11			*Epinephelus marginatus*	EN	+	
12			*Mycteroperca rubra*	LC		
13		Fistulariidae	*Fistularia petimba*	LC		+
14			*Fistularia commersonii*	-		+
15		Haemulidae	*Pomadasys stridens*	-		+
16		Holocentridae	*Sargocentron rubrum*	-		+
17		Labridae	*Symphodus tinca*	LC		
18			*Thalassoma pavo*	LC		

19			*Xyrichthys novacula*	LC		
20		Moronidae	*Dicentrarchus labrax*	NT		
21		Mullidae	*Mullus barbatus*	LC		
22			*Mullus surmelatus*	-		
23			*Parupeneus forsskali*	-		+
24		Muraenidae	*Enchelycore anatina*	LC		+
25			*Muraena helena*	LC		
26		Pempheridae	*Pempheris vanicolensis*	-		+
27		Plotosidae	*Plotosus lineatus*	-		+
28		Pomacentridae	*Chromis chromis*	LC		
29		Scaridae	*Scarus ghobban*	-		+
30		Sciaenidae	*Umbrina cirrosa*	VU		
31		Scorpaenidae	*Pterois miles*	-		+
32		Serranidae	*Serranus scriba*	LC		
33		Siganidae	*Siganus luridus*	-		+
34			*Siganus rivulatus*	-		+
35		Sparidae	*Lithognathus mormyrus*	LC		
36			*Oblada melanura*	LC		
37			*Pagrus auriga*	DD		
38			*Pagrus pagrus*	LC		
39			*Sarpa salpa*	LC		
40			*Sparus aurata*	LC		
41			*Spicara smaris*	LC		
42			*Diplodus annularis*	LC		
43			*Diplodus cervinus*	LC		
44			*Diplodus sargus*	LC		
45			*Diplodus vulgaris*	LC		
46		Tetraodontidae	*Torquigener flavimaculosus*	-		+
47	**Elasmobranchii**	Dasyatidae	*Dasyatis marmorata*	DD		
48			*Dasyatis pastinaca*	VU		
49			*Himantura uarnak*	EN		
50		Glaucostegidae	*Glaucostegus cemiculus*	-		
51		Gymnuridae	*Gymnura altavela*	CR		
52		Mobulidae	*Mobula mobular*	EN	+	
53		Rajidae	*Dipturus batis*	-		
54			*Raja clavata*	NT	+	
55			*Rostroraja alba*	EN		
56		Rhinobatidae	*Rhinobatos rhinobatos*	EN	+	
57	**Echinoidea**	Diadematidae	*Diadema setosum*	-		+
58	**Florideophyceae**	Corallinaceae	*Jania rubens*	-		
59		Rhodomelaceae	*Laurencia obtusa*	-		
60			*Laurencia papillosa*	-		
61	**Hexacorallia**	Actiniidae	*Anemonia sulcata*	LC		
62	**Holothuroidea**	Synaptidae	*Synaptula reciprocans*	-		

63	**Hydrozoa**	Aglaopheniidae	*Macrorhynchia philippina*	-		+
64	**Malacostraca**	Scyllaridae	*Scyllarides latus*	-		
65	**Mammalia**	Phocidae	*Monachus monachus*	CR	+	
66	**Nuda**	Beroidae	*Beroe ovata*	-		+
67	**Phaeophyceae**	Dictyotaceae	*Padina pavonia*	-		
68			*Dictyota dichotoma*	-		
69		Sargassaceae	*Cystoseira compressa*	-		
70			*Cystoseira barbata*	-		
71			*Cystoseira corniculata*	-		
72			*Sargassum vulgare*	-		
73		Stypocaulaceae	*Stypocaulon scoparium*	-		
74			*Stypopodium schimperi*	-		
75	**Reptilia**	Cheloniidae	*Caretta caretta*	LC	+	
76			*Chelonia mydas*	-	+	
77	**Scyphozoa**	Ulmaridae	*Aurelia aurita*	-		
78		Rhizostomatidae	*Rhopilema nomadica*	-		+
79	**Tentaculata**	Bolinopsidae	*Mnemiopsis leidyi*	-		+
80	**Ulvaceae**	Ulvaceae	*Ulva lactuca*	-		
81	**Ulvophyceae**	Codiaceae	*Codium fragile*	-		+
82	**Polychaeta**	Amphinomidae	*Hermodice carunculata*	-		
83	**Aves**	Laridae	*Larus michahellis*	LC		
84			*Larus canus*	LC		

IUCN Mediterranean Conservation Status

Most of the recorded species were classified as Least Concern (LC) in the IUCN Mediterranean Red List (Table 1). Several species, however, were assigned elevated threat categories, including Epinephelus marginatus (EN), Gymnura altavela (CR), Himantura uarnak (EN), Rostroraja alba (EN), and Umbrina cirrosa (VU). The presence of multiple threatened elasmobranchs and commercially exploited teleosts highlights the ecological sensitivity of the study area. A smaller subset of species remained Data Deficient (DD), such as Epinephelus costae and Mullus surmuletus, indicating a need for improved regional monitoring.

National Protection Status (Türkiye)

According to the national legislation indicators in the species list, several taxa were marked with "+", denoting their legal protection status in Turkey (Table 1). This group primarily included threatened elasmobranchs (*Raja clavata*, *Rhinobatos rhinobatos*, *Mobula mobular*), invasive species (*Fistularia commersonii, Siganus luridus, Siganus rivulatus, Diadema setosum*), and charismatic megafauna such as *Monachus monachus* and *Caretta caretta*. The overlap between nationally protected species and those of high IUCN concern demonstrates consistency between Turkish conservation policy and regional threat assessments.

Natura 2000 Evaluation

To determine their relevance to the European Union's Natura 2000 conservation framework, all taxa were assessed by comparing them with the species lists of the EU Habitats Directive (Annexes II, IV and V) and the Birds Directive (Annex I). Among all recorded species, only five taxa were found to be included in the Habitats Directive, while none of the bird species recorded in the area were listed under Birds Directive Annex I (Table 2).

Table 2. The list of all species recorded in the study area within natura 2000 species annexes

Species	Class	Annex II	Annex IV	Annex V
Alosa fallax	Teleostei	+		+
Dicentrarchus labrax	Teleostei			+
Monachus monachus	Mammalia		+	
Caretta caretta	Reptilia		+	
Chelonia mydas	Reptilia		+	

Only one fish species, *Alosa fallax*, was identified as an Annex II taxon. This species is recognized as requiring the establishment of Special Areas of Conservation due to its ecological and conservation importance. Three species recorded in the study area (*Monachus monachus, Caretta caretta*, and *Chelonia mydas*) were listed in Annex IV. These groups are highly regulated to protection during their entire natural distribution and the occurrence of the two turtle species of sea turtles and the endangered Mediterranean monk seal is a testament to the importance of protection of the coastal and marine environment examined.

Annex V contained two fish species, Alosa fallax and Dicentrarchus labrax, and this inclusion is relevant to the requirement of protection by habitat as well as controlled exploitation. Existence of D. labrax, which is commercially viable species, supports the applicability of sustainable fisheries management in the area.

The documented species of birds (Larus michahellis, Larus canus) was not mentioned in Birds Directive Annex I. Even though provisions regarding these species are included in general Birds Directive, they are not priority species when it comes to being listed as a Natura 2000 site.

In total, 5 of the 84 species recorded in the study area were found to be Natura 2000-relevant taxa according to the Habitats Directive and most of them were marine megafauna of high conservation interest. This is a relatively low percentage of the total species richness which includes ecologically and legally important species whose occurrence has given the habitat under study a conservation priority.

Table 3. Habitat composition in relation to natura 2000 (annex I) of the study area

Habitat type	**Field size-m^2**	**%**
Sandy bottom	7614583	90,53
Reef	493836	5,87
Macroalg	40911	0,49
Racky area	26065	0,31
Gravel coastlince	35548	0,42
Sand and gravel coast line	200417	2,38
Sum	8.411.360	100

The study area comprised 8.41 km² of benthic and coastal habitats (Table 3), dominated by sandy substrates (Figure 2). Habitat composition was compared with the EU Habitats Directive Annex I habitat types, which form the basis for Natura 2000 habitat conservation and Special Area of Conservation (SAC) designations in European marine environments.

A comparison of local habitat categories with the Annex I marine habitat types indicates that only a subset of the observed habitats corresponds directly to Natura 2000 priority habitat definitions.

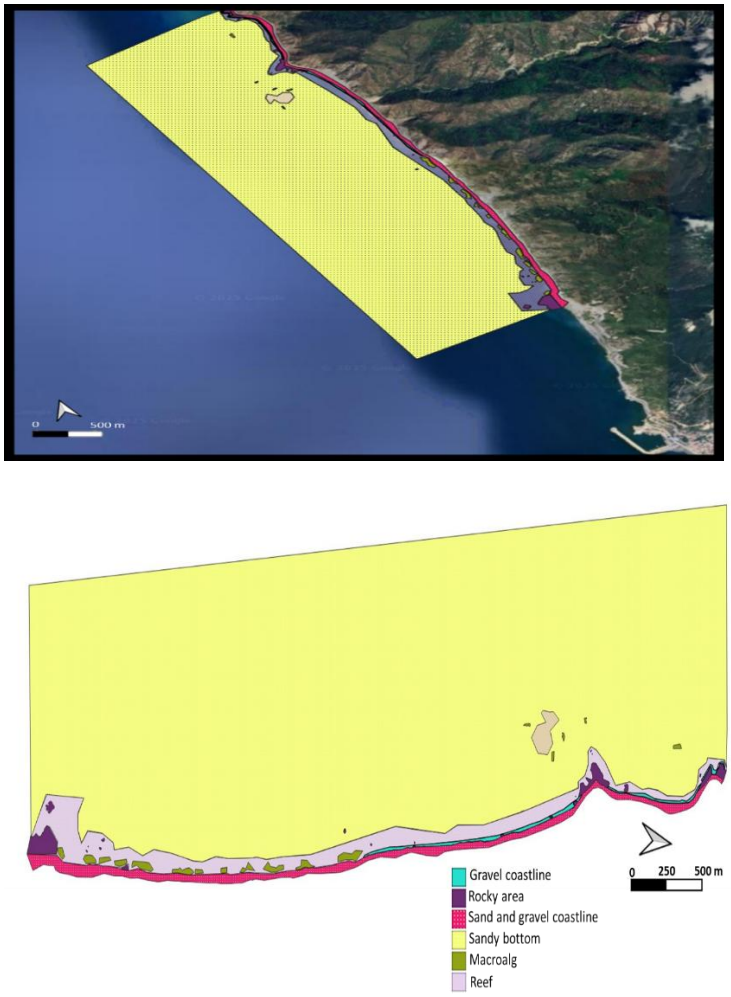

Figure 2. Map of the samandağ–hatay region in the northeast mediterranean showing the geographic extent of the surveyed ray field and surrounding coastal habitats (above). spatial distribution of benthic habitat types within the study area, including sandy bottoms, reefs, rocky substrates, macroalgal patches, gravel coastlines, and mixed sand–gravel habitats (below)

Correspondence With Natura 2000 Annex I Marine Habitat Types

Extensive soft-sediment sandy bottoms (90.53%) form the overwhelming majority of the study area. However, unvegetated sandy substrates are not listed as priority marine habitats in Annex I unless they support specific communities (e.g., Zostera beds, lagoonal systems, or coastal dune systems). No such habitat-forming macrophytes (e.g., seagrasses) were recorded in the present survey. Therefore, the dominant habitat does not fall within Annex I conservation priorities.

The reef + racky area (5.87% + 0.31) are quite similar to Annex I Habitat 1170-Reefs. This is a type of habitat that has been known to be ecologically important because it has a high level of biodiversity, structural complexity and serves as a nursery and refuge habitat to fish and invertebrates. Though covering a small area of the study area, this habitat is the main Natura 2000-relevant habitat of the area. Importantly, several species detected in the study such as groupers (*E. marginatus*), moray eels, and elasmobranch speciess are strongly associated with reef structures, reinforcing the ecological significance of this habitat.

Macroalgal assemblages do not constitute an independent Annex I habitat classification. However, they may form part of the "Reefs" (1170) category when they grow on hard substrate and support biogenic complexity. Given the very limited spatial extent (<1%), these patches represent low-cover supporting elements of the reef habitat.

Although gravel coastlines and mixed coarse-sediment shores were present, these do not match any Annex I coastal habitat types unless they form part of: 1170 Reefs (when structurally consolidated), 1110 Sandbanks (when submerged, stable, with permanence), or 1140 Mudflats and sandflats (not applicable here). Therefore, these habitats contribute to local geomorphological diversity but do not constitute Natura 2000-priority habitat types on their own.

The habitat structure of the study area is strongly dominated by non-priority sandy soft-bottom habitats, while Natura 2000-relevant habitats constitute only ~6% of the total area. This co-occurrence of Annex I habitat and threatened fauna particularly elasmobranchs, groupers, and protected megafauna highlights the critical role of small reef patches in maintaining local biodiversity and underscores their importance for regional conservation planning in alignment with the Natura 2000 framework (Table 4).

Table 4. Habitat types identified in the samandağ–hatay study area, their spatial coverage, and correspondence to natura 2000 (EU habitats directive annex i) marine habitat types. the table highlights the dominance of sandy bottoms and the limited but ecologically relevant distribution of habitat 1170 reefs

Local Habitat Type	Area (m²)	% Cover	Corresponding Natura 2000 Annex I Habitat Type	Annex I Code
Sandy bottom	7.614.583	90.53%	No direct Annex I habitat	–
Reef	493.836	5.87%	Reefs	1170
Racky area (rocky substrate)	26.065	0.31%	Reefs	1170
Macroalgae (macroalgal beds)	40.911	0.49%	Part of "Reefs" when on hard substrate	1170 (subcomponent)
Gravel coastline	35.548	0.42%	No direct Annex I habitat	–
Sand & gravel coastline	200.417	2.38%	No direct Annex I habitat	–
Total	8.411.360	100%	–	–

Photographs taken during observations of certain species in the region during project activities are shown in Figure 3. Only *Monachus monachus* observation in the region was taken from citizen science.

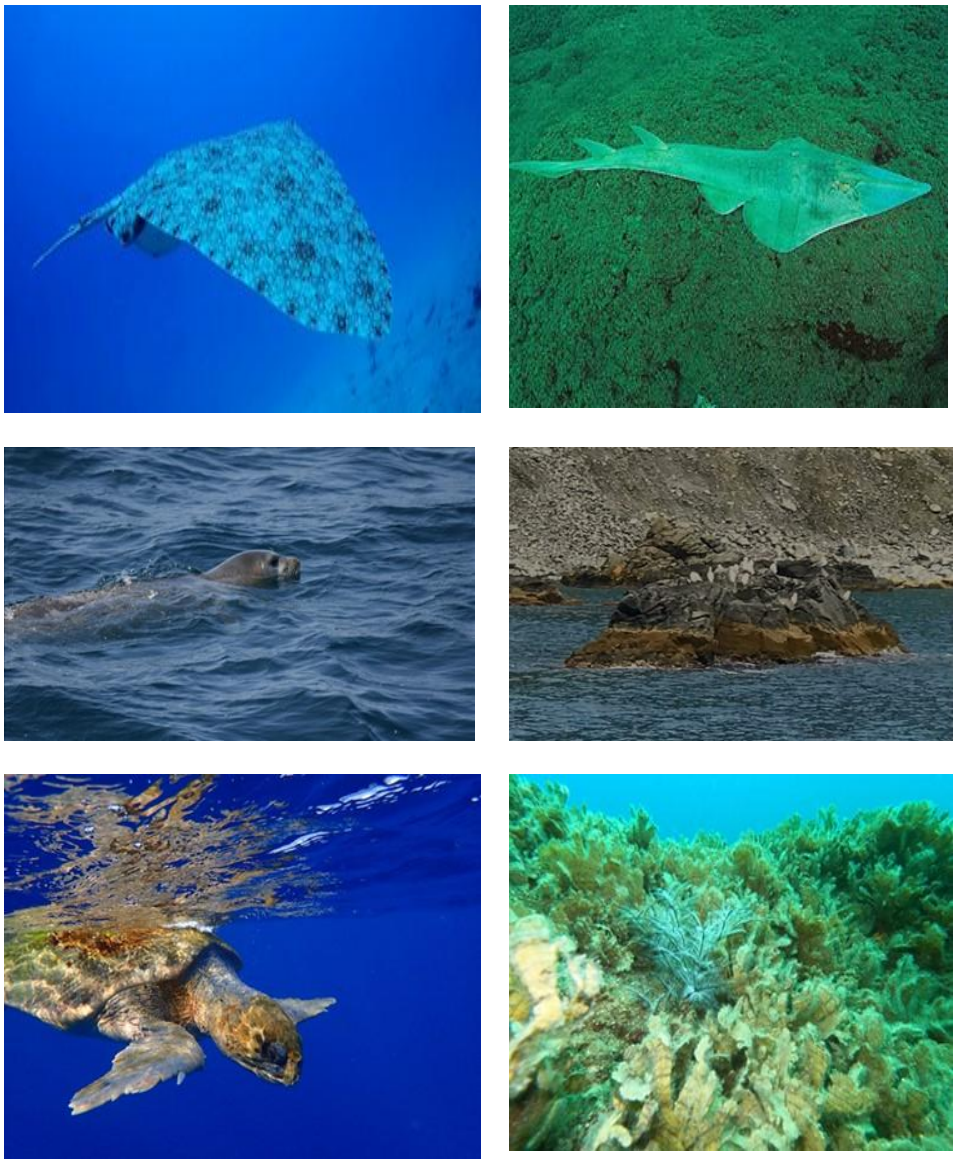

Figure 3. Site seing of some species from the region during the monitoring. the name of species from left to right and down: gymnura altavela, rhinobatos rhinobatos, monachus monachus, larus spp., chelonia mydas, stypopodium schimperi and macrorhynchia philippina together

Discussion

The current paper gives a cumulative assessment of marine biodiversity, habitat assemblage and conservation significance in the framework of EU Natura 2000 scheme, the IUCN Mediterranean Red List and the Turkish domestic conservation laws (Boisseau et al., 2024). The results show that, even though a considerable level of species richness was observed in the location of the study, a relatively small number of taxa can be considered priorities according to the European laws. However, the ecological significance of the region can be highlighted by the spatial overlap of the high-value habitats with the threatened or legally preserved species.

The habitat analysis showed that the study area is heavily dominated by non-priority sandy bottoms (>90%), which is a typical characteristic of most Mediterranean coastal areas. Despite these expansive sites,

however, these soft-bottom environments tend to support less structural complexity and hence few species of conservation interest than do hard-bottom regions (Boedeker et al., 2006).

However, reef habitats (Habitat 1170) even though they comprise less than a quarter of the area surveyed were found to be the most important Natura 2000-relevant habitat type. Habitat 1170 is listed on the EU facilities Directive because of its ecologically favorable characteristics, and the current investigation proves its excessive ecological significance. The reef patches had the greatest taxonomic diversity as well as the most concentrated number of threatened or nationally protected species. The trend is in line with past Mediterranean literature, which underscores this type of substratum as a biodiversity hotspot and nursery ground, as well as refugia of commercially and ecologically valuable species (Rincón et al., 2021; Guidetti et al., 2019; Konstantina et al., 2021).

The conservation assessment of species-level indicated that there is a complex interaction between global (IUCN), European (Natura 2000), and national (Turkiye) protection systems. Even though most species in the dataset could be defined as Least Concern, there was a significant assemblage of stressed elasmobranchs and large teleosts with some such species as Gymnura altavela, Rostroraja alba, and Epinephelus marginatus. Most of them are not listed in Natura 2000 annexes, even though the threat levels of IUCN are high, as well as national protection status (Karadurmuş & Sarı, 2024; Grancagnolo et al., 2025; Fortic et al., 2023).

On the other hand, all of the species that were found in this study and listed in Natura 2000 (Monachus monachus, Caretta caretta, Chelonia mydas, Alosa fallax, Dicentrarchus labrax) are regional endangered, globally endangered, or of great ecological importance. Their presence validates the conservation importance of the location but also places emphasis on the fact that not all the locally endangered species are covered by the EU annex system. This conflict between European and regional conservation priorities has been reported in a number of Mediterranean settings (Gianni et al., 2022) and indicates a necessity to have supplementary local management methods.

The Natura 2000 priority lists contained only 5 out of 84 of the species present at the study area. Although this percentage can seem small, it is in line with the stringent requirements of Natura 2000, which focuses on pan-European conservation priority species, but not locally endangered taxa. The fact that Annex IV species (Monachus monachus, Caretta caretta, Chelonia mydas) are present suggests that the study area comprises important habitat use areas to these mega fauna which is highly protected. The presence of A. fallax found in both Annex II and V suggests that the coastal-marine connectivity and estuarine processes can be of ecological significance in the area. The species of several seabirds though no Birds Directive Annex I species were registered help in the baseline biodiversity measurements.

The joint species-habitat analysis of the study creates the necessity of habitat-specific protection practices. The biological value of reefs compared with their small spatial scale implies that the small patches of hard-bottom can be crucial nodes in the maintenance of biodiversity in systems based on sediments. Since the majority of Natura 2000 species and a significant number of nationally protected species are linked to these habitats (Mikkonen & Moilanen, 2013; Rincón et al., 2021; Guidetti et al., 2019), the selective management would contribute to better conservation results to a great extent.

Moreover, this variation in assessment of IUCN level of threat and Natura 2000 listing of various susceptible species especially elasmobranchs suggests that local management measures (e.g. fishing restrictions, gear limiting, or spatial inferences) could be justified to exceed the scope of the Natura 2000 rules. The debris caused by the earthquake in the area was utilized to fill the foothills and swept by rain into the sea

bringing immense destruction to those areas where the stingrays reside, especially the sandy part where they breed (Turan & Doğdu, 2025). Thus, the ecological sensitivity of the area is denoted by the anthropogenic pressures (small-scale fishing, illegal bottom trawling, plastic and agricultural pollution, coastal erosion and post-disaster debris), which are characterized by the growing influence of alien (primarily Lessepsian) species (Taylan et al., 2019) and must be evaluated in terms of the conservation within the boundaries of the Natura 2000 network.

Finally, the combination of habitat mapping and the conservation assessment of the species proves that the ecological significance of the research area is not provided by its large cover of soft-bottom but by the scattered system of reefs, which provide a high density of endangered and legally-protected taxa. Even though the representation of Natura 2000 is limited by the quantity of species, the presence of the Annex II and Annex IV species and the presence of Annex I reef habitats proves the relevance of the area to be included in the conservation networks of the region. These results imply that fine-scale heterogeneity of habitat may be crucial in marine conservation of the coastal areas as well as to give scientific foundation to future management of the area basing on the habitats and may also give the area a chance to be included in the wider frameworks of marine conservation.

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Author Contributions

All Authors contributed equally.

Conflict of Interest

The authors declared that no conflict of interest.

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