©Yolda Initiative

YOLDA

NATURE-CULTURE COEXISTENCE

A SPATIAL PRIORITIZATION ALONG THE AEGEAN SEASCAPES IN TÜRKİYE

2025

YOLDA

NATURE-CULTURE COEXISTENCE

A SPATIAL PRIORITIZATION ALONG THE AEGEAN SEASCAPES IN TÜRKİYE

2025

NATURE-CULTURE COEXISTENCE
A SPATIAL PRIORITIZATION ALONG THE AEGEAN SEASCAPES IN TÜRKİYE

Özge Balkız, Gönül Ayça Orhon, Burcu Ateş, Gözde İloğlu, Tevfik Ceyhan, Zafer Tosunoğlu, Esra Kartal, Gelincik Deniz Bilgin, Harun Güçlüsoy, Ayşe Turak, Nurbahar Usta, Engin Yılmaz

2025

Halıcı Sk. 12/1, Gaziosmanpaşa 06700 Ankara

ISBN 978-625-97586-0-2 (PDF)

Desing and Layout : Gönül Ayça Orhon
Cover Photograph: Engin Yılmaz © Yolda Initiative

Citation:
Balkız, Ö., Orhon, G.A., Ateş, B., İloğlu, G., Ceyhan, T., Tosunoğlu, Z., Kartal, E., Bilgin, G.D., Güçlüsoy, H.,Turak, A., Usta, N., Yılmaz, E. (2025). Nature-Culture Coexistence – A Spatial Prioritization Along the Aegean Seascapes in Türkiye. Yolda Initiative Publication. Ankara.

Disclaimer on Maps and Spatial Representation

The maps presented in this publication are intended solely for illustrative purposes. The depictions of fishing grounds and the study area do not represent precise digital spatial data. They are simplified visual representations and should not be interpreted as reflecting the exact geographical boundaries of either the fishing grounds or the study area.

Acknowledgements

This project has been a true adventure, made possible by dedicated experts who believe in conservation - despite all the hardships and challenges they face along the way - and that sharing knowledge would bring us closer to a harmonious world. We extend our heartfelt thanks to them for their unwavering support throughout this demanding task: Adnan Ayaz, Altan Lök, Arda Tonay, Aylin Akkaya, Ayşegül Çil, Baran Yoğurtçuoğlu, Beyza Türkozan, Bikem Kesici, Cem Dalyan, Cem Orkun Kıraç, Cemre Balkı, Cevdet Kabal, Çetin Ilgaz, Dilara Arslan, Danae Portolou, Dilek Şahin, Dilek Türkmen, Ertan Dağlı, Emrah Manap, Erhan Mutlu, Esra Başak, Fatih Erdoğan, Gökmen Argun, Güner Ergün, H. Barış Özalp, Kerem Ali Boyla, Marianna Giannoulaki, Mark John Costello, Mehmet Gölge, Mehmet Zülfü Yıldız, Melih Er, Muhammed Duman, Murat Bilecenoğlu, Nebahat Dinler, Necati Bayındır, Nedim Kartal, Oktay Aslanöz, Oya Ayman, Ramazan Özkaya, Solmaz Karabaşa, Vahit Alan, Yakup Kaska, Yalçın Savaş, and the precious participants of the Nature and Culture Coexistence on the Aegean Coasts Workshop.

We also would like to thank these organizations for their support to this project: Ministry of Agriculture and Forestry General Directorate of Fisheries and Aquaculture, Ministry of Agriculture and Forestry General Directorate of Nature Conservation and National Parks, Ministry of Interior Coast Guard Command, Ministry of Environment, Urbanization and Climate Change General Directorate of Protection of Natural Assets, Turkish Statistical Institute Department of Agricultural Statistics, The Scientific and Technological Research Council of Türkiye (TÜBİTAK) Marmara Research Center, UNDP Türkiye, GEF Small Grants Programme Türkiye, Adnan Menderes University Faculty of Agriculture, Ege University Faculty of Fisheries, Çanakkale Onsekiz Mart University Marine Science and Technology Faculty, İstanbul University Faculty of Aquatic Sciences, Pamukkale University Faculty of Science, Central Union of Fisheries Cooperatives (SÜR-KOOP), Ecosytem Protection and Nature Lovers Association (EKODOSD), Ege Ecotourism Association, Fisherwomen Association, Proje Evi Cooperative, Nature Conservation Centre (DKM), Nature Research Society (DAD), Mediterranean Conservation Society (AKD), Sea Turtle Research, Rescue and Rehabilitation Center (DEKAMER), Turkish Marine Research Foundation (TUDAV), WWF Türkiye and Ayvalık 3 Sea Diving Center.

Last but not least, we specially thank the small-scale fishers who feed us, working tirelessly through snow and winter, and sharing valuable information on their livelihoods with us.

This project is implemented with Yolda's own resources and co-funded by the Turquoise Coast Environment Fund–Turkey, within the framework of collaboration with the Conservation Collective and the Support Foundation for Civil Society, as well as the 'Environment Fund' of the Embassy of France in Ankara.

Table of Contents


DENIZ 9

Executive Summary

The Aegean coastal and marine ecosystems are vital for both biodiversity and small-scale fisheries in Türkiye. Unfortunately, despite facing similar threats, these two fields are often studied separately. Small-scale fisheries, which are integral to the region's cultural and economic fabric, have a lower environmental impact - when practiced sustainably - than industrial and large-scale fisheries. At the core of this project, we assumed a more positive interaction between biodiversity and this cultural practice. Thus, unlike other studies, "A Cultural Landscapes Based Assessment: Coexistence of Nature and Culture in Aegean Coasts of Türkiye" project aimed to address both biodiversity and small-scale fisheries through a nature-cultural mutuality vision. This report summarizes the project's approach and outcomes.

The goal of the project was to identify priority areas along the Aegean seascapes of Türkiye where future conservation investments could be directed by various stakeholders. To achieve this, we didn't just focus on the significance of these areas for biodiversity or small-scale fisheries, nor solely on the density of threats they face in both domains. We also considered the level of conservation investments previously allocated. Our overall aim was to pinpoint areas that are important for both biodiversity and small-scale fisheries, are more threatened compared to others, and have so far received fewer conservation investments. This approach allowed us to identify areas with a more urgent need for conservation attention.

Through a participatory approach to data gathering, we gained a comprehensive understanding of the local and regional dynamics. The project brought together two key datasets: (i) Biodiversity (BD) data and (ii) Small-scale Fisheries (SSFs) data. Some examples to the data gathered are distribution data of important biodiversity elements (e.g., marine mammals, seagrass meadows, fish species, and coralligenous assemblages), habitat diversity, fishing gear selectivity, level of marine pollution, catch per unit effort, and the proportion of women fishers, among others.

We spatialized and analyzed data across multiple themes using different weights, differentiating their impacts on identifying priority areas for conservation efforts targeting both biodiversity and small-scale fisheries. The main methodology employed was a multi-criteria decision mechanism, which synthesized the effects of multiple factors toward a common goal. Both marine and terrestrial data were used, incorporating national and international data sources, as well as expert insights, to enhance data quality. All collected data were digitized and spatialized. To perform comparisons and prioritization in the study area, a scale of 1x1 km grid was chosen for the study, balancing the need to capture detailed features while retaining data resolution. Biodiversity optimization analysis, paired with cost layers, was conducted using advanced software to produce robust, objective results.

The project's aim was not only to produce results but to generate actionable outcomes that can be implemented by various stakeholders engaged in biodiversity conservation and supporting small-scale fisheries. As a result of the analysis, a final solution set of priority areas was identified, concentrated in three regions: Saros Bay, Ayvalık, and Ildır Bay. Saros Bay, in particular, had the highest coverage in terms of grid cells. The outcomes are designed to be accessible to a wide range of stakeholders, including policymakers, practitioners, and potential donors, offering structured, science-based information to guide decision-making.

1.Introduction

The seascapes of the Aegean Sea are home to diverse marine and coastal ecosystems characterized by high species richness, presence of threatened species, along with unique, important, or threatened habitats such as seagrass meadows and coralligenous assemblages (Akçalı et al. 2019a; Coll et al., 2012; Katağan et al. 2015; Sini et al., 2017). This high richness was acknowledged with the delineation of the Mediterranean Basin, including the Aegean seascapes, as one of the world's 36 biodiversity hotspots (CEPF, 2010). These areas of high biodiversity importance offer invaluable ecosystem services, including climate change mitigation and adaptation, disaster risk reduction, tourism, maintenance of fisheries resources, and bringing substantial health, social, and economic benefits to coastal communities (Barbier et al., 2011; Roberts et al., 2017). The coastal and marine ecosystems along Türkiye's extensive coastline of approximately 3,500 km support the livelihoods and food security of millions of people (Birkan & Öndes, 2020; Çöteli, 2023). This is particularly significant for small-scale fishers.

Historical evidence indicates the presence of small-scale fishing practices in the Aegean Sea dating back to ancient times (Mylona, 2014). These practices have preserved their artisanal nature until recently, characterized by using small vessels and traditional fishing gear, defining these labor-intensive operations across generations (Ceyhan et al., 2006; Cochrane & Garcia, 2009; Farrugio et al., 1993). They typically operate with modest production units, characterized by low input and output, requiring minimal capital investment. These operations are usually family-managed (half of the small-scale fishers work alone in Türkiye; Ünal & Ulman, 2020), sometimes with one or two employees, reflecting a strong community-centric approach. The harvested fish are frequently sold in local markets, maintaining a close connection between the region's maritime activities and its residents (Göktürk & Deniz, 2017).

The longstanding interaction and interdependence with the seascape have fostered a rich body of traditional ecological knowledge among small-scale fishers, shaped by accumulated experiences passed down through generations and across communities. At its core, this knowledge is rooted in the understanding that their survival, and that of future generations, depend on respecting the continuous interactions with the sea. As central to their livelihoods, small-scale fisheries in the Aegean region have historically played a fundamental role in ensuring the responsible management and sustainable use of aquatic resources and the ecosystems that support them (Ünal et al., 2022a; 2022b). Consequently, the survival of many threatened species and habitats in the region is closely linked to the low-impact gears and techniques employed by these sustainable small-scale fisheries (Hendriks, 2022). This millennia-old interaction between small-scale fishers and the sea has resulted in a rich legacy that significantly influences the region's cultural heritage (Başağaç & Bilgin Altınöz, 2018; Çakırlar & Çilingiroğlu, 2018). These fishers play a crucial role in fostering social cohesion and sustaining rural communities, generating multiplier effects across other coastal sectors. Hence these areas should be regarded as Cultural Seascapes[1] and Socio-Ecological Production Seascapes[2] (Berkes, 2009; Stithou et al., 2022).

Yet, marine and coastal ecosystems along the Aegean Sea are experiencing significant rates of species loss and habitat loss and degradation, to the detriment of sustainable small-scale fisheries that rely on resource-based livelihoods (Coll et al., 2010; Tsirintanis et al., 2022). This loss and degradation result in the decline of the functions and services these ecosystems provide, adversely impacting biodiversity and the livelihoods of coastal communities and societies at large in Türkiye. This shift is primarily attributed to the significant transition over the past three to four decades from predominantly artisanal practices to intensive exploitation by industrial fisheries, exacerbated by unsustainable consumption patterns (Demirel et al., 2020; Ünal & Ulman, 2020). As a result, fish stocks in the Mediterranean Basin, including the Aegean Sea, are subjected to chronic overfishing, with 58% of stocks being fished at unsustainable levels in 2021 (FAO, 2023).

In Türkiye, negative changes in marine ecosystems are primarily attributed to unsustainable large-scale fisheries, characterized by sophisticated technology, excessive catch capacities, and ineffective regulations (e.g., a minimum depth limit of 24 meters for purse seines), which increases the risk of adverse impacts on benthic habitats (Akçay et al., 2025). Türkiye has emerged as the largest contributor to capture fisheries in the Mediterranean and Black Seas (FAO, 2023). In addition to these legal yet unsustainable industrial fishing practices, the Aegean seascapes face a significant and widespread threat from illegal, unreported, and unregulated (IUU) fishing, underscoring the urgent need for improved enforcement of regulations (Öztürk, 2015). Meanwhile, small-scale fisheries, rightfully often regarded as the custodians of the seascapes, make up 90% of the fishing fleet in Türkiye but contribute only to app. 11% of the total catch volume (as of 2022; Akbaş et al., 2023).

Other threats acting on the seascapes in Türkiye are over-exploitation of fishery resources exacerbated by unselective, seabed impacting fishing gears and techniques (Ulman et al., 2020). These include bycatch of threatened fish species, marine mammals, marine turtles, and invertebrates, among others, and the destruction of critical blue carbon habitats (Genovart et al., 2017; Lewison et al., 2014). Pollution, residential & commercial coastal development, introduction, and spread of invasive alien species are other major threats to biodiversity in the region (Çinar et al., 2021; MedECC, 2020; Şekercioğlu et al., 2011; UNEP/MAP, 2012). While being a part of the Mediterranean Basin with a warming 20% faster than the global average, the impacts of climate change exert additional pressure on already strained ecosystems and small-scale fisheries in the Aegean region (MedECC, 2020).

To summarize, the health of Aegean seascapes and small-scale fisheries are closely interlinked, with both facing significant threats from similar sources. This underscores the need for coordinated conservation and management efforts that focus on both biodiversity and the

---

1 Cultural landscapes and seascapes (CLS) refer to the areas which human activities are among the key agents in the evolution of the environment. Conceptually it moves beyond the human–nature dichotomy, based on a recognition that humans are integral components of ecosystems and human history is essentially connected with the cultivation of nature, of the physical environment, which has historically shaped and engendered present-day landscapes and seascapes. This relation can also be found in the root of the word 'culture' in Latin, which is cultum, referring to lands and cultivated plants. We therefore understand cultural landscapes and seascapes as a term that embraces the diversity of tangible and intangible manifestations of the interaction between humankind and its environment.

2 Socio-ecological production landscapes and seascapes (SEPLS) are dynamic mosaics of habitats and other land and sea use where harmonious interactions between people and nature maintain biodiversity while providing humans with goods and services needed for their livelihoods, survival, and well-being in a sustainable manner.

small-scale fisheries in the region. National and local conservation NGOs (non-governmental organizations) have been actively working to address these challenges and have made notable contributions. However, current conservation actions remain under-resourced, and spatially restricted, limiting the ability to deliver the large-scale impact needed.

Furthermore, while Marine Protected Areas (MPAs) are not officially defined in Turkish legislation, approximately 4% of Türkiye's territorial waters are currently protected under various designations by the Ministry of Environment, Urbanization and Climate Change, and the Ministry of Agriculture and Forestry (WWF-Türkiye, 2020). However, this coverage is insufficient given the region's rich biodiversity, especially when compared to the European Union, where around 11% of waters are protected by MPAs.

Despite successful examples, the loss of biodiversity and the degradation of sustainable sea-use systems are projected to continue, and in some cases, accelerate in the region. The lack of integrated regional spatial planning that balances social, ecological, and economic objectives, hinders effective analysis, prioritization, and allocation of resources. Therefore, a prioritization to identify seascapes that are of urgent need to direct future conservation investments targeting both biodiversity and small-scale fisheries was critical. With a vision toward nature-culture mutuality and a specific aim to fill this gap, we implemented a project entitled "A Cultural Landscapes Based Assessment: Coexistence of Nature and Culture in Aegean Coasts of Türkiye " between 2022 and 2024. This project is implemented with Yolda's own resources and co-funded by the Turquoise Coast Environment Fund–Turkey, within the framework of collaboration with the Conservation Collective and the Support Foundation for Civil Society, as well as the 'Environment Fund' of the Embassy of France in Ankara. This spatial profiling study serves as a decision-support tool, designed to assist decision-makers and potential donors targeting the Aegean seascapes. The project also aimed to contribute to exchanges among local stakeholders, fostering synergies among multiple actors for more inclusive decision-making and implementation processes in nature conservation and sustaining livelihoods.

2. Methodology

The overall aim of the project was to select a set of priority areas along the Aegean Coast of Türkiye where future conservation investments could be made by different actors. We aimed to select these areas given their importance for both biodiversity (BD) and small-scale fisheries (SSFs) and given that they faced high(er) density of threats towards both topics, but received relatively low(er) conservation investments so far. The methodology we adopted to achieve this aim and the data we gathered for this purpose are detailed in the sections below.

2.1. Geographical Scope

We used the boundaries of Geographical Sub-region (CAB) 22 - Aegean Sea, as defined by the General Fisheries Commission for the Mediterranean (GFCM) to gather data in this study. This large area, which covers Turkish territorial waters, international waters, and Turkish coasts in the Aegean Sea, was adopted as the boundary for systematic data collection. In this context, we first included data from international sources within this wide area boundary and then detailed the analysis on a narrower geographical scale. While drawing this "finer scale boundary", the fishing grounds where small-scale fisheries operate were taken as the basis, and a boundary that is a maximum of 15 nautical miles from the coast, including protected areas and areas with fishing bans, was included to finalize its geographical extent (Figure 1).

Figure 1. Study area boundaries

2.2. Data Collection

The research and data collection phase are integral to informing the spatial prioritisation exercise, serving as a foundation for a comprehensive understanding of the interplay between biodiversity and SSFs. In the project, we collected data on biodiversity and small-scale fisheries from a wide range of sources. These included a literature review (articles, reports, books, grey literature), structured and semi-structured interviews, fieldwork, and an expert workshop.

Fieldwork

Fieldwork was essential for taking initial steps to engage with various stakeholders in the project area while collecting information and data from them. As part of our project, we conducted three fieldwork sessions between March and October 2023 in Edremit Bay of Balıkesir Province (including Ayvalık, Burhaniye, Altınoluk, Küçükkuyu, Behram, and Sivrice), İzmir Province (Foça, Urla, and Karaburun Peninsula), and Bozcaada, Çanakkale Province. Our goal was to gather comprehensive data on small-scale fisheries and establish a baseline understanding of the current situation of this cultural practice in the region. Through structured interviews (with up to 35 questions), we collected data on fishing techniques and gears, target species, traditional ecological knowledge of fishers, and the socio-economic and demographic structure of the fisheries cooperatives. We conducted interviews with fishers as well as structured interviews with relevant public institutions, CSOs, and researchers. Besides these interviews, we mapped the fishing grounds of each fisheries cooperative visited, based on the fishing gear used. For each fisheries cooperative, we drew the fishing grounds together with the fishers, by asking them particular questions about the geography of their practice, including bearing points and the maximum distance from the coast per each fishing gear. This method enabled fishers to mark the fishing grounds on the maps provided and resulted in high-resolution mapping of the fishing grounds.

Overall, we visited 18 fisheries cooperatives, interviewed 30 small-scale fishers, and engaged with 8 different stakeholders (public institutions, CSOs, researchers, private sector, and local people), corresponding to 25 expert/day work.

Data Collection from Central Union of Fisheries Cooperatives (SÜR-KOOP)

The largest civil organization representing fishers in Türkiye is the Central Union of Fisheries Cooperatives (SÜR-KOOP), comprising 572 fisheries cooperatives and 16 regional unions. In our project, we benefitted from their archive and analyzed their database in the Aegean Region to gain insights into the organizational structure of SSFs in the Aegean Coast of Türkiye. The data included information such as the names of fisheries cooperatives in the region, the total number of members, and the total number of boats associated with each cooperative.

Data Collection from Turkish Statistical Institute (TÜİK)

In Türkiye, the Turkish Statistical Institute (TÜİK) is the leading public body in providing statistical data about various fields of knowledge, including fisheries as part of agricultural statistics. To analyze a diverse range of data from a large dataset and, thus, to draw consistent conclusions, we processed the TÜİK data in the Fisheries Statistics Micro Data Set 2021 (Su Ürünleri İstatistikleri Mikro Veri Seti – 2021) using the R programming language, specifically leveraging the library packages (namely tidyverse, tibble, dplyr and ggplot2). The study was conducted at the district level and detailed for vessel length groups 1 (5 to 7 meters), 2 (8 to 9 meters), and 3 (10 to 12 meters), specified in the micro data set. This data exclusively covers vessels operating in the Aegean Sea, including information on the number of vessels, fishing gear types, seasonal and annual operation duration, days spent at sea, catch volume, target species, marketing details, and demographic information related to the occupation such as gender and age. After analyzing the collected data, we finally consolidated them in a matrix that forms the basis for various stages of our analysis.

Structured Interviews with Fisheries Cooperatives

Our project is distinct in considering environmental and socio-economic values together in biodiversity conservation at such a large geographical scale. Thus, the data related to the livelihoods of local communities, in this case SSFs, played a crucial role in the analysis. Regarding that, to obtain up-to-date information about the current situation of SSFs in the Aegean Region, we carried out structured interviews with 93 SÜR-KOOP member fisheries cooperatives from Enez, Edirne Province to Ortaca, Muğla Province (see Annex 1). The interviews were based on a questionnaire (with up to 35 questions) conducted over phone calls, which were held systematically in four rounds to gather additional information or to verify the data in each round. The interviews aimed at collecting data about the fishing grounds, the fisheries cooperative's practice (diversity of fishing gears, technical specifications of fishing gears, total number of vessels using each fishing gear), the organizational structure of the fisheries cooperative (total number of partners, total number of boats), the socio-demographic structure of the fisheries cooperative (number of partners under 40 years, number of women partners and fishers) and general problems related to SSFs in the region. The questions about the identification of fishing grounds were designed on the basis of four fishing gear types: Handlines, longlines, gillnets (set, combined and trammel) and encircling gillnets. Fishers were asked about the type of gear they use (with their sub-types), the frequency of use per day for each gear, the length of each gear and where they use the gears, informed by the depth, the distance covered from the shore in four directions (North, South, East and West) and the (local or official) names of the visited places. Interviews were held between May and December 2023 with each interview lasting approximately 30 minutes (overall 60 hours). Collected data on fishing grounds was then digitized using QGIS Software.

Expert Workshop

Our project adopted a participatory approach that values diverse knowledge sources. In that regard, on December 5-6, 2023, we organized the "Co-existence of Nature and Culture in the Aegean Coasts Workshop" in Ankara to discuss our preliminary findings as well as to co-produce new data with participants. The event brought together 54 participants from relevant stakeholders (SSFs cooperatives, NGOs, universities, decision-makers, UN representatives, donors, the private sector, and independent researchers) dedicated to researching and conserving marine ecosystems and SSFs in the Aegean Coast of Türkiye. In the workshop, we conducted five sessions using where various methods such as mapping, questionnaires and group discussions. During the workshop, we realized the following tasks:

- presenting the data we collected on biodiversity and small-scale fisheries and gathering feedback from participants,
- reviewing and expanding data on projects on the conservation of Turkish Aegean coastal and marine biodiversity and SSFs,
- mapping area-specific threats to Aegean coastal and marine biodiversity and fisheries in the GIS environment, by assessing impact, urgency, and reversibility with participant input,
- exploring non-state actors' conservation solutions to address area-specific threats,

- weighting the impacts of various factors within the project's methodology to identify priority areas.

Expert Meetings

Our project embraced an interdisciplinary approach, integrating data on biodiversity and socio-economical aspects together. This approach benefitted a lot from expert opinion and for that, we organized several knowledge-sharing sessions with scientific and technical experts in relevant fields. These diverse topics, such as the conservation status of seagrass habitats, status of seabirds, and marine mammals in the Aegean Sea, as well as the need for establishing public monitoring systems for SSFs and their impact on seascapes. In that regard, from September 2022 to January 2024, we organized a total of 40 knowledge-sharing meetings with over 30 experts. Each meeting lasted between 60 and 90 minutes and was based on semi-structured interviewing method. These interviews provided finer-scale input to our analysis.

2.3. Approach

In this study, we aimed to identify a set of priority areas to direct conservation efforts on biodiversity and small-scale fisheries by spatializing and analyzing data on different themes and topics together. The main approach used in this context was the multi-criteria decision mechanism. In this approach, different effects of multiple factors toward a common goal were synthesized.

Within the scope of the project, two main datasets were brought together: (i) Biodiversity (BD) data and (ii) Small-scale Fisheries (SSFs) data. Some of the data we collected were continuous layers, some were categorical data describing specific areas (e.g. presence/absence data describing species distributions), and some were existent within administrative boundaries (such as provinces and districts). In the study, we spatialized, i.e. digitized, all data collected from different sources. While doing so, to perform comparisons and prioritization in the study area, a study unit of 1x1 km grid size was selected. This scale was chosen as it is sufficiently coarse to reveal different features in the result set (hereon Final Solution Set) but is also fine scale enough to retain the data resolution. Finally, areas, where small-scale fishing activities are carried out (i.e., fishing grounds), were identified as our basis. The final solution set identified through the analysis (in 1x1 km grid cells) were restricted to small-scale fishing grounds in the last step of the analysis as there areas were the primary focus of our project. In addition to this primary data set towards BD and SSFs, we collected additional data increasing or decreasing the choice of area selection on both topics. Figure 2.1, 2.2, 2.3, 2.4 provides detailed information on the data collected.

The approach we adopted in analyzing and synthesizing the data collected under the project was basically as follows: The Biodiversity data (BD) and the Small-scale Fisheries data (SSFs) were evaluated independently from one another and integrated into the analysis with equal weights. As a result of these assessments, six separate datasets, the type and source of which are described below, were created for each study unit (1x1 km grid cells) in the study area. These datasets were then synthesized using multi-criteria decision-making approaches.

- BD – Important Biodiversity Elements
- BD - Factors Increasing Choice
- BD - Factors Decreasing Choice
- SSFs Areas (Fishing Grounds)
- SSFs - Factors Increasing Choice
- SSFs - Factors Decreasing Choice

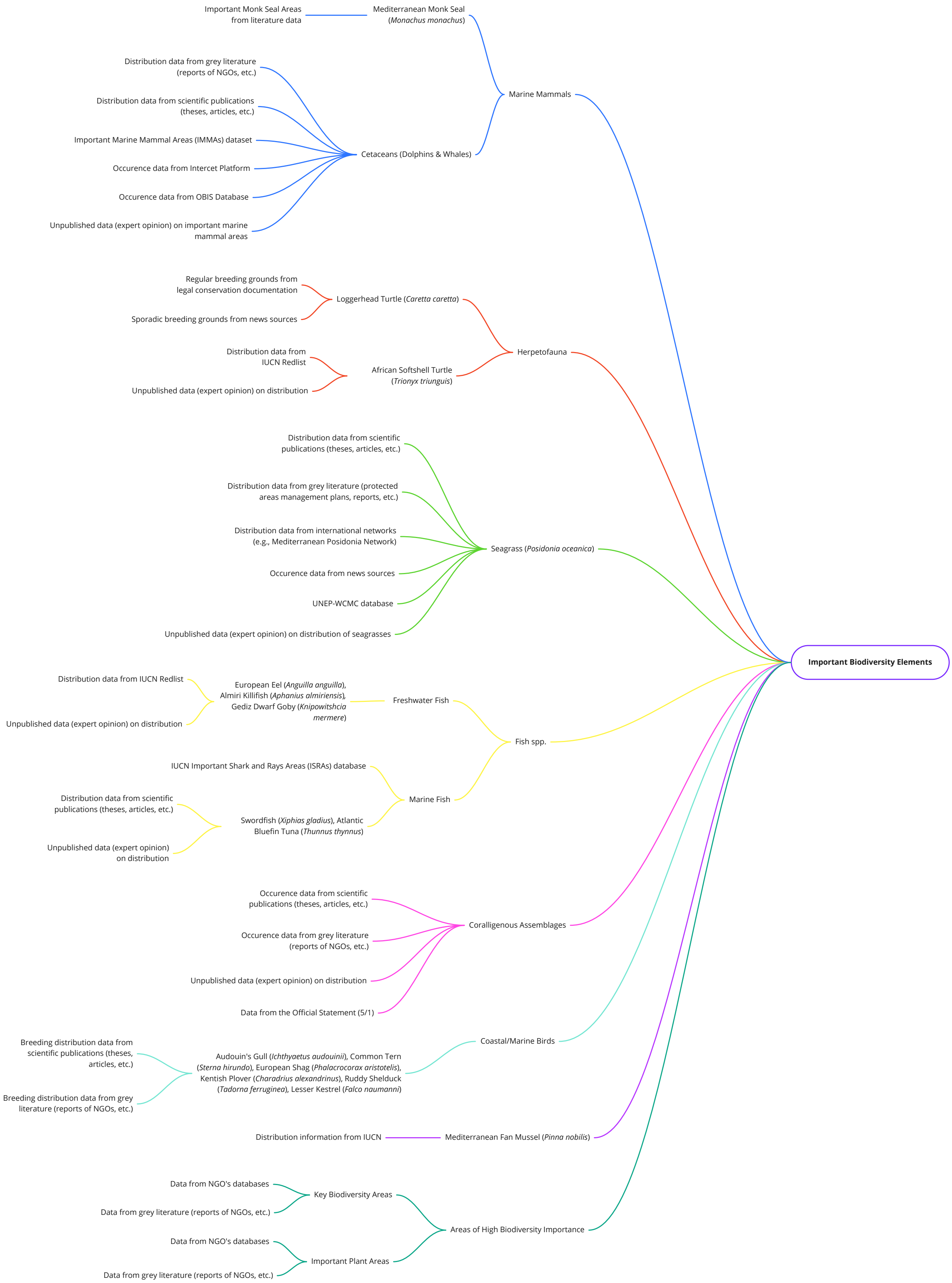


Figure 2.1. The details of the data sources and datasets used in the project - Important Biodiversity Elements

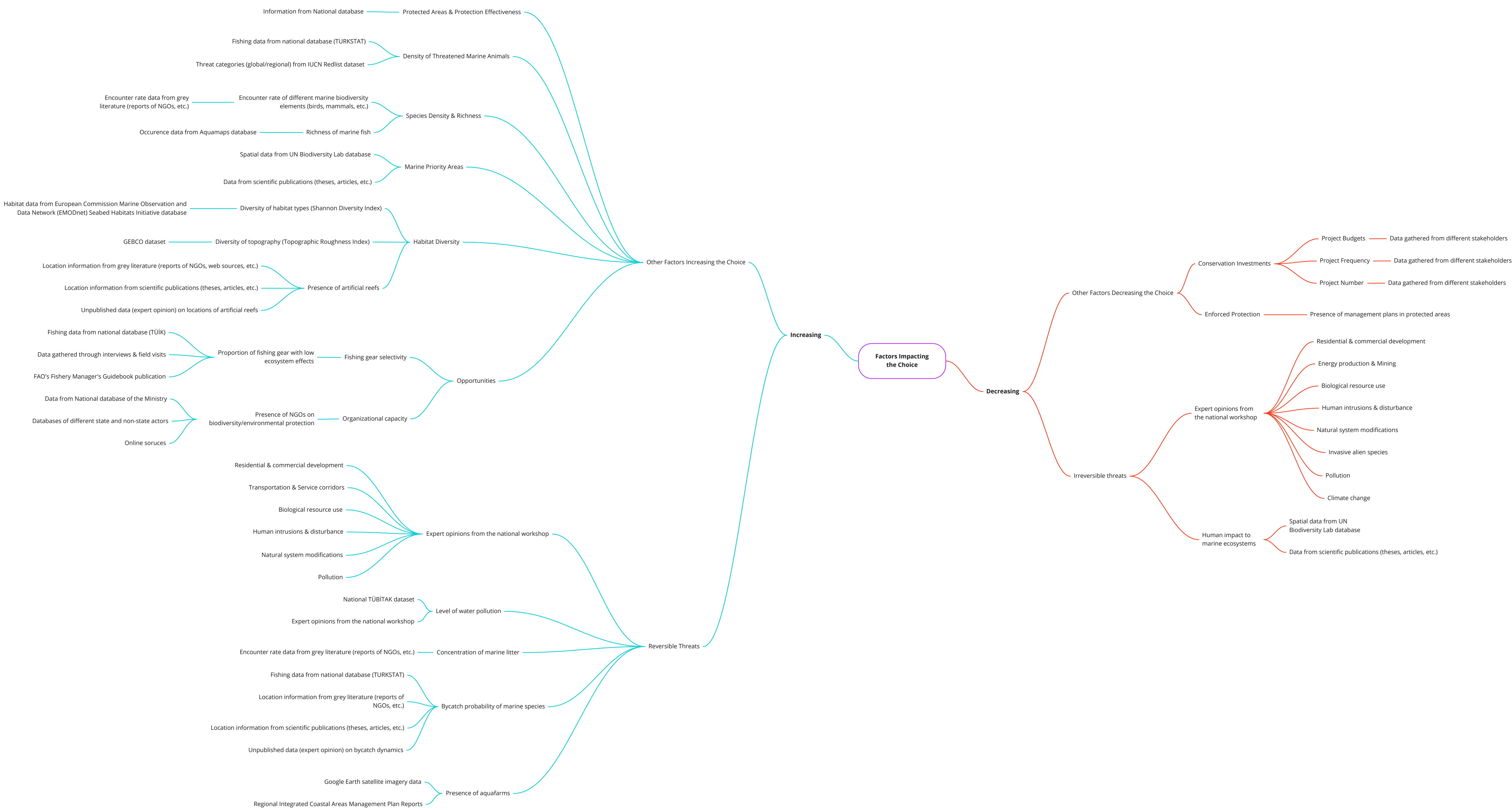


Figure 2.2.The details of the data sources and datasets used in the project - Factors Impacting Choice for BD

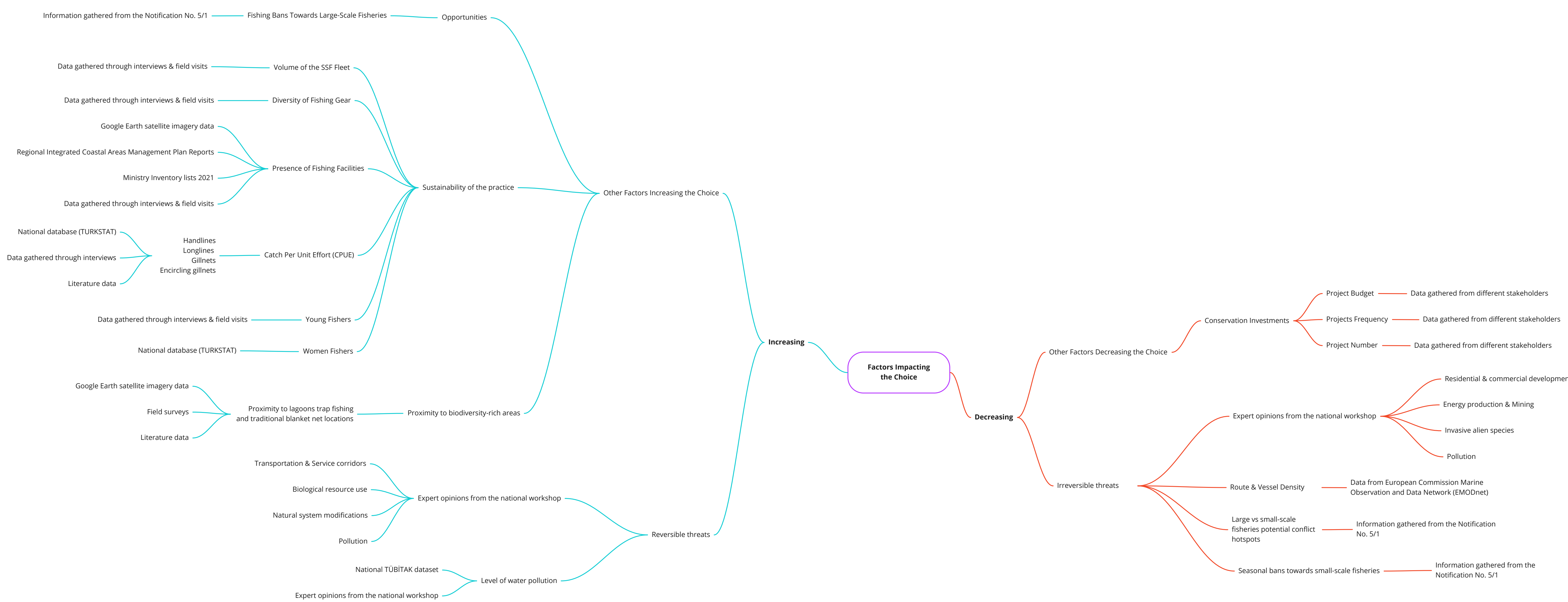


Figure 2.3. The details of the data sources and datasets used in the project - Factors Impacting the Choice for SSFs

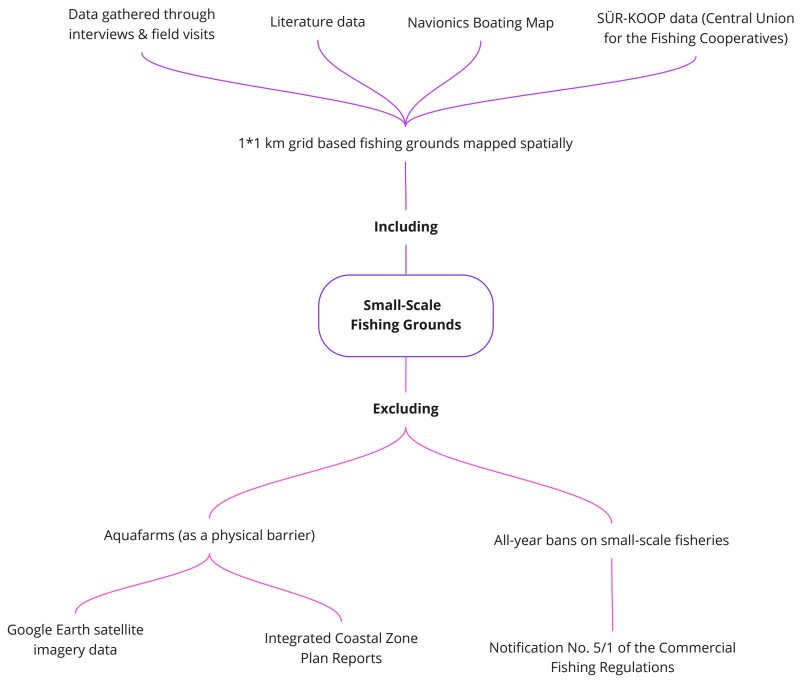


Figure 2.4.The details of the data sources and datasets used in the project - Small-Scale Fishing Grounds

2.4. Digitization of Data

2.4.1. Intersection Ratios with Study Units

In the project, we compiled data on important biodiversity elements (priority species and areas), and factors that increase or decrease the choice for biodiversity (BD) and small-scale fisheries (SSFs) from diverse sources. While some of these data were readily digital, some were digitized, i.e. spatialized, by our team within the scope of the project. Of the digitized data, some could be transferred directly onto the 1x1 km grid cells used in the project (e.g., coral communities, fishing grounds, and district-based data or some categorical data). Others, however, were collected or digitized as polygons independent of the study area grid (e.g., important biodiversity areas, and protected areas). In these latter cases, a need to overlap them with our 1x1 km grid cells emerged, and using specific thresholds while doing so was found necessary. As a general rule, an intersection threshold of 50% was applied. The data with a lower intersection were considered absent from the corresponding study units. This threshold was revised for the important biodiversity elements, to avoid neglecting their impact in the analysis. For example, the Loggerhead Turtle (*Caretta caretta*) is a priority species that nests in very few areas along the Aegean Coast. To integrate the nesting beaches of this species in the analysis, the 50% intersection threshold (with 1x1 km grid cells) was revised, and a much lower min. intersection ratio was adopted (0-2.5%). The specific intersection thresholds considered for the biodiversity elements are presented in Table 1.

The intersection ratios for all the data layers were calculated automatically in a Geographical Information Systems (GIS) environment. However, manual selections could be made in certain cases. For example, one of the SSFs bans was within a radius of 500 m around the river mouths. This ban was not transferred to study units through an automated intersection, instead the study units were selected manually. Lastly, some of the data collected

Table 1. Important biodiversity elements and intersection ratios used*

Important Biodiversity Elements	Min. Intersection Ratios (%)
Cetaceans (Dolphins and Whales) – Important Marine Mammal Areas (IMMAs) & Unpublished data (expert opinion) on important areas	50
Cetaceans (Dolphins and Whales) – İzmir & Aliağa Observations	25 (izmir) 5 (Aliağa)
Loggerhead Turtle (*Caretta caretta*) – Established & Sporadic Breeding Grounds	2,5 (Established) NA (Sporadic)**
African Softshell Turtle (*Trionyx triunguis*) distribution	25
Seagrass (*Posidonia oceanica*) distribution	2.5
Marine Fish – Important Shard and Ray Areas (ISRAs)	50
Marine Fish – Candidate Important Shard and Ray Areas (cISRAs)	45
Marine Fish – Areas of Interest of ISRAs	50
Marine Fish – Areas hosting high Swordfish and Atlantic Bluefin Tuna populations	50
Freshwater Fish – Distribution of 3 important species	5
Seabirds – Audouin's Gull, Common Tern & European Shag breeding distributions	20
Seabirds - Ruddy Shelduck breeding distribution	25
Seabirds - Kentish Plover & Lesser Kestrel breeding distributions	50
Areas of High Biodiversity Importance – Key Biodiversity Areas (KBAs)	50
Areas of High Biodiversity Importance – Important Plant Areas (IPAs)	25

**The important biodiversity elements whose data was present on the 1x1 km grid cells are not provided in the table.*
***No min. intersection rate was used.*

were in raster format (tiff). The transfer of these data to our study grids was based on the pixel values overlapping with each grid cell, and the maximum of these values were used.

2.4.2 Marine and Terrestrial Data

In the project, we aimed to work on and produce results about the coastal and marine ecosystems. We thus needed to consider the representation of terrestrial and marine elements in the study units (1x1 km grid cells) during the digitization of data. We aimed to exclude areas that majorly hold terrestrial ecosystems. For this, we used the coastline of Türkiye as a reference and set a threshold of ≥90% overlap with terrestrial ecosystems for exclusion. The grids with such overlaps were majorly terrestrial and therefore excluded from the analysis.

We considered the need to review the 90% overlap ratio for the important biodiversity elements as well. The distribution of some biodiversity elements did overlap with grid cells that harbor a large proportion of terrestrial elements (e.g. herpetofauna and freshwater fish). However, we detected that this 90% threshold ensured the representativeness of these elements in the analysis through their presence in the neighboring study units. Therefore, the use of a lower threshold for the important biodiversity elements was deemed unnecessary and no consequent revision was performed.

Lastly, some of our collected data was based in terrestrial regions (i.e. TÜİK data, ministry data, stakeholder data). This warranted the need to create a way of representing such data on our grid cells (coastal and marine). To achieve this, we applied a distance-based function to assign province and district information to each grid cell in our study area. The distances were calculated from the center point of each grid cell to the shoreline point that is closest to them. The province and district information at the shoreline point was then assigned to the cells.

2.5. Important Biodiversity Elements and Conservation Targets

In this study, we gathered data on priority elements of biodiversity, namely priority species and areas of high biodiversity importance. In other words, our focus did not cover all biodiversity elements of the Aegean Coast and Sea but rather covered the threatened elements and the areas hosting them. The selection of threatened species was realized through the IUCN Red List data (International Union for the Conservation of Nature; www.redlist.org) and expert opinions. For areas of high biodiversity importance, we used studies of non-governmental organizations. Details on this topic are provided in the following sections. This way priority species and areas were integrated into the study as important biodiversity elements (Figure 2.1).

This study aimed to identify priority areas where conservation efforts will be directed by spatializing and analyzing data on different themes and topics together. The representation of the selected important biodiversity elements, i.e. the distribution of priority species and areas, with a certain proportion in the resulting priority area set, was among the main targets. This rate, i.e. the conservation target, is a parameter that defines at least how many grid cells (1x1 km) of the priority species and areas included in the assessment should be targeted for conservation. The conservation targets for the priority species were assigned individually. For this assignment, we first considered the threat categories of the species (IUCN Red List assessments, prioritizing regional assessments; if unavailable, global assessments). In datasets with more than one species (e.g., birds), the category of the most threatened species was considered. Secondly, we evaluated the area covered by these biodiversity elements (i.e., the number of grids) in the project area after applying the intersection thresholds. Similarly, for the areas of high biodiversity importance, the total distribution area was taken into consideration. Based on this information, conservation targets were set for each element separately (Table 2). A biodiversity optimization analysis (detailed in Section 5.4) was realized by considering these conservation targets. In addition, for each of the important biodiversity elements, penalty scores -which would be added to the result if the conservation targets could not be achieved in the optimization analysis - were identified. Thus, the resulting priority set of the analysis was encouraged to move towards areas that meet the conservation targets.

Table 2. Conservation targets and penalty scores of Important Biodiversity Elements

Important Biodiversity Elements	Conservation Target (%)	Conservation Target (1x1 km grids)	Penalty Score
Mediterranean Monk Seal – Important Monk Seal Areas	5	118	0.5
Cetaceans (Dolphins and Whales) – Important Marine Mammal Areas (IMMAs)	2	74	0.5
Cetaceans (Dolphins and Whales) – Unpublished data (expert opinion) on important areas	5	54	0.5
Cetaceans (Dolphins and Whales) – İzmir & Aliağa Observations	0,5	23	0.5
Cetaceans (Dolphins and Whales) - INTERCET heatmap data (intensity of observations)	2-5	60-77	0.5
Cetaceans (Dolphins and Whales) - OBIS heatmap data (intensity of observations)	1-2,5	7-12	0.5
Cetaceans (Dolphins and Whales) - ASI density data (Fig. 8&10)	0,5-0,75	15-34	0.5
Loggerhead Turtle (*Caretta caretta*) – Established & Sporadic Breeding Grounds	50	8-24	0.25
African Softshell Turtle (*Trionyx triunguis*) distribution	5	45	0.5
Seagrass (*Posidonia oceanica*) distribution	7,5	138	0.5
Marine Fish – Important Shard and Ray Areas (ISRAs)	1	80	0.5
Marine Fish – Candidate Important Shard and Ray Areas (cISRAs)	1	1	0.5
Marine Fish – Areas of Interest of ISRAs (AOIs)	0,5	25	0.5
Marine Fish – Areas hosting high Swordfish and Atlantic Bluefin Tuna populations	1,25&2,5	47&51	0.5
Freshwater Fish – Distribution of 3 important species	15	34	0.5
Coralligenous assemblages' locations	40	95	0.5
Birds – Audouin's Gull breeding distribution	15	35	0.5
Birds - Kentish Plover & Ruddy Shelduck & Common Tern & European Shag breeding distributions	5	28	0.5
Birds - Lesser Kestrel breeding distribution	2,5	18	0.5
Areas of High Biodiversity Importance – Key Biodiversity Areas (KBAs)	2,5	69	0.5
Areas of High Biodiversity Importance – Important Plant Areas (IPAs)	2,5	3	0.5
Mediterranean Fan Mussel (*Pinna nobilis*) – Distribution hosting mass mortality & remaining native range	2,5&1,67	121&37	0.5

2.6. Cost Layer

In our analysis, we calculated a Cost Layer to assess the combined effect of diverse factors that increase and decrease the choice for biodiversity and small-scale fisheries. The cost calculated in this approach is not a real economic cost, but an indication of the difficulty or ease of working in an area in line with the objectives. For this, we calculated cost layers separately for the BD and SSFs data. What we intended here was to generate information on the degree of difficulty associated with realizing conservation investments related to BD or SSFs in study units. For example, the presence of elements that support the richness of biodiversity in an area (e.g. artificial reefs), the presence of non-governmental organizations working on conservation, or the presence of protected areas are factors that will increase the choice of that area for biodiversity. Similarly, areas with high sustainability of the SSFs practices (e.g., more young fishers, higher diversity of fishing gears, or higher catch per unit effort (CPUE)) are factors that will increase the choice for SSFs.

While assessing the total cost, we treated the conservation investments and threats specifically. In this study, conservation investments were identified as one of the factors that decrease the choice for SSFs and BD. Our general approach was to prioritize areas that have not received much conservation investment, and in this sense, with higher investment needs. In other words, of any two study units (1x1 km grid cells) with similar elements, the one that received less conservation investment was given a lower cost and granted a higher choice.

Regarding the threats, our general approach was not to avoid sites with threats, but on the contrary, to focus on the areas with a high concentration and/or impact of threats. However, an important distinction was made on the reversibility of threats. Irreversible threats were identified as threats whose negative impacts (on BD or SSFs) could not be reduced/reversed in line with conservation investments. Whereas reversible threats were those that are actionable, in other words, the negative impacts could be reduced/reversed through effective investments on the ground. Therefore, in the cost analysis, reversible threats were handled in a way to increase the choice and decrease the overall cost. Irreversible threats, on the other hand, were handled in a way to decrease the choice and increase the cost.

As detailed in the following sections of the report, various layers were produced in the analysis with different resolutions and approaches. We aimed to differentiate their impacts on the analysis by assigning them individual weights. The weight coefficients were determined through surveys, expert workshops, and the participation of project team experts. In particular, data resolution, reliability, and the relevance of the element were considered together during weighting (Table 3).

These layers were synthesized under 4 sub-groups with their specific weights: factors increasing choice, reversible threats, factors decreasing choice, and irreversible threats separately for BD and SSFs. We then grouped them under two to calculate the cost: Factors Decreasing Choice (increasing the cost) and Factors Increasing Choice (decreasing the cost). To do so, the four sub-groups were combined by giving a weighted multiplier effect. The weights used were determined by the methods used within the scope of multi-criteria decision analysis principles. While calculating the total cost layer, the following formula was used for both BD and SFF:

$$(\text{Irreversible Threats}*1.75+\text{Other Factors Decreasing Choice}*1.25) - (\text{Reversible Threats} + \text{Other Factors Increasing Choice})=\text{Total Cost}$$

Table 3. The layers used in the cost analysis, their weights, and sub-groups

BD/SSFs	Layer Name	Weight	Sub-Group Name
BD	Protected areas & Protection effectiveness	4,54	Other Factors Increasing Choice
	Density of threatened marine animals	4.13	Other Factors Increasing Choice
	Species density & richness	1.00	Other Factors Increasing Choice
	Marine priority areas	1.00	Other Factors Increasing Choice
	Habitat diversity – Diversity of habitat types	3.88	Other Factors Increasing Choice
	Habitat diversity – Diversity of topography	4.13	Other Factors Increasing Choice
	Habitat diversity – Presence of artificial reefs	3.93	Other Factors Increasing Choice
	Opportunities - Fishing gear selectivity	3.88	Other Factors Increasing Choice
	Opportunities - Organizational capacity	3.67	Other Factors Increasing Choice
	Expert opinions from the Nature and Culture Coexistence on the Aegean Coasts Workshop	2.00	Reversible Threats
	Level of water pollution - National TÜBİTAK Dataset	2.50	Reversible Threats
	Level of water pollution - Expert opinions from the Nature and Culture Coexistence on the Aegean Coasts Workshop	1.50	Reversible Threats
	Concentration of marine litter	1.00	Reversible Threats
	Bycatch probability of marine species	3.25	Reversible Threats
	Presence of aquafarms	3.00	Reversible Threats
	Conservation Investments – Project budget	4.46	Other Factors Decreasing Choice
	Conservation Investments – Project frequency	3.63	Other Factors Decreasing Choice
	Conservation Investments – Project number	3.13	Other Factors Decreasing Choice
	Enforced Protection – Presence of management plans in protected areas	3.57	Other Factors Decreasing Choice
	Expert opinions from the Nature and Culture Coexistence on the Aegean Coasts Workshop	2.00	Irreversible Threats
	Human impact to marine ecosystems	3.15	Irreversible Threats

BD/SSFs	Layer Name	Weight	Sub-Group Name
SSFs	Opportunities - Fishing bans towards large-scale fisheries (weights distinguished by each of the ban's impact on SSFs)	1.25-3.75-5	Other Factors Increasing Choice
	Sustainability of the practice – Volume of the SSFs fleet	4.50	Other Factors Increasing Choice
	Sustainability of the practice – Diversity of fishing gear	3.88	Other Factors Increasing Choice
	Sustainability of the practice – Presence of fishing facilities	4.12	Other Factors Increasing Choice
	Sustainability of the practice – Catch Per Unit Effort (CPUE)	4.13	Other Factors Increasing Choice
	Sustainability of the practice – Young fishers	3.71	Other Factors Increasing Choice
	Sustainability of the practice – Women fishers	2.50	Other Factors Increasing Choice
	Proximity to biodiversity-rich areas	2.88	Other Factors Increasing Choice
	Expert opinions from the Nature and Culture Coexistence on the Aegean Coasts Workshop	2.00	Reversible Threats
	Level of water pollution - National TÜBİTAK Dataset	2.50	Reversible Threats
	Level of water pollution - Expert opinions from the Nature and Culture Coexistence on the Aegean Coasts Workshop	1.50	Reversible Threats
	Conservation Investments – Project budget	4.46	Other Factors Decreasing Choice
	Conservation Investments – Project frequency	3.63	Other Factors Decreasing Choice
	Conservation Investments – Project number	3.13	Other Factors Decreasing Choice
	Expert opinions from the Nature and Culture Coexistence on the Aegean Coasts Workshop	2.00	Irreversible Threats
	Route & Vessel Density	3.13	Irreversible Threats
	Large vs small-scale fisheries potential conflict hotspots	1.88	Irreversible Threats
	Seasonal bans towards small-scale fisheries (weights distinguished by each of the ban's impact on SSFs)	1.25-2.50-3.75	Irreversible Threats

2.7. Biodiversity Optimization Analysis

A. Optimization

To identify areas important for biodiversity, we performed an optimization analysis using both the conservation targets of the important biodiversity elements and the cost layer for biodiversity (Figure 3). The small-scale fisheries were considered an element to conserve on their own. We therefore didn't need to apply an optimization analysis on this topic, and the priority areas were determined using the calculated cost surface. Then, by intersecting these two result sets, the SSFs cost surface and the BD optimization results set, the final solution set of priority areas for BD and SSFs was obtained.

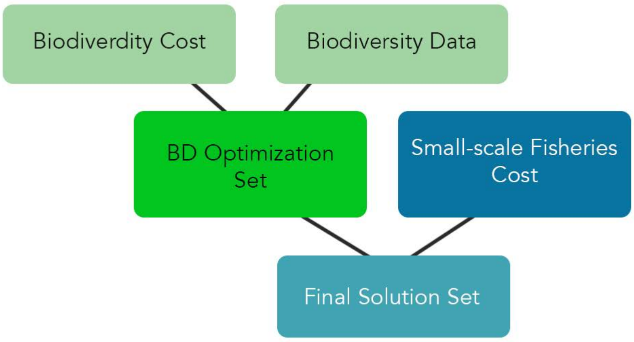


Figure 3. Data analysis approach for biodiversity and small-scale fisheries

The optimization analysis was carried out using a software called MARXAN (Game and Grantham, 2008). In the optimization process, the conservation targets of the priority species and areas (important biodiversity elements) and the cost of each study unit (1x1 km grid cell) were considered to achieve the highest conservation target with the lowest cost. For this, an algorithm of MARXAN software (Simulated Annealing Algorithm, followed by Iterative Improvement) was used.

We have always envisaged the final solution set to be restricted to SSFs fishing grounds. However, to maintain the integrity of the biodiversity optimization, the optimization analysis was carried out in a wider boundary than the fishing grounds (detailed in Section 5.4). After the results were obtained, the study area boundary was narrowed to the fishing grounds.

While producing the final solution set of priority areas, we decided to exclude certain areas where conservation objectives have already been achieved. In this context, protected areas (details presented in Section 3.2.1.1) and areas where fishing (small or large-scale) is completely prohibited were included in both the initial solution set and the final solution set of the analysis due to their contribution to conservation (locked-in status in the MARXAN Algorithm). In the optimization analysis, the algorithm was able to select areas

The analysis results consist of a final solution set of priority areas (1x1 km grids) where conservation investments will be realized both towards biodiversity and small-scale fisheries. Lastly, if the selected areas were scattered throughout the study region, implementing conservation practices would become challenging. We therefore modified the algorithm to reduce the boundary length and increase the selection of neighboring grids. The boundary length modifier also urged the algorithm to complement the protected areas.

These enabled the analysis to produce optimum results. The basic parameters used in the analysis are given in Table 4.

Table 4. The algorithms and parameters used in the analysis

Parameters	Value
Number of repeat runs (or solutions)	1,000
Run option	1 - Simulated Annealing followed by Iterative Improvement
Iterative improvement	0 - Normal
Number of iterations	10,000,000
Number of temperature decreases for annealing	10,000
Proportion of planning units in initial reserve system	0.5
Boundary Length Modifier	1

The resulting area set from the biodiversity optimization analysis was overlapped with the cost surface of the SSFs at the final step of the analysis. This permitted producing a final solution set of priority areas limited to the fishing grounds.

B. Scenarios

In our study, we also ran eight scenarios to assess the impact of different factors on our analysis and finetune our results. The main purpose of these scenarios was to observe how the results were impacted by changes in assigned weights and additional factors. Table 5 summarizes the objectives of and discussions regarding the scenarios considered.

Table 5. The objectives, methods and results of the scenarios

No	Aim and Method
Scenario 1	Reducing the probability of selecting districts with geographical advantage (longer boundaries) by introducing the inverse relation of square number of maritime districts with a lower coefficient.
Scenario 2	Excluding the pollution data from the national workshop from the cost calculations of BD and SSFs.
Scenario 3	Integrating the large vs small-scale fisheries potential conflict hotspots to the reversible threats in place of irreversible threats for SSFs.
Scenario 4	Excluding the large vs small-scale fisheries potential conflict hotspots layer from the cost layer of SSFs.
Scenario 5	Not using locked-in grids and treating all grids equally in the optimization analysis.
Scenario 6	Incorporating Cumulative Human Impact data to reversible threats for calculating BD cost.

No	Aim and Method
Scenario 7	Combination of Scenarios 1 & 2
Scenario 8	The boundary length effect for the convergence of the final solution set to the coastline rather than to the marine areas is less costly in the squares with a terrestrial area.

3. Biodiversity

3.1. Important Biodiversity Elements

A. Marine Mammals

The Aegean Sea holds significant global importance for marine mammals due to its unique ecological characteristics and diverse species populations. Acting as an ecological corridor, it facilitates the movement and genetic flow of marine species between the Black Sea and the Eastern Mediterranean (Anagnostou et al., 2022).

There have been ongoing efforts to observing and monitoring the populations of these species realized by different organizations, including NGOs (Sualtı Araştırmaları Derneği - Akdeniz Foku Araştırma Grubu; SAD-AFAG, Turkish Marine Research Foundation; TUDAV, Marine Mammals Research Association; DMAD, Mediterranean Conservation Society; AKD, WWF-Türkiye), academia (İstanbul University, Ege University, Dokuz Eylül University, Middle East Technical University), among others.

Different marine mammal species, including cetaceans and the Mediterranean Monk Seal (*Monachus monachus*), can be found wandering the Aegean Sea (Tonay et al., 2015). These marine mammals are faced with threats more intensively than in previous decades (Notarbartolo di Sciara and Tonay, 2021). Therefore, it was of high importance to integrate distribution and population density data on these groups in the analysis as a measure of biodiversity.

Accordingly in the study, marine mammals were assessed as two groups: the Mediterranean Monk Seal and Cetaceans (Dolphins & Whales). Below the details of the information gathered are presented including the data sources and the organizations/experts who supported the data-gathering process.

A.1. Mediterraenan Monk Seal (*Monachus monachus*)

Mediterranean Monk Seal (*Monachus monachus*) is one of the most symbolic threatened species in the Aegean Sea. The threat status of the species was recently downscaled from Endangered (EN) to Vulnerable (VU) globally and in Europe thanks to long-term conservation efforts, while remaining Endangered in the Eastern Mediterranean (Karamanlidis et al., 2023).

SAD-AFAG (Sualtı Araştırmaları Derneği - Akdeniz Foku Araştırma Grubu) is one of the leading NGOs working towards the conservation of the species since the 1980s in Türkiye. To identify sites hosting important populations of the Mediterranean Monk Seals, guidance from SAD-AFAG was taken. Despite stable population trends, numerous threats to the Monk Seal still persist in Türkiye keeping the status of the species critical. Therefore, effective conservation measures for the species and its habitat remain of crucial importance and should be pursued with vigor (Karamanlidis et al., 2023). The threats to the species and its habitat are outlined in detail in Kıraç and Savaş (2019) and Kıraç et al. (2022).

Important Monk Seal Areas

Following the input of SAD-AFAG experts (Cem Orkun Kıraç, Yalçın Savaş), the Important Monk Seal Areas identified in the National Strategic Action Plan for the Conservation of Monk Seal in Türkiye (Kıraç et al., 2013) were used. Even though the species is highly mobile and can be observed throughout much of the region, these sites indicate key areas that host important sub-populations, particularly breeding coastal habitats that merit conservation action in Türkiye. The data was digitized from the action plan to map the sites of importance along the Aegean Coast. A total of 31 areas were mapped using QGIS Software, falling within the boundaries of GFCM Geographic Sub-Area 22 Aegean Sea (Figure 4).

For the analysis, we set a conservation target of 5%, or an area of 118 km², for the Mediterranean Monk Seal. Like other important biodiversity elements, the threshold was given by considering the threat status of the species and its total distribution in the study area (2,352 km²).

Figure 4. Map showing the Important Monk Seal Areas in Türkiye within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

A.2. Cetaceans (Dolphins and Whales)

Up to 11 species of cetaceans, namely dolphins and whales, are observed in the seas of Türkiye (Notarbartolo di Sciara and Tonay, 2021). The threat status of these species differs among one another, it is however fair to assume that the level of pressure acting on them is increasing steadily (Notarbartolo di Sciara and Tonay, 2021). As a measure of marine biodiversity, existing data and information on the distribution of cetaceans and areas that hold a relatively "greater" importance for their conservation was gathered. For this, different data owners were contacted, and a literature search was carried out with the guidance of experts from Universities (Istanbul University Faculty of Aquatic Sciences), NGOs (Marine Mammals Research Association; DMAD, Turkish Marine Research Foundation; TUDAV, Hidrobiyolojik Araştırmalar Derneği; HİDRA, and the Mediterranean Conservation Society; AKD) (Figure 5).

Our overall approach was to gather existing data on the ensemble of species instead of focusing on the individual species' information. This was mainly due to the diverse nature of the accessible data. Therefore, areas designated as important for cetaceans or those with a high number of observations (as a measure of species richness) were employed. The sources used include region-wide studies (ACCOBAMS, 2021; Akkaya et al., 2021), databases (Intercet Platform, OBIS Database), local studies (Alan et al., 2018; Alan, 2015), and expert opinions (Aylin Akkaya, unpublished data). Additionally, recently published Important Marine Mammal Areas (IMMAs) data were utilized (IUCN MMPATF, 2023).

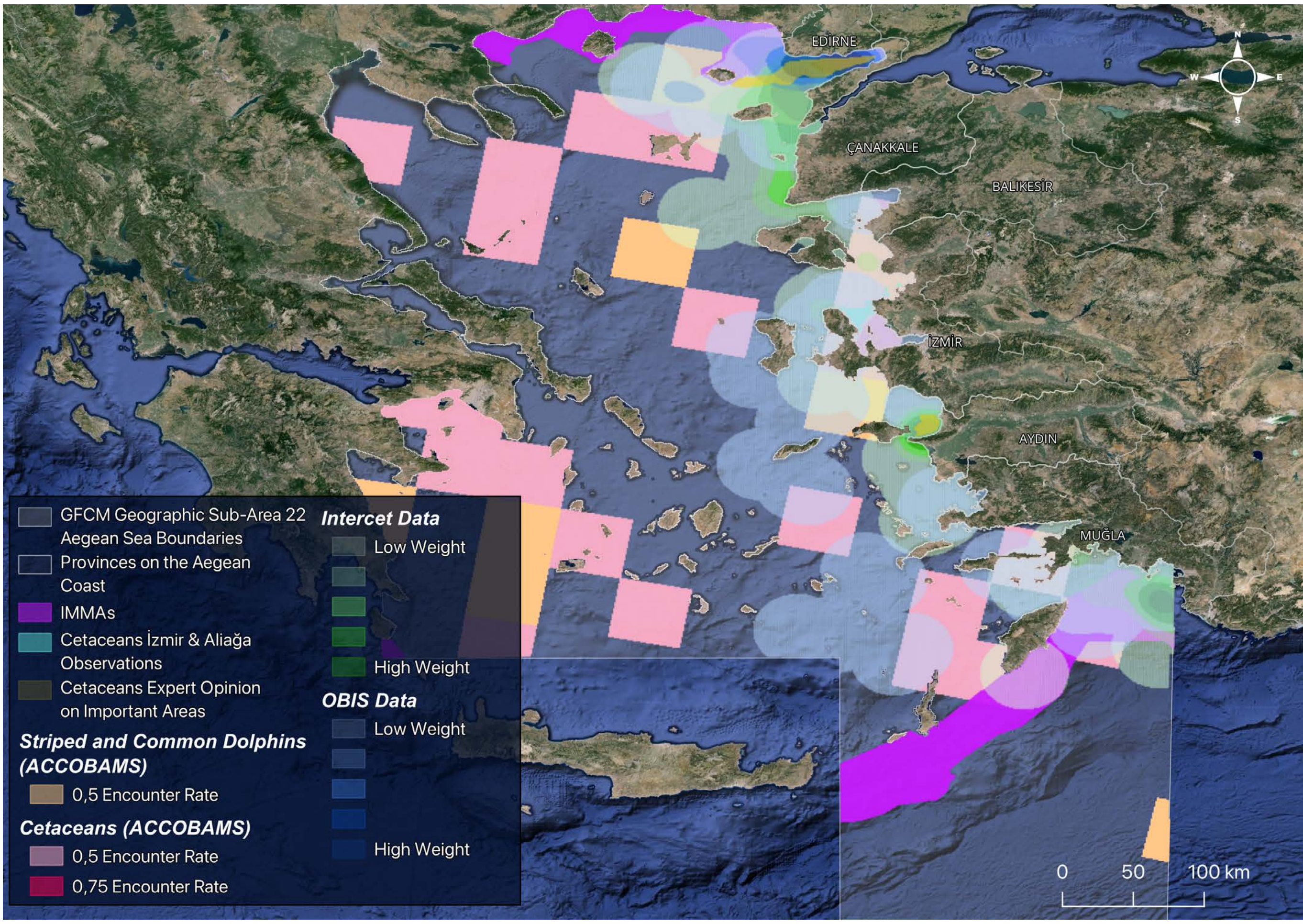


Figure 5. Map showing different types of cetacean data gathered within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

Data collection carried out in the boundaries of GFCM Geographic Sub-Area 22 Aegean Sea is detailed below:

- Encounter rate data on cetaceans gathered through systematic aerial surveys was used (ACCOBAMS, 2021). The relevant information presented in the publication was digitized. Species-level distinctions could not be gathered from this dataset. The encounter rates at 50x50 km scale were used as a measure of the relative importance of each study unit (1x1 km grid cells) for cetaceans.
- Observations of different species of cetaceans were gathered from the Intercet Platform (through the permits of the Marine Mammals Research Association; DMAD, TUDAV, and Istanbul University) and the OBIS Database following the acquisition of relevant permits. These data sources provided point location information for each observation on a species, excluding observer effort. The point information needed to be translated into distribution maps to better reflect the presence or absence of species in general terms. To achieve this in the project, we generated heatmaps, in line with the intensity of the observations, without making a species-level distinction. This provided information that was less detailed than species-level distribution maps, yet more informative than point-level information. The intensity of the observations was used as a measure of the relative importance of each study unit (1x1 km grid cells) for cetaceans.
- Observation data from local studies were gathered from publications (Akkaya et al., 2021; Alan, 2015; Alan et al., 2018) and digitized. Some of the data sources permitted distinguishing species while others did not.
- Expert opinions were gathered to verify and to fill the gaps in the collected data when necessary from unpublished data (Aylin Akkaya, unpublished data).
- Important Marine Mammal Areas do correspond to "discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation" (IUCN MMPATF, 2023). 242 IMMAs have been identified based on qualifying and supporting species, which includes the Mediterranean Monk Seal. Given that in our study, important Mediterranean Monk Seal Areas have already been taken into consideration, we used the IMMA data with one adaptation; we have excluded IMMAs whose delineation was based solely on the presence of the Mediterranean Monk Seals. As a result, 3 IMMAs falling within our GFCM Geographic Sub-Area 22 Aegean Sea boundaries were included in the analysis.

In the study, we assigned conservation targets to each of these datasets by considering two factors – the resolution of the data, and the total distribution in the study area. Given the nature of the data, we couldn't distinguish the species, hence their threat status, and integrate this into assigning conservation targets. As a rule, in line with the resolution of the data, we assigned higher targets to data with higher resolution, and thus higher precision. Furthermore, with the heatmaps we generated for the global datasets (Intercet Platform and OBIS Database), we differentiated conservation targets and assigned higher targets to grids holding higher observation intensity. Conservation targets of these data layers differed between 0,5% to 10%. Where there were overlaps in these data layers, they were incorporated into the optimization separately as independent components.

B. Herpetofauna

Türkiye hosts a high diversity and endemism of amphibians and reptiles (Ilgaz, 2019). The majority of the species are distributed in inland terrestrial and freshwater ecosystems. Yet there are important elements of this group present along the coastal ecosystems in the Aegean Region in Türkiye. Among them, globally known species of marine turtles, which are also amongst the most studied species in the country by different NGOs (WWF-Türkiye, Sea Turtle Research, Rescue and Rehabilitation Center; DEKAMER) and universities (Pamukkale University, Aydın Adnan Menderes University) are present.

To determine which elements of herpetofauna to integrate into the analysis, a selection process was developed with the aid of experts from Ege University (Dilara Arslan and Çetin Ilgaz), and DEKAMER (Yakup Kaska). Thereon with the support of an expert from Adıyaman University (Mehmet Zülfü Yıldız) the assessment was realized. Using the database of IUCN, a list of amphibian and reptile species distributed in Türkiye was generated. Using the list, species (i) distributed along the coast, especially in lagoons, and (ii) which have higher threat status at the global level (using IUCN red list categories) were selected. This way, species representative of the coastal ecosystems and priority for conservation could be identified. This exercise produced two target species to integrate into the analysis: the Loggerhead Turtle (*Caretta caretta*) and African Softshell Turtle (*Trionyx triungus*).

B.1 Loggerhead Turtle (*Caretta caretta*)

Loggerhead Turtle is among the emblematic species (VU; Vulnerable at the global scale, Casale and Tucker, 2017) with a very long monitoring and conservation history in Türkiye. The conservation initiatives undertaken by non-governmental organizations, governmental institutions, and academia since the 1970s, culminated in the adoption of the Notification on the Conservation of Sea Turtles (dated and numbered 2009/10; Deniz Kaplumbağalarının Korunması Genelgesi). The well-established breeding locations of the species are detailed in this notification. These sites are located more in the southern part of the country, mostly towards the Mediterranean Region. Yet, since the onset of the 2010s, there has been an increasing number of sporadic breeding attempts in the Aegean Region of the country. The breeding dynamics in this region are rather diverse; some sites hosted consistent nesting activity by only one or two adults over 13 years, while there are sites where successful breeding took place only once but with a higher number of animals. Overall, these breeding sites were used sporadically with a small number of nests established. However, following the guidance of experts from DEKAMER, it was concluded that even small, they hold the potential to become more established breeding grounds in the future. For this reason, these sites were also included in the prioritization analysis.

The regular breeding sites along the Aegean Coast were digitized from the Notification. A total of 3 areas were mapped using QGIS Software, falling within the boundaries of GFCM Geographic Sub-Area 22 Aegean Sea. For the sporadic breeding locations, literature surveys (Başkale et al., 2018; Pietroluongo et al., 2018; Yalçın Özdilek et al., 2020) and detailed surveys on news sources (covering a period between 2011 and 2023) were realized. As a result, 21 beaches that were used sporadically were mapped (Figure 6). For the analysis, we set a conservation target of 50%, or an area of a total of 32 km^2, for the Loggerhead Turtle. The high threshold was given by taking into account the high threat status of the species and its total distribution in the study area (63 km^2).

Figure 6. Map showing the established and sporadic breeding grounds of Loggerhead Turtle (*Caretta caretta*) within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

B.2. African Softshell Turtle (*Trionyx triunguis*)

African Softshell Turtle is a reptile species with is threatened at the global (VU; Vulnerable; van Dijk et al., 2017) and even more at the Mediterranean scale (CR; Critically Endangered; European Reptile & Amphibian Specialist Group, 1996). We downloaded species distribution data from the IUCN Red List database (IUCN, 2017) and used the area within the boundaries of GFCM Geographic Sub-Area 22 (Aegean Sea) in our analysis (Figure 7).

For the analysis, we set a conservation target of 5%, or an area of a total of 45 km², for the African Softshell Turtle (distribution within the study area was 888 km²).

Figure 7. Map showing the distribution of African Softshell Turtle (*Trionyx triunguis*) within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

C. Seagrass (*Posidonia oceanica*)

Seagrass (*Posidonia oceanica*) is an important indicator species for the health status of coastal ecosystems (Montefalcone, 2009; Personnic et al., 2014). Forming meadows, this Mediterranean endemic species is an important component of marine biodiversity via increasing oxygen availability, sustaining habitat, and serving as a refuge and breeding ground, fixing carbon, among other functions (Akçalı et al., 2019a; Duman et al., 2019; Montefalcone, 2009). Given the importance of the species in representing marine biodiversity status, significant efforts were dedicated to gather information about their distribution, under the guidance of experts (Muhammed Duman, Erhan Mutlu). National and international literature and global data sources were also explored (Figure 8).

The main source of information for the distribution of seagrass in the Aegean region of Türkiye was the outcomes of the Duman et al. (2019) paper. This study utilized acoustic ground-discrimination systems to map the distribution of *Posidonia oceanica*. Detailed spatial data provided by the research team, reflected the distribution of the species for certain sample regions along the Aegean Coast. For the remainder of the region, to complement the species distribution, a detailed literature search of articles, grey literature, and news sources was realized (Ateş et al., 2005; Akçalı et al., 2019a, 2019b; Bizsel et al., 2010; Cirik and Akçalı, 2013; Gümüşoğlu, 2010; Mutlu et al., 2023; Mutlu, 2020; Yokeş and Demir, 2013; Yüksel et al., 2015). Furthermore, international data sources were explored (@Golder, Univ Corse, Okianos, The French Biodiversity Agency (OFB), Mediterranean Posidonia Network (MPN), UNEP-WCMC & Short, 2020). For the analysis, we set a conservation target of 7.5%, or an area of a total of 138 km^2, for seagrass.

Figure 8. Map showing the distribution of seagrass (*Posidonia oceanica*) within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

D. Fish

Working in the coastal and marine realms, information on fishes, especially the more threatened components of fish communities was fundamental in the study. Given the importance of coastal ecosystems, especially the lagoons and deltas for biodiversity, we didn't limit our efforts to focus solely on the marine but also considered the priority freshwater fish species.

D.1. Marine Fish

More than 540 marine fish species are present in the seas surrounding Türkiye (Bilecenoğlu et al., *unpublished data*), and more than 400 of them are present in the Aegean Sea (Bilecenoğlu et al., 2014). There are ongoing efforts to prepare a national red list of marine fish in the country, but results have not been published yet. Consequently, there is no available information on the marine species threatened at the national level and their distributions. To address this knowledge gap, we searched different international data sources, prioritizing the IUCN Mediterranean scale assessments. We searched distribution information, mainly maps of the species that are threatened (CR, EN, VU) or Near Threatened (NT), from the Mediterranean and the Black Sea as the Marine Regions and Türkiye. However, none of the selected species had distribution maps available in the IUCN red list database; and other data sources provided encounter information and not distribution maps. Therefore, to account for the important and priority elements of marine fish, we used two data sources as proxies of marine fish diversity, as detailed below.

Important Shark and Ray Areas (ISRAs)

Sharks and rays are amongst the most threatened components of marine fish diversity, with one-third of the species threatened at the global scale (Dulvy et al., 2021). There have been international efforts to identify the areas that are important for these species, which has led to the successful development of the ISRA (Important Shark and Ray Areas) approach. ISRAs are "discrete, three-dimensional portions of habitat, important for one or more shark, ray, and chimaera species, that are delineated and have the potential to be managed for conservation". Different criteria such as vulnerability, restricted range, life-history features, and special attributes are used in this approach to identify areas. For all the ISRAs identified, factsheets detailing the area, and the species which trigger different criteria are provided (see details in https://sharkrayareas.org/e-atlas/) (Figure 9).

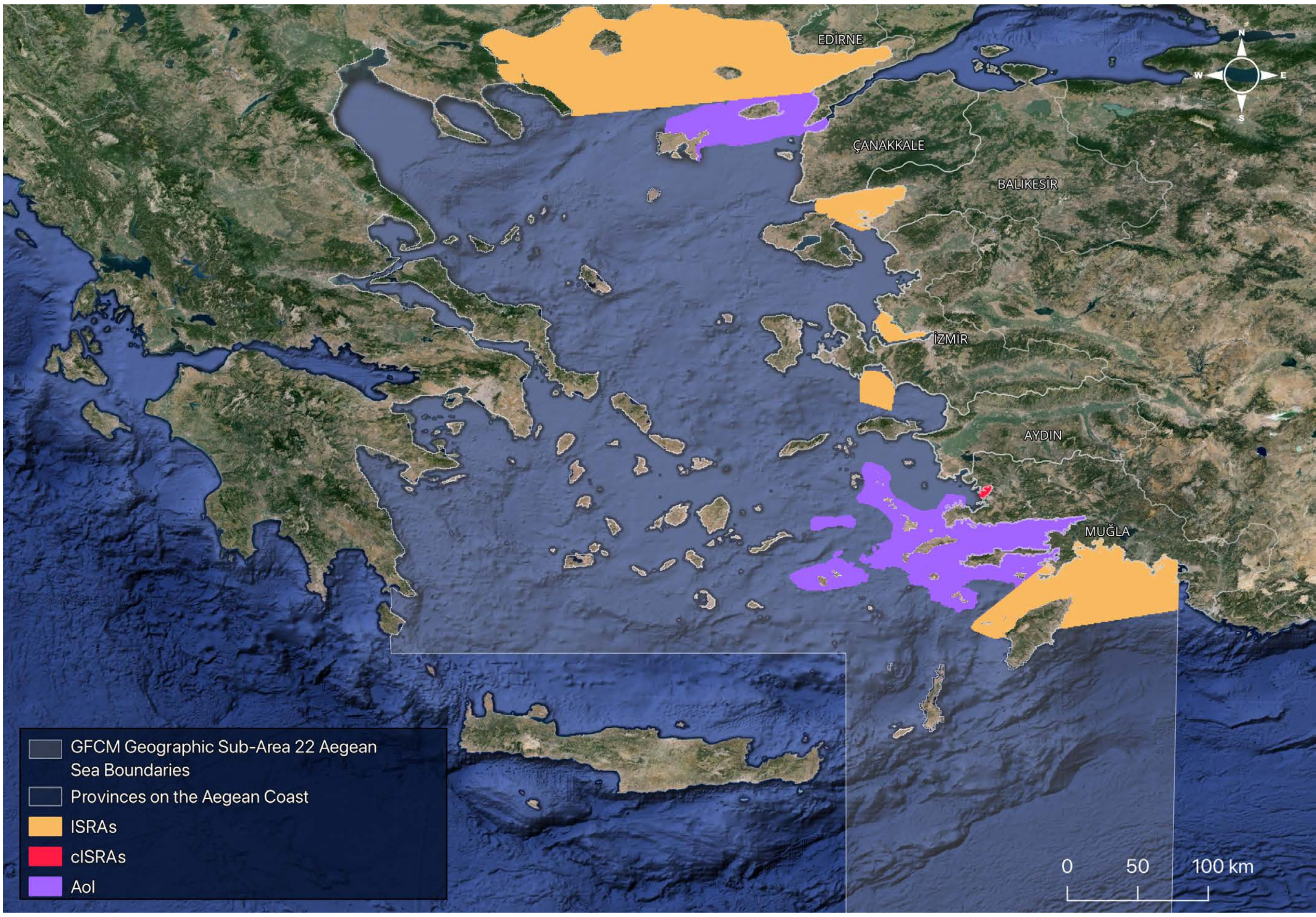


Figure 9. Map showing ISRAs, cISRAs and AoI within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

In this study, ISRAs delineated at the scale of the Mediterranean scale were employed (IUCN SSC Shark Specialist Group, 2022). 6 such areas were present in our study area (namely Thracian Sea Shelf, Southeastern Aegean Sea, Sigacik Bay, Izmir Bay, Edremit Bay, and Boncuk Bay). Furthermore, candidate ISRAs (cISRAs) and Areas of Interest (AoIs) were incorporated into the analysis. Candidate ISRAs are areas that trigger the ISRA criteria, but which await the review of an independent review panel to be classified as ISRAs. In our study area, one cISRA, namely Güllük Bay was present. Lastly, Areas of Interest are areas that don't have sufficient information to trigger the ISRA Criteria and thus do not become a candidate ISRA (cISRA). Yet in the presence of additional information, they hold the potential to become ISRAs. In our study area, two AoIs were identified (Truva Shelf, Dodacanese). In our analysis, we used all 3 components of the ISRAs.

For the analysis, we set a conservation target of 1%, or an area of a total of 80 km^2, for ISRAs. We used the same conservation target for cISRAs, which led only to an area of 1 km^2. Lastly for AoIs, we used a lower target as 0,5%, which meant an area of 25 km^2.

Areas Hosting High Swordfish and Atlantic Bluefin Tuna Populations

Swordfish (*Xiphias gladius*) and Atlantic Bluefin Tuna (*Thunnus thynnus*) are ecologically significant keystone species with a disproportionately high impact on their ecosystem relative to their population density (Rodriguez-Marin et al., 2015; MacKenzie et al., 2021; Andrews et al., 2022). Swordfish is Near Threatened (NT) at the global scale (Collette et al., 2022), and Atlantic Bluefin Tuna is Endangered (EN) at the Mediterranean scale (Di Natale et al., 2011). These species are managed by Regional Fisheries Management Organizations (RFMOs) due to their high economic value. As key predators, regions with higher populations of these species are indicative of areas with greater marine fish richness. Both species are highly migratory and present throughout the study area, yet in this study, we aimed to identify critical sites for these species in the Aegean Sea. Using existing literature, we mapped heavily fished locations of these species (Akyol et al., 2010, 2014; Ceyhan et al., 2018; Karakulak, 1999, 2004; Karakulak and Oray, 1995; Karakulak et al., 2004, 2016; Karakulak and Ceyhan, 2024; Mengual, 2023). A correlation between the fishing pressure and population size was assumed, as such economically important species are likely targeted in areas with higher populations (Figure 10).

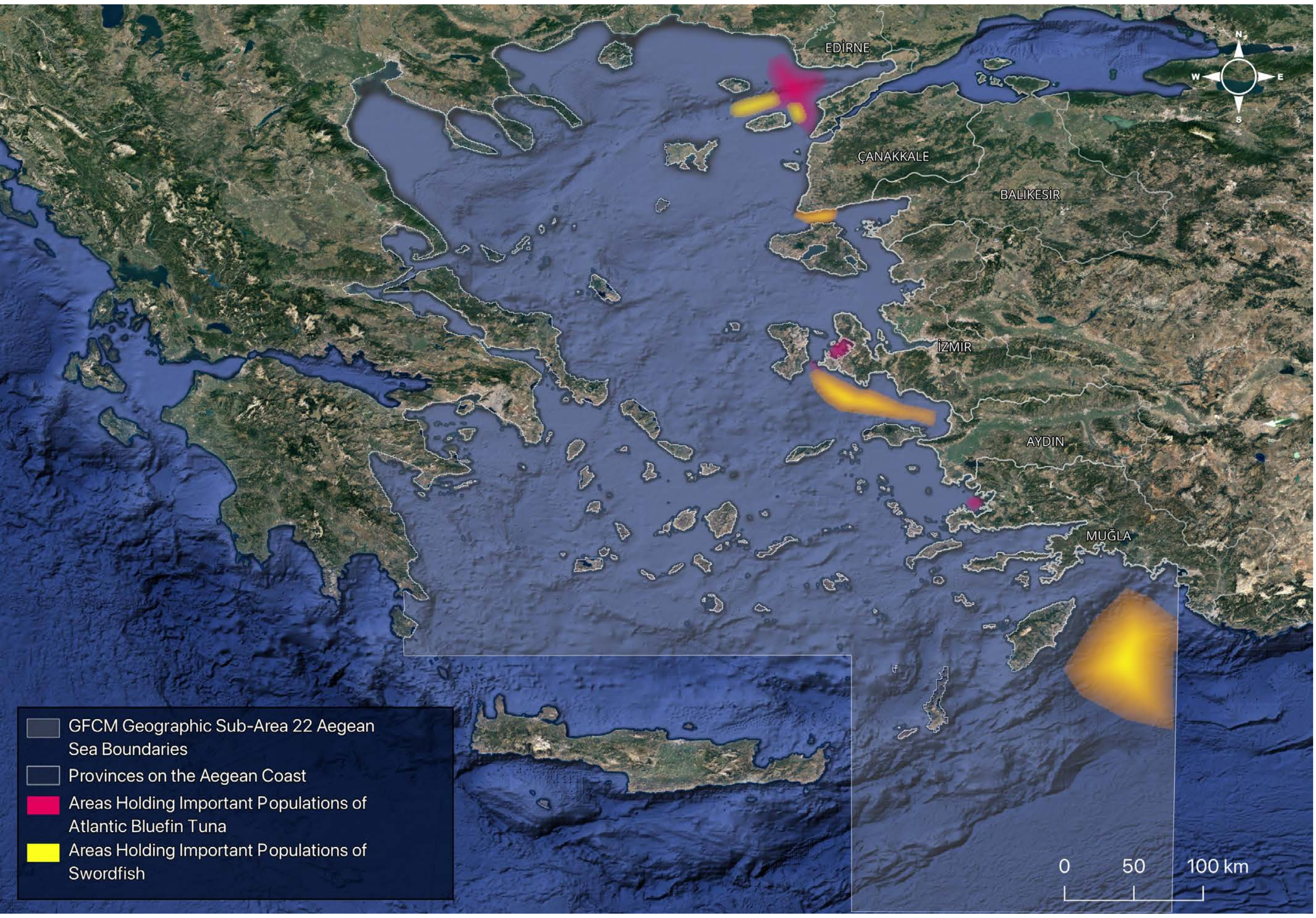


Figure 10. Map showing areas holding important populations of Swordfish and Atlantic Bluefin Tuna within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

For the analysis, we set a conservation target of 1.25%, or an area of a total of 47 km^2, for the Atlantic Bluefin Tuna. Given the higher threat status (Near Threatened, NT) of the Swordfish, we used a higher conservation target of 2.5%, which led to an area of 51 km^2.

D.2. Freshwater Fishes

Freshwater fishes are among the species groups with a high rate of endemism in Türkiye. Based on current data and expert assessment provided by Baran Yoğurtçuoğlu, the co-chair of the Western Palearctic of IUCN/SSC Freshwater Fish Specialist Group, of the approximately 380 freshwater fish species recognized in Türkiye, 46% are endemic, and many occur in only one or two locations. These species are mainly distributed in inland ecosystems, but there are species of conservation priority distributed along the ecosystems of the Aegean Region in Türkiye.

To determine which species of freshwater fish should be included in the analysis, a step-by-step selection process was developed with the aid of local IUCN experts. The first step was to identify all freshwater fish species that occur in coastal ecosystems. Three species were then selected that are (i) threatened (CR, EN or VU), and (ii) inhabit coastal or fresh or brackish water ecosystems. These species were: European Eel (*Anguilla anguilla*), Almiri Killifish (*Aphanius almiriensis*), and Gediz Dwarf Goby (*Knipowitschia mermere)*. The European Eel and Almiri Killfish are both Critically Endangered (CR) at the global level, while Gediz Dwarf Goby, an endemic species of Türkiye, is Vulnerable (VU).

We aimed to identify areas with important feeding and spawning grounds (excluding European Eel) for these species in the study area. The European Eel is a species that can be found all along the Aegean coast, but only sites where the species aggregates in high densities were selected as areas of conservation concern. For this, hydro basins as identified in Lehner and Grill (2013; 8^{th} level) were used. The experts highlighted significant micro-basins where the species is actually or potentially present and which are also crucial for both biodiversity and socio-economic activities. The distribution of the species falling within the boundaries of GFCM Geographic Sub-Area 22 Aegean Sea was used in the analysis (Figure11).

For the analysis, we set a conservation target of 15%, or an area of a total of 34 km^2, for the three freshwater fish species in total.

Figure 11. Map showing hydro basins (8th level) representing important feeding and breeding grounds (except European Eel) of the three freshwater fish species within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

E. Coralligenous Assemblages

In marine ecosystems, coralligenous assemblages, which are habitats established by one or more coral species, are one of the most important biodiversity hotspots, together with seagrasses (SPA/RAC, 2017; Ballesteros, 2006; Sala and Knowlton, 2006). Yet they are also one of the most threatened components of biodiversity, especially due to trawling, anchoring, pollution, invasive alien species, and climate change, amongst other factors (SPA/RAC, 2017). In the Aegean Sea, the coralligenous assemblages host also a high biological diversity and threatened species (Bilecenoğlu and Çınar, 2015; Özalp, 2013, 2021; Yokeş and Demir, 2013). Considering their importance, significant efforts were dedicated to gathering information about the distribution of coral species, with the aid of experts (Ertan Dağlı, H. Barış Özalp), and using the literature (Cihangir et al., 2011; Gönülal and Güreşen, 2017; Güreşen et al., 2015; Özalp, 2013, 2016, 2018, 2019a, 2019b, 2021, 2023; Özalp and Odabaşı, 2021; Özalp and Alparslan, 2011, 2016; Özalp and Altuncu, in prep.; Öztürk et al., 2008; Topçu Eryalçın, 2017; Yokeş and Demir, 2013; Yığın et al., 2022), and information in the national legislations (Anonymous, 2020) (Figure 12).

Our overall approach was to gather existing data on the ensemble of species instead of focusing on the individual species' information. This was mainly due to the diverse nature of the accessible data. Furthermore, in the absence of detailed information on the location of the species, the distribution information was digitized using our study units (1x1 km grid cells). Information on the distribution of habitats made up of up to 14 species was gathered this way (*Axinella cannabina, Balanophyllia europaea, Caryophyllia caespitosa, C. inornata, C. smithii, Eunicella cavolini, E. singularis, Leptopsammia pruvoti, Madracis pharensis, Paramuricea clavata, Phyllangia mouchezi, Polycyathus muellerae, P. pulchellus,*

Figure 12. Map showing the distribution of coralligenous assemblages within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries.

Savalia savaglia).

For the analysis, given the importance of the coralligenous assemblages, we set a high conservation target of 40%, or an area of a total of 95 km^2.

F. Birds

As a reliable indicator of biodiversity, we gathered information on birds in the analysis. The Aegean Sea hosts up to 360 bird species (Onmuş, 2015). Among them, pelagic birds are few, e.g., Yelkouan Shearwater (*Puffinus yelkouan*), a species Vulnerable (VU) at the global scale (BirdLife International, 2018). There has been no confirmed breeding of these seabirds in the Aegean Sea of Türkiye (BirdLife International, 2024). Therefore, in place of employing information on pelagic seabirds, we focused on gathering information about the breeding distribution of marine & coastal birds in the study area. Under the guidance of ornithology experts (Kerem Ali Boyla, Dilek Şahin) 6 species were selected as target species for this study (namely European Shag (*Phalacrocorax aristotelis*), Common Tern (*Sterna hirundo*), Ruddy Shelduck (*Tadorna ferruginea*), Lesser Kestrel (*Falco naumanni*), Audouin's Gull (*Ichthyaetus audouinii*), Kentish Plover (*Charadrius alexandrinus*)).

The information on the breeding grounds and/or areas where these species were resident was gathered mainly from the Breeding Bird Atlas study outcomes (Boyla et al., 2019), and the distribution maps presented by Kirwan et al. (2010). The missing information was complemented from different literature sources (Onmuş, 2015; Onmuş and Gönülal, 2019; Yaylalı et al., 2023). Given these species use mainly land, distribution information was confined to terrestrial areas for the analysis (Figure 13).

For the analysis, we distinguished conservation targets among the 6 species, taking into consideration the threat status of the species at the global level, and their total distribution in the study area. The highest target was assigned to Audouin's Gull (*Ichthyaetus audou-*

Figure 13. Map showing the distribution of the target bird species within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

inii), which is Vulnerable (VU) at the global level. Its conservation target was set to 15%, corresponding to an area of a total of 35 km^2. The conservation targets of Kentish Plover (*Charadrius alexandrinus*), Ruddy Shelduck (*Tadorna ferruginea*), Common Tern (*Sterna hirundo*), and European Shag (*Phalacrocorax aristotelis*), was set to 5%, corresponding to a total area of 28 km^2. Finally, the conservation target of the Lesser Kestrel (*Falco naumanni*) was assigned as 2.5%, an area of 18 km^2. In grid cells with multiple seabird species, thus multiple conservation targets, we considered the highest conservation target, rather than summing the targets of all species present.

G. Mediterranean Fan Mussel

Mediterranean Fan Mussel (*Pinna nobilis*) an endemic of the Mediterranean Sea, is one of the biggest bivalve molluscs on the global scale (Pensa et al., 2022). Filtering water and contributing to water clarity are the key ecological roles of the species (Cabanellas-Reboredo et al., 2019; Trigos et al., 2014). The species is listed as Critically Endangered (CR) at the global scale, mainly due to a parasite causing massive outbreak (Kersting et al., 2019). Using the map provided in IUCN (November 2019) the distribution information was digitized using the study units (1x1 km grid cells) of the project. While doing so, the native range and the sites hosting mass mortality ≥85% were distinguished from one another to reflect the status of the species along the study area (Figure 14).

For the analysis, the conservation target was set to 2.5% in sites hosting mass mortality (121 km^2) and set to 1.67% in the remaining native range of the species (an area of a total of 37 km^2). There are recent studies which indicate the complete extinction of the species along the coasts in Türkiye (Öndes et al., 2020), yet we included it in our analysis with a lower impact.

Figure 14. Map showing the distribution of the Mediterranean Fan Mussel within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

H. Areas of High Biodiversity Importance

Different approaches exist to identify areas hosting important elements of biodiversity at the global scale. Key Biodiversity Areas (KBAs), Important Bird Areas (IBAs), Prime Butterfly Areas (PBAs), and Important Plant Areas (IPAs) are examples. They rely mainly on identifying areas that trigger certain criteria (e.g., presence of species with certain threat status, habitat choice or behavior of species, etc.). In most cases, they are developed for single or multiple species groups. In Türkiye, through the efforts of NGOs, in collaboration with universities, 255 Important Bird Areas (IBAs; Eken et al., 2006), 305 Key Biodiversity Areas (KBAs; Eken et al., 2006), 122 Important Plant Areas (IPAs; Özhatay et al., 2003), and 65 Prime Butterfly Areas (PBAs; Karaçetin et al., 2011) have so far been identified, reflecting the high biodiversity value of the country. In this study, to represent the areas of high biodiversity importance along the Aegean Coast, KBAs, IBAs, and PBAs were digitized, and IPAs were supplied by WWF-Türkiye.

In this study, we mainly focused on coastal and marine ecosystems. To identify the areas of high biodiversity importance with coastal and marine elements, we adopted a step-by-step approach. The first step was assigning a geographical filter to select the areas of high biodiversity importance in our study area. This elimination led to mostly selecting coastal areas, but there were also areas hosting mainly terrestrial elements. Therefore, we did an additional analysis using CORINE Land Cover Data (2018) and river network data (OpenStreetMap, 2024) to assess the presence of coastal and marine elements within the boundaries of these areas. We used mainly marine waters, and maritime wetlands at the Label 2 level of the CORINE data and thereon checked to see whether they successfully represented the coastal ecosystems. We further checked the overlap with riverine ecosystems from the coast up to 5 km inland. This double check permitted excluding areas of high biodiversity importance which were majorly terrestrial. Lastly, the species that triggered the delineation of these areas were assessed to see whether any area was selected exclusively for terrestrial species. This three-step elimination approach (utilizing a mix of manual and automatized processes) led to the selection of 15 KBAs and 2 IBAs in the study area (Figure 15). For the analysis, the conservation target for both KBAs and IBAs was set to 2.5%, resulting in an area of a total of 72 km^2.

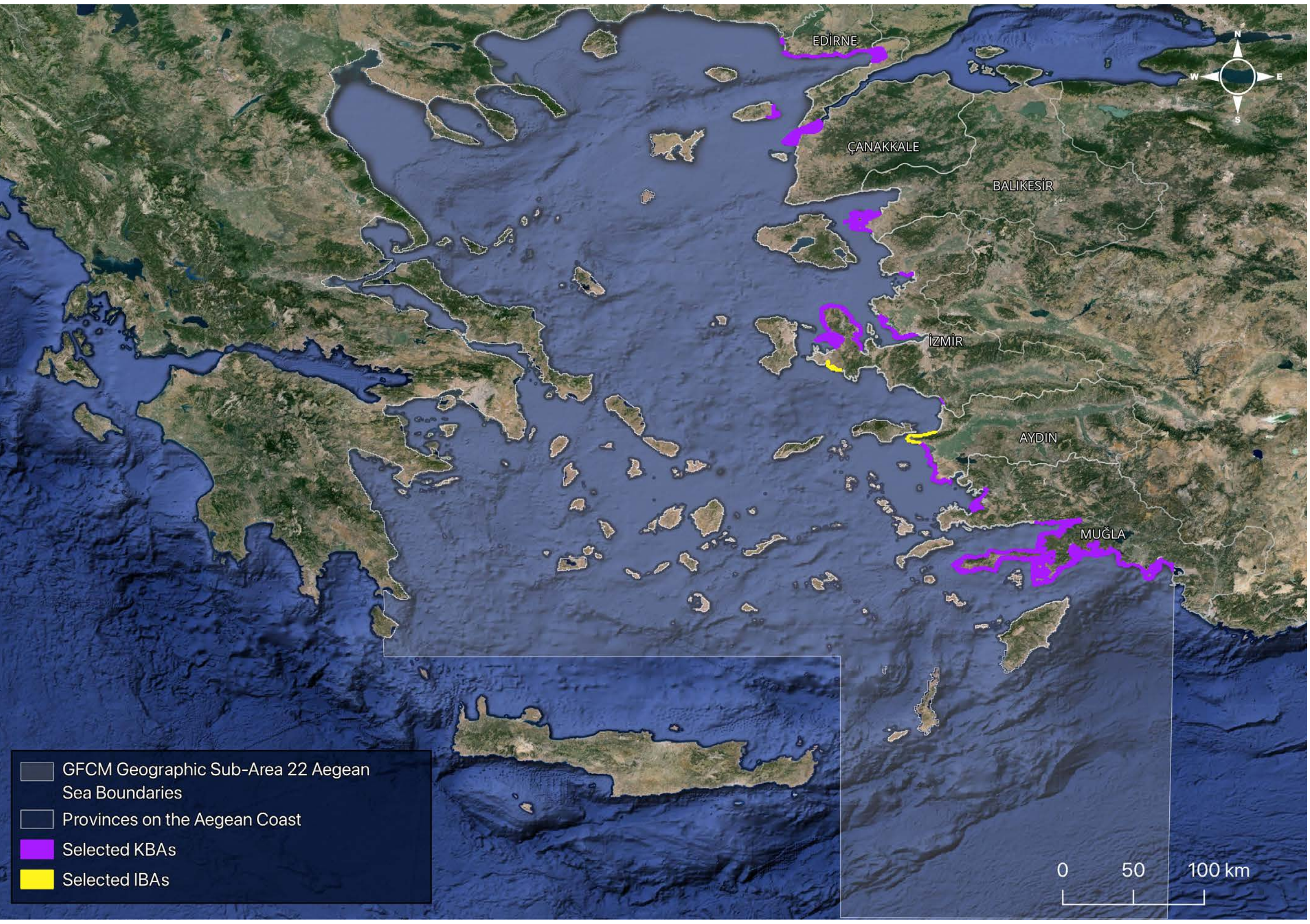


Figure 15. Map showing the KBAs and IBAs selected in the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

3.2. Factors Impacting the Choice

3.2.1. Increasing

3.2.1.1. Other Factors Increasing the Choice

A. Protected Areas & Protection Effectiveness

Protected areas are clearly defined geographical spaces, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (Dudley, 2008). As an important contributor to biodiversity, we considered the national protected areas in Türkiye.

There exist different types of protected areas in Türkiye (changing from national parks to natural monuments, from wildlife reserves to nature conservation areas). The reasons for their delineation, their management approaches, or the level of protection do vary among them. Therefore, our first step was to select the types of protected areas that truly consider the conservation of biodiversity, corresponding to the IUCN definition. For this aim, we employed the outcomes of the study of the Nature Conservation Centre (Doğa Koruma Merkezi), which assessed Türkiye's protected area status and their corresponding IUCN Protected Area Management Categories. As a result, we kept 7 categories of protected areas (i.e., National Parks, Natural Monuments, Nature Conservation Sites, Wildlife Reserves, Ramsar sites, Special Environmental Protection Areas, Natural SİTs).

Secondly, within and among protected area types, the conservation effectiveness varies. We were able to integrate the variation in conservation effectiveness among protected area types. This was realized through gathering expert opinions with a survey. Mean scores collected in the survey were used to differentiate the different types of protected areas.

For data gathering, we digitized the marine protected areas as identified by WWF-Türkiye. Secondly, to complement this information, we explored the protected area data from the online databases, and web sources, and digitized the additional protected areas. As a result of this exercise, we selected 14 protected areas from 4 different statuses in the study area (Figure 16).

Figure 16. Map showing the selected protected areas within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

B. Density of Threatened Marine Animals

In our study, we aimed to focus on areas that hosted higher concentrations of threatened elements of biodiversity. The data with high resolution on these elements were integrated into the analysis as Important Biodiversity Elements, while others were used as factors increasing the biodiversity choice. Distribution data on threatened marine animals are limited for the reasons detailed in Section 3.1, Biodiversity. We relied on the TÜİK 2021 fishery statistics for this purpose. We gathered fishing data of 75 marine fish, crustaceans, and mollusk species along the Aegean Coast. Thereon, a scoring exercise was carried out to prioritize the threat status of these species. We used IUCN Red List categories of the species at the regional (if available; Mediterranean or European) and global levels (IUCN, 2023).

Efforts to prepare the national red list of marine fish in Türkiye have been initiated but are not yet complete, and the national threat status of both crustacean and mollusk species is missing. Therefore, as an indicator of the threat status of these animal species, we primarily used the Mediterranean-level threat assessments. In their absence, we referred to European-level assessments, and if neither were available, we used global assessments for scoring.

Scores for different threat categories were assigned to each species with a red list assessment; highest to Critically Endangered (CR) and lowest to Least Concern (LC) species. To be precautionary, Data Deficient (DD) species, and species whose threat status is not evaluated (Not Evaluated; NE) were assigned scores higher than LC. The resulting scores used were as such:

Threat Category	Scores
Critically Endangered (CR)	4 points
Endangered (EN)	3 points
Vulnerable (VU)	2 points
Near Threatened (NT)	1 point
Data Deficient (DD)	1 point
Not Evaluated (NE)	0.5 point
Least Concern (LC)	0 points

In the study, we aimed at highlighting areas that hold higher populations of threatened species. Assuming a direct correlation between population density and the catch volume, we utilized fishery statistics, specifically the catch volume, at the district level (TÜİK, 2021) to indicate species density. We thereon calculated a score for each district by multiplying the catch volume of each species at a district (relative to its total volume along the study area) with its IUCN score. This way, we obtained a value linked to the distribution of the species along our study area, rather than the differing fishing efforts among districts, as the latter showed great dependency on a variety of unquantifiable factors. We then summed this value for all species caught in the district and normalized it. The data we used in the analysis was linked to districts and, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data). This permitted highlighting the areas where the threatened species were more concentrated along the Aegean Sea (Figure 17).

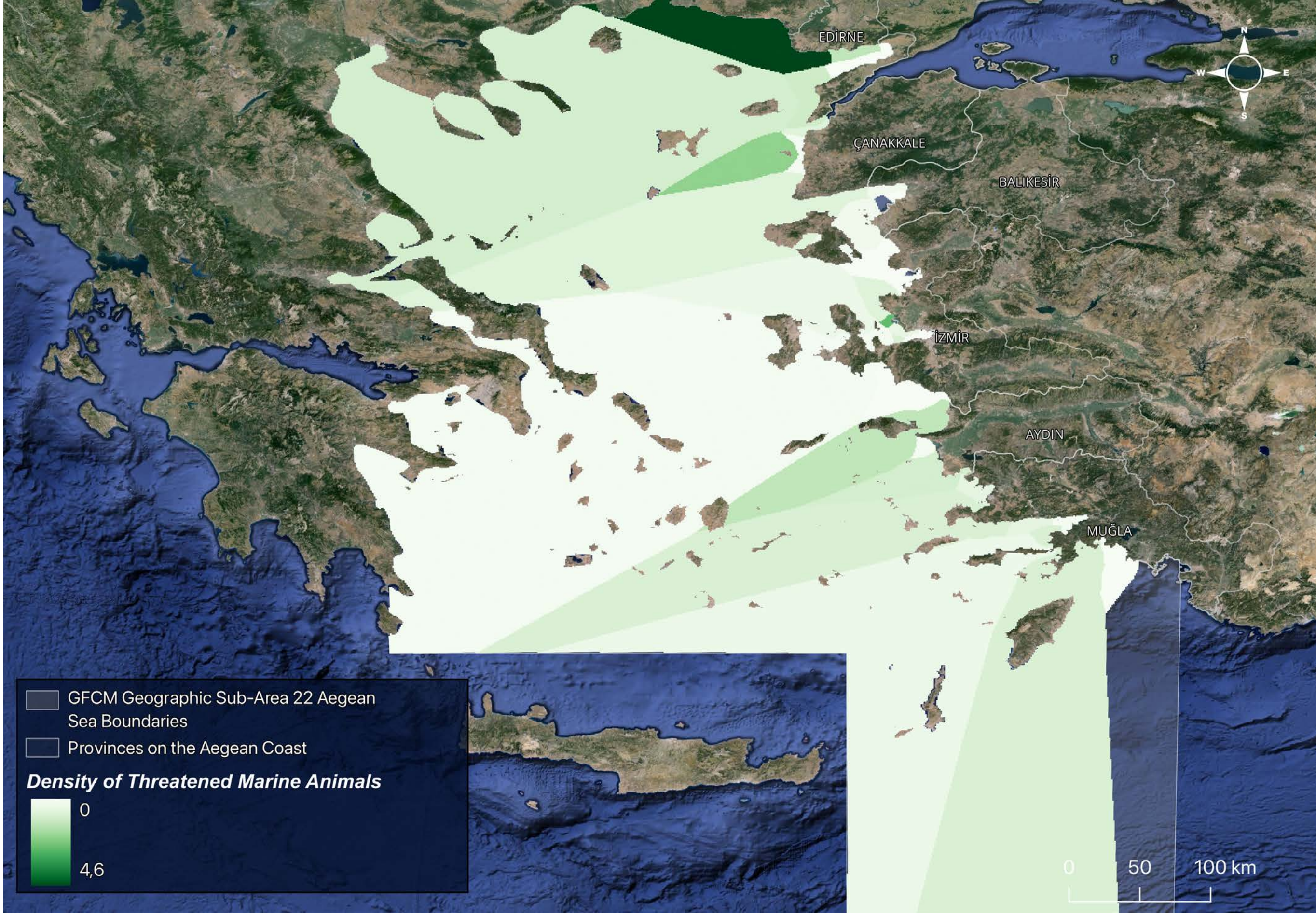
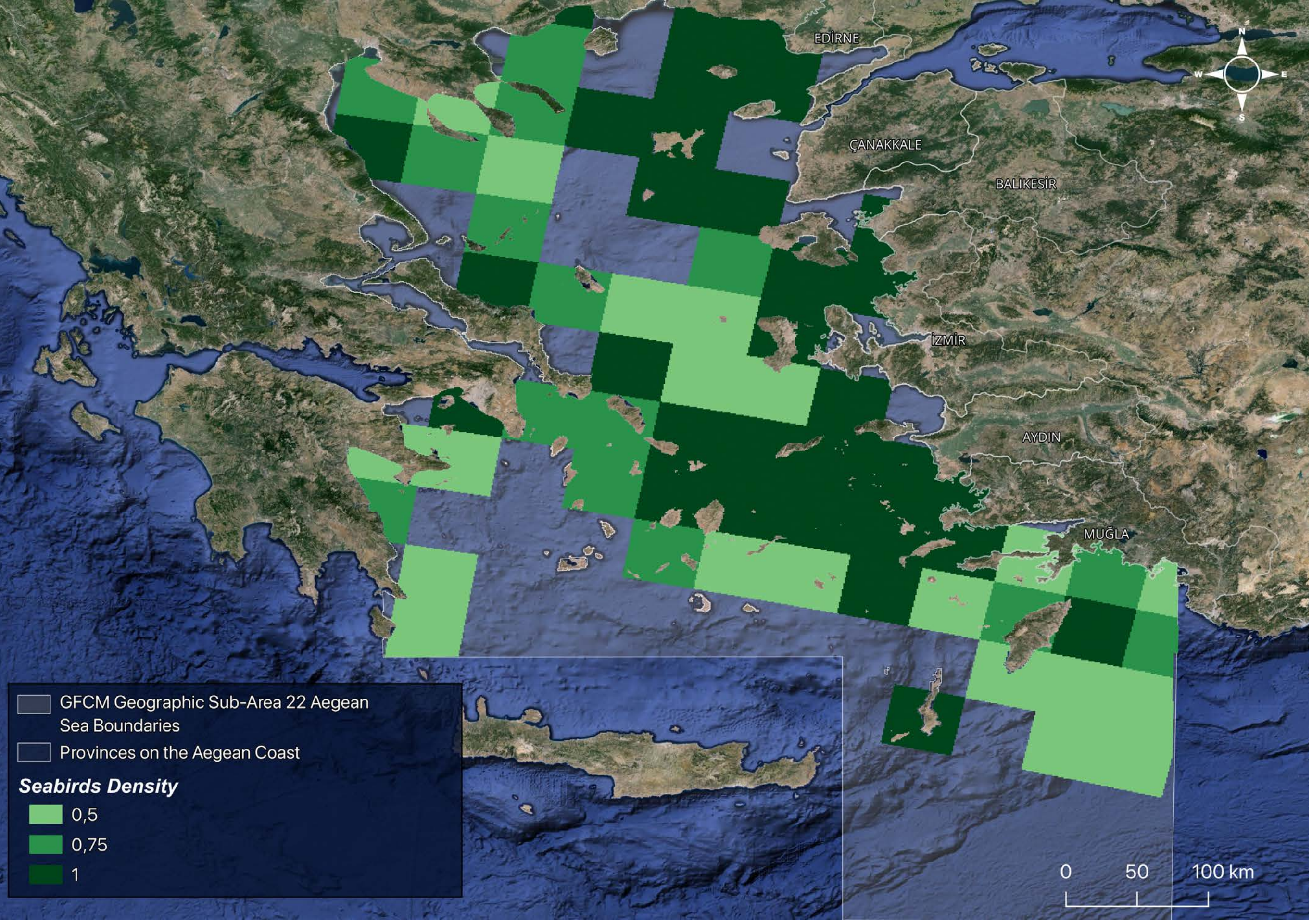
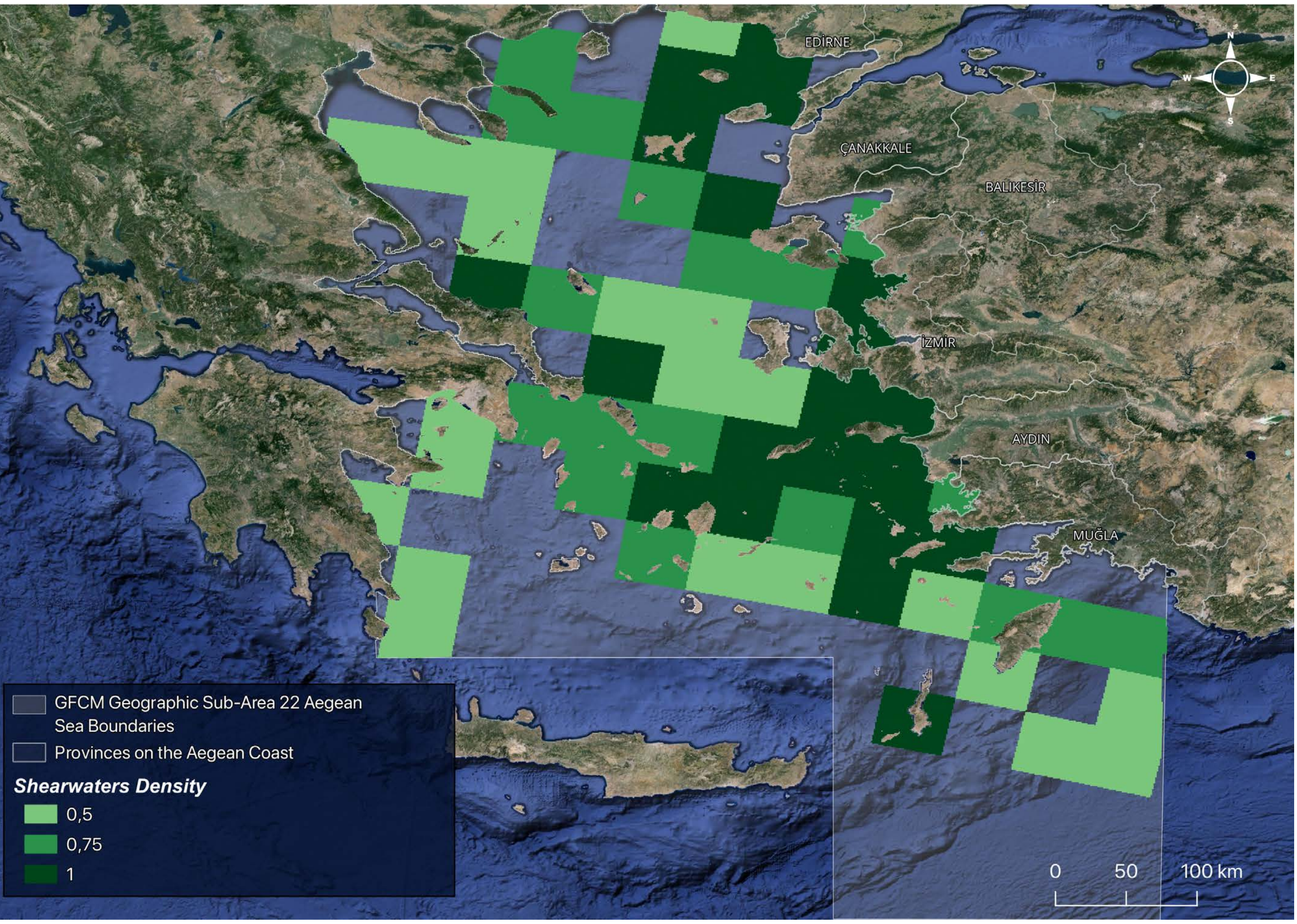


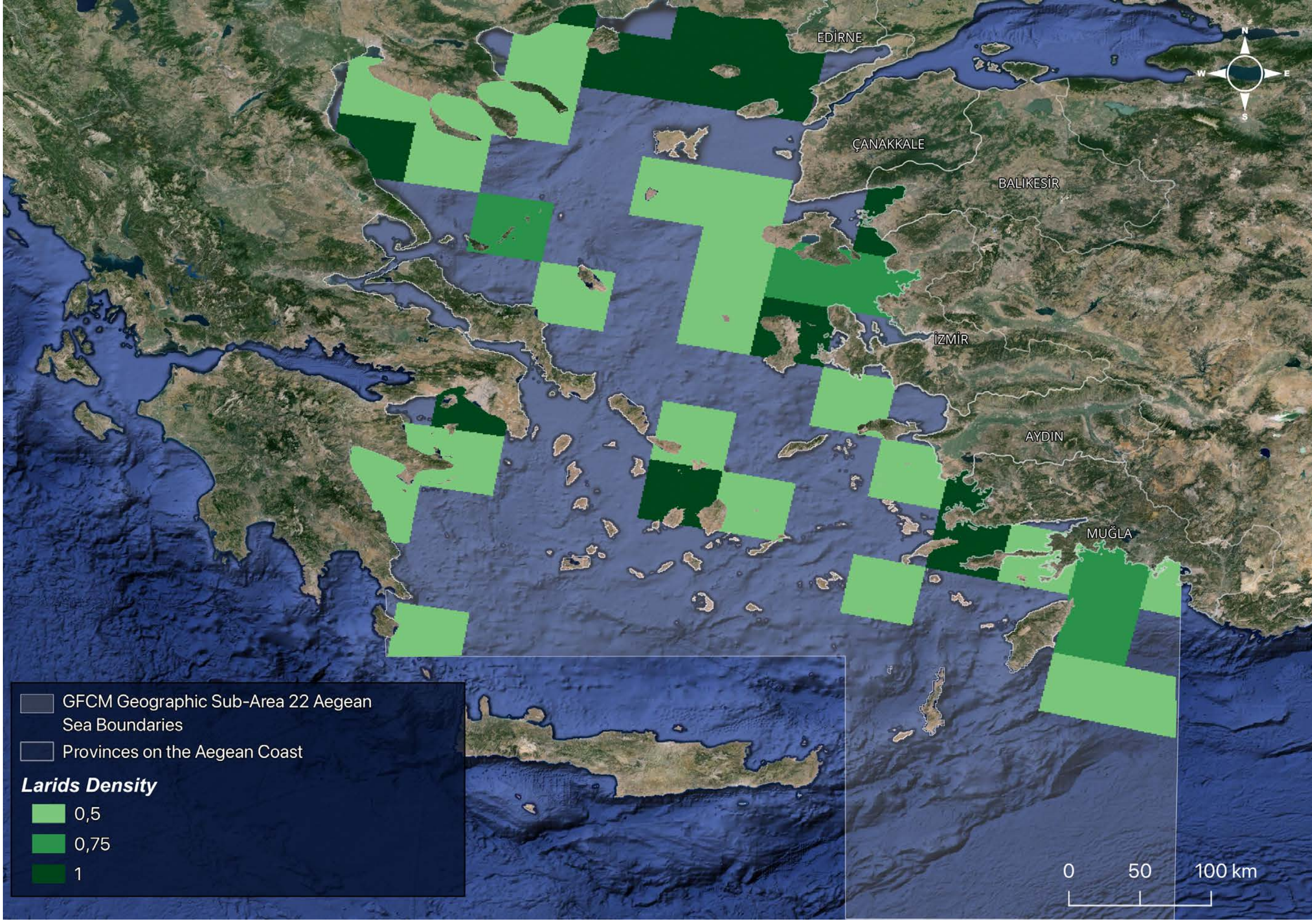
Figure 17. Map showing the density of threatened marine animals within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

C. Species Density and Richness

Two data sources were used to present areas that hosted higher species density and richness. The first was the encounter rate data on cetaceans gathered through systematic aerial surveys (ACCOBAMS, 2021b). The data on marine mammals with higher resolution were integrated into the analysis as Important Biodiversity Elements (encounter rates at 50x50 km scale) whereas those with lower resolution (100x100 km) were employed here. The encounter rate of seabirds (not focusing on breeding areas) and the encounter rate of marine mammals presented in the publication were digitized. The encounter rates were used as a measure of the relative importance of each study unit (1x1 km grid cells) for cetaceans. The second dataset was the global Aquamaps database (Kaschner et al., 2019). In the dataset, occurrence information of fish and invertebrate species by grid was downloaded and filtered to use higher-quality data. In the analysis, a positive correlation between the choice and species density & richness was established (Figure 18 and Figure 19).


EDIRNE
ÇANAKKALE
BALIKESIR
İZMIR
AYDIN
MUĞLA
GFCM Geographic Sub-Area 22 Aegean Sea Boundaries
Provinces on the Aegean Coast
Seabirds Density
0,5
0,75
1
0
50
100 km


EDIRNE
ÇANAKKALE
BALIKESIR
İZMIR
AYDIN
MUĞLA
GFCM Geographic Sub-Area 22 Aegean Sea Boundaries
Provinces on the Aegean Coast
Shearwaters Density
0,5
0,75
1
0
50
100 km


EDİRNE
ÇANAKKALE
BALIKESİR
İZMİR
AYDIN
MUĞLA
GFCM Geographic Sub-Area 22 Aegean Sea Boundaries
Provinces on the Aegean Coast
Larids Density
0,5
0,75
1
0
50
100 km


EDİRNE
ÇANAKKALE
BALIKESİR
İZMİR
AYDIN
MUĞLA
GFCM Geographic Sub-Area 22 Aegean Sea Boundaries
Provinces on the Aegean Coast
Deep Divers Density
0,2
0,6
0
50
100 km

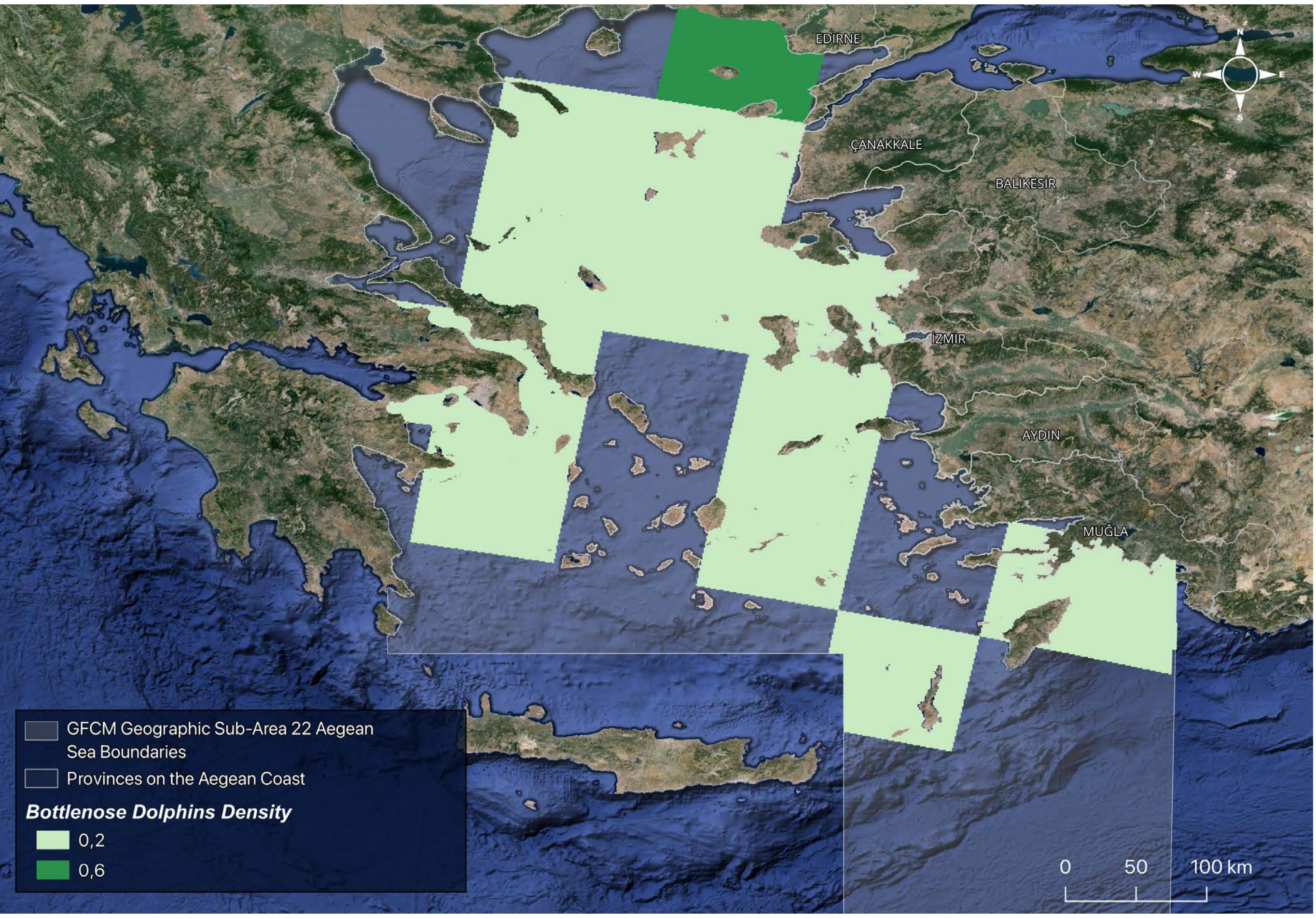


Figure 18. Maps showing different components of species density within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

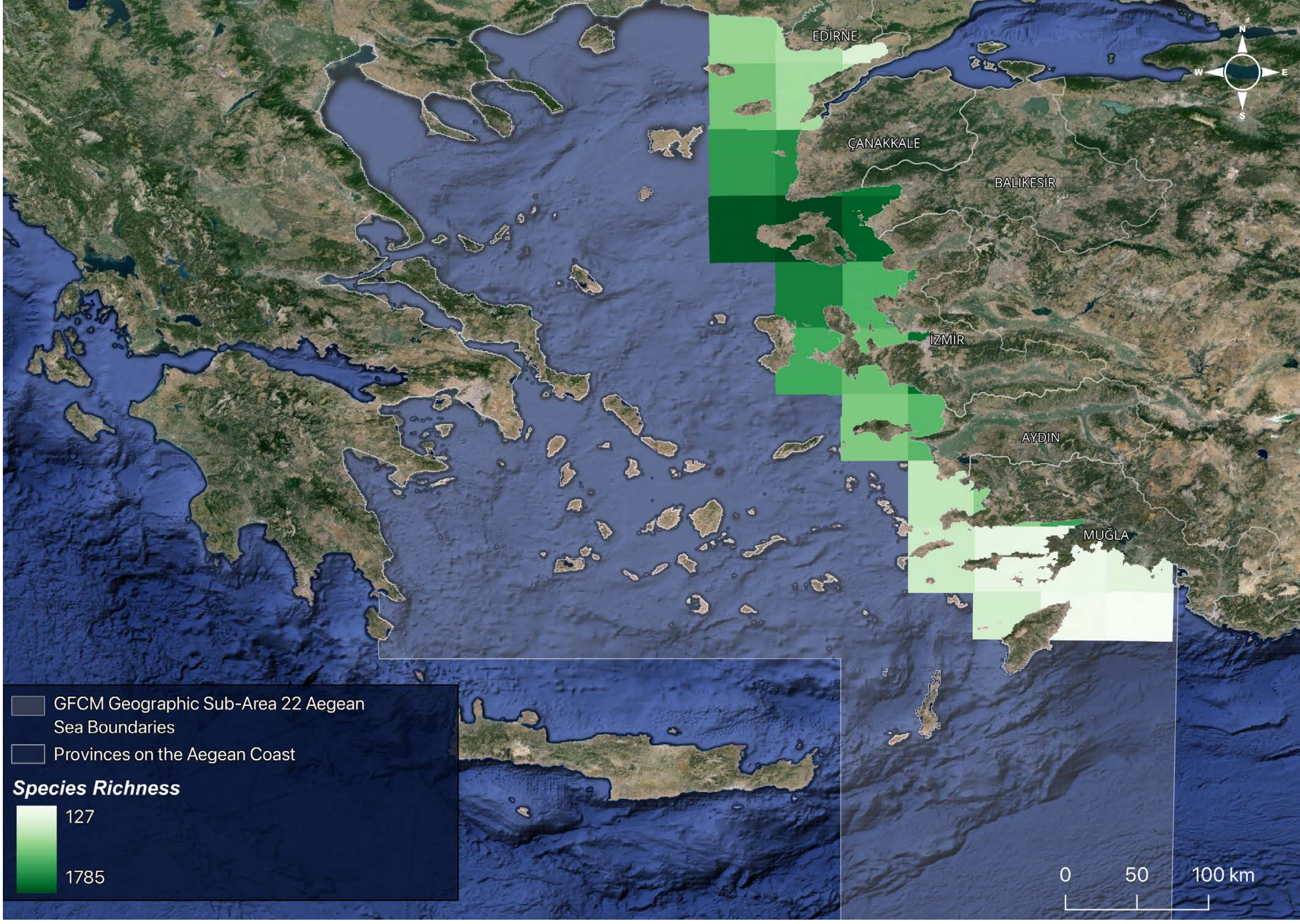


Figure 19. Map showing species richness within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

D. Marine Priority Areas

There exist various international data sources, which have identified marine priority areas at the global scale. One of them is the UN Biodiversity Lab database . In this dataset, a global layer was prepared by Sala et al. (2021) to highlight such areas. Their analysis considered areas of high importance in the ocean based on the objectives of improving global fish catch, safeguarding carbon stocks, and protecting marine biodiversity. With each objective having equal weight, the resulting synthesis layer presented the relative importance of each cell/pixel, ranging from the most important (1) to the least (0). Values between 0.95-1 correspond to the most important 5% of the ocean and values between 0.9-1 correspond to the most important 10%. We used this synthesis raster layer and among overlapping pixels, we used the maximum values in our grid cells to exacerbate the differences among grids (Figure 20).

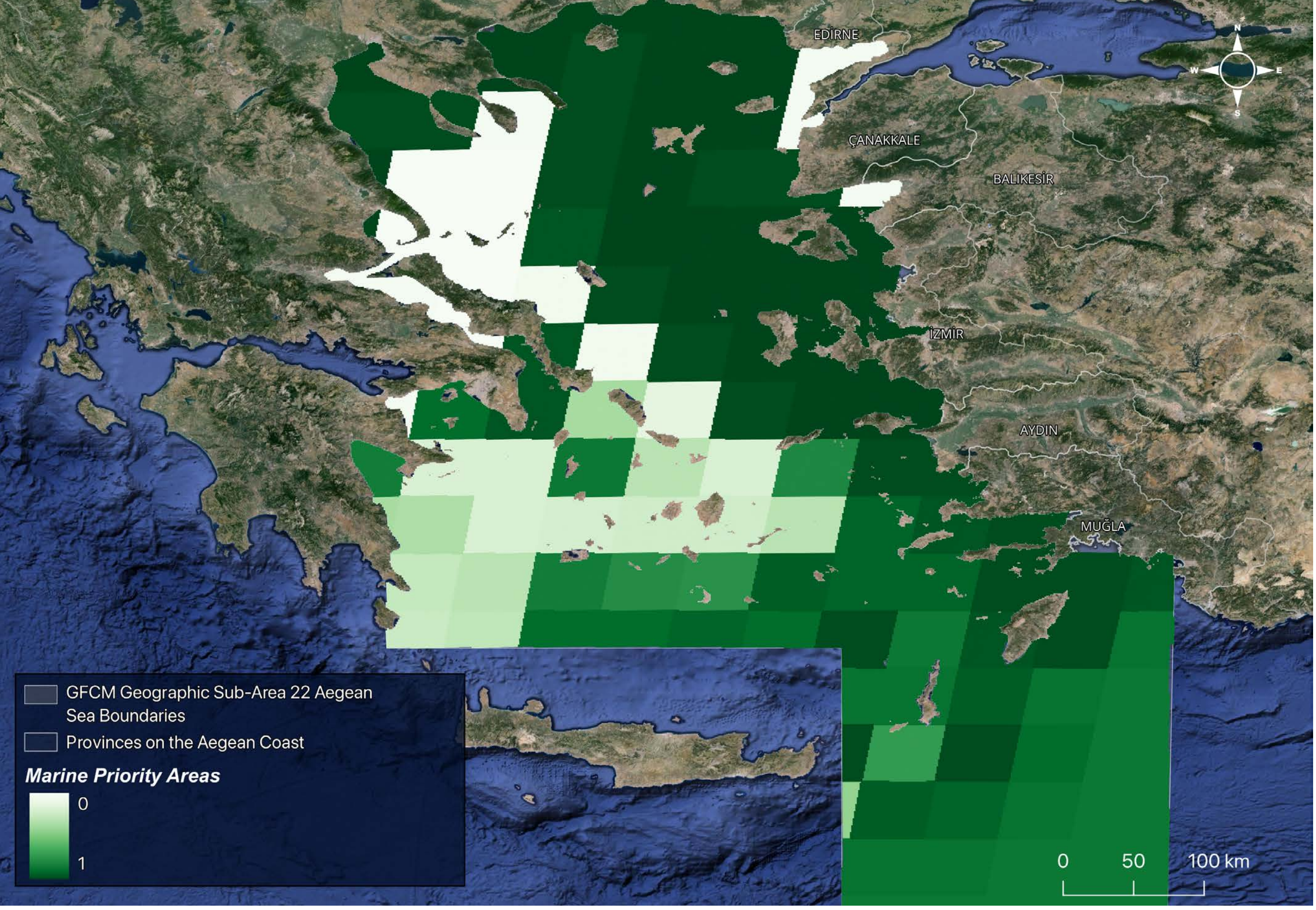


Figure 20. Map showing priority areas within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

E. Habitat Diversity

Habitat diversity is an important determinant of marine biodiversity (Sala and Knowlton, 2006; Tittensor et al., 2010). Different types of information were used to represent the level of habitat diversity in the study area. One of them was the habitat data from the European Commission Marine Observation and Data Network (EMODnet) Seabed Habitats Initiative database. The classification in this database was realized through their biological zone, energy class, oxygen regime, salinity regime, seabed substrate, and riverine input. In this database, the habitat types with the highest resolution were used to obtain the habitat diversity by calculating the Shannon Diversity Index (Shannon, 1948) for the 9x9 km area surrounding each grid cell.

The variability of marine topography is also acknowledged as a major determinant of habitat diversity (Lazarus and Belmaker, 2021; Walker et al., 2009; Zawada et al., 2010). Thus, the second assessment in the study was based on the topographical diversity, namely rugosity. For this, QGIS Software's "Ruggedness Index" package was used here to produce a terrain heterogeneity index as described in Riley et al. (1999). The algorithm mainly assessed the topographical difference between a cell and its neighboring 8 cells in a moving window fashion using GEBCO bathymetry data (GEBCO Compilation Group, 2023).

Lastly, we considered the impact of artificial reefs on increasing habitat diversity (Charbonnel et al., 2002; Jensen, 2002) and integrated it into the study. To gather information about the locations of the artificial reefs throughout the study area, with the aid of experts (Altan Lök, H. Barış Özalp, Oktay Aslanöz, ***pers. comm.***), a detailed literature search was realized (Acarlı, et al., 2020; Gül et al., 2006, 2011; Kemer, 2022; Lök et al., 2002, 2022; Lök and Gül, 2005; Özalp, 2009; Özgül and Lök, 2017; Özgül, 2010; Ulaş et al., 2008). In the absence of detailed information on the exact location of artificial reefs, the distribution information was digitized using the study units (1x1 km grid cells) of the project. In general terms, a positive correlation between habitat diversity and biodiversity choice was established in the analysis (Figure 21, Figure 22 and Figure 23).

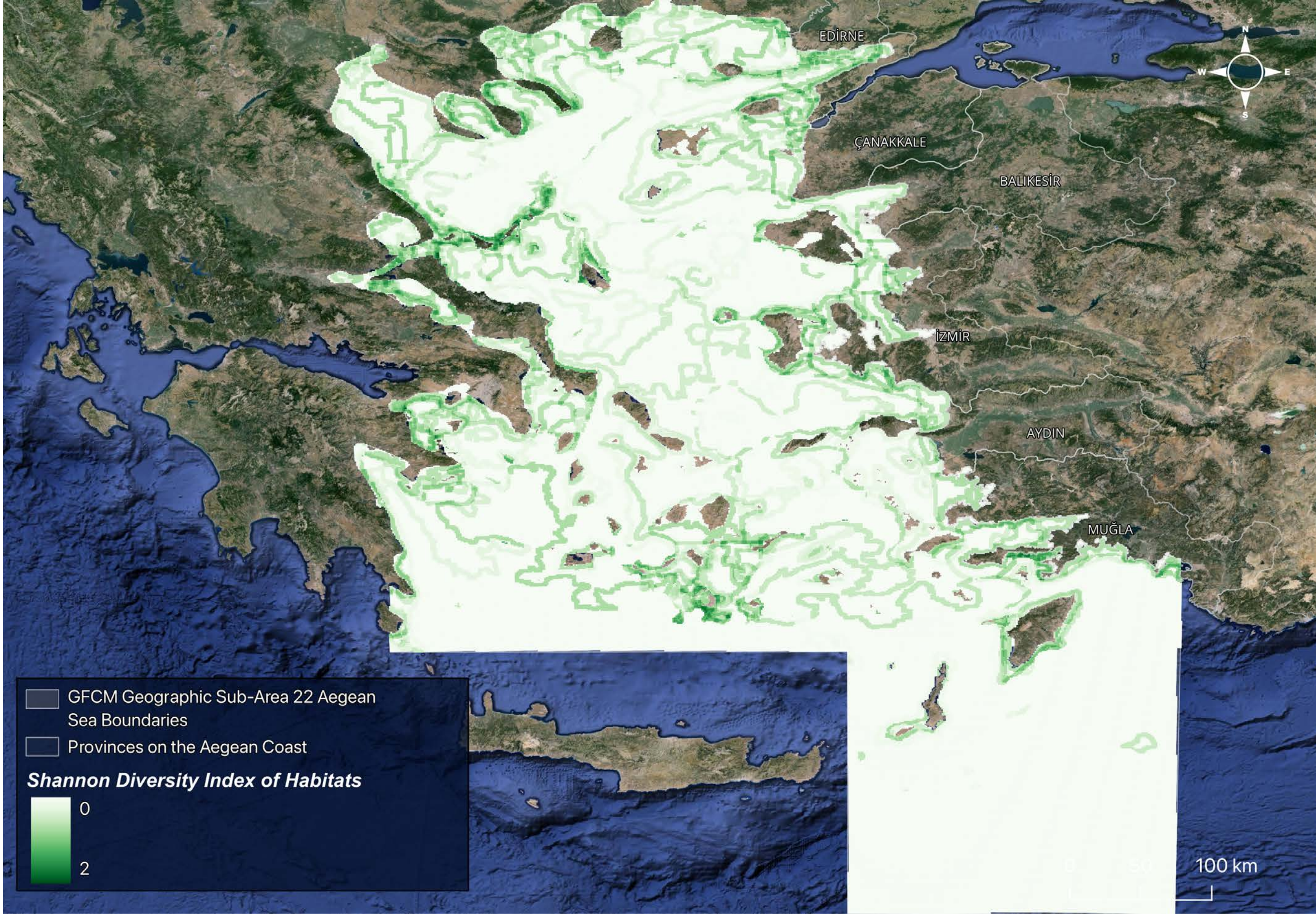


Figure 21. Map showing the Shannon Diversity Index of habitats within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

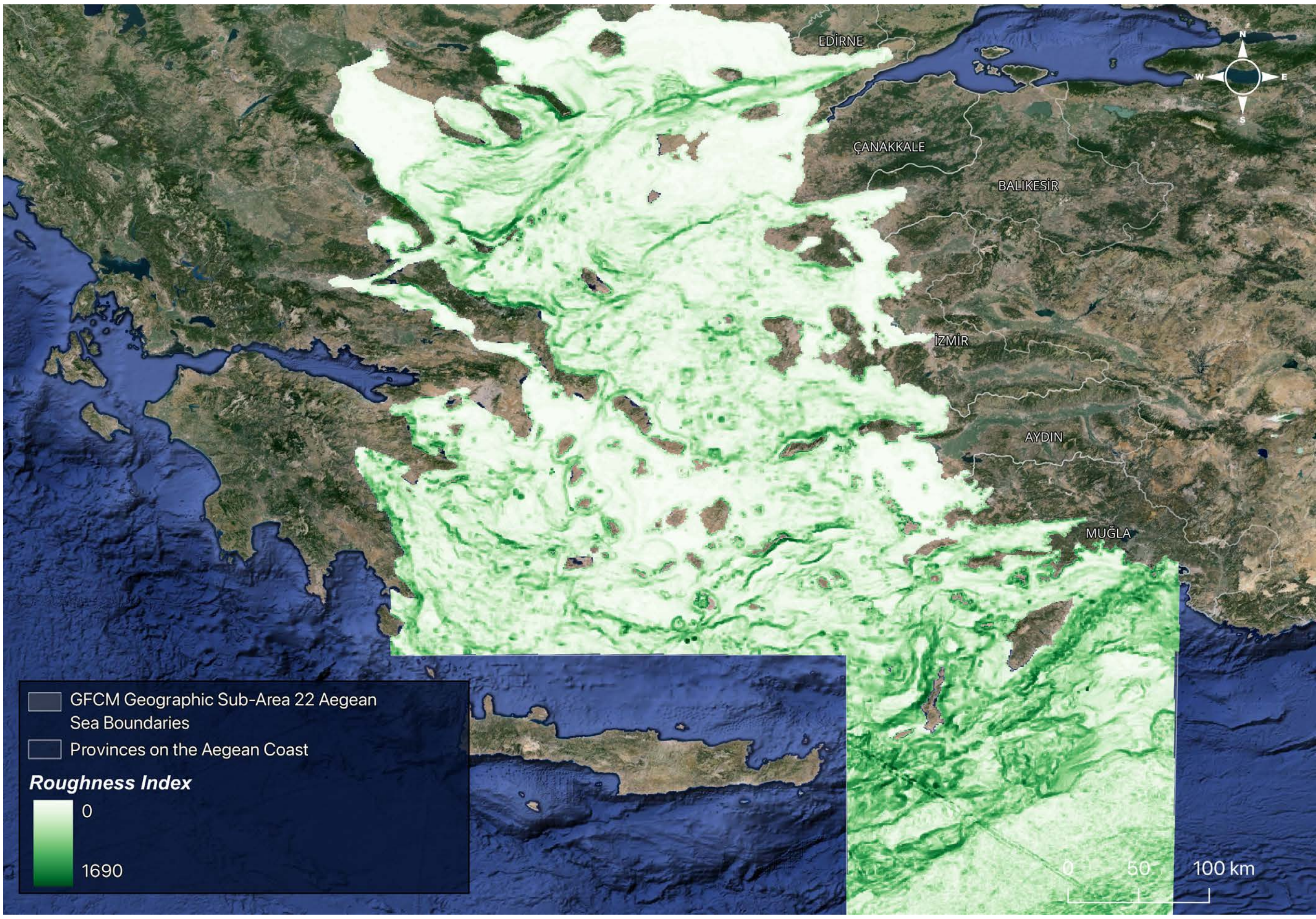


Figure 22. Map showing the rugosity index within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

Figure 23. Map showing the artificial reefs locations within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

F. Opportunities – Fishing Gear Selectivity

The disruption of ecological balance in the marine environment, the use of harmful fishing methods and gears by fishers, and overfishing are factors that negatively impact fish stocks (McClanahan and Mangi, 2004; Coll, et al., 2008; FAO, 2020; Pauly and Zeller, 2016). The increase in the number, size, and performance of fishing gears, along with advances in technology leads to further increases in fishing pressure (Aydın and Düzgüneş, 2007). Therefore, it is important to assess the selectivity of fishing gears to understand its effect on marine biodiversity.

A Fishery Manager's Guidebook of FAO (Bjordal, 2009) puts forward that "the selectivity of a certain fishing method depends on its ability to select the desired ("target") species and sizes of fish from the variety of organisms present in the area where the fishery is conducted." According to the guide, the overall selectivity of a fishing method is determined by both the inherent selective characteristics of the fishing gear and its mode of operation. To both conserve fish stocks and maximize fishing efficiency, fishing gear can be improved in many ways, with the most important and effective method being improving the selectivity of fishing gear or using more selective fishing gear (Aydın and Düzgüneş, 2007). Given the impact of gear selectivity on fish stocks, we considered selectivity among the important determinants of fish abundance and marine biodiversity and, thus, included it in our analysis.

To display the correlation between biodiversity and fishing, we analyzed the degree of selectivity per district by referring to the abovementioned guidebook (see Annex 2 for fishing gear types). In the guide, "Ecosystem Effect Index" per fishing gear is suggested to identify gear selectivity and ecosystem effects of fishing based on size selection, species selection, unaccounted mortality, ghost fishing, habitat effects, energy efficiency, and catch quality. The more selective gear types are represented with a higher Ecosystem

Effect Index. According to these generalized estimates of different fishing methods, we suggested an Ecosystem Effect Index for fisheries in the Aegean Sea of Türkiye (Table 6). Our suggested version differed from FAO's estimates as we considered fishing gears explicitly identified in Turkish legislation, which are categorized as sub-types of "gillnets and entangling nets" and "hooks and lines".

Table 6. Ecosystem Effect Index for selected fishing gears used in the Aegean Sea of Türkiye

Gear Type*	Turkish Names	FAO Category**	Ecosystem Effect Index
Encircling Gillnets	Çevirme uzatma ağları (Sade ağ)	Gillnets and entangling nets	4.7
Encircling Gillnets (Trammel)	Çevirme uzatma ağları (Fanyalı ağ)	Gillnets and entangling nets	4.7
Encircling Gillnets (Combined)	Çevirme uzatma ağları (Karma ağ)	Gillnets and entangling nets	4.7
Trammel Nets	Fanyalı uzatma ağları	Gillnets and entangling nets	4.7
Combined gill-nets-trammel nets	Karma uzatma ağları	Gillnets and entangling nets	4.7
Set Gillnets	Galsama uzatma ağları	Gillnets and entangling nets	5.4
Handlines	Oltalar	Hooks and lines	7.3
Longlines	Paragatlar	Hooks and lines	7.1

** Gear types corresponding to the Turkish legislation.*
*** Details provided in Annex 2.*

Departing from this approach, we first calculated the proportion of the total catch per fishing gear. We then summed these proportions multiplied with the Ecosystem Effect Index values. In other words, we aimed to display the contribution of fishing gears with different selectivity to overall fish catch. For this analysis, we used two main data: (i) the data showing the total catch for each species on the basis of fishing gear per district, accessed via the TÜİK Fisheries Micro Data Set of 2021 (Su Ürünleri İstatistikleri Mikro Veri Seti – 2021) and (ii) the Ecosystem Effect Index suggested above. Finally, we examined the results to ensure they accurately reflect the real situation. The data we used in the analysis was linked to districts, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data). The districts with high selectivity scores increased the choice in our analysis (Figure 24).

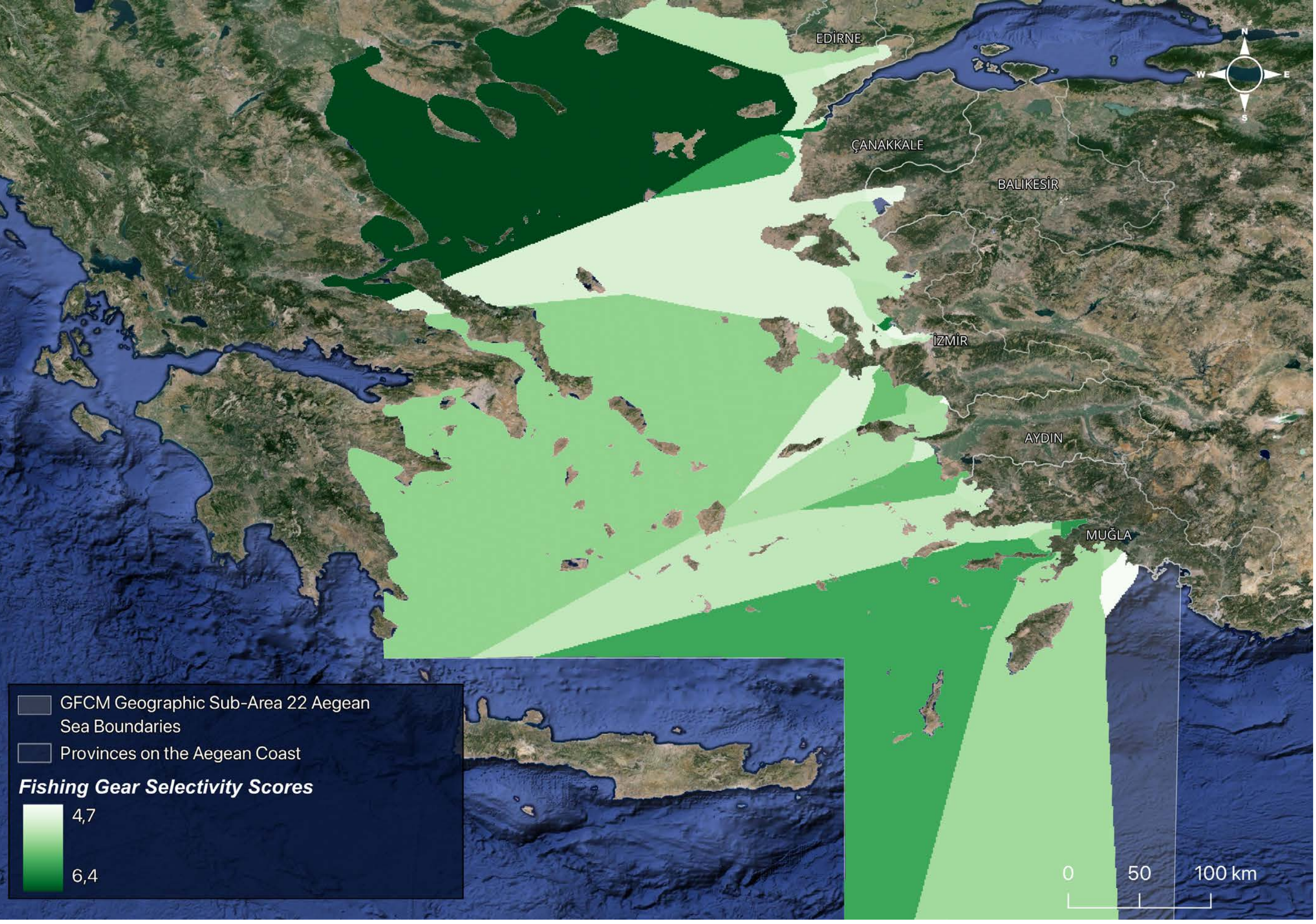


Figure 24. Map showing fishing gear selectivity scores within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

G. Opportunities – Organizational Capacity

An important determinant of conservation success is the participation of non-state actors. As Berkes (2004) points out, "the very nature of complex environmental problems requires a different, participatory approach; … the age of management is over". In our assessment, local organizational capacity refers to the presence of non-state actors (namely civil society organizations; CSOs) actively working on biodiversity conservation in the project area. By integrating local know-how into conservation, CSOs may bring situated and fine-grained information as well as *in-situ* resources and support, making conservation projects more cost-effective and resilient with the use of social capital (Agrawal and Gibson, 1999; Borrini-Feyerabend, et al., 2004; Pretty and Smith, 2004). They are also well-positioned to contribute to ongoing assessments, identify emerging threats, and adapt management practices as needed for continuous monitoring and evaluation of different elements of biodiversity. Moreover, the presence of CSOs shows us the potential for prospective collaborations. Given all these, we considered the local organizational capacity as a key factor that increases our choice as their presence offers local partnership possibilities and community-driven solutions for long-term impact.

We used the density of CSOs to determine the organizational capacity in each district. A step-by-step analysis was conducted to identify the number of CSOs and other civic initiatives (platforms, cooperatives, etc.):

- First of all, we used the search engine called "Associations by Province and Activity" (İllere ve Faaliyet Alanlarına göre Dernekler) by the General Directorate for Relations with Civil Society of the Ministry of Interior of the Republic of Türkiye. Based on the list of districts in the project area, we searched associations by province and district under the category of "Environment (Çevre)" and assembled the obtained data.
- We reviewed the list of CSOs supported by United Nations Development Programme Global Environment Facility Small Grants Programme between 2000-2023 and the monitoring and evaluation reports of investment programmes by the Ministry of Environment, Urbanization and Climate Change.

- We explored other national databases developed through the efforts of different initiatives. One of them is the database of the Foundation for the Support of Women's Work (Kadın Emeğini Değerlendirme Vakfı), another is the database of the Association of Civil Society Development Center (Sivil Toplum Geliştirme Merkezi). Lastly, we accessed the local CSO network developed under the "Empower the Nature Network" (Doğaya Güç Kat Projesi) of the Nature Research Society (Doğa Araştırmaları Derneği) and added related organisations to the database.
- We expanded the database with the inclusion of NGOs and civic initiatives identified via responses to the "Conservation Investments Questionnaire" (see Section 3.2.2.1), especially using partner organisation information (Yolda Initiative, 2023).
- Finally, we conducted a detailed Google search on a district basis employing keywords like "nature conservation organizations", "environmental organizations" and "species conservation organizations" to assess whether new CSOs to integrate into the list could be detected.

Overall, we developed the list of CSOs on a district basis and excluded the national-scale organisations from the analysis. In the assessment, we used the number of CSOs in each district as a measure of the organizational capacity, yet we could not further explore the details of the organizations' capacity (e.g., budget, human resources, gender ratio, effectiveness, impact success) given the absence of such data. The data we used in the analysis was linked to districts, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data). Districts hosting a higher number of CSOs were assessed as areas with higher local organizational capacity (Figure 25).

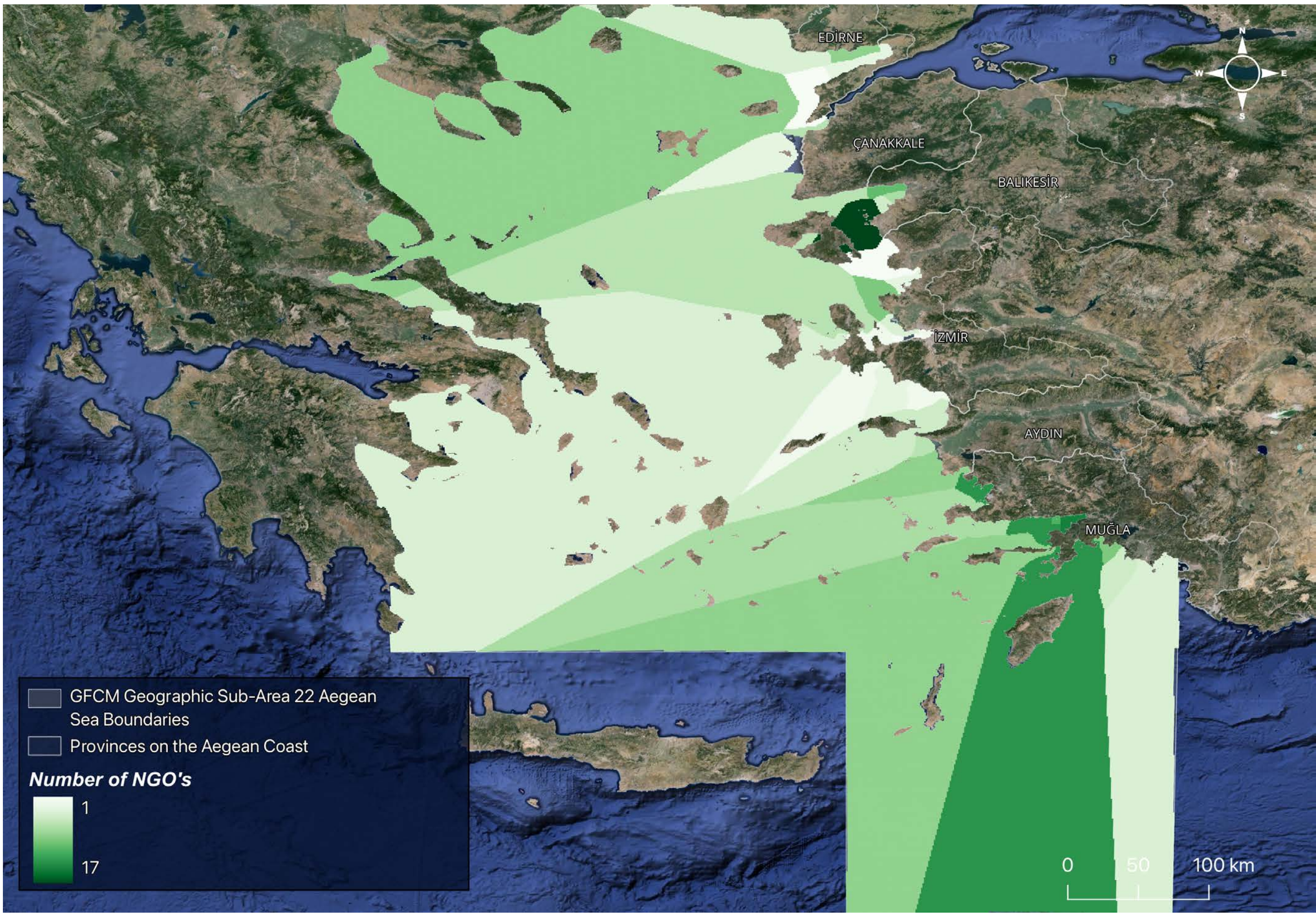


Figure 25. Map showing the number of CSOs within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

3.2.1.2 Reversible Threats

In our study, we aimed at focusing on areas prone to threats that have the potential to be resolved given the presence of efforts and are thus reversible. We therefore distinguished reversible and irreversible threats (detailed below) and considered reversible threats as a factor increasing our choice in the analysis. To quantify the effect of reversible threats, we assessed a number of individual factors and calculated their combined impact.

A.Expert Opinions From the National Workshop

On 5-6 December 2023, the Nature and Culture Coexistence on the Aegean Coasts Workshop was carried out with the participation of 54 experts from different institutions throughout the Aegean Coast in Türkiye. One session of the workshop was dedicated to mapping threats to biodiversity and small-scale fisheries with the participation of experts.

As a thumb of the rule, as we aimed to distinguish areas holding higher densities of threats, we asked the experts to focus only on locally distinguishable threats and disregard those that act throughout the Aegean Coast and Sea in the same dynamics. Secondly, during the data collection, we asked experts to provide information only on threats that could be mapped (with location information). In the workshop, all the spatial information on threats was mapped with the aid of GIS experts. Lastly, for each of the mapped threats, we gathered 5 fields of information: (i) threat class (biodiversity or small-scale fisheries), (ii) threat description, (iii) threat impact score, (iv) threat urgency score, and (v) threat preventability score. The impact, urgency, and preventability of threats were all scored between 1-5 by the experts during the workshop. This approach is an adaptation of the IUCN Red List Threats Classification Scheme (Salafsky et al., 2008; Annex 3), where the timing, scope, and severity of threats are taken into account.

Following the workshop, the information provided by the experts was subjected to a set of controls and classifications. We distinguished the threats' effect on the analysis in two levels. Firstly, a threat classification was carried out, where each threat was assigned to a class and sub-class following the IUCN Threat Classification System. The sub-classes were then assigned a threat score normalized between 0 and 5, and this was used as the first-level distinction in our data classification (Table 7).

The distinction between threat sub-classes was also used in a further step to better represent the dynamics of the threats. We know that while most threats are bound to a local area, some have a greater impact extent geographically (e.g., Pollution). Due to this variance, we assessed the impact area of such threats (Residential & Commercial Development, Mining & Quarrying, Roads & Railroads, Pollution) and assigned buffer functions to them, while keeping other threats only at their originally drawn extents. To do so, we assessed threats' impact mechanisms at the sub-class level. For the Pollution threat (IUCN code 9), we considered the spread of pollution and assigned a buffer distance (min. 500 m and max. 2,500 m), which was scaled in line with the impact scores assigned during the workshop. For the Residential & Commercial Development, Mining & Quarrying, and Roads & Railroads threats (IUCN codes 1, 3.2, and 4.1), a 50 m buffer was applied to extend the coastal and inland threats to the marine boundaries.

For the second-level distinction, we distinguished the relative importance of threats under the same IUCN sub-class. This calculation was based on the threats' impact and urgency scores which were assigned by the experts at the workshop. To obtain this, a new score reflecting the multiplication of those two factors was then multiplied with the IUCN sub-class score given in Table 7.

Table 7. Threat classification according to the IUCN Red List Threats Classification Scheme, their IUCN codes, and threat scores.

Threat IUCN Sub-Class*		IUCN Code	Sub-Class Threat Score
Residential & Commercial Development	Housing & Urban Areas	1.1	3
Residential & Commercial Development	Commercial & Industrial Areas	1.2	3
Residential & Commercial Development	Tourism & Recreation Areas	1.3	3
Energy Production & Mining	Mining & Quarrying	3.2	2
Transportation & Service Corridors	Roads & Railroads	4.1	3
Transportation & Service Corridors	Shipping Lanes	4.3	3
Biological Resource Use: Fishing & Harvesting Aquatic Resources	Intentional Use: subsistence/small-scale (species being assessed is the target)	5.4.1	3,75
Biological Resource Use: Fishing & Harvesting Aquatic Resources	Intentional Use: large-scale (species being assessed is the target)	5.4.2	5
Biological Resource Use: Fishing & Harvesting Aquatic Resources	Unintentional effects: subsistence/small-scale (species being assessed is not the target)	5.4.3	3,75
Biological Resource Use: Fishing & Harvesting Aquatic Resources	Unintentional effects: large-scale (species being assessed is not the target)	5.4.4	5
Human Intrusions & Disturbance	Recreational Activities	6.1	2
Human Intrusions & Disturbance	War, Civil Unrest & Military Exercises	6.2	2
Natural System Modifications	Dams & Water Management/Use	7.2	2
Natural System Modifications	Other Ecosystem Modifications	7.3	3
Invasive & Other Problematic Species, Genes & Diseases	Invasive Non-Native/Alien Species/Diseases	8.1	4
Invasive & Other Problematic Species, Genes & Diseases	Problematic Native Species/Diseases	8.2	4
Pollution	Domestic & Urban Waste Water	9.1	1,2
Pollution	Industrial & Military Effluents	9.2	2
Pollution	Agricultural & Forestry Effluents	9.3	1,6
Pollution	Garbage & Solid Waste	9.4	1,2
Pollution	Thermal Pollution	9.6.2	0,4

Threat IUCN Sub-Class*		IUCN Code	Sub-Class Threat Score
Pollution	Noise Pollution	9.6.3	0,8
Climate Change & Severe Weather	Droughts	11.2	1

**Given the differences among the threats identified for biodiversity and small-scale fisheries, and further between reversible and irreversible threats, threat sub-classes differ between these four groups.*

Thereafter, threats acting on biodiversity or SSFs were distinguished from one another. This way two independent layers were prepared. Lastly, a threshold was assigned to the threat preventability scores to distinguish reversible and irreversible threats under both layers. Threats with preventability scores < 3 (out of 5) were categorized as irreversible, while those with preventability scores ≥ 3 were categorized as reversible. As a result, 2 sets of threats (reversible and irreversible) for both biodiversity and small-scale fisheries were produced (Figure 26).

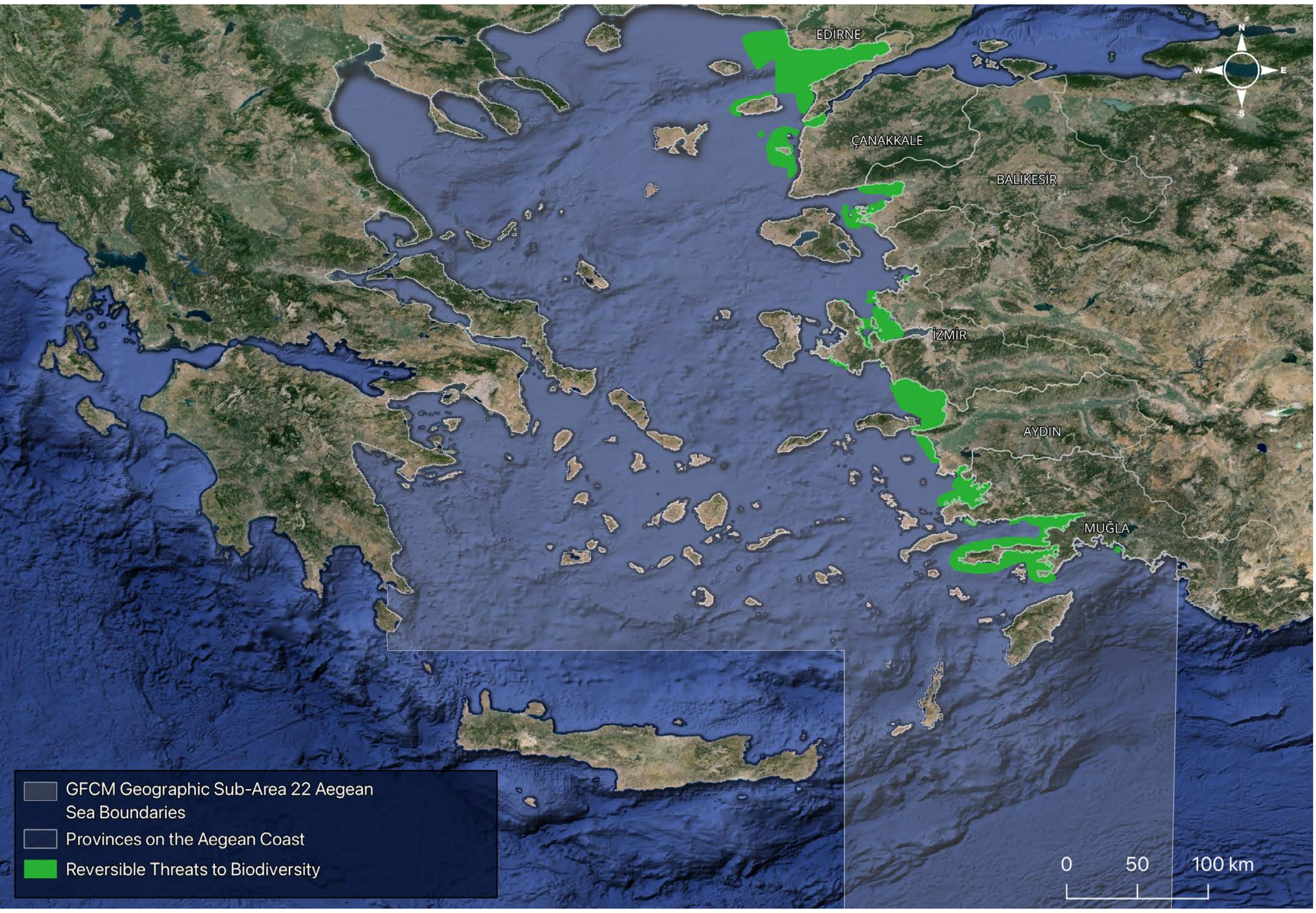


Figure 26. Map showing the reversible threats to biodiversity from expert opinions from the national workshop within the GFCM Geographic Sub-Area 22 boundaries

B.Level of Water Pollution

Water pollution remains a crucial factor affecting biodiversity at the global scale, let alone in the Aegean Sea (Gregory, 2009; Teuten et al., 2009). The impact and urgency of this problem were highlighted by the Nature and Culture Coexistence on the Aegean Coasts Workshop discussions (Balkız et al., 2023). In this study, we integrated water pollution as a reversible threat acting both on biodiversity and SSFs.

There is a wide range of causes for water pollution and its level depends on diverse factors, including the type of pollution (e.g., solid waste vs. chemical vs. thermal), and water currents, among others (Chaudhry and Malik, 2017; Florescu et al., 2011). Given the complex nature of this topic, it is highly challenging to reflect the pollution levels in the Aegean Sea with high accuracy. A study conducted in 2021 by the National Scientific and Technological Research Council of Türkiye (TÜBİTAK) documented the outcomes of systematic measurements, sampling, and analysis from 95 stations along the Aegean Sea (T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı, 2022). The dataset incorporated measurements of conductivity, temperature, and depth (CTD), ecological quality status (EQS), eutrophication, Secchi disk depth (SDD), and the trophic index (TRIX). The results of the study are presented within Water Management Units (WMUs), which are the smallest units within European Union Water Framework Directive (WFD). There are 24 such WMUs in the Aegean Region of Türkiye.

To integrate the results of this study, we implemented some revisions on the WMU boundaries and classification. Firstly, the WMU boundaries fell short of our study area, therefore we needed to extend the outcomes of the study to our boundaries. We employed a function of inverse distance to cover the remaining study area, as we had no information outside of the WMU boundaries. A scale of 0.5 km was set as the step size for this function, and a 50 km limit from the boundaries of the WMUs was set as the furthest distance the pollution could travel (Pedrotti et al., 2016). Secondly, the TÜBİTAK WMU's were classified into 5 distinct water quality levels: Bad, Poor, Medium, Good, Very Good. To further increase the distinction between our study units (1x1 km grid cells), intermediary classes were integrated into the function. Lastly, the mean value of the neighboring grid cells was calculated and set as the center grid cell's value. As a result of this process, we obtained a density surface of the water pollution level in our study area.

These measurements provided irreplaceable, highly detailed data on the chemical composition in the study area. Yet, it did not represent the current levels of pollution. Therefore, the pollution threat data collected during the Nature and Culture Coexistence on the Aegean Coasts Workshop was used as a supplementary source of information. For this, we first checked the consistency between the two data sources and found that the workshop data mostly highlighted locations with low water quality levels as classified in the TÜBİTAK dataset with some divergences. The basis for this is likely the time difference between the two studies (3 years). While the TÜBİTAK dataset focused on the chemical analysis highlighting levels of water pollution, the workshop inputs highlighted sources for the pollution (e.g., agricultural, industrial, or urban). The workshop data also listed ghost fishing gears (detailed in Section 3.2.1.2, Concentration of Marine Litter), light, thermal, and noise pollution as sources. These threats were excluded from the produced surface as they were not complementary to the TÜBİTAK data. A similar approach to that described for the TÜBİTAK dataset was utilized to create the water pollution density surface from the workshop dataset. A unit of 0.5 km was kept as the step size, and a limit of 50 km from the boundaries of the pollution polygons was kept as the limiting distance. The impacts of threats assigned during the workshop were used to distinguish relatively more and less polluted areas, with the integration of intermediary classes to achieve higher distinction levels. Lastly, the mean value of the neighboring grid cells was calculated and set as the center grid's value. The limitations of the workshop data were that it comprised localized, temporally limited, and likely biased data as it was solely based on the workshop participants' expertise. Thus, even as a supplementary data source, the impact of this layer was incorporated with a lower co-efficient to the analysis. To enhance the analysis outcomes, future studies can incorporate the water treatment facilities and their capacities coupled with population size and other factors (Figure 27 and Figure 28).

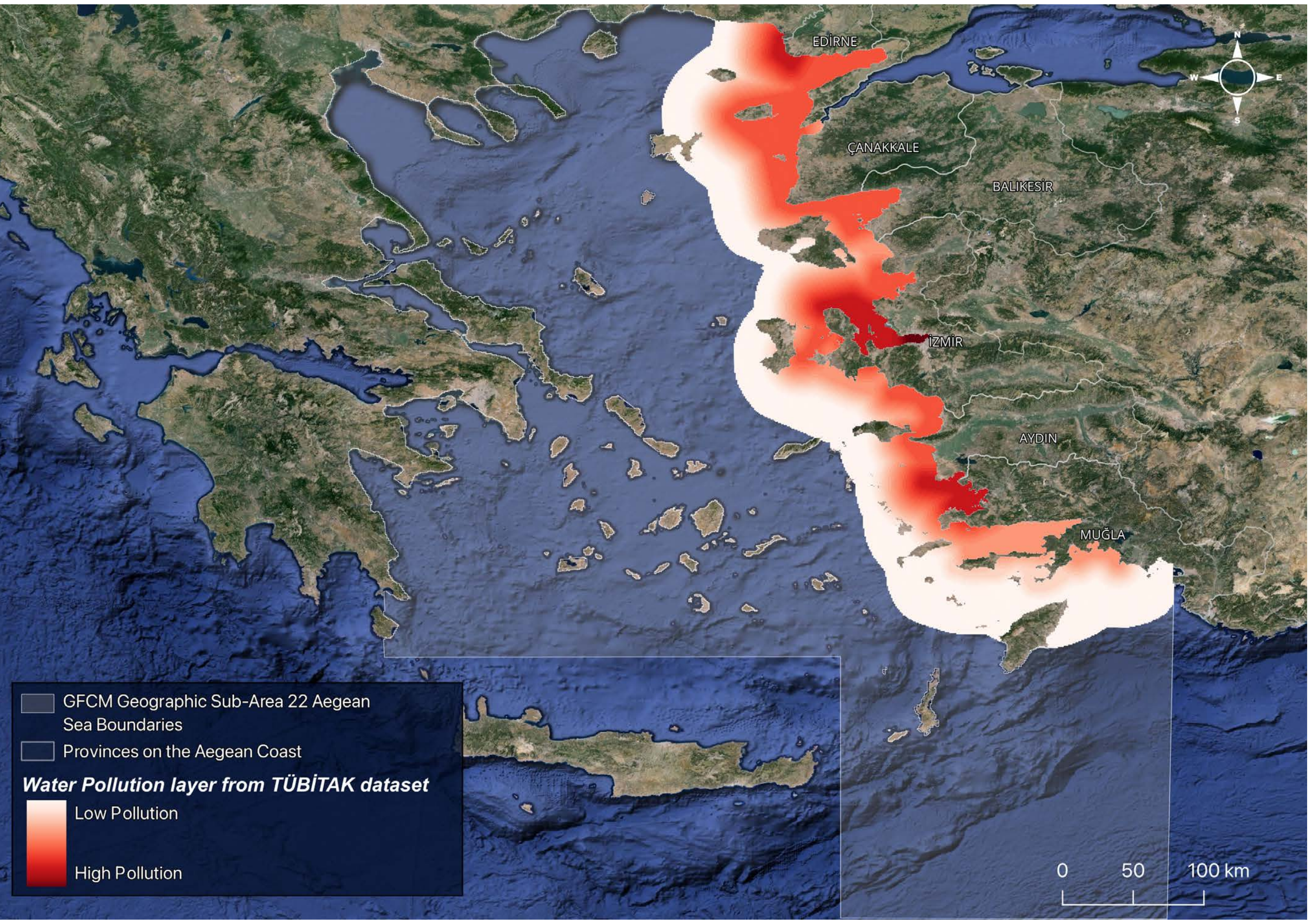


Figure 27. Map showing the Water Pollution layer from TÜBİTAK dataset within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

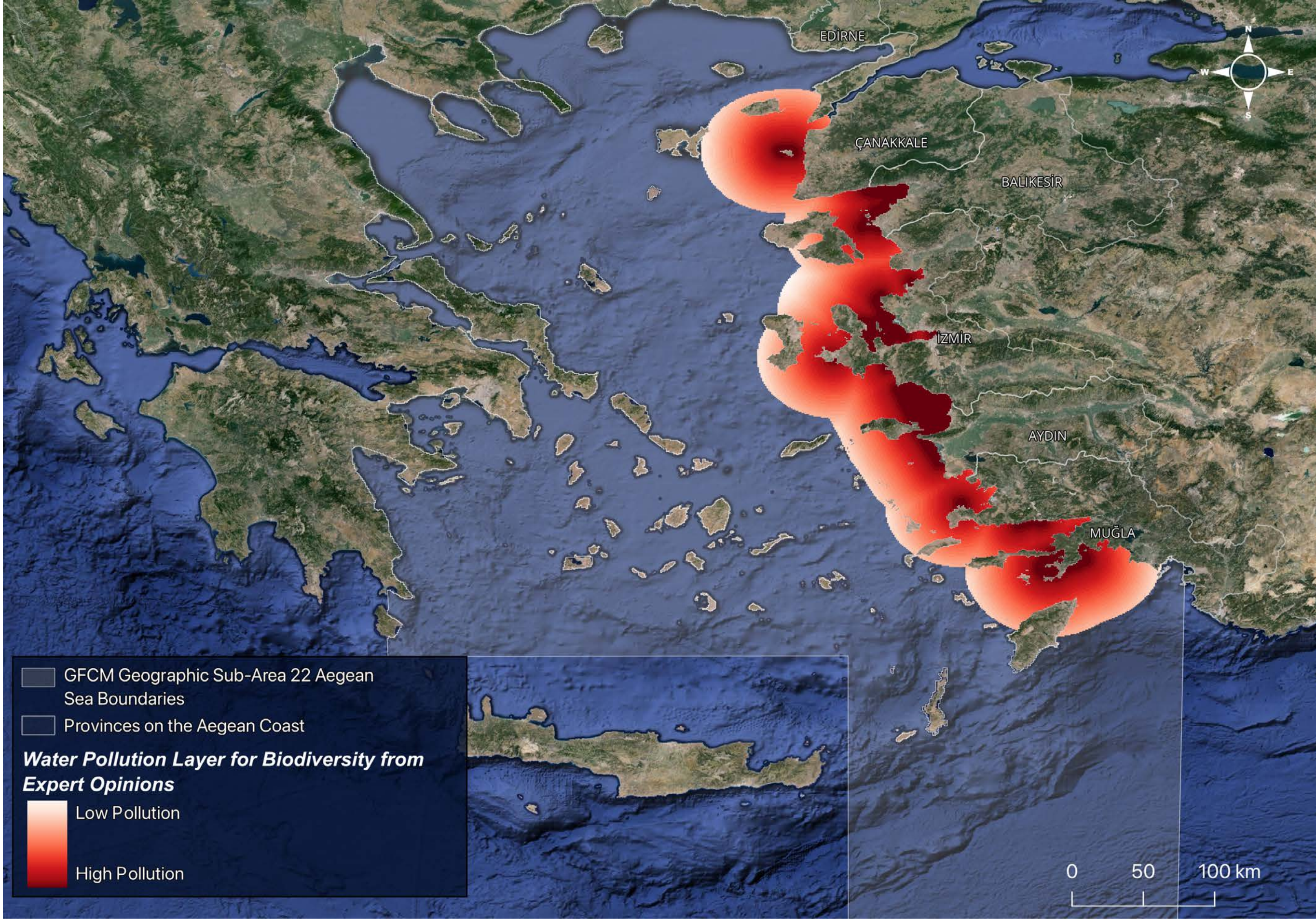


Figure 28. Map showing the Water Pollution layer for Biodiversity from expert opinions within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

C.Concentration of Marine Litter

Water pollution at the chemical level was discussed in the previous sections. Here we assessed the effects and range of floating debris in the Aegean Sea separately as a source of physical pollution. Studies highlight that floating debris can travel upwards of 1,000 meters (Law et al., 2010; Maximenko et al., 2012), whereas chemical pollution has a much lower travel range (Pedrotti et al., 2016). Thus, the concentration of marine litter in the Aegean Sea decidedly required further discussion in our study.

Marine litter encounter rate data on a 50x50 km grid was gathered from the ACCOBAMS Survey Initiative (ASI; ACCOBAMS, 2021). This data, originally spanning the range 10W to 40E, was digitized in the original projection within the GFCM Geographic Sub-Area 22 boundaries and then reprojected to our study projection. A unit conversion followed by the normalization of the values was also made, as the original data, in the scale of 50x50 km, was ultimately transformed onto 1x1 km grid cells. This data was used as a separate source of reversible threats along the Aegean Sea (Figure 29).

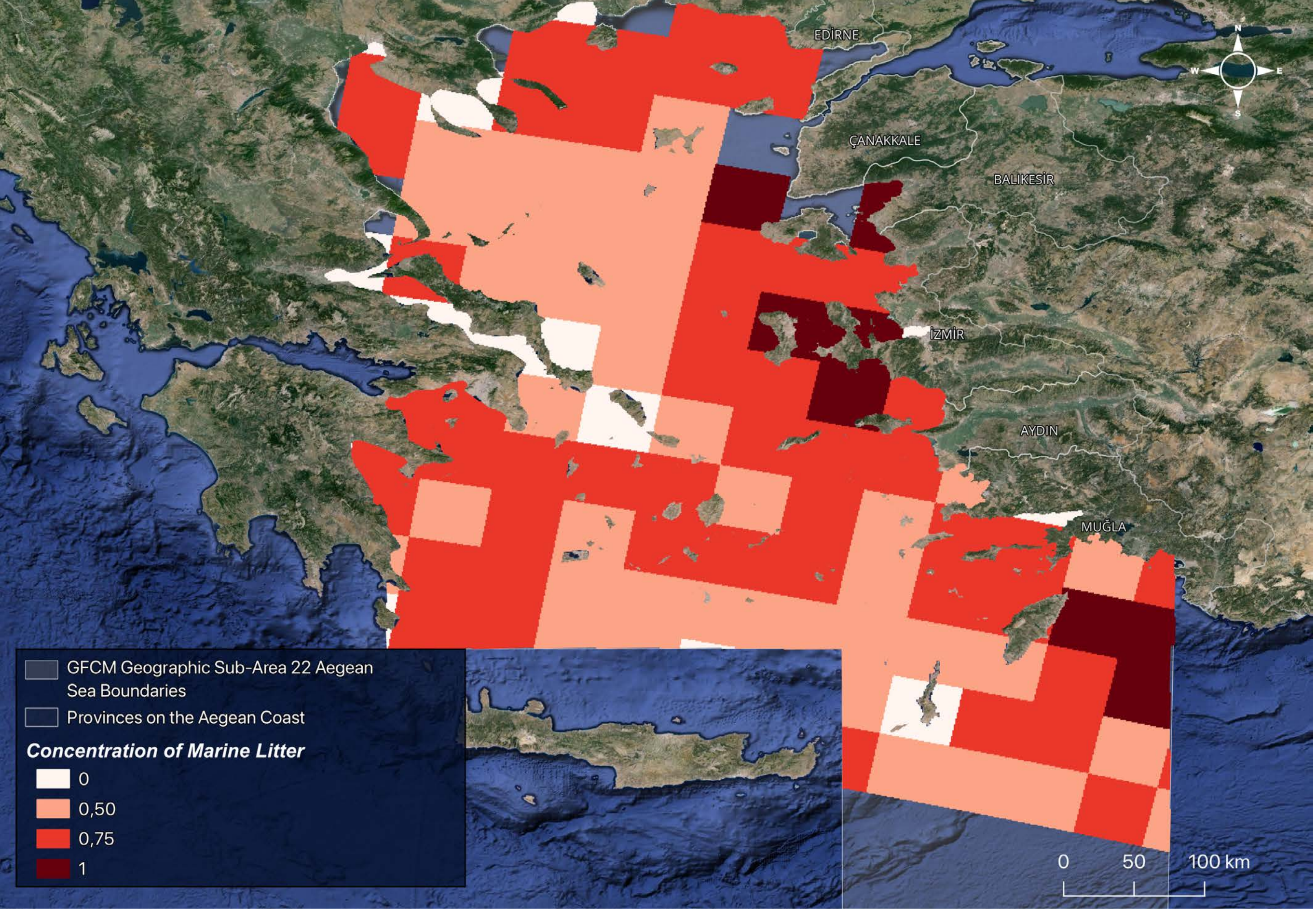


Figure 29. Map showing the Concentration of Marine Litter (reprojected) within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

D.Bycatch Probability of Marine Species

Bycatch or incidental catch refers to the capture of unintended species during fishing operations and is an important threat to marine biodiversity at the Mediterranean scale (Carpentieri et al., 2021). Its impact covers various species groups, including seabirds, pelagic or demersal fish species, marine mammals, marine turtles, and invertebrates, among others (Genovart et al., 2017; Lewison et al., 2014; Otero et al., 2019).

Efforts to monitor longline fishers have been initiated along the Aegean Sea in Türkiye to monitor and assess bycatch impacts, particularly on seabirds, but regional assessments have yet to yield results (Şahin, 2017). With guidance from Dilek Şahin, a method to evaluate the relative bycatch risk to marine biodiversity was developed using longline fishery efforts as a proxy (TÜİK, 2021). To calculate the maximum effort for precautionary measures, we identified the types of longlines used at each port. We then enumerated the number of boats equipped with each type of longline, providing a baseline for our calculations. Next, we determined the number of operational days for each boat, indicating the temporal extent of the fishing activities (on fish and invertebrate spp.). The total number of hooks deployed by each type of longline was found, as more hooks correlate with a greater potential catch. Additionally, we considered the daily usage rate of each longline type, representing how many times each longline was used per day. Finally, we multiplied all to calculate the total number of hooks in the sea. This approach provided comparable regional data on the intensity of longline fishing efforts, serving as a proxy for bycatch risk in the study. The data we used in the analysis was linked to districts, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data) (Figure 30).

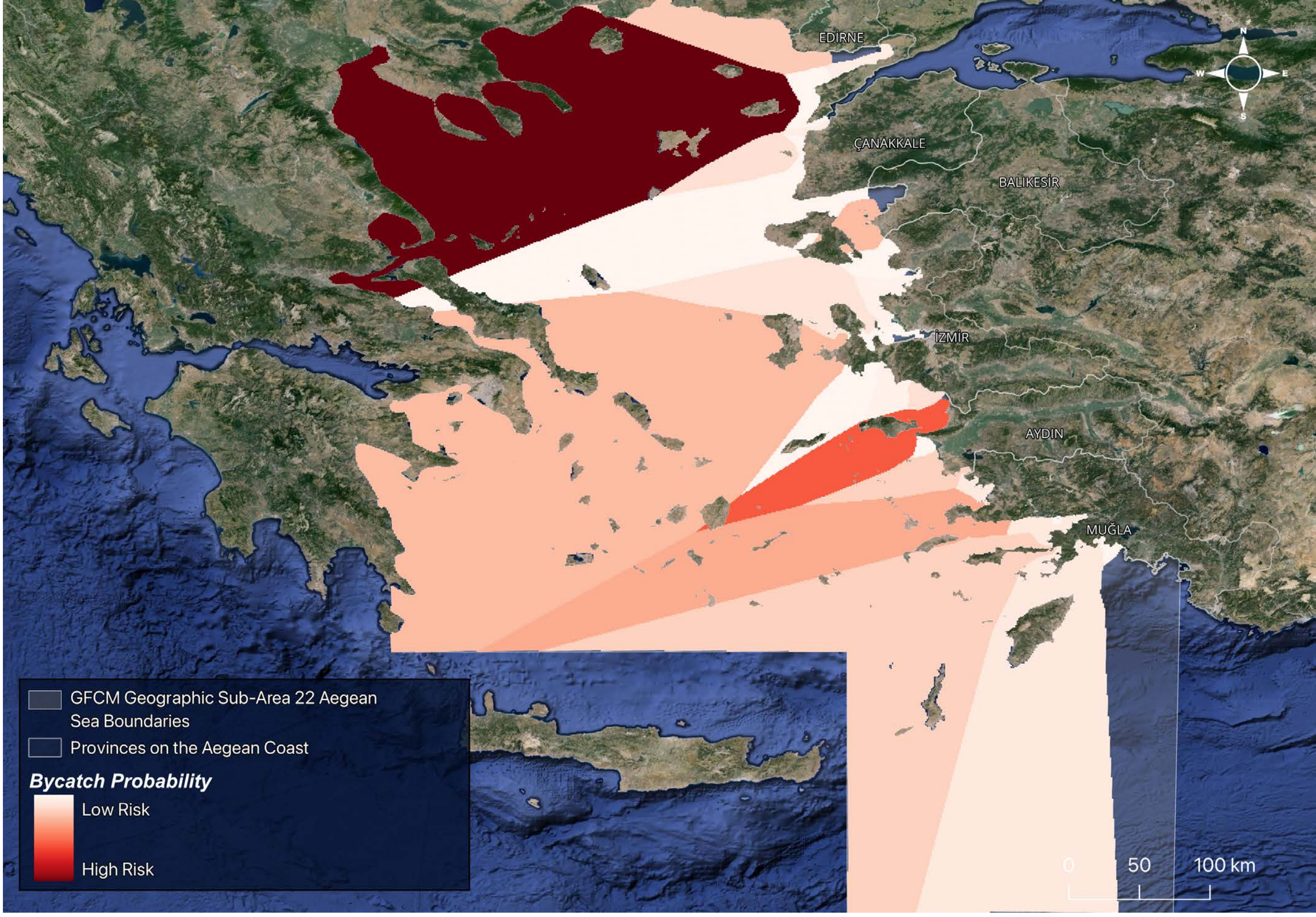


Figure 30. Map showing the bycatch probability within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

E.Presence of Aquafarms

Aquaculture, the farming of aquatic organisms including fish, mollusks, crustaceans, and aquatic plants, is a common and increasing practice along the seas of Türkiye (Özden, 2015). 2023 statistics highlight that >60% of the aquatic products produced in Türkiye originate from aquafarms (Çöteli, 2023). Given the increased prevalence of this practice, a series of discussions were held on how to integrate it into our analysis. These discussions were further elaborated during the Nature and Culture Coexistence on the Aegean Coasts Workshop in December 2023.

As a result of these discussions and the literature data, the impact of aquafarms was integrated into the biodiversity analysis. Various legal frameworks aim to regulate aquaculture and its impact on biodiversity in Türkiye (Akyol, et al., 2019). However, there are opposing opinions on the impact of aquacultural practices on biodiversity exist. By adopting a more precautionary approach, the presence of aquafarms in an area was used as a reversible threat acting on biodiversity in the optimization analysis.

In the absence of an open-source dataset about the location of aquafarms, their detection was carried out manually using Google Earth satellite images. The latest available satellite images (as of May 2024) were used to map the aquafarms. Furthermore, information at different resolutions (coordinate data, descriptions of location, or information about their absence) were gathered from Integrated Coastal Management Plans of Northern and Southern Aegean regions (Balas and İnan, 2023; Tür, 2023) and incorporated into the produced spatial maps. This labor-intensive study was carried out meticulously throughout the Aegean coast of Türkiye. The presence or absence of aquafarms was used as grid-based information in the biodiversity optimization analysis. To assign this information to the 1x1 km grid cells of our analysis, an overlap of at least 5% within the individual grid cells was adopted (Figure 31).

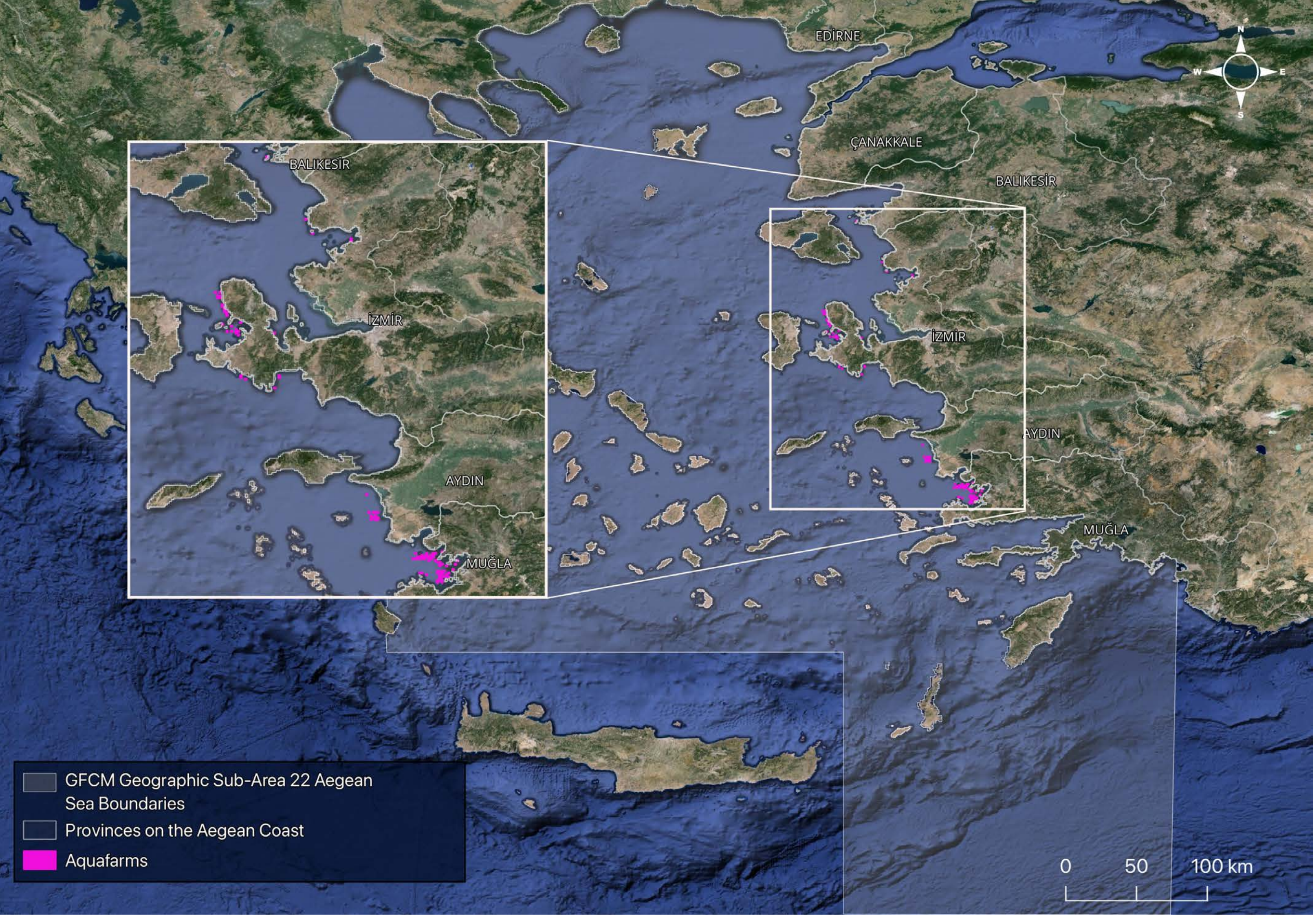


Figure 31. Map showing aquafarms within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

3.2.2. Decreasing

3.2.2.1. Other Factors Decreasing the Choice

A. Conservation Investments

In Türkiye, both state and non-state actors are involved in biodiversity conservation and the sustainability of small-scale fisheries (SSFs). The investment of such actors on both topics through various projects (hereon conservation investments) is key in understanding the intensity of conservation efforts for biodiversity and SSFs in a given area. The higher level of conservation investments (measured through different indices as detailed below) indicates areas where different actors such as CSOs, state organizations, universities, and research institutes were engaged in these topics and allocated their resources. Our aim here was to identify areas with the need for more financial support and actor engagement, we therefore incorporated the conservation investments as a factor decreasing our choice.

In the Aegean coasts of Türkiye, some areas are known to host a higher conservation interest, especially towards the conservation of priority species (e.g., *Caretta caretta*, *Monachus monachus*, etc.) and habitats (e.g., seagrass meadows (*Posidonia oceanica*), etc). Similarly, some areas along the coast are recognized for having received more substantial support to foster the sustainability of SSFs. Yet, on neither of the two topics (i.e., biodiversity or SSFs) there have been attempts to bring together information about the variation of the conservation investments at the regional scale. To provide a detailed assessment of the conservation investments at a comparable level, we gathered information at the district level across the entire region (previously referred to as the 'project area') and analyzed it under three indices: budget, number, and frequency of projects. This multi-layered and elaborate analysis enables us to reach a finer-scale assessment. We conducted this assessment in the following consecutive steps:

- We created an online Conservation Investments Questionnaire (Yolda Initiative, 2023) to collect information on conservation projects on biodiversity and SSFs in the Aegean coasts of Türkiye (see Annex 4). For the period to cover, we chose between 2000 and 2023. Given the changes to both biodiversity and SSFs dynamics in the last 20 years, we didn't consider older conservation investments. The questionnaire was developed with the purpose of collecting essential information on the budget, time period and scope of the conservation projects, lead organizations, geographical coverage (by district), as well as optional data such as partners and project area name.
- We gathered information by using this template in three steps:
    - » We shared the questionnaire with 110 CSOs (detailed in Section 3.2.1.1, Organizational Capacity).
    - » During the Nature and Culture Coexistence on the Aegean Coasts Workshop (Balkız et al., 2023), a special session was dedicated to reviewing the information gathered through the questionnaires and filling the gaps with the aid of the participants. The gaps majorly pointed to the projects led by universities and research institutes and were complemented during and after the workshop.
    - » With the contributions of Güner Ergün and Mehmet Gölge, final additions were made especially regarding state-led conservation investments.
- We thereon prepared a Conservation Investments Database which involved various project information derived from these sources. In a matrix structure, for each of the projects the following data fields (when present) were filled: (i) project name, (ii) coordinating organization(s), (iii) partners, (iv) project area (at the scale of districts), (v) project period, (vi) total budget (categoric information as <5,000 EUR, 5,000-50,000 EUR, >50,000 EUR), and (vii) project scope (small-scale fisheries, species conservation, habitat conservation). Although equipped with such an elaborate data set, we could not integrate information on the implementation success of these projects, since qualitative aspects of the projects were less accessible and processable.
- The database included projects conducted by CSOs, universities, research institutes, and also state-led conservation efforts (e.g., inventory and monitoring projects realized in Special Environmental Protected Areas) (FAO, 2023; Global Environment Facility, 2023; T.C. Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı, 2023; T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı, 2023).

Once the database was finalized, we produced three indices (budget, number, and frequency of projects) separately for biodiversity conservation and sustaining small-scale fisheries:

- For the project budget, we calculated the total project budget per district. When beforementioned categoric information was supplied, to sum the budgets, we used averages. If a project was implemented in multiple districts, we divided the sum equally among all involved districts unless a particular budget for specific districts was mentioned in the survey responses.
- For the project number, we simply summed up the number of projects per district.
- For the project frequency, we aimed to distinguish districts that regularly received conservation investments. For this, we produced frequency value by taking into account the number of projects carried out in a district by year; the number of consecutive projects; the total number of years in which consecutive projects were sequenced, and the total number of projects (Value=Consequtive Years/24*Consequtive Projects/Total Projects).

These indices were included in the analysis as different layers, since each of them provided different information about the conservation investments landscape. The results showed changing levels of conservation investments. The data we used in the analysis was linked to districts, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data) (Figure 32, Figure 33 and Figure 34).

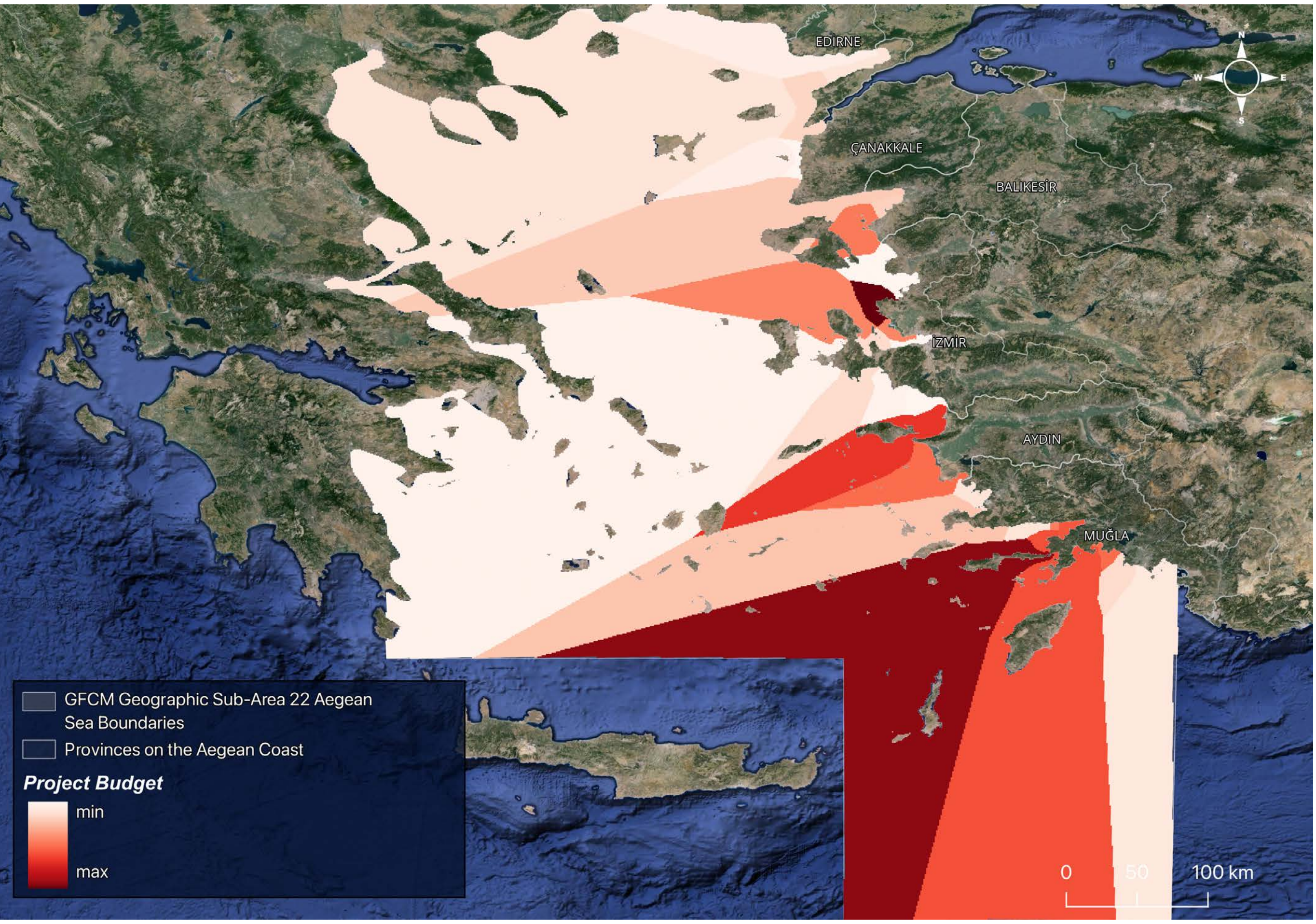


Figure 32. Map showing the total budget of conservation investment projects within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

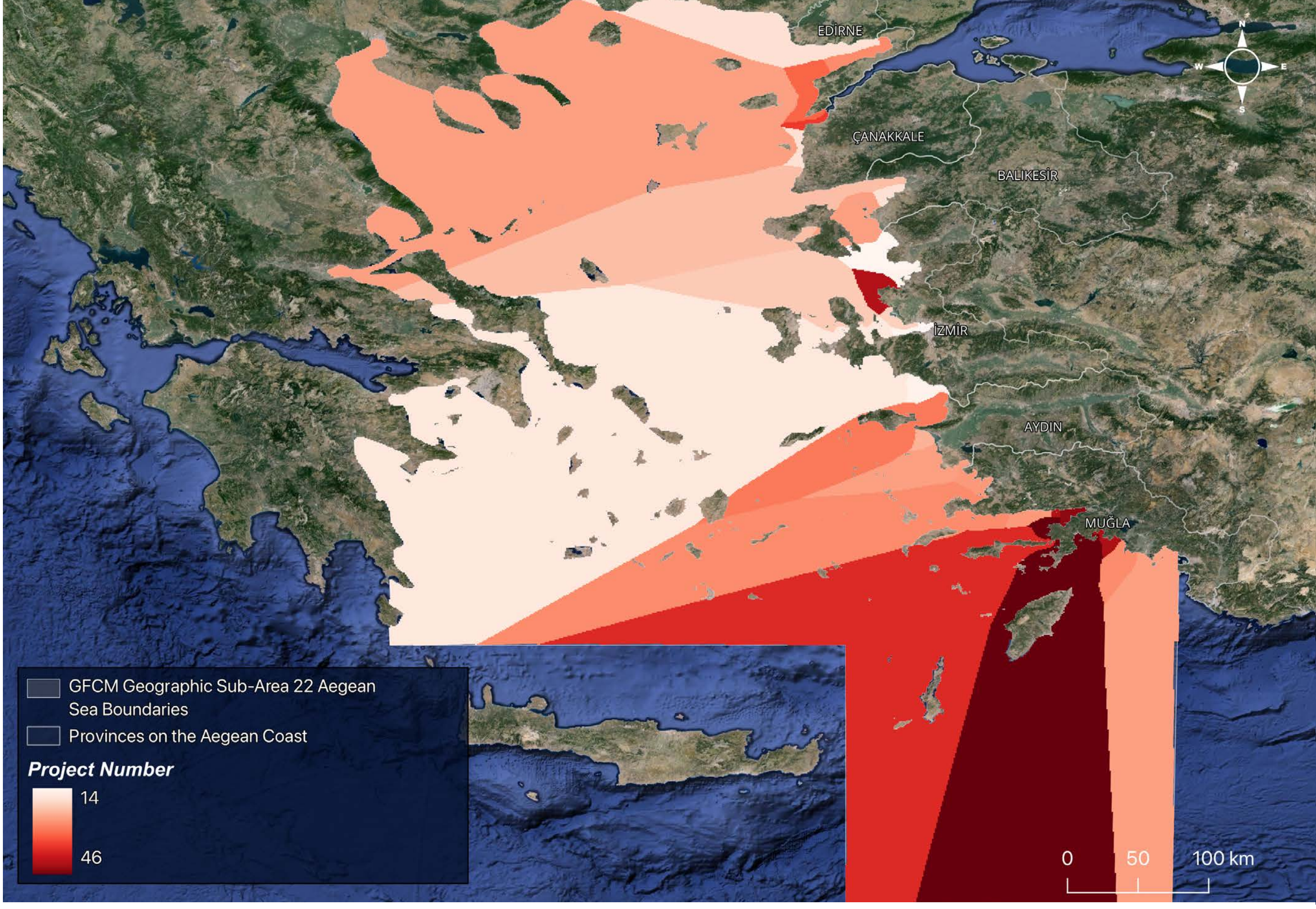


Figure 33. Map showing the number of conservation investment projects within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

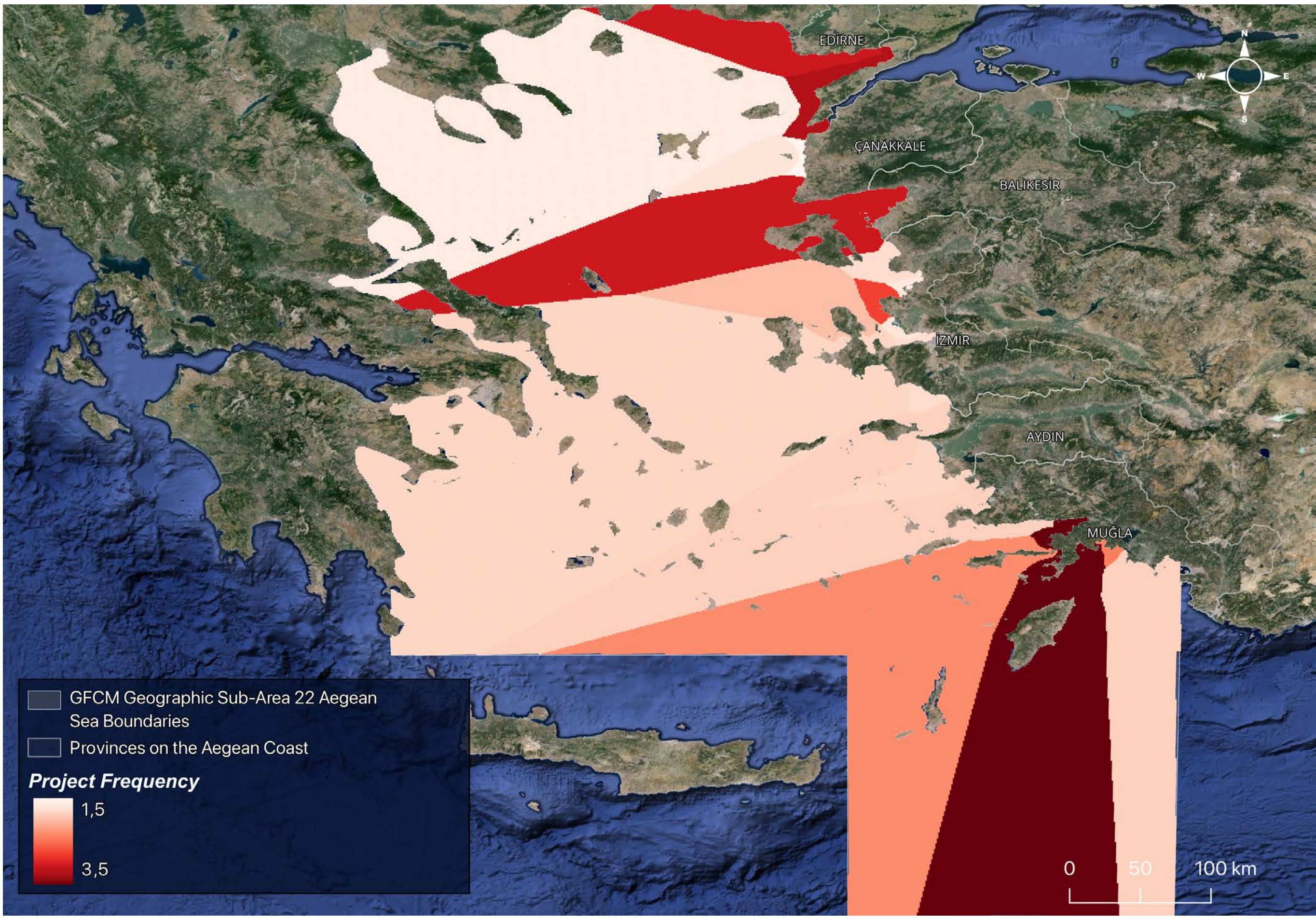


Figure 34. Map showing the frequency of conservation investment projects within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

B. Enforced Protection

The presence of management plans in protected areas was considered as another layer of information to assess the level of conservation efforts in the study area. The management plans showed the areas with enforced protection efforts that relatively few new actors are needed. Therefore, it was incorporated into the analysis as a factor decreasing our choice (Figure 35). Other types of protected area management plans are present in the area, yet we considered solely the presence of management plans in National Parks as they are the most effectively implemented.

Figure 35. Map showing the presence of management plans in protected areas within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

3.2.2.2 Irreversible Threats

Information and data on threats were important factors used in our analysis. We distinguished two main types of threats (reversible and irreversible) and defined irreversible threats as those that cannot be resolved even with the presence of conservation efforts. In other words, areas with higher rates of irreversible threats were included in the analyses as a factor decreasing our choice.

A.Expert Opinions from the National Workshop

The details of the data gathered from the national workshop are presented under Section 3.2.1.2, Reversible Threats. The main difference in this part was that we chose threats with preventability scores (assigned by the experts in the workshop) < 3 (out of 5) as irreversible and analyzed them following the same approach as the reversible threats (Figure 36).

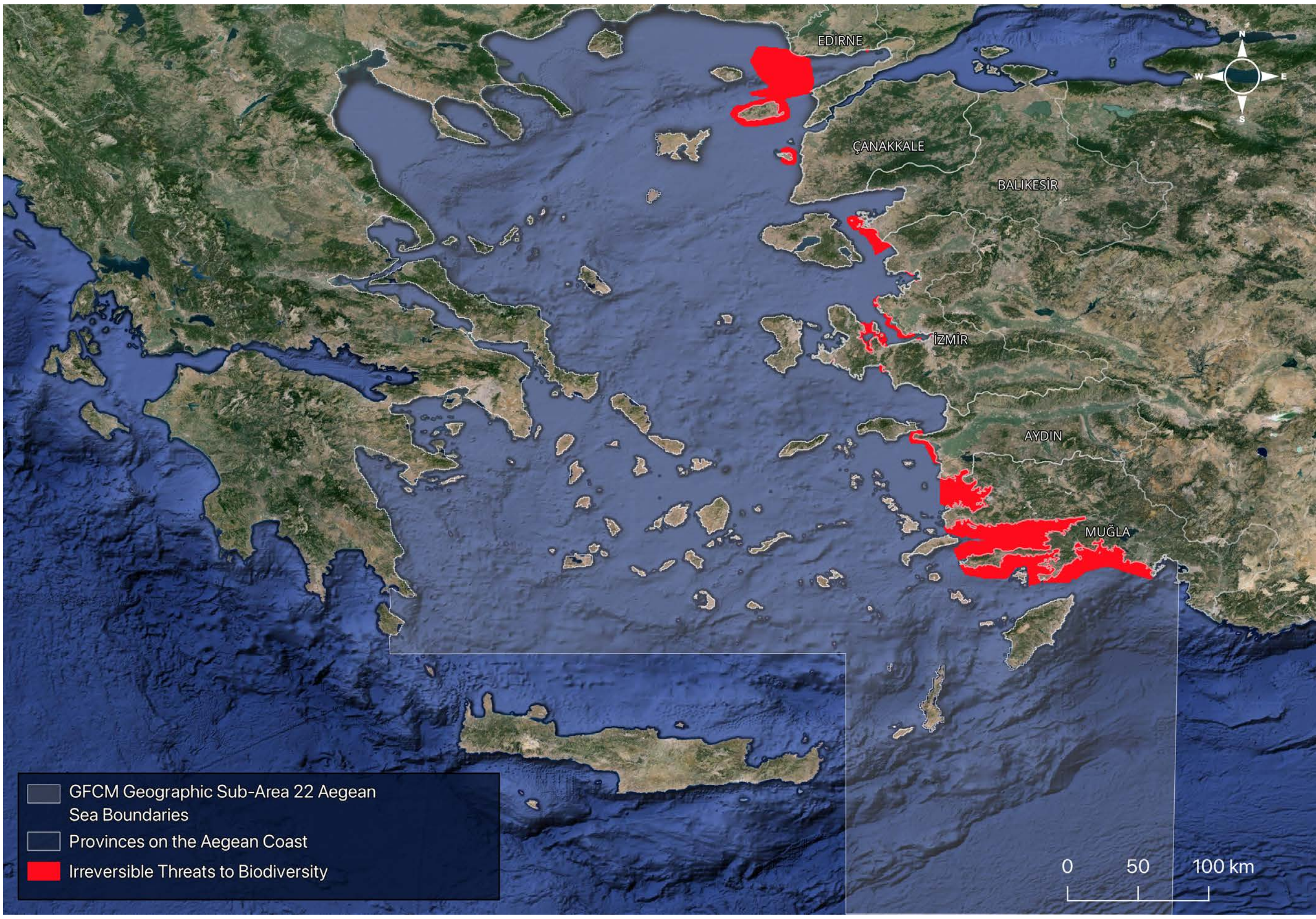


Figure 36. Map showing the irreversible threats to biodiversity from expert opinions from the national workshop within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

B.Human Impact to Marine Ecosystems

There are countless ways human activities impact marine ecosystems and their biodiversity (Halpern et al., 2008). Such impacts include but are not limited to decreases in marine species populations, habitat degradation, and diversion of water and flow modification (Kappel, 2005). Certain datasets provide information about this at the regional or global scales. One such database is provided by the UN Biodiversity Lab. Among the different data provided in this database, the United Nations Cumulative Human Impact to Marine Ecosystems (Halpern et al., 2015) assesses the anthropogenic impact on marine diversity.

The UN Cumulative Human Impact to Marine Ecosystems dataset includes data on oil rigs, invasive alien species, artisanal and demersal fishing practices, land and ocean pollution, climate data such as sea level rise, ocean acidification, and sea surface temperature, global shipping traffic, direct human disturbance, and inorganic pollution. Impacts of both reversible and irreversible threats are embedded in the dataset, but for the purposes of this study, we incorporated this data into irreversible threats as a composite source. One limitation of the data is that it relied on measurements from 2013, and thus is not representative of the current scale of the human impact. Moreover, some of the listed individual factors were already included in our study through alternate sources (e.g. shipping traffic and ocean pollution). Hence, the data was incorporated into the analysis with a low weight to minimize the effects of these shortcomings. The dataset was available in raster format, and we incorporated it into our study grids (1x1 km) through the calculation of zonal statistics (zonal maximums) of the pixel values that fell within each unit grid cell (Figure 37).

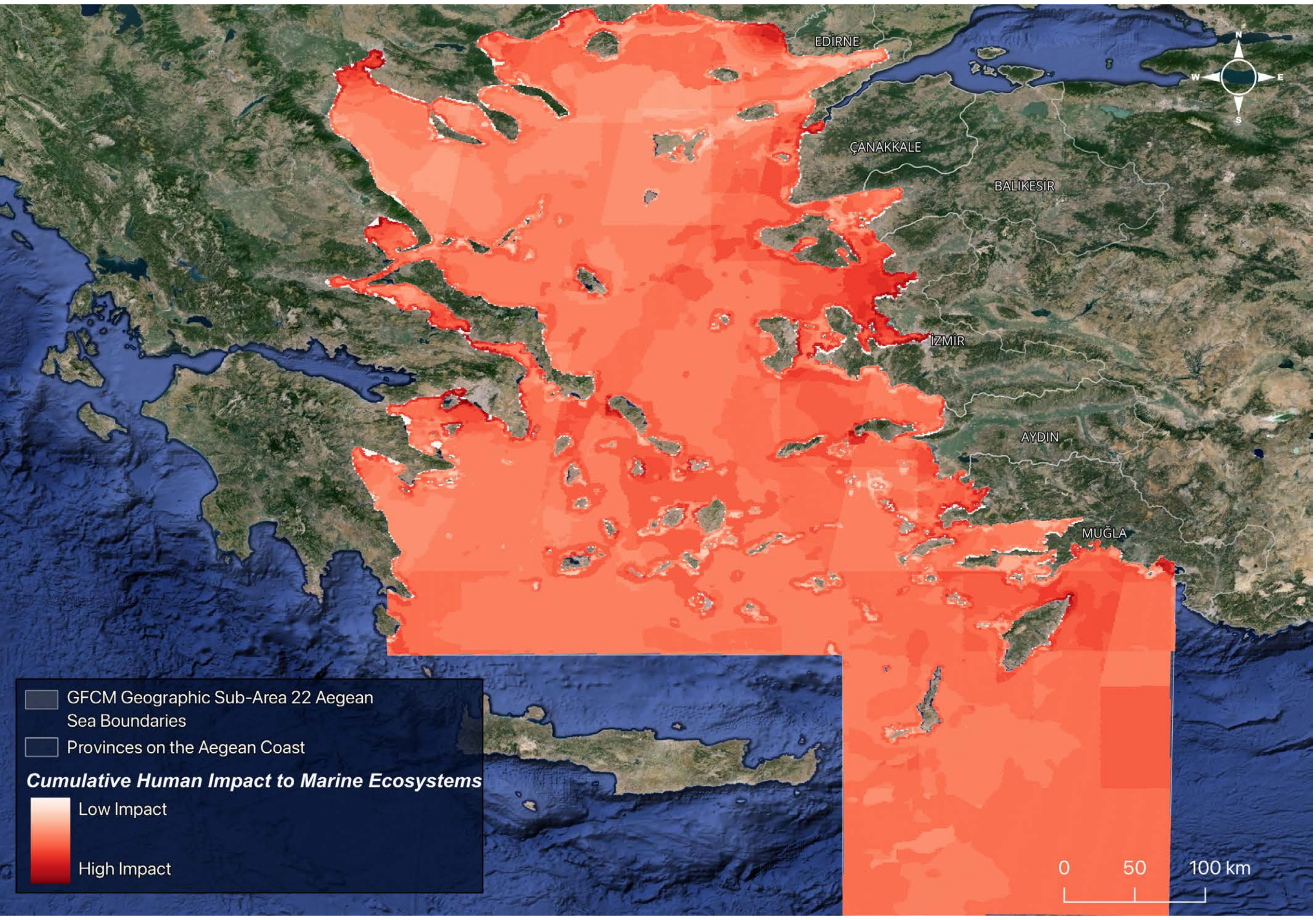


Figure 37. Map showing the Cumulative Human Impact to Marine Ecosystems layer from the United Nations dataset within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

4.Small-scale Fisheries

4.1 Fishing Grounds

Included Areas

The sea has no physical boundaries, but external factors limit the sea's use for small-scale fishing vessels. The fishing grounds of small-scale fisheries vary according to factors including but not limited to the technological equipment, access to resources, weather conditions, and sea currents. Each fisher chooses the most suitable fishing gear and areas based on their knowledge and experience. Daily and longer operations are planned and carried out under the influence of all these variables, in accordance with the regulations at the national scale. The spatial extent of the small-scale fishing activities at the Aegean Sea was one of the main pillars of our project.

The scientific literature on fishing grounds of small-scale fisheries in Türkiye is extremely limited. No open-source data (digital or otherwise) is available at the regional scale. Some literature information is present about fishing grounds at the local scale (e.g. Güçlüsoy et al., 2024; Ünal et al., 2022), but they are not detailed enough for our analysis. Therefore, considerable effort was dedicated to collecting this dataset. The research began with face-to-face interviews at field visits. During these field visits, the fishing grounds were drawn in a geographically comprehensive and detailed manner through direct markings made by the fishers on maps (distinguishing fishing gear and target species). Field visits were carried out in Edremit, Karaburun, Urla, Foça, and Bozcaada districts between March and October 2023. Further data was collected through telephone interviews. The phone interviews targeted representatives from all the 93 fisheries cooperatives in the study area. The cooperative representatives were reached with the support of the SÜR-KOOP and its regional units. The interviews were carried out via structured questionnaires, systematically over 8 months and in four rounds (gathering information on different aspects in each round). The questions, like the face-to-face interviews, were designed on the basis of fishing gear and fishers were asked what type of gear they used and where they used it. The questions continued with the depth and the distance they covered from the shore. In four directions, the names of the places (local or official names) visited were noted. Collected data on fishing grounds was then transferred into spatial platforms using QGIS Software. To create a clear reference in the marine environment, the data was mapped using a 1x1 km grid system. GEBCO Compilation Group (2023) bathymetry file and Navionics Boating Map (n.d.) information were employed during the mapping step (Figure 38).

Figure 38. Map showing the small-scale fishing grounds on the Aegean Coast of Türkiye

Excluded Areas

Upon the finalization of the fishing grounds, we incorporated physical and regulatory limitations on small-scale fishing operations. This was carried out using 2 types of information: all-year bans from the Notification as regulatory barriers, and aquafarms as physical barriers. These are detailed below.

All-year bans consisted of restrictions mapped from Notification No. 5/1 (Anonymous, 2020) (Figure 39). These are areas mostly designated for conservation and safety reasons along the coasts of National Parks, wetlands, river mouths, and military zones. These restrictions are fundamentally different from the "seasonal bans on small-scale fisheries" (Section 4.2.2.2) as they do not simply limit the use of certain gear or the catch of certain species, but they close an area to commercial fishing activities of all types completely throughout the year. In the absence of an open-source digital database on these bans, they were spatialized one by one by our team using QGIS Software.

The second source of information was about the aquafarms, which were considered as physical barriers to small-scale fishing activities (Figure 40). This is mainly because, by regulation, the aquafarms cannot be approached by the SSFs vessels by at least 200 meters (Akyol et al., 2019). In other words, a site with several aquafarms will make it impossible for fishing vessels to pass over or between the floating platforms. We thus mapped an area of 200 m surrounding the locations occupied by aquafarms and used it as an exclusion criterion for the small-scale fishing grounds. The details about data collection on aquafarms are presented in Section 3.2.1.2.

Figure 39. Map showing the year-long bans on SSFs within the small-scale fishing grounds

Figure 40. Map showing the aquafarms within the small-scale fishing grounds

4.2.Factors Impacting the Choice

4.2.1. Increasing

4.2.1.1. Other Factors Increasing the Choice

A.Fishing Bans Towards Large-Scale Fisheries

One of the main foci of this study is SSFs and Large-Scale Fisheries (LSFs) are a predominant factor impacting their dynamics. These two practices target the same resources in the sea. However, LSFs vessels have more capacity to reach larger catch volumes compared to small-scale vessels (Akbaş et al., 2023; Prestrelo et al., 2019). This creates a more challenging and competitive environment for people whose livelihood depends on small-scale fishing. Therefore, regulatory limitations on LSFs were included in the analysis as an "opportunity" for small-scale fisheries.

The classification of fisheries doesn't distinguish large-scale from small-scale fisheries but employs the type of fishing gear instead (Anonymous, 2020). To detect the fishing bans towards the LSFs, we mainly used the articles on the use of trawls and purse seine nets (Articles 9 and 10). In the absence of an open-source digital database on these bans, they were spatialized one by one by our team using QGIS Software. The coordinates provided in the Notification were digitized directly, while bans with location descriptions were digitized by transferring them to our study units (1x1 km grid cells) (Figure 41).

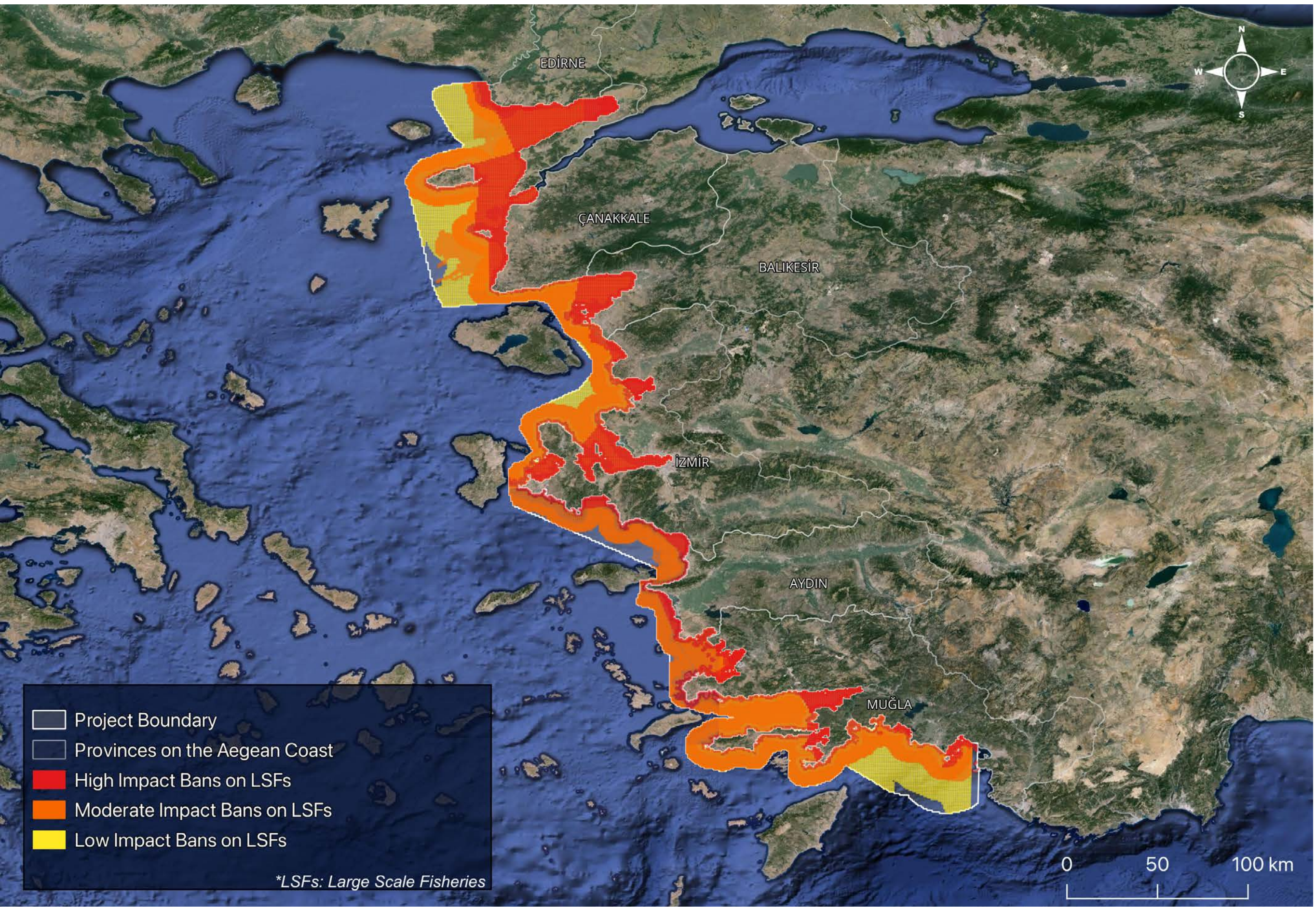


Figure 41. Map showing the different types of fishing bans towards large-scale fisheries on the Aegean Coast of Türkiye

Secondly, we distinguished the impacts of bans, in other words, the opportunities they create for SSFs, from one another. To do so, we assessed each regulation and its area individually and scored their impacts on SSFs (as Low, Moderate, High, or Full). The scoring mainly aimed at reflecting how high of an opportunity the bans created on SSFs. For example, if a ban on big-scale fisheries was covering an area with little SSFs activity, a low score was assigned. This approach allowed the analysis to differentiate the impact of specific bans within their regional contexts, providing a nuanced understanding of how these restrictions affect small-scale fisheries.

B.Sustainability of the Practice

B.1. Volume of the SSFs Fleet

SSFs are both a form of cultural practice and an indispensable means of livelihood in Türkiye. The national fishing fleet predominantly comprises vessels equipped with passive fishing gear, thus are small-scale. Nearly 88% of the registered fishing vessels (13,354 out of a total of 15,236) use passive fishing gear (GFCM, 2024). The number of boats which shows the volume of the SSFs fleet, is one of the most important indicators of SSFs' sustainability. Hence this data was taken into consideration in our study.

To determine the number of SSFs boats operating in the Aegean Sea, we conducted a survey using three different types of sources. Firstly, the data were collected from the General Fisheries Commission for the Mediterranean, which annually publishes data on the registered fleet size and further details on vessels, making it possible to access the total number of SSFs vessels (GFCM, 2024). Secondly, we collaborated with the 'Data Research Centre' in TÜİK to get district-based data and developed codes to filter the relevant information on the number of SSFs vessels (TÜİK, 2021). Lastly, the same information was gathered by our team during the structured interviews with 93 cooperatives. To collect this data, we asked questions about the number of boats registered to the fisheries cooperatives. Through this, we were able to collect information more representative of the SSFs practitioners at the district level.

The fishing boat numbers from these three datasets were compared. In our decision-making process, we prioritized the relevance of data concerning boats under 12 meters in length, along with district-level information and representation from small-scale fisheries cooperative organizations. The information that our team obtained from the interviews was chosen to be utilized as it was deemed the most reliable for the analysis. This data was linked to the fishing grounds spatially for each cooperative. In cases where there is more than one cooperative in the same district, the total number of boats was integrated (Figure 42).

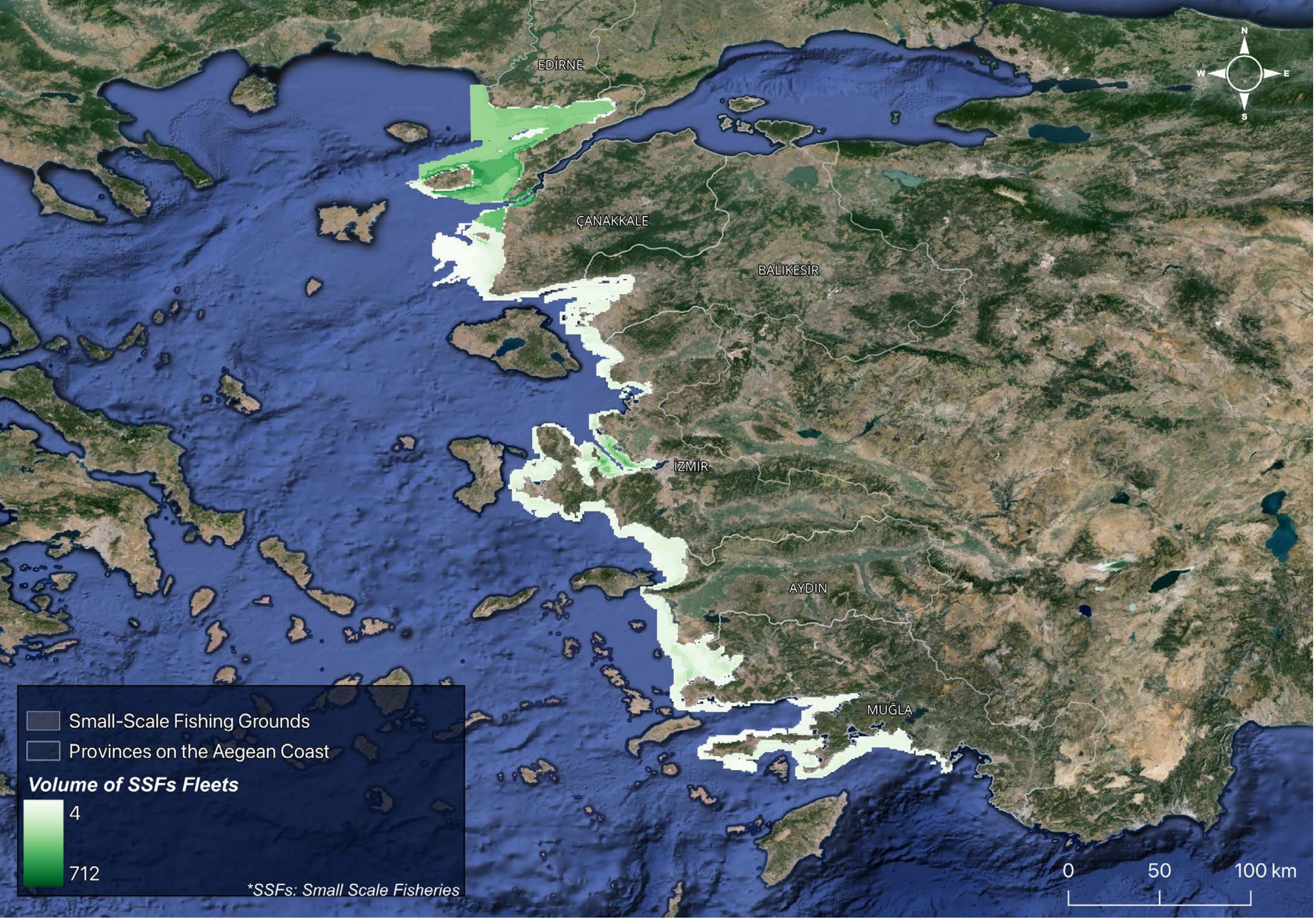


Figure 42. Map showing volume of SSFs fleets within the small-scale fishing grounds

B.2. Diversity of Fishing Gear

Small-scale fishing is a labor- and skill-intensive activity (Cochrane & Garcia, 2009). The duration of fishing operations varies based on the type of fishing gear used and the target species. To enhance operational efficiency, a wide variety of small-scale fishing gear has been developed, each designed to catch the desired species in different environmental conditions. In Türkiye, the common fishing gear categories that small-scale fishers use are gillnets and entangling nets, hooks and lines, which themselves have subcategories. Furthermore, the use of the same type of gear may change based on local factors, including habitat type and depth.

During the field surveys realized in March and October 2024, we observed the use of different fishing gears and gear types in SSFs vessels. Based on internal discussions, as a novel approach, we assumed this diversity supports the long-term viability of their operations. Therefore, the diversity of fishing gear in boats was included in the analysis as an indicator of the sustainability of the practice.

The information on the number of vessels with different types of gear and their sub-categories was gathered during the structured interviews with 93 cooperatives. Detailed questions on the number of baskets and hooks of longlines, the quantity of thick and fine hooks, the types and quantities of gillnets and entangling nets, and the lengths of these nets were asked in each cooperative. Eventually, the number of vessels with different gear sub-categories was summed for each cooperative and divided by the number of total registered. The value produced was used as a measure of the diversity of fishing gear for each vessels cooperative (Figure 43). On this topic, further detail could be added by considering the operational efficiency (the time spent by fishers on operations/day), yet the available data on this aspect for Türkiye lacks the necessary level of detail.

Figure 43. Map showing diversity of SSFs fishing gears within the small-scale fishing grounds

B.3. Presence of Fishing Facilities

Fishing facilities have critical importance for the sustainability of small-scale fisheries. Managed by fisheries cooperatives, they provide required safe places for fishing vessels, protecting them from storms and currents. Fishing facilities and infrastructures are also equipped with several resources, such as electricity, ice supply, cleaning, and other maintenance needs. They can include areas designated for fish sales and some of them even have coffeehouses and restaurants, all managed by fisheries cooperatives. These services are important for the succession and longevity of the cooperatives (Ünal et al., 2009; Yapanto et al., 2020). These services further contribute to the development of solidarity and communication among fishers, as they provide a meeting place during the day for the fisher community. For these reasons, the presence of these facilities and infrastructures was acknowledged as a factor in enhancing the sustainability of small-scale fishing practices.

There exists no open-source database about the locations of fishing facilities but only an inventory list, provided on the Ministry of Agriculture and Forestry website. This list specified the name of the district but did not present information on the exact locations and it was not up to date. Consequently, extensive efforts were dedicated to fill this gap. Information from integrated coastal plans, specifically the Expert Assessment Reports on Coastal Facilities (for the provinces of Edirne-Tekirdağ-Kırklareli, Balıkesir-Çanakkale, and Aydın-Muğla) approved by the General Directorate of Spatial Planning was mapped by our team one-by-one using QGIS Software. Upon that, 2022-2023 satellite images from Google Earth were used to cross-check the data. The total number of facilities was used as a measure of fishing facility infrastructure density in the analysis.

To produce comparable results among the study area, we used district-level analysis and calculated the total number of fishing facilities in each district per cooperative number. With this method, we wanted to demonstrate areas that hold a higher density of fishing facilities per district and cooperative. The data we used in the analysis was linked to districts, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data) (Figure 44). Lastly, in this assessment, we could not assess the condition of the infrastructure and services provided by the fishing facilities in the absence of this data in our study area.

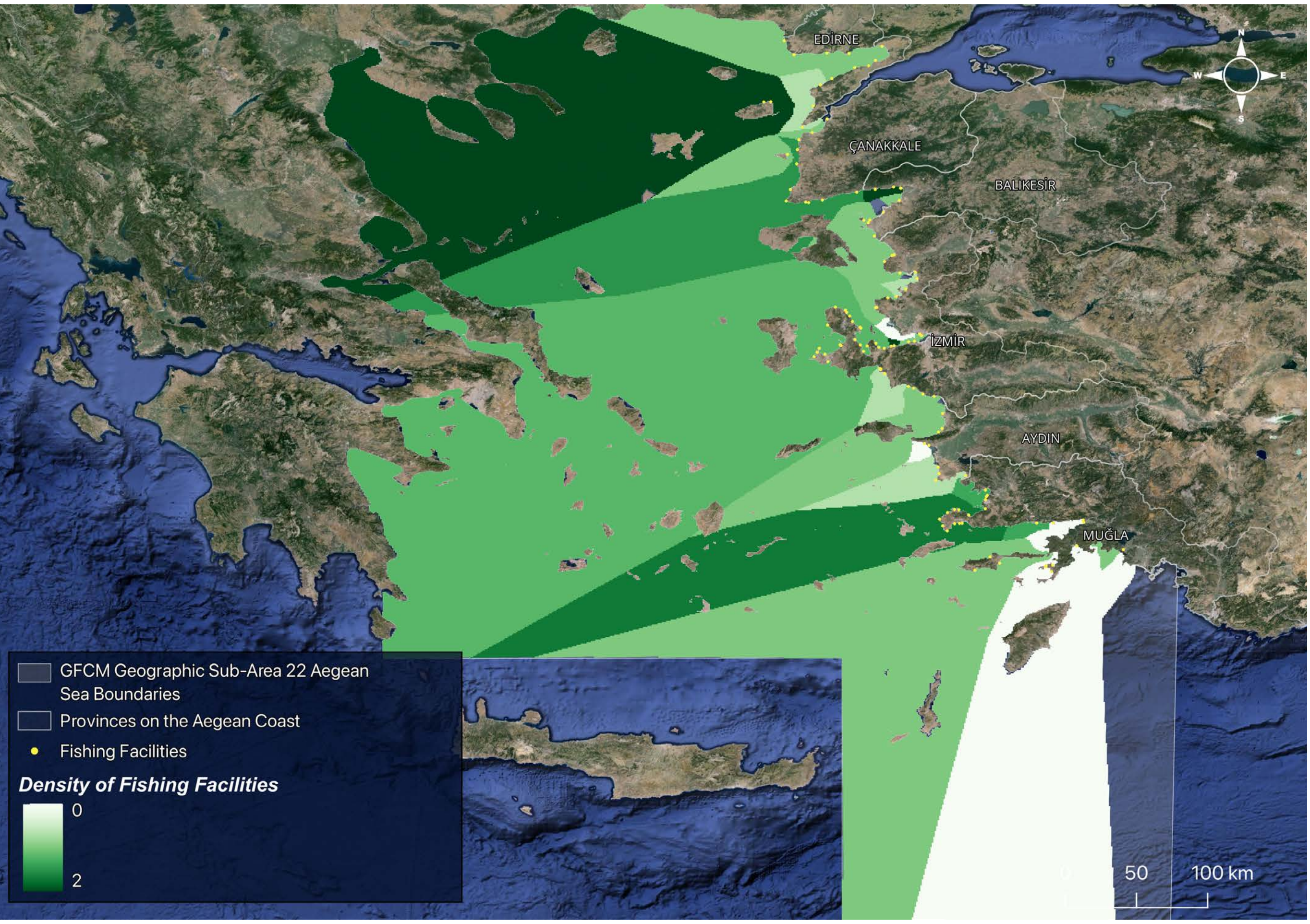


Figure 44. Map showing the fishing facility infrastructure density within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

B.4. Catch Per Unit Effort (CPUE)

Catch Per Unit Effort (CPUE) is a fundamental metric in fisheries science, reflecting the quantity of fish caught relative to the fishing effort exerted. The specific measure of fishing effort can depend on the fishing methods and types of fishing gear used. Effort can be quantified in various ways, such as the number of hours fished, the number of nets used, the length of gillnets, or the number of traps set, allowing for flexibility in choosing the most appropriate metric for different fisheries (Akyol et al., 2012; Akyol and Ceyhan, 2009; FAO, 1998; Gulland, 1983; Hinton and Maunder, 2004; Karakulak and Ceyhan, 2024; Maunder et al., 2006; Maunder and Punt, 2004; Rodríguez-Marín et al., 2003; Su et al., 2008). This adaptability is crucial for accurately assessing fish stocks and managing fisheries sustainably.

In our study, CPUE metrics informed us about the economic efficiency of a type of gear, so-called 'fishing success' which indicates the financial sustainability of SSFs. Therefore, higher CPUE means fishers use their resources (e.g., time, fuel, labor) more efficiently, leading to lower operational costs and higher profitability. This helps to ensure the long-term viability of the fisheries, providing a stable income for the fishers and supporting the local economy. Therefore, the districts with higher CPUE values increased the choice in our analysis.

To assess CPUE values per district, we collected multifaceted data. The analysis was based on four main fishing gear types utilized by fishers of the Aegean Sea: Handlines, longlines, gillnets, and encircling gillnets. We used the data accessed via the TÜİK Fisheries Micro Data Set of 2021 (Su Ürünleri İstatistikleri Mikro Veri Seti – 2021) and assessed the following data per gear at the district level: Total number of boats, total number of days spent fishing in a year, total number of hours spent fishing in a day, average number of fishing gears released in a day and total catch volume per species.

In addition to the abovementioned data, the length of the nets and the number of hooks in longlines necessary for the CPUE calculation were accessed via a literature review (Akyol et al., 2007; Akyol et al., 2008; Akyol et al., 2011a, 2011b; Akyol et al., 2016; Akyol and Ceyhan, 2007a, 2007b, 2007c; Akyol and Ceyhan, 2010a, 2010b; Altınağaç et al., 2008; Ayaz et al., 2012; Ceyhan and Akyol, 2005; Kınacıgil et al., 2013; Tokaç et al., 2010; Tosunoğlu et al., 2019). With catch records classified according to fishing gear on a species basis, the average net lengths of gillnets used in that region, as documented in the literature, were standardized to 1,000 meters. Similarly, the average number of hooks from the longline was standardized to 1,000 meters, accounting for the total days of use of each fishing gear as reported in the literature (Ceyhan and Akyol, 2006; Kaykaç et al., 2020; Sağlam et al., 2015; Tokaç et al., 2010; Tosunoğlu et al., 2019). Finally, the average CPUE per day for one fishing boat was calculated as kilograms per 1,000 meters of net for gillnets and encircling gillnets, kilograms per 1,000 hooks for longlines, and kilograms per day for handlines. The results were standardized to enable a reliable comparison among districts. The data we used in the analysis was linked to districts and, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data) (Figure 45).

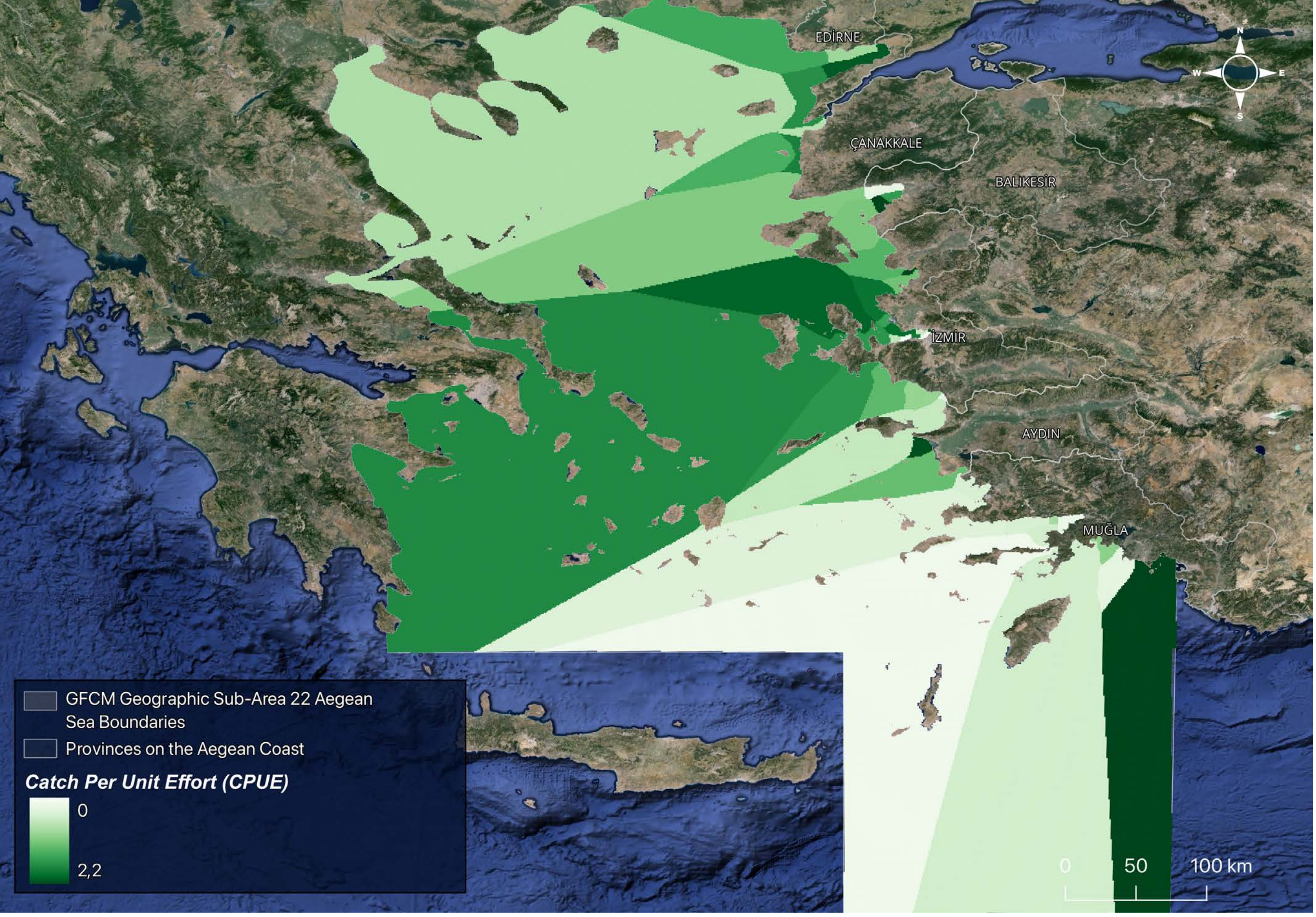


Figure 45. Map showing catch per unit effort (CPUE) within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

B.5. Young Fishers

The workforce of the SSFs tends to get older since many fishers are middle-aged or older (Ünal & Göncüoğlu, 2012). Such demographic shifts threaten the transmission of traditional ecological knowledge and, consequently, the sustainability of fisheries (Tam et al., 2018) Younger people often pursue jobs in sectors like tourism or agriculture because of the economic instability associated with fishing. This problematic is valid for many countries including Türkiye (FAO, 2020; T.C. Tarım ve Orman Bakanlığı, 2019). This demographic trend creates challenges for adaptation to the changing environmental and social conditions and the continuity of small-scale fishing in Türkiye. Given the importance of this topic, we integrated it into our analysis. The higher proportion of young fishers in a cooperative contributed positively to the choice in the analysis as it indicated a higher potential for the continuation and sustainability of the practice.

Initially, data was gathered from the official database (TÜİK, 2021), which categorizes the ages of all individuals working in the fishing sector into three groups: under-20, 20-50, and above 50. On the other hand, the UN Trade & Development Handbook of Statistics (UNCTAD, 2023) notably uses an age division that highlights the significance of individuals aged 40 years and below as young. Recognizing the relevance of this demographic group for the sustainability of fisheries in the district, we collected data specifically on cooperative members aged 40 years and below during our field visits and structured interviews with 93 cooperatives. These two sets of data were diligently compared to one another to see which one was better in resolution and represented the actual situation better. This led to the selection of using the information gathered from the cooperatives for fishers under 40 in comparison to the total number of members. The analysis was carried out based on districts. In the presence of more than one cooperative in a district, we presented the overall proportion (Figure 46).

Figure 46. Map showing ratio of young fishers within the small-scale fishing grounds

B.6. Women Fishers

Small-scale fishing is a family-based tradition that shapes the cultural geography of coastal communities. Apart from catching fish, net mending, setting up the gear for fishing, and cleaning are also part of it and these works are shared within the family. As well as catching the fish, women take part in several stages of the operation. However, women's efforts are often underestimated or neglected in the common perception of a "fisher" as is the case in any sector of work (FAO, 2013). Recognizing and enhancing the visibility of women's contributions is not only a matter of gender equality but also crucial to the resilience and sustainability of small-scale fisheries. Women's involvement enriches the social fabric of fishing communities and diversifies household strategies for adaptation, knowledge transmission, and ecosystem stewardship (House et al., 2023; FAO, 2020). For this reason, the visibility of women's efforts in the practice is crucial for initiating gender equality. We therefore assessed the presence of women fishers as a factor increasing the sustainability of the practice, hence the choice in our analysis.

There are different types of data and information available on women in the profession, discussing the division of labour and working conditions. The Mediterranean Conservation Society and SÜR-KOOP have conducted comprehensive studies on this topic (Kartal et al., 2022). Additionally, TÜİK has data on women fishers in small-scale fisheries (TÜİK, 2021). We further asked the number of women fishers during our structured interviews with 93 cooperatives. In the end, among all these different data sources, we had to determine which one was more suitable and reliable for our analysis. For this, the numbers presented in the grey literature reports, official statistics, and data gathered through interviews were compared, and even though it had lower resolution, we concluded to use TÜİK's provincial data on women fishers since it was covering the whole study area. The results were standardized to enable a reliable comparison among provinces. The data we used in the analysis was linked to provinces and, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data) (Figure 47).

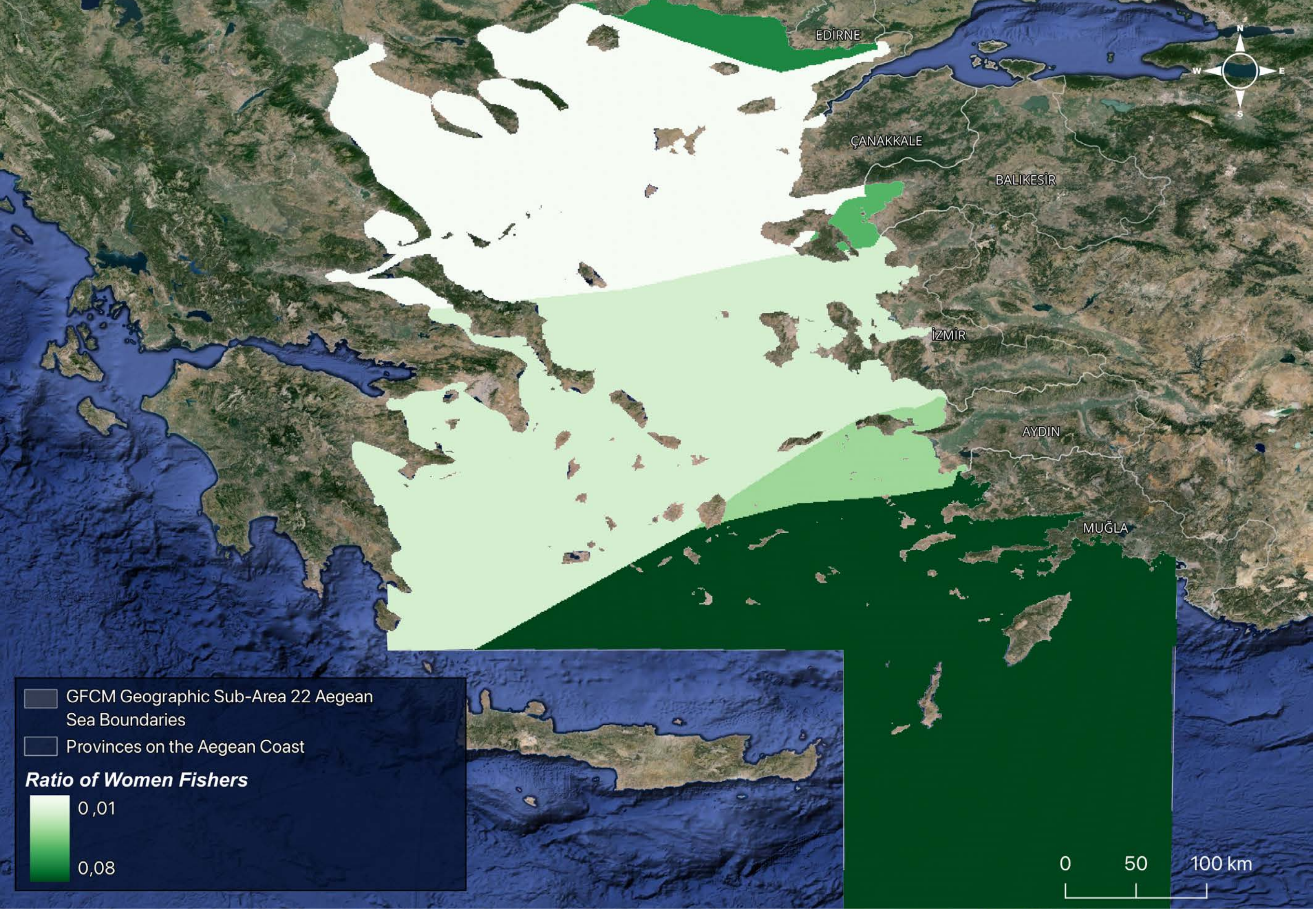


Figure 47. Map showing ratio of women fishers within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

C.Proximity to Biodiversity-Rich Areas

In our study, we considered two types of biodiversity-rich areas: areas with Lagoon Trap Fishing and those with Traditional Shore Operated Stationary Lift Nets. Among the 29 lagoons present along the Aegean Coast, literature research revealed that only 6 are currently used for "lagoon trap fishing" and their traps are placed at the inlets of the lagoons (Tosunoğlu et al., 2017). The precise locations of these traps at the inlets were obtained based on Tosunoğlu et al. (2017) and then verified using Google Earth 2022-2023 satellite images, with updates made when necessary. In the 6 lagoons, 17 traps were mapped as points, to have a better precision of the inlets. The proximity of the biodiversity-rich areas to the fishing grounds was then calculated as the distance between these points and the center points of the SSFs fishing grounds 1x1 grid cells (Figure 48).

On the Traditional Shore Operated Stationary Lift Nets (referred also as traditional blanket nets), there exists no open-source data available. Therefore, we conducted field studies in Karaburun, Urla and Foça during May 2023 to determine their exact locations. Similar to lagoon trap fishing, we calculated the distance between the locations of the Traditional Shore Operated Stationary Lift Nets (as points) and the center points of the SSFs fishing grounds grids cells (1x1 km) (Figure 49). For both cases, the grid cells closer to the biodiversity-rich areas increased the choice in our analysis, as they positively contributed to SSFs.

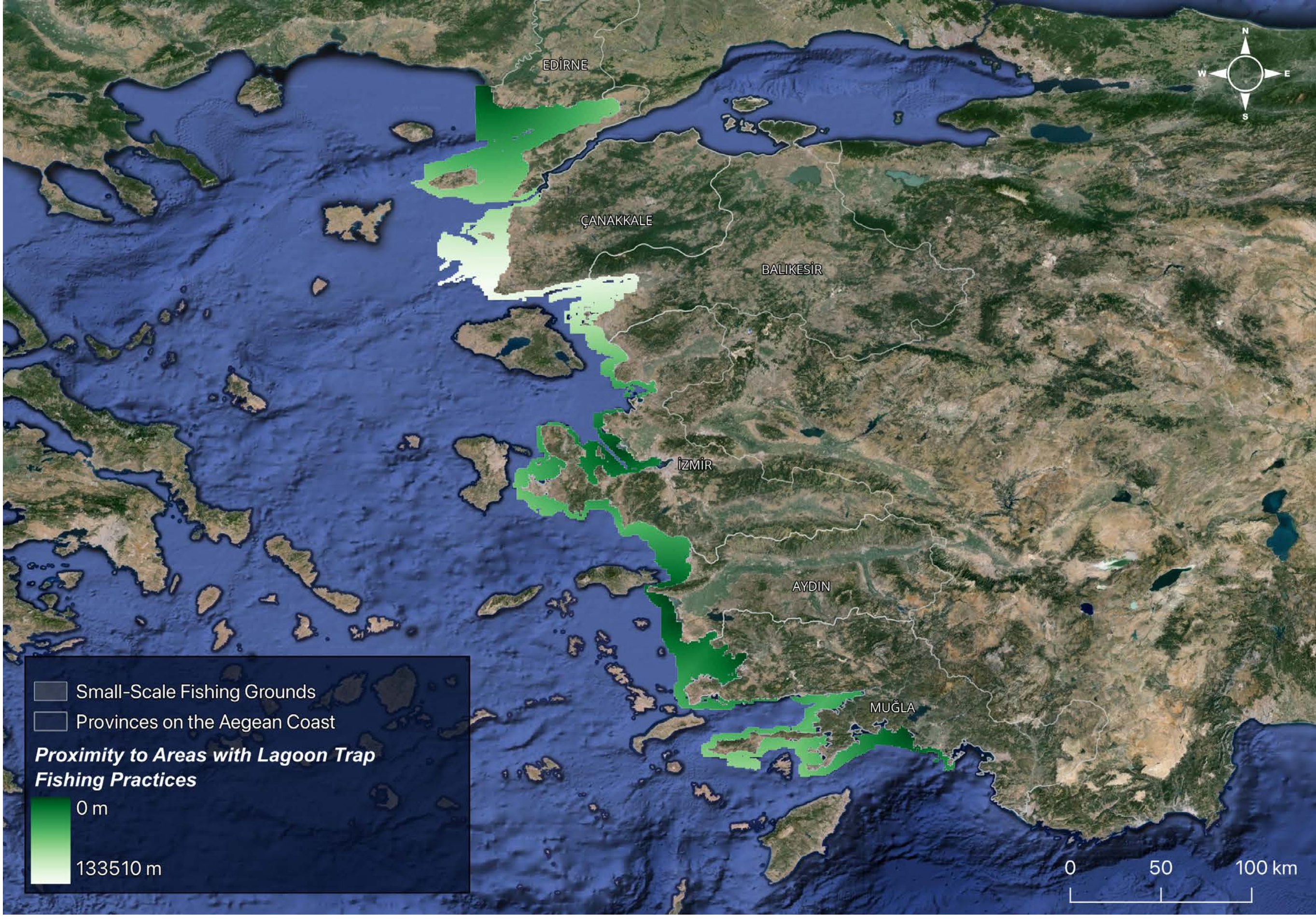


Figure 48. Map showing proximity to areas with Lagoon Trap Fishing within the small-scale fishing grounds

Figure 49. Map showing proximity to areas with Traditional Shore Operated Stationary Lift Nets within the small-scale fishing rounds

4.2.1.2 Reversible Threats

The details of the reversible threats in our study are discussed in Section 3.2.1.2. Following the same approach, we analyzed expert opinions from the national workshop and the level of water pollution from different sources towards small-scale fisheries (Figure 50, Figure 51 and Figure 52).

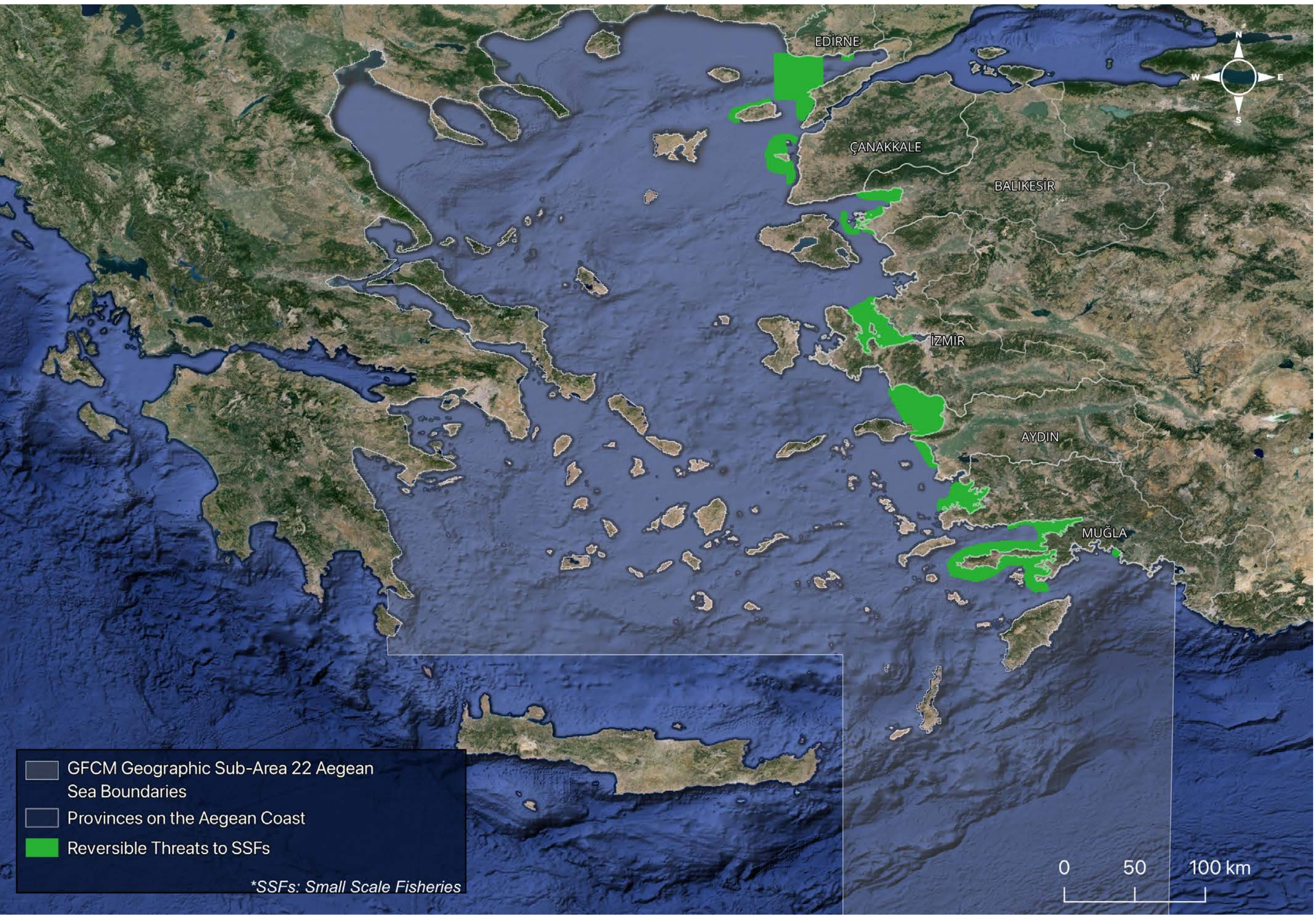


Figure 50. Map showing the reversible threats to SSFs from expert opinions from the national workshop within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

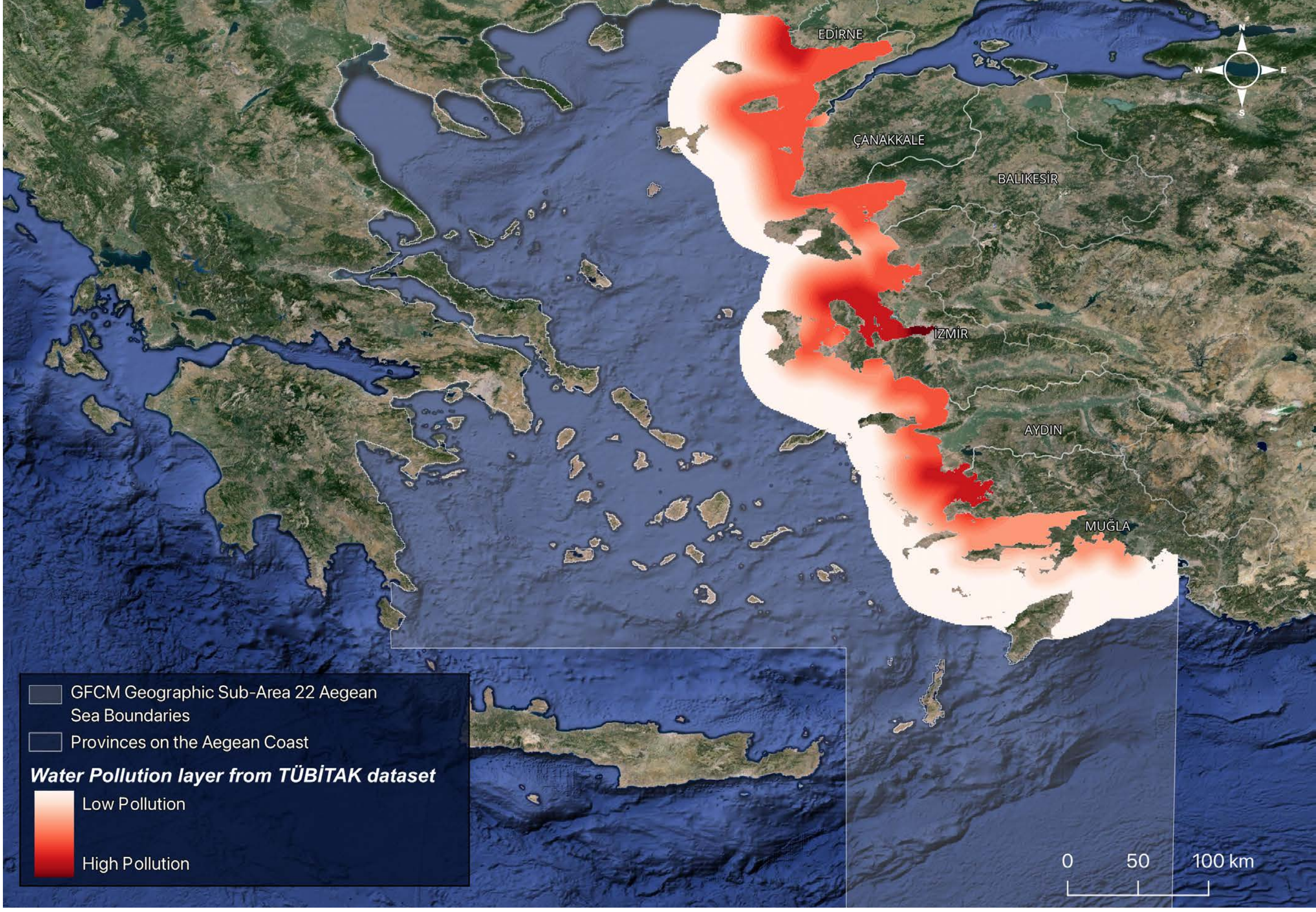


Figure 51. Map showing the Water Pollution layer from TÜBİTAK dataset within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

Figure 52. Map showing the Water Pollution layer for SSFs from expert opinions within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

4.2.2 Decreasing

4.2.2.1 Other Factors Decreasing the Choice

A.Conservation Investments

The approach is detailed under Section 3.2.2.1. The data we used in the analysis was linked to districts and, therefore terrestrial by nature. We applied a distance-based function to assign the information to each grid cell in our study area (details provided in Section 2.4, Digitization of Data) (Figure 53, Figure 54 and Figure 55)

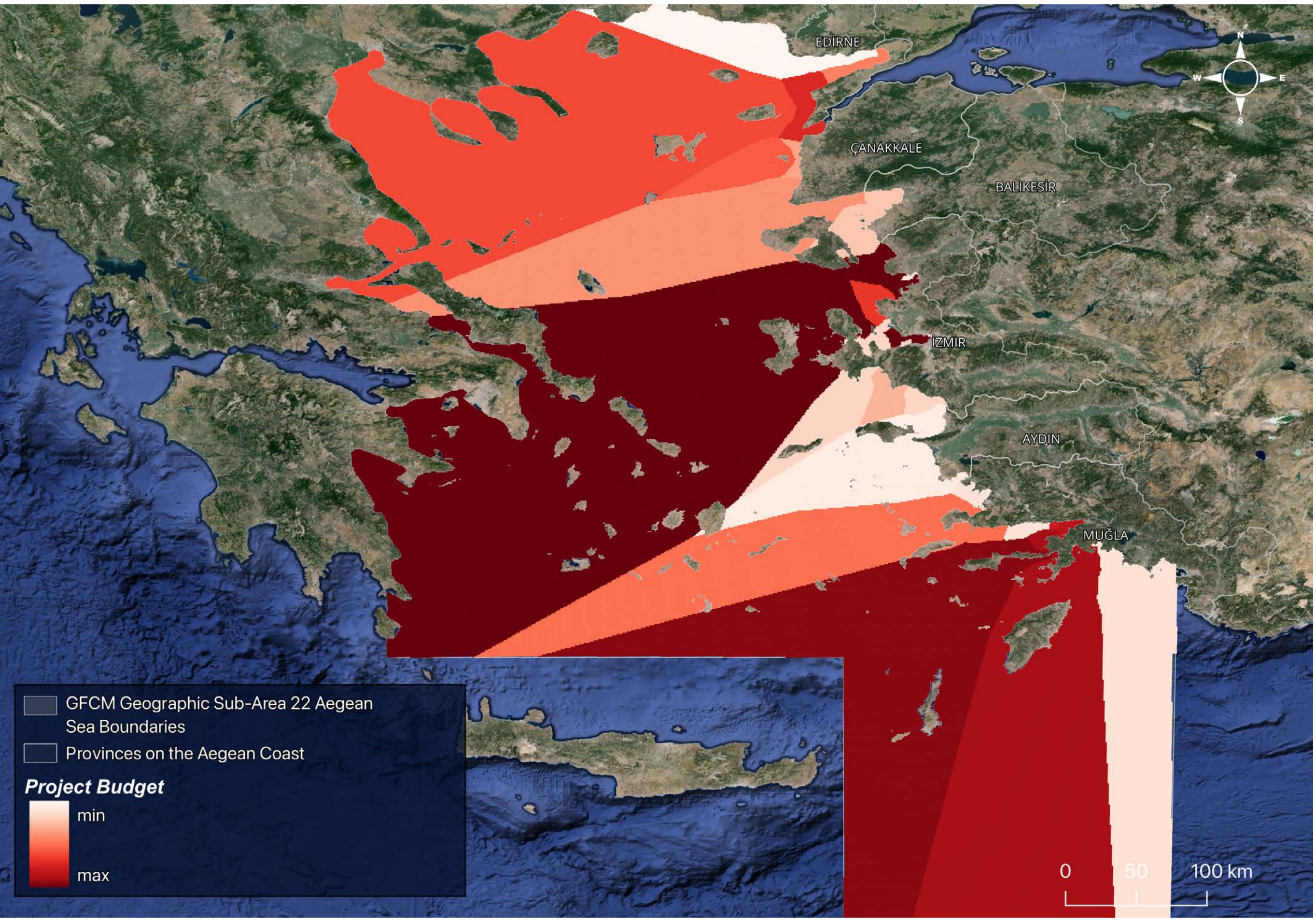


Figure 53. Map showing the budget of conservation investment projects within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

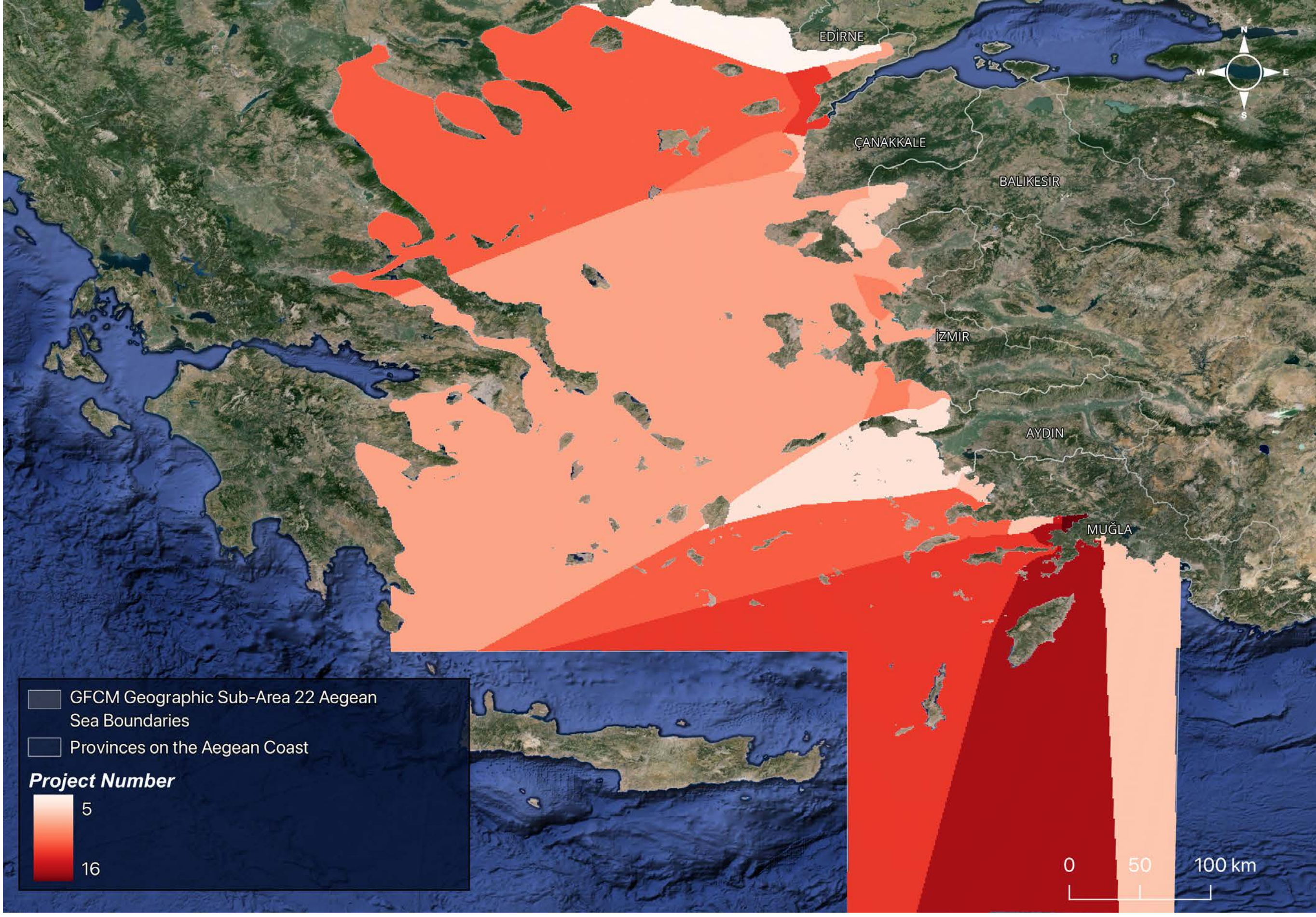


Figure 54. Map showing the number of conservation investment projects within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

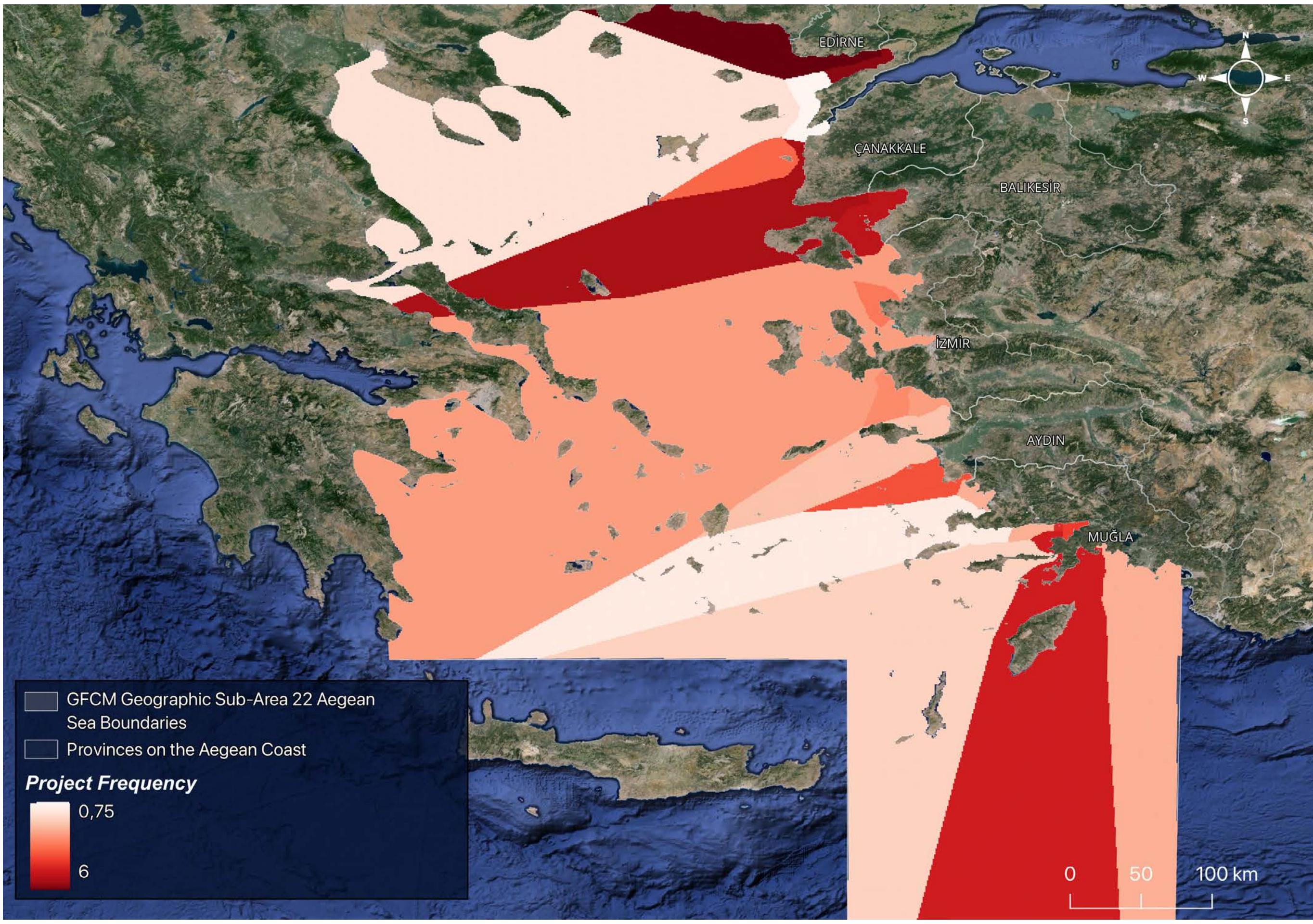


Figure 55. Map showing the frequency of conservation investment projects within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

4.2.2.2 Irreversible Threats

A.Expert Opinions from the National Workshop

The details of the irreversible threats in our study are discussed in Section 3.2.2.2. Following the same approach, we analyzed expert opinions from the national workshop (Figure 56).

Figure 56. Map showing the irreversible threats to SSFs from expert opinions from the national workshop within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

B.Route & Vessel Density

Marine traffic is one of the factors impacting small-scale fishing activities (Kavadas et al., 2015). Marine routes and the density of vessels, other than fishing vessels, can act as a physical barrier to SSFs' mobility and activity range. In the presence of an international data source on this topic (European Marine Observation and Data Network; EMODnet), we incorporated the areas of high-density route and vessel traffic (excluding fishing vessels) in our analysis. As these activities cannot be regulated at local or regional scale(s), they were integrated as factors that are irreversible, thus decreasing our choice in the analysis.

For the vessel density, the 2023 annual average shipping density was provided in raster format, in a 1x1 km resolution, expressed as hours per square kilometer per month (Vessel Density). Here, we used data on annual averages of all vessel types combined and excluded the vessel density of fishing vessels. The raster grid was then projected to our study units (1x1 km grid cells) by calculating the zonal maximum in each grid cell and was normalized. For the normalization, the standard deviation was used rather than the maximum to condense the range of values in our study area (Figure 57).

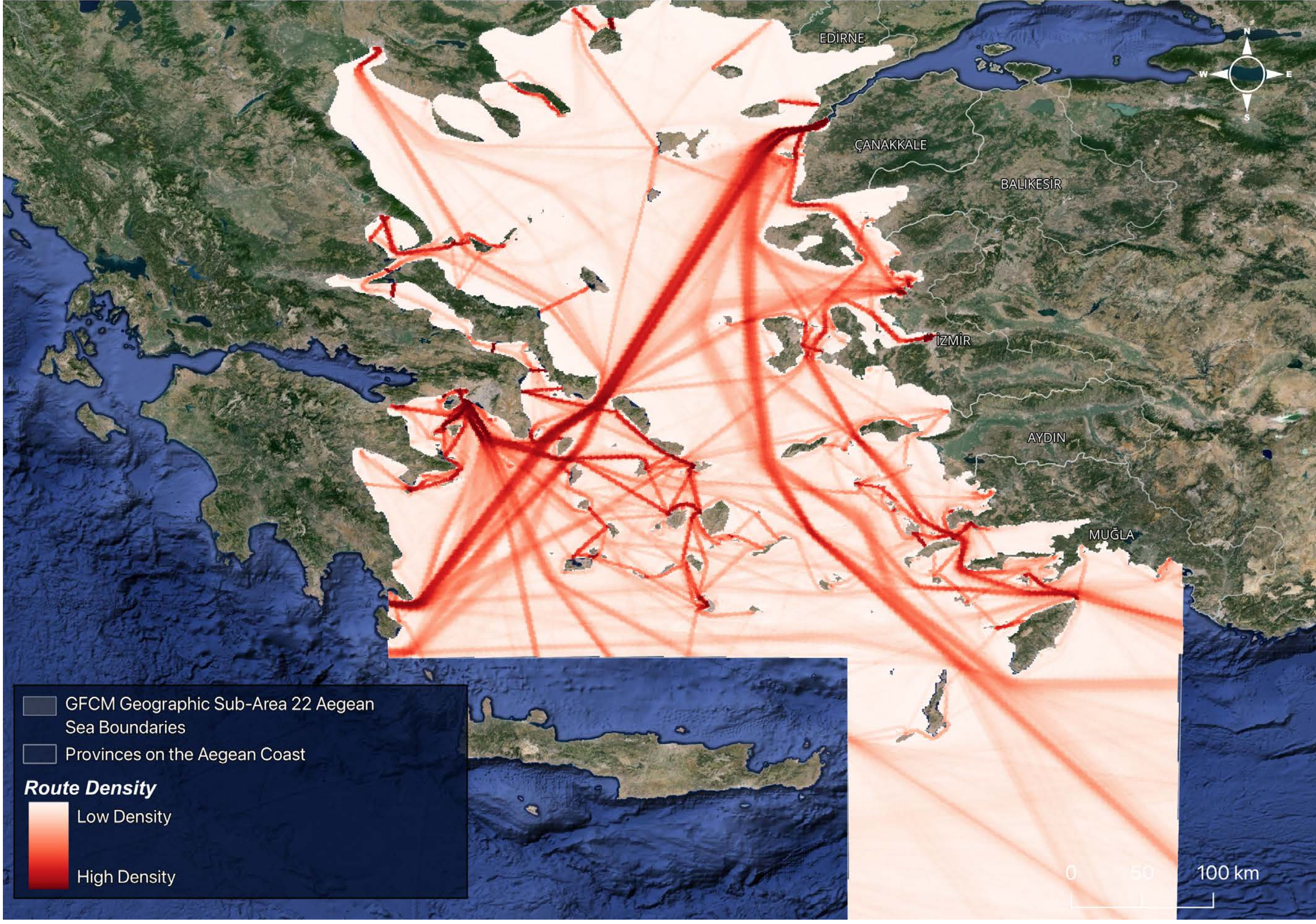


Figure 57. Map showing the Route Density within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

For the route density, the 2023 annual total route density data was available in the same format and resolution (Route Density). Similarly, annual route density totals of fishing vessels were subtracted from the annual totals of all vessel types. The subsequent steps were the same as described above (Figure 58).

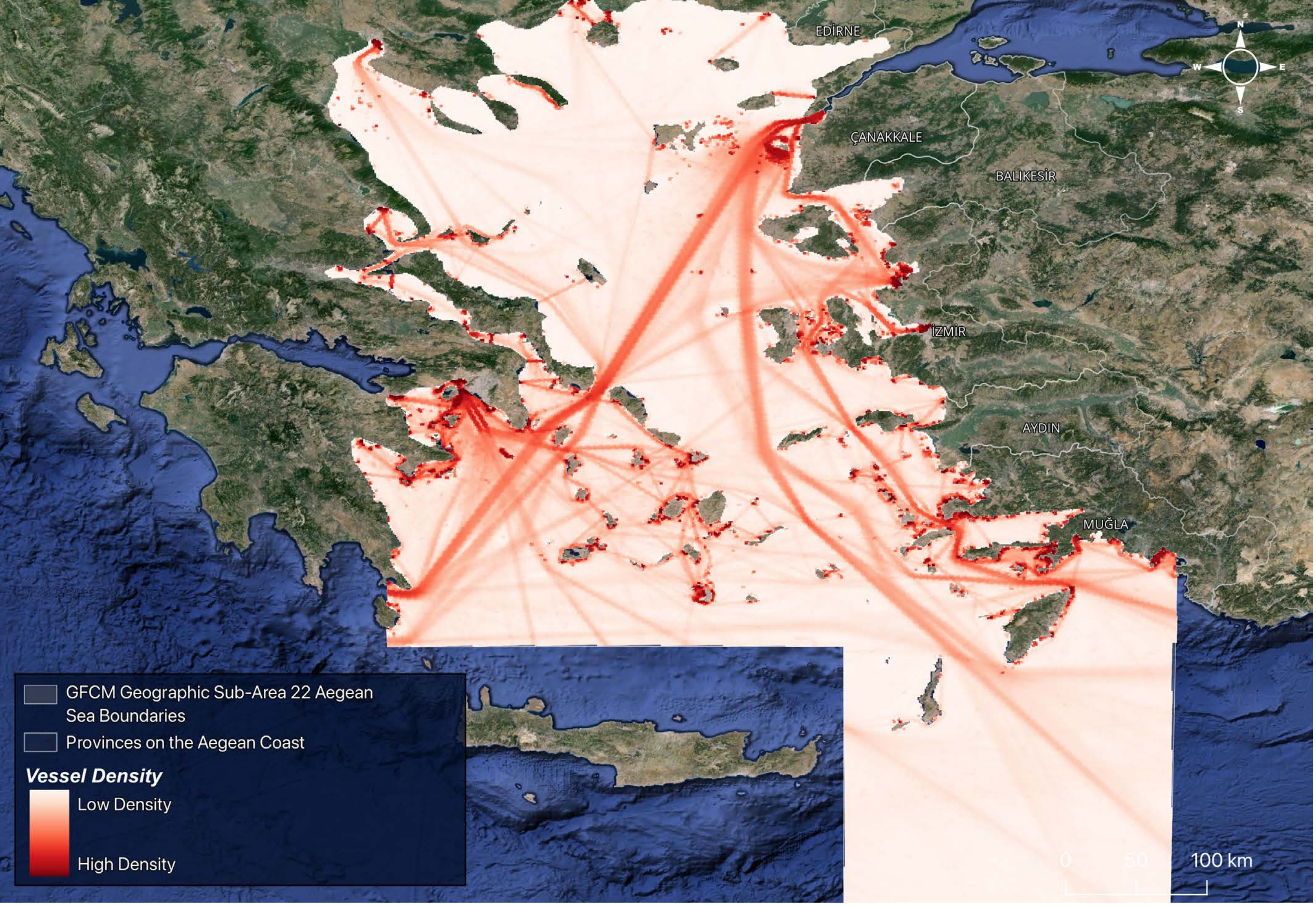


Figure 58. Map showing the Vessel Density within the GFCM Geographic Sub-Area 22 Aegean Sea boundaries

C.Large-scale vs Small-scale Fisheries Potential Conflict Hotspots

Small-scale and large-scale fishing are, by their very nature, in competition with each other as they rely on the same limited sources. In Türkiye, almost 90% of fishing vessels are small-scale (GFCM, 2024). However, their catch volume is much lower than that of the large vessels, as well as their labor capacity, technological equipment, and market reach (Akbaş et al., 2023). Both types of fishing practices are regulated through Notification No. 5/1 (Anonymous, 2020).)

In our project, we integrated the potential conflict between small-scale and large-scale fisheries, as it was highlighted in the structured interviews with fishers and the Nature and Culture Coexistence on the Aegean Coast Workshop as an important topic. The most frequently mentioned feature of the conflict was the overlaps in the fishing grounds. The areas where annual or seasonal bans are present on trawls and purse seines (large-scale fishing) through the Notification were communicated as areas with greater fishing opportunities for small-scale fishers. Hence, to assess the potential conflict hotspots, we mapped areas where small-scale and large-scale fisheries can operate at the same time in line with the Notification. These do not truly correspond to conflict hotspots but rather areas that hold a greater potential for conflict between the two practices.

To delineate the potential conflict hotspots, we identified large-scale fishing activities occurring within the small-scale fishing grounds. We considered areas of year-round bans on large-scale fisheries in two alternative sets. The first of these was by selecting areas with bans for either trawls or purse seine nets as shown in Figure 59.

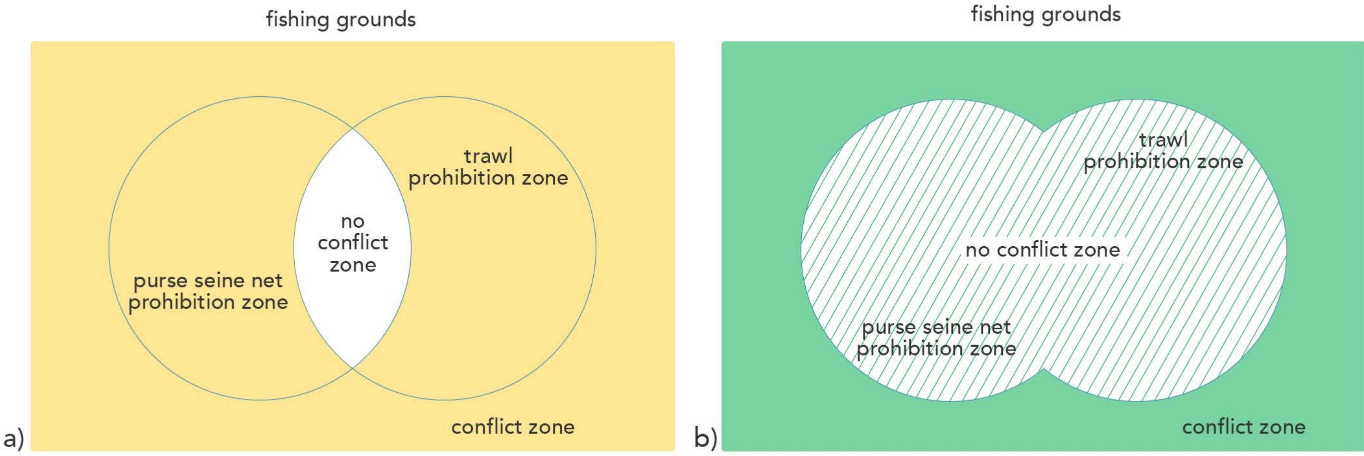


Figure 59. The two alternative sets for bans on large-scale fisheries: (a) showing the potential conflict hotspots remaining when year-long bans on both trawls and seine nets are considered as conflict-free zones, and (b) showing the potential conflict hotspots

The resulting potential conflict areas from both alternatives were reviewed by the project team and the latter was deemed closer to the actuality gathered from the workshop inputs and the structured interviews. To reiterate, the resulting areas do not have to host conflict, rather they represent areas where both large-scale and small-scale fisheries are active at a given time and can potentially have conflict. This potential of conflict was evaluated as an unresolvable issue and thus considered under irreversible threats to SSFs in our analysis (Figure 60).

Figure 60. Map showing the areas with Large-scale vs Small-scale Fisheries Potential Conflict Hotspots within the small-scale fishing grounds

D.Seasonal Bans Towards Small-scale Fisheries

We comprehensively investigated the factors affecting the use of the sea by small-scale fishing vessels. One of the major factors affecting SSFs is the regulatory limitations. Different from large-scale fisheries, SSFs are allowed to operate any time of the year with their vessels and gears. These restrictions were reflected in our analysis as a factor that negatively affects SSFs.

The classification of fisheries doesn't distinguish large-scale from small-scale fisheries but employs the type of fishing gear instead (Anonymous, 2020). To detect the fishing bans towards SSFs, we mainly used Articles 5, 27, 29, and 33 of the Notification. In the absence of an open-source digital database on these bans, they were spatialized one by one by our team using QGIS Software. The coordinates provided in the Notification were digitized directly, while bans with location descriptions were digitized by transferring them to our study units (1x1 km grid cells) (Figure 61).

Given that each ban has distinct purposes and targets, it was indispensable to assess each one individually for accurate integration into the analysis. To do so (similar to our approach in Section 4.2.1.1, Fishing Bans Towards Large-Scale Fisheries), we assessed each regulation and its area individually and scored their impacts on SSFs (as Low, Moderate, High). The scoring mainly aimed at reflecting how high of an impact the ban created on SSFs.

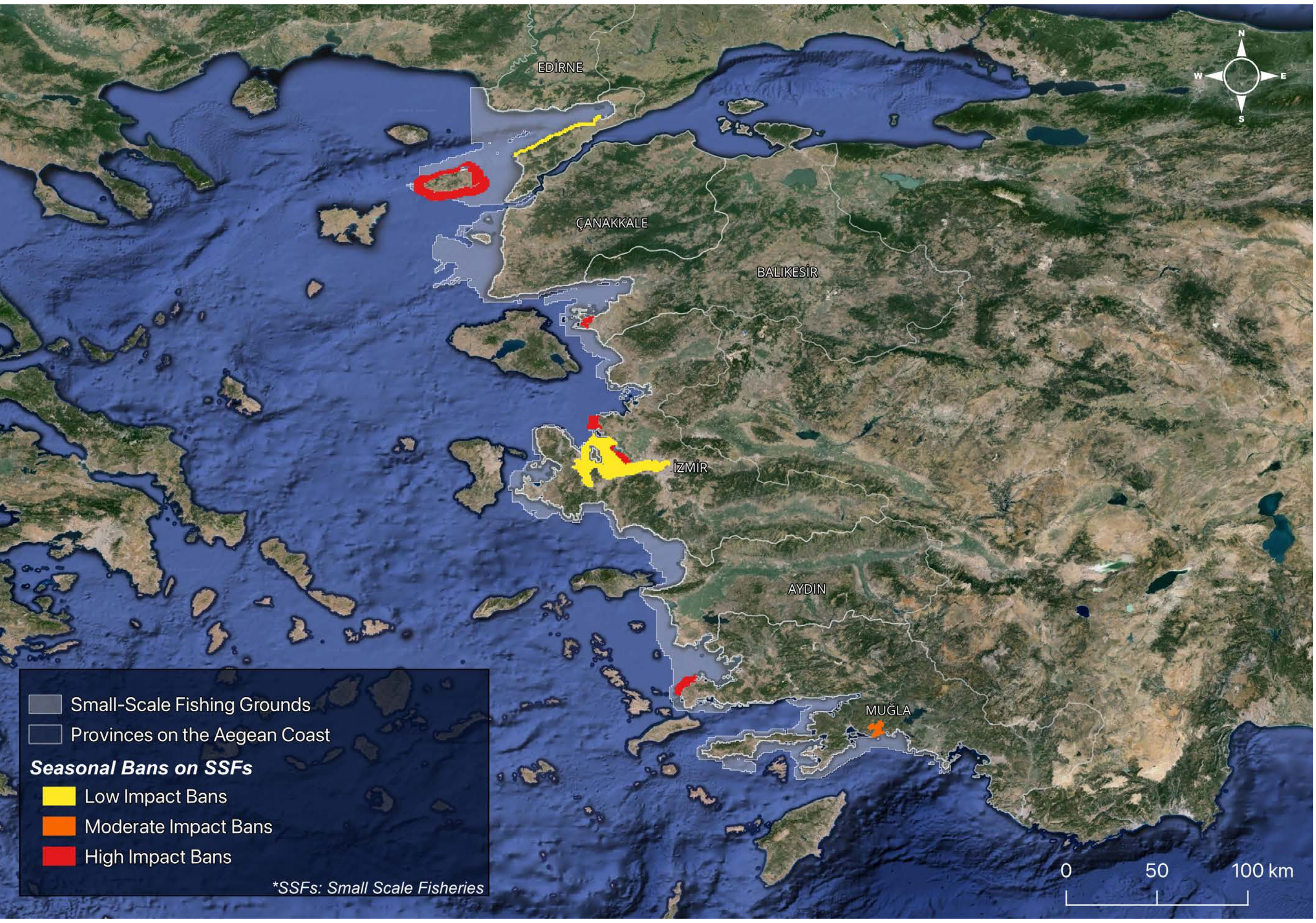


Figure 61. Map showing the different types of seasonal bans towards small-scale fisheries within the small-scale fishing grounds

5.Results

5.1 Biodiversity – Factors Increasing the Choice

In the analysis, we combined reversible threats and other factors increasing the choice. 15 layers (9 choice-related and 6 threat-related) with weights changing between 1 and 4.54 were brought together for this purpose. In the resulting layer, as can be seen from Figure 62, northern and southern parts of the study area held higher choice scores, thus lower costs.

Figure 62. Map showing the scores for factors increasing the choice for biodiversity in each study unit (1x1 km grid cells). The darker green grids represent areas with higher choice and thus lower cost

5.2 Biodiversity – Factors Decreasing the Choice

To generate this layer, we combined irreversible threats and other factors decreasing choice. A total of 6 layers (4 choice-related and 2 threat-related) with weights changing between 2 and 4.46 were brought together for this purpose. In the resulting layer, as can be seen from Figure 63, central and southern parts of the study area held lower choice scores and thus higher costs.

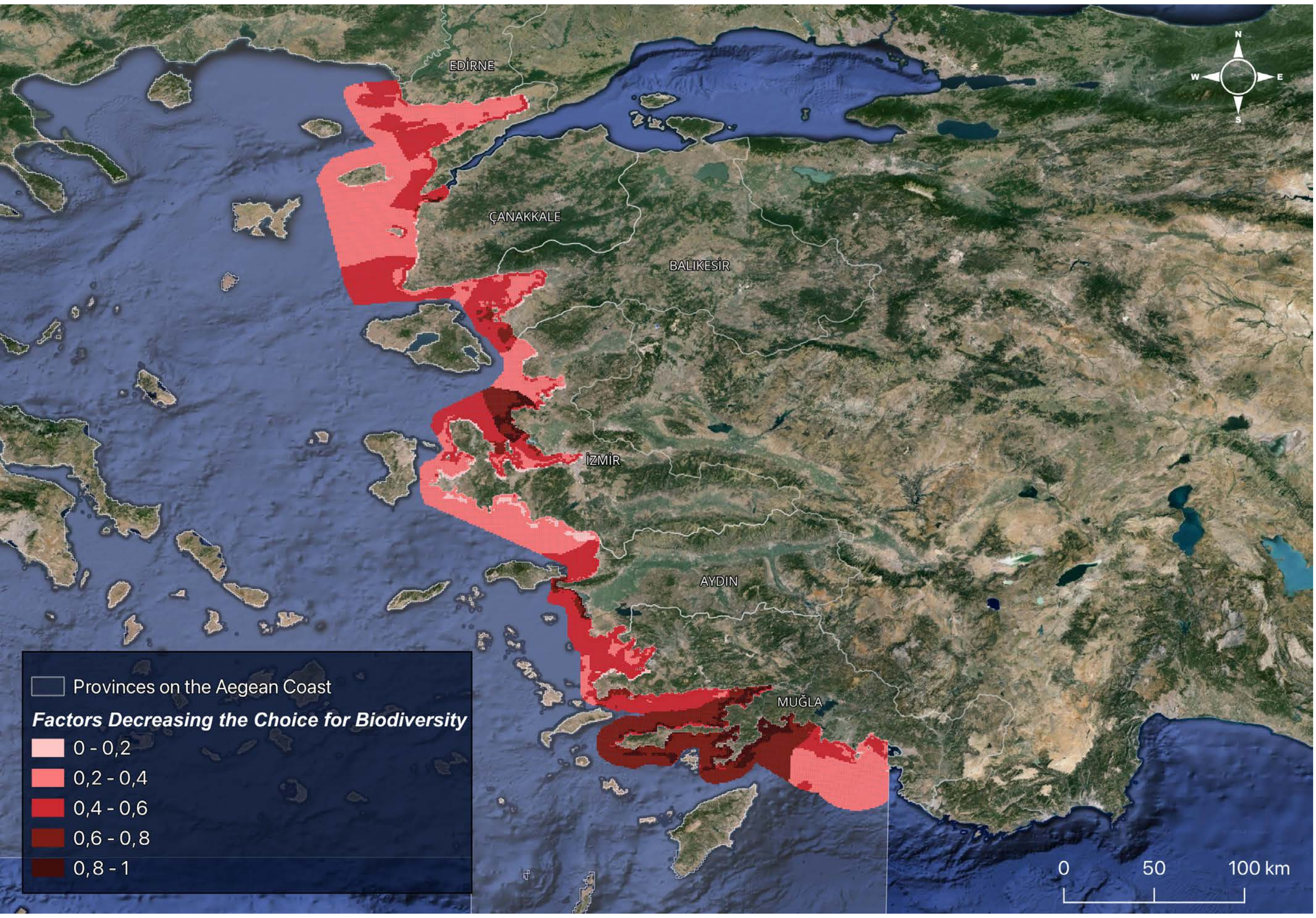


Figure 63. Map showing the scores for factors decreasing the choice for biodiversity for each study unit (1x1 km grid cells). The darker red grids represent areas with lower choice and thus higher cost

5.3 Biodiversity – Cost Layer

Following the methodology detailed in the previous sections, we generated the cumulative cost layer, by independently bringing together the two layers detailed above. As shown in Figure 64, the synthesized biodiversity cost was higher in the central and southern parts of the study area.

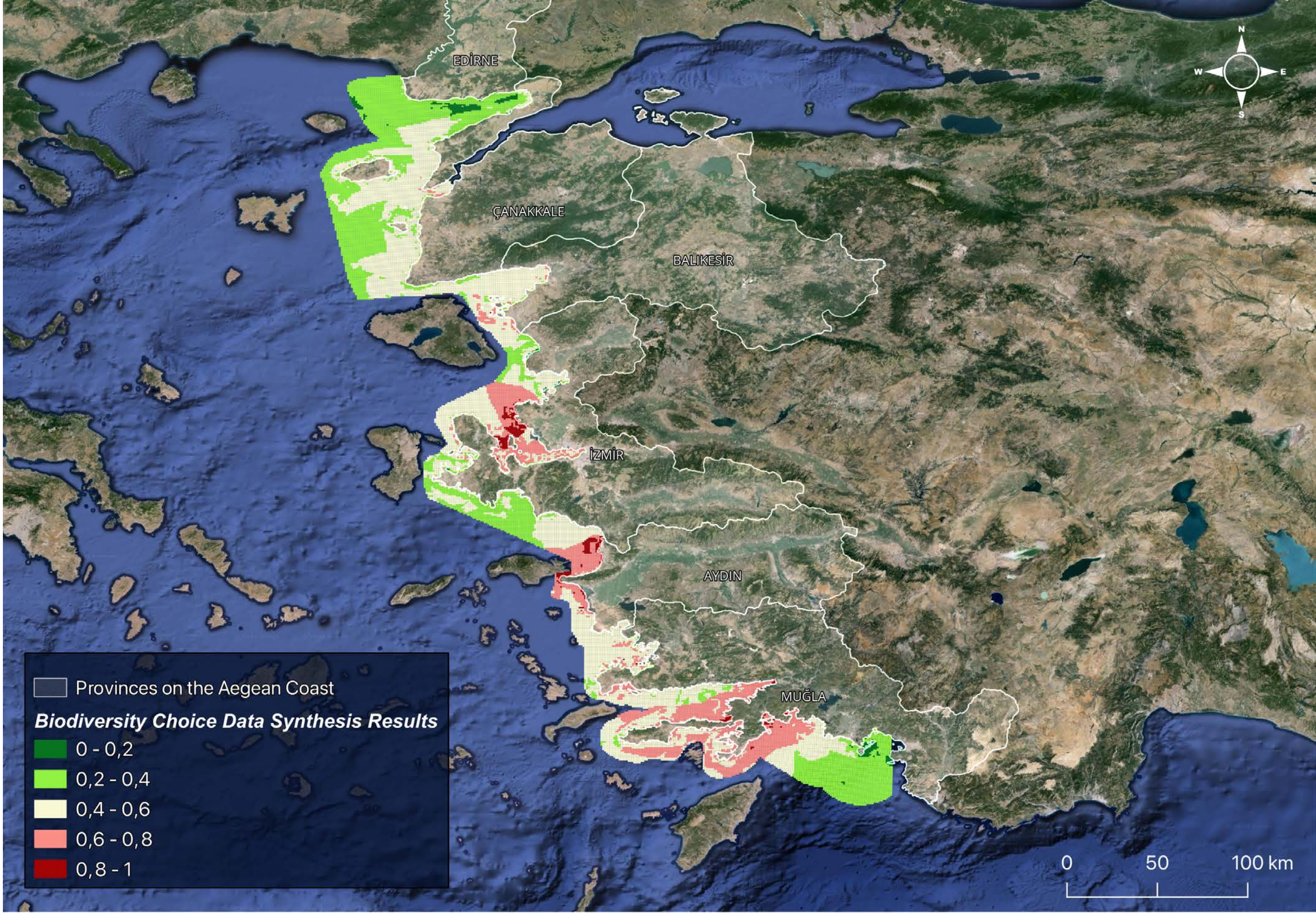


Figure 64. Map showing the cost layer for biodiversity. The darker green grids represent areas with lower costs, thus higher choice, while darker red grids are those with higher costs, thus lower choice

5.4 Biodiversity Optimization

We realized the biodiversity optimization analysis using both the conservation targets of the important biodiversity elements and the cost layer for biodiversity also considering locked-in areas. Figure 65 shows the outcomes of optimization which cover 4,469 study units (1x1 km grid cells). The dashed lines correspond to the locked-in areas used in the analysis, while pink grids are the optimum results for reaching the conservation targets. The outcomes of the biodiversity optimization without the locked-in areas did cover 653 grid cells.

Figure 65. Map showing the outcomes of the biodiversity optimization analysis

5.5 Small-scale Fisheries – Factors Increasing the Choice

In the analysis, we used a total of 11 layers (8 choice-related and 3 threat-related) with weights changing between 1.25 and 4.50 were brought together to obtain the factors increasing the choice for SSFs. In the resulting layer, as can be seen from Figure 66, some areas in the north and middle parts of the study area held higher choice scores, thus lower costs.

Figure 66. Map showing the scores for factors increasing the choice for small-scale fisheries in each study unit (1x1 km grid cells). The darker green grids represent areas with higher choice and thus lower cost

5.6 Small-scale Fisheries – Factors Decreasing the Choice

In the analysis, we used a total of 7 layers (3 choice-related and 4 threat-related) with weights changing between 1.25 and 4.46 were brought together to obtain the factors decreasing the choice for SSFs. In the resulting layer, as can be seen from Figure 67, some areas in the north and south of the study area held lower choice scores and, thus higher costs.

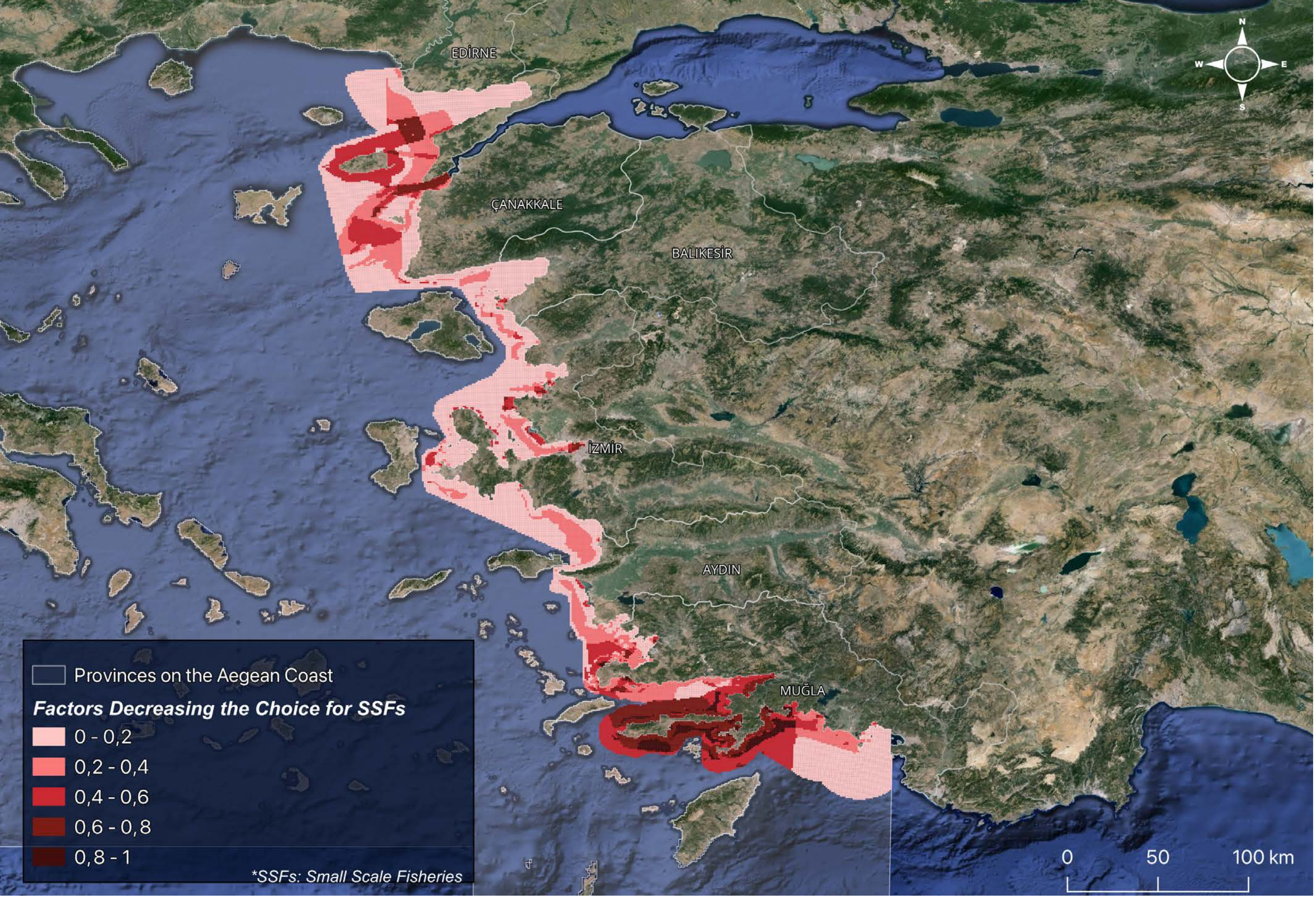


Figure 67. Map showing the scores for factors decreasing the choice for small-scales fisheries for each study unit (1x1 km grid cells). The darker red grids represent areas with lower choice and higher cost

5.7 Small-scale Fisheries – Cost Layer

We generated the cumulative cost layer, by independently combining the two layers detailed above with different weights (1.75 for irreversible threats and 1.25 for factors decreasing choice). As shown in Figure 68, the synthesized small-scale fisheries cost was higher in the southern parts of the study area and some areas in the north.

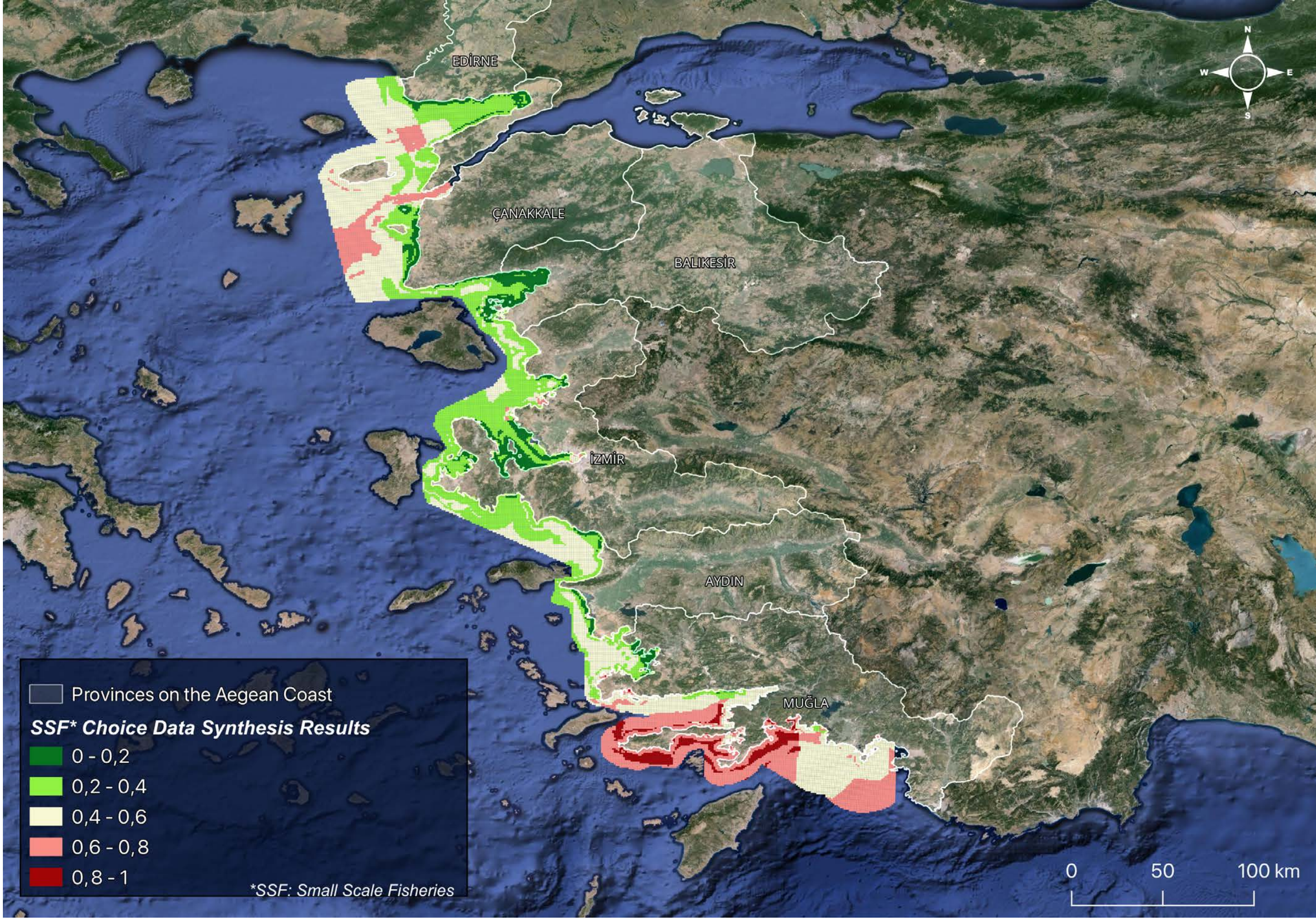


Figure 68. Map showing the cost layer for small-scale fisheries. The darker green grids represent areas with lower costs, thus higher choice, while darker red grids are those with higher costs, thus lower choice

5.8 Final Solution Set

In the last step of the analysis, we brought together the biodiversity optimization outcomes with the cost layer of small-scale fisheries. Figure 69 details the steps taken in a step-by-step approach.

By overlapping the biodiversity optimization results with small-scale fishers' cumulative cost

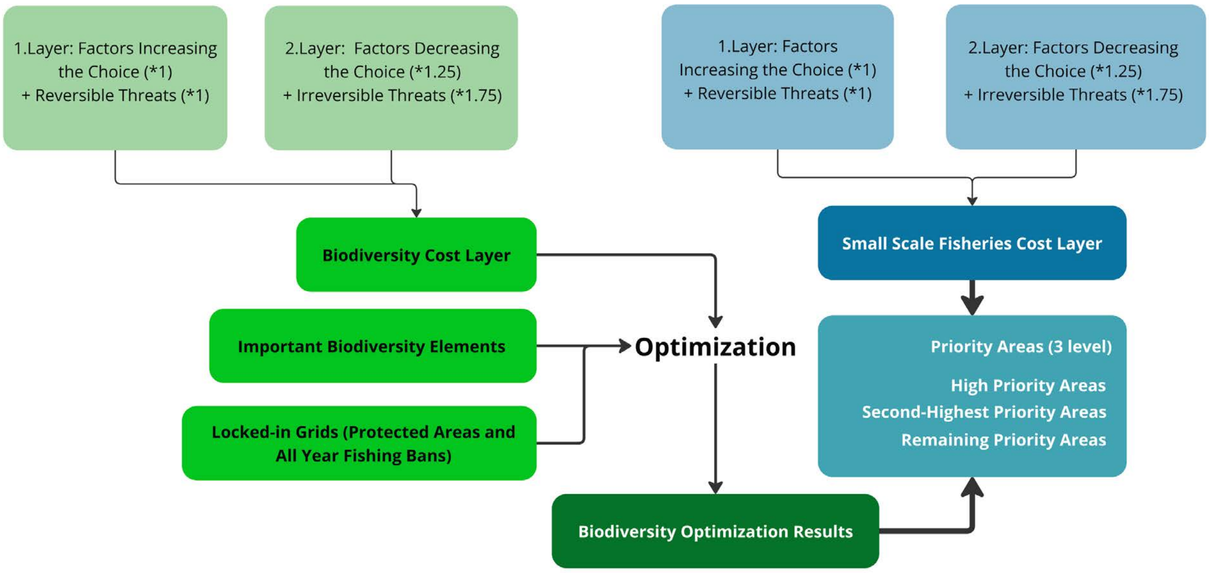


Figure 69. The schematization of the overall analysis

layer, we could restrict our results to the SSFs' fishing grounds. At the final stage, when comparing the results obtained from each of the test scenarios detailed in Section 2.7 (Biodiversity Optimization Analysis), we chose the baseline test conditions as they generated the highest number of conservation targets and produced a more diverse Final Solution Set in terms of geographic representation. In addition, we classified the cost of SSFs into three groups to further prioritize our final solution set of areas. With cost data changing between 0 and 1, we assigned the first quantile as the areas with the lowest 15% cost (resulting in 17 grid cells), second group to 16-20% lowest cost (84 grid cells) and grouped the rest as other areas (552 grid cells). The first two groups in this approach were adopted as the "Final Solution Set" in our project. These areas correspond to the sites that reach optimum biodiversity results and where sustaining small-scale fishery activities has the lowest cost.

Figure 70 presents the final solution set of priority areas, which are concentrated in 3 regions, namely Saros Bay, Ayvalık, and Ildır Bay. As can be seen from the map, in comparison to other areas, Saros Bay did hold a higher coverage (thus a higher number of grid cells). We therefore suggest prioritizing conservation efforts towards both biodiversity and small-scale fisheries in this area.

Figure 70. The final solution set of priority areas and the remaining areas as distinguished by colored classes

Among the triggers of the selection of the area, the presence of important biodiversity elements comes forward. Seagrass meadows (*Posidonia oceanica)*, coralligenous assemblages, Important Monk Seal Areas *(Monachus monachus*), Important Marine Mammal Areas (IMMAs), and Important Shark and Ray Areas (ISRAs) overlapping in the area are among the important biodiversity elements prevailing in the region. Furthermore, the long-term viability of the small-scale fisheries' operations is high in the area. While a significant portion of Saros Bay is legally protected, it lacks substantial on-the-ground conservation efforts. However, there are multiple threats such as illegal, unreported, and unregulated (IUU) fishing, high levels of water pollution, and emerging coastal infrastructures elements, the presence of reversible threats, and relatively low conservation investments that led to the selection of the area.

6.Conclusions and Recommendations

This project represents a pioneering effort made possible through the collaborative contributions of diverse stakeholders committed to biodiversity conservation and supporting small-scale fisheries (SSFs). While numerous initiatives focus on identifying priority areas for biodiversity or cultural landscapes/seascapes, relatively few effectively integrate both. The goal of this project was to select a set of priority areas along the Aegean seascapes of Türkiye where future conservation investments could be targeted by different actors. These areas were selected based on their importance for both biodiversity and small-scale fisheries, as well as the high(er) density of threats they face in both domains while receiving relatively low(er) conservation investments so far.

The spatial nature of this study, combined with the use of specialized programs and softwares, enabled generating objective and practical results, to facilitate on-the-ground implementation. One of the key strengths of the project was its intentional design, which ensured that the outcomes are both accessible and actionable for a wide range of stakeholders, including policymakers, practitioners, and potential donors interested in investing in the region.

Equally important has been the creation of platforms that allow different actors in the region to connect. These exchanges, made possible through a series of meetings, have played a significant role in fostering long-term collaboration and ensuring the project's success. We also recognize the importance of involving local communities in setting conservation priorities, as their sustainable livelihoods can enhance the resilience of conservation efforts and serve as a valuable community-building mechanism.

The project highlighted the critical role of open-source data and data sharing in the fields of biodiversity and small-scale fisheries. The information obtained from both national and international sources was vital for conducting a thorough assessment. However, some limitations were evident, particularly concerning the quality and extent of some of the data utilized in the analysis. Spatial analyses are highly sensitive to these factors, underscoring the need for future efforts to improve various aspects of the data collected. For both biodiversity and SSFs, we were not able to integrate outcomes of trend analysis which would have highlighted the changes at geographical and temporal scales, due to the absence of such data. Thus, the generation and sharing of such data is vital for future assessments. Additionally, generating and sharing information on the status of threatened marine and coastal species and habitats, their national range, and all the changes they undergo over time are critical for further detailing biodiversity information in the future.

One key finding in terms of data gathering especially towards SSFs was the necessity of gathering more detailed and systematic data, which is essential for future spatial assessments. When engaging with SSFs, it is necessary to reach out not only to active fishers, who are predominantly male, but also to other lines of work in fisheries (e.g. fishing net making and repairing), which are mostly represented by women. Also, when engaging with SSFs cooperatives, it is essential to analyze the geographical, cultural and socio-economic context of cooperatives together with the traditional ecological knowledge (TEK) of fishers to build a seated understanding of the specific methods, techniques, and gears in place.

The Aegean seascapes, with their rich biodiversity and cultural heritage, face significant challenges that require immediate and coordinated action. By enhancing Marine Protected Areas (MPAs), supporting sustainable small-scale fisheries, and increasing investment in conservation, Türkiye has the opportunity to safeguard its marine ecosystems for future generations. The findings of this project provide a comprehensive roadmap for prioritizing conservation efforts and aligning them with the needs of local communities. Only through collective action can the dual goals of biodiversity conservation and sustainable livelihoods be achieved in this unique and ecologically significant region.

In conclusion, this project enabled us to conduct a regional-scale spatial prioritization to determine where future investments in biodiversity conservation and small-scale fisheries should be concentrated along the Aegean seascapes. To further this effort, more detailed assessments should be conducted in the selected priority area of Saros Bay. This will help us better identify the necessary actions to include in an effective action plan. Furthermore, disseminating this approach across different geographical and cultural landscapes/seascapes will help optimize the allocation of limited resources toward the most critical themes in Türkiye.

7.Saros Bay Priority Area

Saros Bay, located in the northern Aegean part of Türkiye, is a region of significant biodiversity, as well as cultural and historical importance (TVKGM, 2014, 2018). In a country where habitat alteration and degradation are prevalent, Saros Bay is distinguished by its pristine coastal and marine ecosystems. The area is particularly notable for its underwater upwelling currents, which bring nutrient-rich waters to the surface, supporting a diverse array of marine life (Sayın et al., 2011). Additionally, the bay's asymmetrical bathymetry, with an average depth of 350 meters and a maximum of 700 meters, creates a unique environment that is exceptionally favorable for cetaceans in the Aegean Sea (Öz and İşmen, 2017).

The significance of Saros Bay is highlighted by its designation as a Special Environmental Protection Area (SEPA) in 2010 under the Barcelona Convention, recognizing its outstanding environmental value and the need for protection. This designation aims to conserve the bay's rich biodiversity and ensure the sustainable management of its natural resources. Along the bay's coastline, numerous areas have been classified as 1st or 3rd Degree Natural SİT (Site of Special Protection) zones, indicating their high ecological importance and the need for stringent conservation measures.

To the east of Saros Bay lies the Kavak Delta, an essential wetland ecosystem that plays a critical role in supporting a diverse array of flora and fauna. This delta serves as a crucial habitat for various bird species, amphibians, and other wildlife, contributing significantly to the region's biodiversity. Furthermore, the sand dunes to the north of the bay represent some of the best-preserved dune ecosystems in the area.

The outcomes of our comprehensive study highlighted the northern part of Saros Bay and its surrounding seascapes (outside the SEPA boundaries) as one of the highest priority areas along the Aegean Seascape. Our analysis demonstrated the importance of these areas for investment in biodiversity conservation and for supporting the sustainability of small-scale fisheries. Important biodiversity elements that triggered to selection of this area as priority include seagrass meadows (*Posidonia oceanica*), coralligenous assemblages, Important Marine Mammal Areas (IMMAs), Important Shark and Ray Areas (ISRAs), and bird species. The area hosts two Key Biodiversity Areas (KBAs), with high concentrations of diverse marine biodiversity elements and threatened marine fish species, alongside significant habitat diversity. Despite its protection status, the priority area is still prone to threats arising from different types of human activities, like illegal, unreported, and unregulated (IUU) fishing, high levels of water pollution, invasive alien species, climate change, among others. Nevertheless, on-the-ground conservation efforts for biodiversity and small-scale fisheries are largely missing. Therefore, there is a substantial need for targeted studies to complement conservation and management measures in and outside the protected area.

Below, maps present the important biodiversity elements in the Saros Bay Priority Area (Figure 71, Figure 72, Figure 73, Figure 74, Figure 75, Figure 76 and Figure 77).

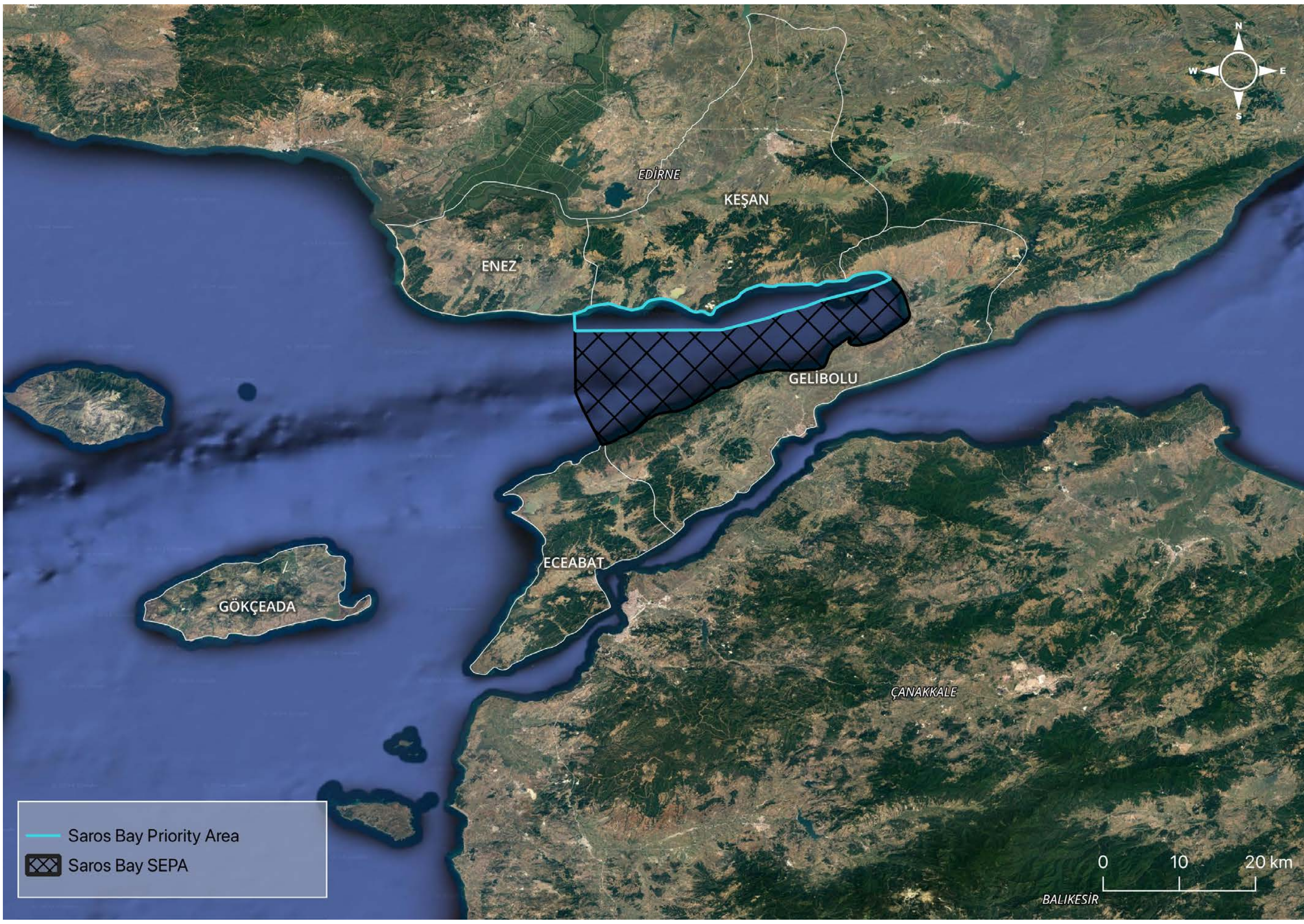


Figure 71. Map showing the Saros Bay Priority Area

Figure 72. Map showing the Saros Bay Key Biodiversity Area

Figure 73. Map showing the distribution of coralligenous assemblages in Saros Bay

Figure 74. Map showing the Important Monk Seal Areas in Saros Bay

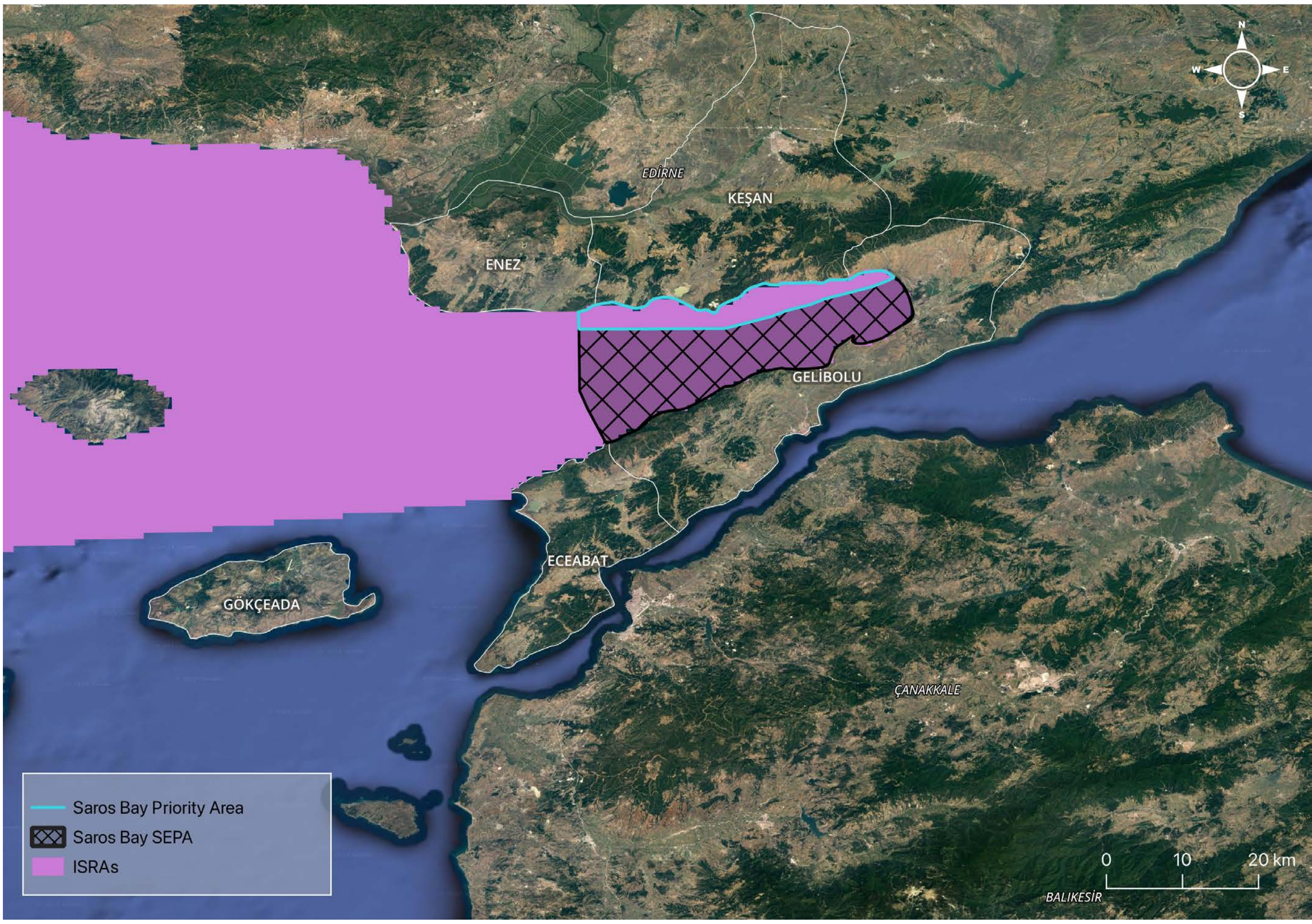


Figure 75. Map showing the Important Shark and Ray Areas (ISRAs) in Saros Bay

Figure 76. Map showing the distribution of seagrass (*Posidonia oceanica*) in Saros Bay

Figure 77. Map showing the Cateceans observation intensity (OBIS database) in Saros Bay

8. References

Introduction

Akbaş, H., Kösoğlu, S.T., Üstündağ, E., Veske, Ş., Erdem, E. (2023). Su Ürünleri İstatistikleri 2023. Balıkçılık ve Su Ürünleri Genel Müdürlüğü [General Directorate of Fisheries and Aquaculture]. Ankara.

Akçalı, B., Kaboğlu, G., Güçlüsoy, H. (2019a). A review on *Posidonia oceanica* (Linnaeus) Delile coverage along the Turkish coasts until 2019. Journal of the Black Sea/ Mediterranean Environment 25(1), 115-124.

Akçay, E. O., Cömert, N., Yıldız, T. (2025). Protecting coastal habitats: Is a 24-meter isobath ban on purse seines adequate for coastal areas and endangered species? Journal of Coastal Conservation, 29(1), Article 7. https://doi.org/10.1007/s11852-024-01097-4

Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C., & Silliman, B. R. (2011). The value of estuarine and coastal ecosystem services. Ecological monographs, 81(2), 169-193.

Başağaç, Ö., & Altınöz, G. B. (2018). Önemli Bir Denizcilik Kültür Mirası: Türkiye'nin Ege Kıyılarındaki Deniz Fenerleri. TÜBA-KED Türkiye Bilimler Akademisi Kültür Envanteri Dergisi, (17), 141-159.

Berkes, F. (2009). Indigenous ways of knowing and the study of environmental change. Journal of the Royal Society of New Zealand, 39:4, 151-156, DOI: 10.1080/03014220909510568

Birkan, R., & Öndes, F. (2020). Socio-economic characteristics of small-scale fisheries in the Aegean Sea, Turkey (eastern Mediterranean). *Acta Ichthyologica et Piscatoria*, 50(3), 257–268. https://doi.org/10.3750/AIEP/02840

CEPF (Critical Ecosystem Partnership Fund). (2010). Ecosystem profile: Mediterranean Basin biodiversity hotspot. CEPF.

Ceyhan, T., Akyol, O., & Vahdet, Ü. (2006). Edremit Körfezi (Ege Denizi) Kıyı Balıkçılığı Üzerine Bir Araştırma. Ege Journal of Fisheries and Aquatic Sciences, 23(3), 373-375.

Cochrane, K. L., Garcia, S. M. (eds.). (2009). A fishery manager's guidebook. John Wiley & Sons.

Coll, M., Piroddi, C., Albouy, C., Ben Rais Lasram, F., Cheung, W. W., Christensen, V., ... & Pauly, D. (2012). The Mediterranean Sea under siege: spatial overlap between marine biodiversity, cumulative threats and marine reserves. Global Ecology and Biogeography, 21(4), 465-480.

Coll, M., Piroddi, C., Steenbeek, J., Kaschner, K., Ben Rais Lasram, F., Aguzzi, J., ... & Voultsiadou, E. (2010). The biodiversity of the Mediterranean Sea: estimates, patterns, and threats. PLoS One, 5(8), e11842.

Çakırlar, C., & Çilingiroğlu, Ç. (2018). Toplumsal tarihin küçük bir hareketi olarak tarih öncesi Ege'de deniz kaynaklarından faydalanma: Unravelling the small movements of prehistory: Exploitation of marine resources in the Aegean. TINA Maritime Archaeology Periodical, 9, 49-76.

Çinar, M. E., Bilecenoğlu, M., Yokeş, M. B., Öztürk, B., Taşkın, E., Bakır, K., ... & Açık, Ş. (2021). Current status (as of end of 2020) of marine alien species in Turkey. PLoS One, 16(5), e0251086.

Çöteli, F.T. (2023). Ürün Raporu Su Ürünleri 2023. Tarımsal Ekonomi ve Politika Geliştirme Enstitüsü, Ankara.

Demirel, N., Dalgıç, G., & Ulman, A. (2020). Reconstructing marine fisheries catches for Turkey in the Eastern Mediterranean Sea (1950–2010). In Ulman, A., Zeller, D., & Pauly, D. (Eds.), Marine Fisheries Catches of Turkey: A Reconstruction of the Marine Fisheries Catches of Turkey (1950–2010) (pp. 49–68). Fisheries Centre Research Reports.

University of British Columbia.

FAO. (2023). The State of Mediterranean and Black Sea Fisheries 2023 – Special edition. General Fisheries Commission for the Mediterranean. Rome. https://doi.org/10.4060/cc8888en.

Farrugio, H., Oliver, P., & Biagi, F. (1993). An overview of the history, knowledge, recent and future research trends in Mediterranean fisheries. Scientia marina, 57(2-3), 105-119.

Genovart, M., Doak, D.F., Igual, J.M., Sponza, S., Kralj, J., Oro, D. (2017). Varying demographic impacts of different fisheries on three Mediterranean seabird species. Global Change Biology 23(8), 3012–3029. https://doi.org/10.1111/gcb.13670

Göktürk, D., & Deniz, T. (2017). Development of sustainable small-scale fisheries management in Turkey. *Journal of Aquaculture & Marine Biology*, 6(1), 197–201. https://doi.org/10.15406/jamb.2017.06.00142

Hendriks, S. L. (2022). Sustainable small-scale fisheries can help people and the planet. Nature, 606(7915), 650-652.

Katağan, T., Tokaç, A., Beşiktepe, Ş., & Öztürk, B. (2015). The Aegean Sea marine biodiversity, fisheries, conservation and governance. Turkish Marine Research Foundation (TUDAV), Istanbul, Türkiye.

Lewison, R. L., Crowder, L. B., Wallace, B. P., Moore, J. E., Cox, T., Zydelis, R., ... & Safina, C. (2014). Global patterns of marine mammal, seabird, and sea turtle bycatch reveal taxa-specific and cumulative megafauna hotspots. Proceedings of the National Academy of Sciences 111(14), 5271-5276.

MedECC. (2020). Climate and Environmental Change in the Mediterranean Basin – Current Situation and Risks for the Future. First Mediterranean Assessment Report [Cramer, W., Guiot, J., Marini, K. (eds.)]. Union for the Mediterranean, Plan Bleu, UNEP/MAP, Marseille, France, 632 pages. ISBN: 978-2-9577416-0-1 / DOI: 10.5281/zenodo.7224821

Mylona, D. (2014). Aquatic animal resources in prehistoric Aegean, Greece. Journal of Biological Research-Thessaloniki, 21, 1-11.

Öztürk, B. (2015). Nature and extent of the illegal, unreported and unregulated (IUU) fishing in the Mediterranean Sea. Journal of Black Sea / Mediterranean Environment, 21(1), 67–91.

Roberts, C. M., O'Leary, B. C., McCauley, D. J., Cury, P. M., Duarte, C. M., Lubchenco, J., ... & Castilla, J. C. (2017). Marine reserves can mitigate and promote adaptation to climate change. Proceedings of the National Academy of Sciences, 114(24), 6167-6175.

Sini, M., Katsanevakis, S., Koukourouvli, N., Gerovasileiou, V., Dailianis, T., Buhl-Mortensen, L., ... & Zotou, M. (2017). Assembling ecological pieces to reconstruct the conservation puzzle of the Aegean Sea. Frontiers in Marine Science, 4, 347.

Stithou, M., Kourantidou, M., & Vassilopoulou, V. (2022). Sociocultural ecosystem services of small-scale fisheries: challenges, insights and perspectives for marine resource management and planning. Aquatic Ecosystem Health & Management, 25(3), 22–33.

Şekercioğlu, Ç. H., Anderson, S., Akçay, E., Bilgin, R., Can, Ö. E., Semiz, G., ... & Dalfes, H. N. (2011). Turkey's globally important biodiversity in crisis. Biological Conservation, 144(12), 2752-2769.

Tsirintanis, K., Azzurro, E., Crocetta, F., Dimiza, M., Froglia, C., Gerovasileiou, V., ... & Katsanevakis, S. (2022). Bioinvasion impacts on biodiversity, ecosystem services, and human health in the Mediterranean Sea. Aquatic invasions, 17(3), 308-352.

Ulman, A., Demirel, N., Pauly, D., Zengin, M. (2020). The lost fish of Turkey: A recent history of disappeared species and commercial extinctions. Frontiers in Marine Science, 7, 650. https://doi.org/10.3389/fmars.2020.00650

UNEP/MAP. (2012). State of the Mediterranean marine and coastal environment. In United Nations Environment Programme/Mediterranean action plan (UNEP/MAP) - Barcelona convention, Athens, 2012. 96 pages.

Ünal, V., Tıraşın, E.M., Tosunoğlu, Z. (2022a). An ecosystem approach to fisheries management for small-scale fisheries in Gökova marine protected area, Turkey: challenges encountered during the transition process. In M. Vasconcellos, V. Ünal (eds.), Transition towards an ecosystem approach to fisheries in the Mediterranean Sea (pp. 117–136). Food and Agriculture Organization of the United Nations, Rome.

Ünal, V., Tosunoğlu, Z., Tıraşın, E.M. and Vasconcellos, M. (2022b). The implementation of the ecosystem approach to fisheries management in Gökçeada, Turkey – Baseline report. Rome, FAO. https://doi.org/10.4060/cb9174en.

Ünal, V., & Ulman, A. (2020). The current status and challenges facing the small-scale fisheries of Turkey. In J. J. Pascual-Fernández, C. Pita, & M. Bavinck (eds.), Small-scale fisheries in Europe: Status, resilience and governance (pp. 83–103). Springer.

WWF-Türkiye. (2020). Korumazsak Kaybederiz: Sürdürülebilir Bir Türkiye İçin Korunan Alanları Hedef: 2030'a Kadar %30. WWF-Türkiye Yayınları.

Methodology

Game, E. T., & Grantham, H. S. (2008). Marxan user manual. For Marxan version, 1(10).

Marine Mammals

ACCOBAMS. 2021. Estimates of abundance and distribution of cetaceans, marine mega-fauna and marine litter in the Mediterranean Sea from 2018-2019 surveys. By Panigada S., Boisseau O., Canadas A., Lambert C., Laran S., McLanaghan R., Moscrop A. Ed. ACCOBAMS - ACCOBAMS Survey Initiative Project, Monaco, 177 pp. data in the publication was digitized by the Yolda Initiative.

Akkaya, A., Brouwer, S., Awbery, T., Lyne, P., Özciğer Senalp, D., Yalçın, D.G., Akkaya, K. 2021. DMAD Marine Mammals Research Association Annual Report 2021.

Alan, V., Kaboğlu, G., Akçalı, B., Bengil, F., Ubay, B., Güçlüsoy, H. (2018). Sightings of Small Delphinids in the Southern Çandarlı Bay (Aegean Sea) between 2015 and 2018. Journal of the Black Sea/Mediterranean Environment 24(3), 224-232.

Alan, V. (2015). İzmir Körfezi'nde Yaşayan Cetacea Türlerinin Popülasyonları Üzerine Bir Araştırma. Dokuz Eylül University, Graduate School of Natural and Applied Sciences, Master's Thesis. İzmir.

Anagnostou, C., Kostianoy, A., Mariolakos, I., Panayotidis, P., Soilemezidou, M., & Tsaltas, G. (2022). The Aegean Sea: a "water way" connecting the diverse marine ecosystems of the Black Sea and the eastern Mediterranean Sea. In The Aegean Sea Environment: The Geodiversity of the Natural System (pp. 3-48). Cham: Springer International PublishingIntercet Platform. https://www.intercet.it/

IUCN MMPATF. (2023). Global Dataset of Important Marine Mammal Areas (IUCN IMMA). [September 2023].Made available under agreement on terms and conditions of use by the IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force and accessible via the IMMA e-Atlas.

Karamanlidis, A.A., Dendrinos, P., Fernandez de Larrinoa, P., Kıraç, C.O., Nicolaou, H., Pires, R. (2023). Monachus monachus. The IUCN Red List of Threatened Species 2023: e.T13653A238637039. https://dx.doi.org/10.2305/IUCN.UK.2023-1.RLTS.T13653A238637039.en. [Accessed on May 2024].

Kıraç, C.O., & Savaş, Y. (2019). Assessments for threats and ecological needs of monk seal populations in Turkish Aegean and the Sea of Marmara. In the 5th International Conference on Marine Mammal Protected Areas, ICMMPA5, 8-12 April 2019 Costa Navarino, Messinia, Greece.

Kıraç, C.O., Savaş, Y., Sevingel, N., Canbolat, G., Bozoklar, F.Y., Kozludere, S., Timuçin, O., Polat, E., Yiğiterhan, O., Tunalı, F., Cantekin, E., Yılmazerli, H., Argun, G., Yüksel, L., Kıraç, D., Erciyes, C., Tuneli, T. (2022). Mediterranean monk seal and coastal habitat monitoring and threats against its existence in İzmir, Muğla and Antalya, Türkiye. 3rd National Symposium on Marine Monitoring & Assessment. T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change] and TÜBİTAK-MAM [Marmara Research Center], Antalya, 6-9 December 2022.

Kıraç, C.O., Veryeri, N.O., Güçlüsoy, H., Savaş, Y. (2013). Akdeniz Fokunun *Monachus monachus* Türkiye'de Korunması Ulusal Stratejik Eylem Planı. UNEP RAC/SPA, T.C. Orman ve Su İşleri Bakanlığı, Doğa Koruma ve Milli Parklar Genel Müdürlüğü [Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks], SAD-AFAG. N°32 / RAC/ SPA / 2011. 12 May 2013. Ankara, Türkiye.

Notarbartolo di Sciara, G., & Tonay, A.M. (2021). Conserving Whales, Dolphins and Porpoises in the Mediterranean Sea, Black Sea and adjacent areas: an ACCOBAMS status report. ACCOBAMS, Monaco. 160 p.

OBIS Database. (n.d.). https://orbis.bvdinfo.com/. [Accessed on December 2023].

Tonay, A.M., Dede, A., Amaha Öztürk, A. (2015). Cetacean in the Aegean Sea. In The Aegean Sea: Marine Biodiversity, Fisheries, Conservation and Governance. Katağan, T., Tokaç, A., Beşiktepe, Ş., Öztürk, B. (eds). TUDAV Publication No: 41, 599-611.

Herpetofauna

Başkale, E., Sözbilen, D., Katılmış, Y., Azmaz, M., Uzuner, M., Sürücü, B., Kaska, Y. (2018). The sporadic nesting sites of loggerhead and green turtles on western Anatolian coasts. In the 38th Annual Symposium on Sea Turtle Biology and Conversation 18-23 February 2018, Kobe.

Casale, P. & Tucker, A.D. (2017). *Caretta caretta* (amended version of 2015 assessment). The IUCN Red List of Threatened Species 2017: e.T3897A119333622. https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T3897A119333622.en. [Accessed on January 2024].

European Reptile & Amphibian Specialist Group. (1996). *Trionyx triunguis* (Mediterranean subpopulation). The IUCN Red List of Threatened Species 1996: e.T22200A9364253. https://dx.doi.org/10.2305/IUCN.UK.1996.RLTS.T22200A9364253.en [Accessed on January 2024].

Ilgaz, Ç. (2019). Türkiye sürüngen faunasının endemizm durumu. Journal of the Institute of Science and Technology, 9(3), 1243-1252.

IUCN. 2017. *Trionyx triunguis*. The IUCN Red List of Threatened Species. Version 2023-1. https://www.iucnredlist.org. [Downloaded on 1 September 2023].

Pietroluongo, G., Quintana, B., Dias, V., Falquina Fernández, F.J., Gheorghiu, A., Moscatelli, S., ... & Miliou, A. (2018). Evidence of nesting area of *Caretta caretta* and potential foraging areas of *Caretta caretta* and *Chelonia mydas* on Samos and Lipsi Islands, North-eastern Aegean Sea. 6th Mediterranean Conference on Marine Turtles. 16-19 October 2018, Poreč, Croatia.

T.C. Çevre ve Orman Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü. [Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks] 2009/10 tarih ve sayılı Deniz Kaplumbağalarının Korunması Genelgesi [Notification on the Conservation of Marine Turtles].

van Dijk, P.P., Diagne, T., Luiselli, L., Baker, P.J., Turkozan, O. & Taskavak, E. (2017). *Trionyx triunguis*. The IUCN Red List of Threatened Species 2017: e.T62256A96894956. https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T62256A96894956.en

Yalçın Özdilek, Ş., Kırbeci, S., Yalçın, S., Altın, A., Uzatıcı, A., Tosunoğlu, M., Ayaz, A., Öztekin, A., Sönmez, B. (2020). The first record of loggerhead turtle (*Caretta caretta*) nesting on the northernmost Aegean coast, Turkey. Natural and Engineering Sciences 5(3), *198-203.*

News Sources

Aydın24Haber. (2016). Dünyaca Ünlü Plajda Caretta Önlemi https://www.aydin24haber.com/dunyaca-unlu-plajda-caretta-onlemi-215932h.htm

Aydın Ses Gazetesi. (2021). Aquasis Otel’e teşekkür belgesi https://www.sesgazetesi.com.tr/aquasis-otele-tesekkur-belgesi-7817057

Biyologlar.com. (2012). *Caretta caretta* Davutlar sahiline ilk kez yumurta bıraktı. https://www.biyologlar.com/caretta-caretta-davutlar-sahiline-ilk-kez-yumurta-birakti

Banses Gazetesi. (2023). Gökçeada’da *Caretta caretta* yuvası bulundu. https://www.bansesgazetesi.com/haber/gokceadada-caretta-caretta-yuvasi-bulundu/

Cumhuriyet. (2023). Didim’de yavru Caretta carettalar denize ulaştı. https://www.cumhuriyet.com.tr/yasam/didimde-yavru-caretta-carettalar-denize-ulasti-2106892

Gündem Çeşme. (2018). Çeşme'nin ilk Caretta'ları denizle buluştu http://www.gundemcesme.com/haber/Cesme-nin-ilk-Caretta-lari-denizle-bulustu/109807

Gündeme Bakış. (2020). Urla'da 10 caretta caretta yavrusu denizle buluştu. https://www.gundemebakis.com/urlada-10-caretta-caretta-yavrusu-denizle-bulustu

Hürriyet. (2012). Caretta carettalar Dikili'ye göçtü. https://www.hurriyet.com.tr/ege/caretta-carettalar-dikili-ye-goctu-20629084

İhlas Haber Ajansı. (2013). Kuşadası’nda Caretta caretta yumurtalamasında rekor kırıldı. https://www.iha.com.tr/haber-kusadasinda-caretta-caretta-yumurtalamasinda-rekor-kirildi-297948/

İzmir Time 35. (2020). Kuşadası Caretta caretta yavruları için yuva kontrol noktasına kavuştu. https://www.izmirtime35.com/kusadasi-caretta-caretta-yavrulari-icin-yuva-kontrol-noktasina-kavustu-6285-haberi

Milliyet. (2011). Caretta carettalar kuzeye göç etti. https://www.milliyet.com.tr/gundem/caretta-carettalar-kuzeye-goc-etti-1432103

Posta Gazetesi. (2019). Caretta caretta yavruları Bodrum'da ilk kez görüldü https://www.posta.com.tr/galeri/caretta-caretta-yavrulari-bodrumda-ilk-kez-goruldu-2202503/2

Sabah (2023). Didim’de Caretta carettalar plaja yumurtalarını bıraktı. https://www.sabah.com.tr/aydin/2023/06/30/didimde-caretta-carettalar-plaja-yumurtalarini-birakti

Seferihisar Yeni Haber Gazetesi. (2020). Deniz kaplumbağasının yumurtaları koruma altına alındı. https://seferihisar.com/deniz-kaplumbagasinin-yumurtalari-koruma-altina-alindi/

Ses Gazetesi. (2023). Caretta caretta'lar Didim’i mesken tuttu. https://www.sesgazetesi.com.tr/haber/15670841/caretta-carettalar-didimi-mesken-tuttu

Ses Gazetesi. (2023). Didim “Caretta caretta” merkezi olma yolunda. https://www.sesgazetesi.com.tr/haber/15356048/didim-caretta-caretta-merkezi-olma-yolunda

Yeni Akit. (2020). Urla'da 10 Caretta caretta yavrusu denizle buluştu. https://www.yeniakit.com.tr/haber/urlada-10-caretta-caretta-yavrusu-denizle-bulustu-1404920.html

Yeni Kıroba (2019). Ürkmez’in yavruları denize ulaştı. https://www.yenikiroba.com/urkmez39in-yavrulari-denize-ulasti

Seagrass

Akçalı, B., Kaboğlu, G., Güçlüsoy, H. (2019a). A review on *Posidonia oceanica* (Linnaeus) Delile coverage along the Turkish coasts until 2019. Journal of the Black Sea/Mediterranean Environment 25(1), 115-124.

Akçalı, B., Kaboğlu, G., Bizsel K. C., Kavcıoğlu, R., Savaş, Y., Bengil, F., Özaydınlı, M., Kayaalp, J., Sönmez, Flitman, R., Ergün, G., Güçlüsoy, H. (2019b). Habitat mapping in marine protected areas: contributions to management plans in Foça and Kaş-Kekova Special Environmental Protection Areas. In: Proceedings of the 6th Mediterranean Symposium on Marine Vegetation 119 (Antalya, Türkiye, 14-15 January 2019). (eds., Langar H., Ouerghi A.,) SPA/RAC publ., Tunis, 23-28.

Ateş, A., Katağan, T., Kocataş, A., Yurdabak, F.E. (2005). Decapod (Crustacea) fauna of Saros Bay (Northeastern Aegean Sea). Turkish Journal of Zoology 29(2), 119-124.

Bizsel, K.C., Kozludere, S., Beşiktepe, Ş., Bizsel, N., Sayın, E., Yüksek, A., Kaboğlu, G., Akçalı, B., Can Yılmaz, E., Kavcıoğlu, R., İlhan, T., Özaydınlı, M., Bengil, F., Sönmez, R., Kankuş, J., Kuşçu, Ş., Tümer, T., Ergüden, C., Özgen, Ö., Hepsöğütlü, D., (2010). Köyceğiz-Dalyan Özel Çevre Koruma Bölgesi Deniz ve Kıyı Alanlarında Biyolojik Çeşitliliğin Tespiti Projesi Sonuç Raporu. T.C. Çevre ve Orman Bakanlığı Özel Çevre Koruma Kurumu Başkanlığı [Ministry of Environment and Forestry, Special Environmental Protection Agency], Ankara.

Cirik, Ş., Akçalı, B. (2013). Distribution of *Posidonia oceanica* (L.) Delile in the Sea of Marmara. In the First National Workshop on *Posidonia oceanica*, 37-47.

Duman, M., Eronat, A.H., İlhan, T., Talas, E., Küçüksezgin, F. (2019). Mapping *Posidonia oceanica* (Linnaeus) Meadows in the Eastern Aegean Sea Coastal Areas of Turkey: Evaluation of Habitat Maps Produced Using the Acoustic Ground Discrimination Systems. International Journal of Environment and Geoinformatics 6(1), 67-75.

Gümüşoğlu, A. (2010). Gökçeada Çevresi *Posidonia oceanica* L. (Delile) Çayırları Üzerindeki Epifitik Alg Toplulukları. Istanbul University, Institude of Graduate Studies in Sciences, Master's Thesis. İstanbul.

@ Golder, Univ Corse, Okianos, The French Biodiversity Agency (OFB), Mediterranean Posidonia Network (MPN)

Montefalcone, M. (2009). Ecosystem health assessment using the Mediterranean seagrass *Posidonia oceanica*: a review. Ecological indicators 9(4), 595-604.

Mutlu, E. (2020). Doğu Akdeniz Türkiye Kıyılarında *Posidonia oceanica* Çayırlarının Akustik Olarak Biyokütle Miktarlarının Belirlenmesi ve Dağılımlarının Takip Edilmesi. No:117Y133 TÜBİTAK Project report.

Mutlu, E., Duman, G.S., Karaca, D., Özvarol, Y., Şahin, A. (2023). A broad-scale biometrical response of pristine *Posidonia oceanica* meadow to winter and summer conditions in the north-eastern Mediterranean coast. Thalassas: An International Journal of Marine Sciences 40(1), 477-498.

Personnic, S., Boudouresque, C. F., Astruch, P., Ballesteros, E., Blouet, S., Bellan-Santini, D., ... & Ruitton, S. (2014). An ecosystem-based approach to assess the status of a Mediterranean ecosystem, the *Posidonia oceanica* seagrass meadow. PLoS One 9(6): e98994.

UNEP-WCMC & Short F.T. (2020). Global Distribution of Seagrasses (version 7). Seventh update to the data layer used in Green and Short (2003), superseding version 6. Cambridge (UK): UN Environment World Conservation Monitoring Centre. http://data.unep-wcmc.org/datasets/7

Yokeş, M. B., Demir, V. (2013). Ayvalık Adaları Tabiat Parkı Denizel Biyolojik Çeşitlilik Çalışması. T.C.Çevre ve Şehircilik Bakanlığı Tabiat Varlıklarını Koruma Genel Müdürlüğü [Ministry of Environment and Urbanization, General Directorate of Nature conservation and National Marks] Teknik Rapor Serisi, 20, 104 p.

Yüksek A., Demirel S., Demirel, N., Yılmaz, N., Demir, V., Vardar D. (2015). Marmaris Körfezi Yıldız (Cennet) ve Keçi Adaları İçinde Yer Alan *Posidonia oceanica* çayırlarının Tespiti Çalışmaları. Kasım 2015. Marmaris Belediyesi, 69 p.

News Sources

Gazete Ayvalık. (2022). Ayvalık Deniz Çayırları Habitat Haritası Hazırlandı. http://www.gazeteayvalik.com/2022/12/04/ayvalik-deniz-cayirlari-habitat-haritasi-hazirlandi/

Marine and Freshwater Fish

Andrews, A.J., Di Natale, A., Bernal-Casasola, D., Aniceti, V., Onar, V., Oueslati, T., ... & Tinti, F. (2022). Exploitation history of Atlantic bluefin tuna in the eastern Atlantic and Mediterranean-insights from ancient bones. ICES Journal of Marine Science 79(2), 247-262.

Akyol, O., Ceyhan, T. (2014). Turkish harpoon fishery for swordfish *Xiphias gladius* in the Aegean Sea (Gökçeada Island). Journal of Black Sea/Mediterranean Environment 20(1), 46-52.

Akyol, O., Ceyhan, T. (2010). Türkiye Denizlerinde Kullanılan Pelajik Kılıç Paragatları. Ege Journal of Fisheries and Aquatic Sciences 27(4),149-156.

Bilecenoğlu, M., Kaya, M., Cihangir, B., Çiçek, E. (2014). An updated checklist of the marine fishes of Turkey. Turkish Journal of Zoology 38(6), 901-929.

Ceyhan, T., Tserpes, G., Akyol, O., Peristeraki, P. (2018). The effect of the lunar phase on the catch per unit effort (CPUE) of the Turkish swordfish longline fishery in the eastern Mediterranean Sea. Acta Ichthyologica et Piscatoria 48(3), 213-219.

Collette, B.B., Di Natale, A., Fox, W., Graves, J., Juan Jorda, M., Pohlot, B., Restrepo, V. & Schratwieser, J. (2022). *Xiphias gladius*. The IUCN Red List of Threatened Species 2022: e.T23148A46625751. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T23148A46625751.en. [Accessed on January 2024].

Di Natale, A., Collette, B., Pollard, D., Juan Jorda, M., Miyabe, N., Kada, O., Nelson, R., Chang, S., Fox, W. & Uozumi, Y. (2011). *Thunnus thynnus* (Mediterranean assessment). The IUCN Red List of Threatened Species 2011: e.T21860A9330380. [Accessed on January 2024].

Dulvy, N.K., Pacoureau, N., Rigby, C.L., Pollom, R.A., Jabado, R.W., Ebert, D.A., Finucci, B., Pollock, C.M., Cheok, J., Derrick, D.H., Herman, K.B., Sherman, C.S., Vander-Wright, W.J., Lawson, J.M., Walls, R.H.L., Carlson, J.K., Charvet, P., Bineesh, K.K., Fernando, D., Ralph, G.M., Matsushiba, J.H., Hilton-Taylor, C., Fordham, S.V., Simpfendorfer, C.A. (2021). Overfishing drives over one-third of all sharks and rays toward a global extinction crisis. Current Biology 31, 1-15.

IUCN SSC Shark Specialist Group. 2022. Dataset of Important Shark and Rays Areas (IUCN SSC SSG-ISRA). Made available under a User License Agreement by the IUCN SSC Shark Specialist Group and accessible via the ISRA e-atlas. Available at: https://sharkrayareas.org/e-atlas/ [Accessed on July 2022.]

Karakulak, F.S. (1999). Türkiye Sularında Orkinos (*Thunnus thynnus* L. 1758) Balığının Avcılığı ve Biyolojisi. İstanbul Üniversitesi, Fen Bilimleri Enstitüsü. İstanbul.

Karakulak, F.S. (2004). Catch and effort of the bluefin tuna purse-seine fishery in Turkish waters. Fisheries Research 68, 361–366.

Karakulak, F.S., Oray, I.K. (1995). A preliminary report on the investigations of bluefin tuna (*Thunnus thynnus*, L. 1758) caught in the Turkish waters. ICCAT Collective Volume of Scientific Papers 44, 140-143.

Karakulak, S., Oray, I., Corriero, A., Deflorio, M., Santamaria, N., Desantis, S. De Metrio, G. (2004). Evidence of a spawning area for the bluefin tuna (*Thunnus thynnus* L.) in the eastern Mediterranean. Journal of Applied Ichthyology 20, 318–320.

Karakulak, F.S., Öztürk, B., Yıldız, T. (2016). From ocean to farm: capture- based aquaculture of bluefin tuna in the eastern Mediterranean Sea. In: Advances in Tuna Aquaculture from Hatchery to Market. Daniel, D.B., Gavin, J.P., Alejandro, B. (eds). Cambridge, MA: Academic Press, 59–76.

Karakulak, F.S., Ceyhan, T. (2024). The influences of temporal-spatial parameters on CPUE of the Atlantic bluefin tuna purse seine fishery in eastern Mediterranean. Journal of the Marine Biological Association of the United Kingdom 104 (e6), 1–8.

Lehner, B., Grill G. (2013). Global river hydrography and network routing: baseline data and new approaches to study the world's large river systems. Hydrological Process-

es, 27(15), 2171–2186.
MacKenzie, B.R., Romeo, T., Addis, P., Battaglia, P., Consoli, P., Andaloro, F., Sarà, G. (2021). New historical data for long-term swordfish ecological studies in the Mediterranean Sea. Earth System Science Data Discussions 2021,1-15.
Mengual, I.L. (2023). Evaluation of alternative management tools for recreational fishing of *Thunnus thynnus* in the Aegean Sea: CPUE of fishing contests data and analysis of You tube data. Master of Science en Gestión Pesquera Sostenible. Facultad de Ciencias, University of Alicante, 56 pages.
Rodriguez-Marin, E., Ortiz, M., Ortiz de Urbina, J. M., Quelle, P., Walter, J., Abid, N., ... & Zarrad, R. (2015). Atlantic bluefin tuna (*Thunnus thynnus*) biometrics and condition. PLoS One 10(10), e0141478.

Coralligenous Assemblages

Anonymous. (2020). 5/1 Numaralı Ticari Amaçlı Su ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (Tebliğ No: 2020/20) [Notification No. 5.1 of the Commercial Fishing Regulations], T.C. Tarım ve Orman Bakanlığı, Balıkçılık ve Su Ürünleri Genel Müdürlüğü [Ministry of Agriculture and Forestry, General Directorate of Fisheries and Aquaculture] https://www.resmigazete.gov.tr/eskiler/2020/08/20200822-8.pdf
Ballesteros, E. (2006). Mediterranean Coralligenous Assemblages: A Synthesis of Present Knowledge. In: Oceanography and Marine Biology: An Annual Review 44. Gibson, R., Atkinson, R., Gordon, J. (eds). pp. 123-195.
Bilecenoğlu, M., Çınar, M.E. (2015). Endangered Species of the Aegean Sea. In: The Aegean Sea: Marine Biodiversity, Fisheries, Conservation and Governance. Katağan, T., Tokaç, A., Beşiktepe, Ş., Öztürk, B. (eds). TUDAV Publication No: 41. pp. 583-598.
Cihangir, H.A., Pancucci-Papadopoulo, M.A., Yılmaz, E.C. (2011). First record of Aiptasia mutabilis (Cnidaria: Anthozoa) from Turkish seas. Turkish Journal of Zoology 35(3), 447-450.
Gönülal, O., Güreşen, S.O. (2017). A catalogue of the marine species: Gökçeada Marine Museum. Turkish Journal of Bioscience and Collections 1(1), 1-15.
Güreşen, S., Topçu, N., Öztürk, B. (2015). Distribution and mortality of the Mediterranean Stony Coral (*Cladocora caespitosa* Linnaeus, 1767) around Gökçeada Island (Northern Aegean Sea). Cahiers de Biologie Marine 56(3), 283-288.
Özalp, H.B. (2013). Çanakkale Boğazı'nda Dağılım Gösteren Sert Mercan Türlerinin (Cnidaria, Anthozoa, Scleractinia) Taksonomik ve Ekolojik Özellikleri (Yöksis No: 343404). Çanakkale Onsekiz Mart University, Doctoral Thesis.
Özalp, H. B. (2021). First massive mucilage event observed in deep waters of Çanakkale Strait (Dardanelles), Turkey. Journal of the Black Sea/Mediterranean Environment 27(1), 49-66.
Özalp, H.B., Odabaşı, D.A. (2021). Gökçeada Kıyılarında Dağılım Gösteren Sert Mercan Çeşitliliğinin Belirlenmesi. Çanakkale Ondokuz Mayıs University, Bilimsel Araştırma Proje Raporu.
Özalp, H.B. (2018). TÜBİTAK 116Y030 (Coordinator). Kuzey Ege Adaları (Bozcaada, Mavriya) ve Marmara Denizi'nde Dağılım Gösteren Sert Mercan Çeşitliliğinin Belirlenmesi. Mart 2016 - Nisan 2018.
Özalp H.B. (2019a). Denizler Altında Yapay Habitatlar: Bozcaada Resiflerine ve Biyoçeşitliliğe Bir Bakış (1. edition), ISBN: 9786056735004. Çanakkale, Türkiye, 165 p.
Özalp, H.B., (2019b). Biodiversity of Marine Caves and Cave-Like Formations around the Northern Aegean Islands (Gökçeada, Bozcaada). In Marine Caves of the Eastern Mediterranean Sea Biodiversity, Threat and Conservation. Öztürk, B (ed). Turkish Marine Research Foundation (TUDAV) press, İstanbul, pp: 166-185.
Özalp, H.B. (2016). Bozcaada *Cladocora caespitosa* (Anthozoa, Scleractinia, Faviidae) resiflerinde izleme çalışmaları: Popülasyon gözlemi ve koloniler üzerindeki yaşamsal

risk *Caulerpa racemosa* (Ege Denizi, Türkiye). Türkiye Deniz Bilimleri Konferansı [Oral Presentation], pp. 59.

Özalp, H.B., Alparslan, M. (2016). Scleractinian diversity in the Dardanelles and Marmara Sea (Turkey): morphology, ecology and distributional patterns. Oceanological and Hydrobiological Studies 45(2), 259-285.

Özalp, H.B., Alparslan, M. (2011). The first record of *Cladocora caespitosa* (Linnaeus, 1767) (Anthozoa, Scleractinia) from the Marmara Sea. Turkish Journal of Zoology 35(5), 701-705.

Özalp, H.B. (2023). Özel Proje/Savalia2018/72. Çanakkale Boğazı, Babakale ve Assos kıyılarında dağılım gösteren nesli tehlike altındaki *Savalia savaglia* mercan habitatları ekolojisi ve demografik özelliklerinin belirlenmesi (Assos, Babakale, Çanakkale Boğazı). 2018- ongoing (*unpublished data*).

Öztürk, B., Doğal, A., Bitlis, B., Önen, M. (2008). Ptenoglossa species (Mollusca: Gastropoda) distributed along the Turkish coast of the Aegean Sea. Turkish Journal of Zoology 32(2), 201-211.

Sala, E., Knowlton, N. (2006). Global marine biodiversity trends. Annual Review of Environmental Resources 31, 93-122.

SPA/RAC. 2017. Action Plan for the Conservation of the Coralligenous and Other Calcareous Bio-concretions in the Mediterranean Sea. UN Environment/MAP Athens, Greece.

Topçu Eryalçın, N. E. (2017). Saros Körfezi Gorgon (Anthozoa, Octocorallia, Holaxonia) Topluluklarının Demografik Yapıları. KSÜ Doğa Bil. Derg. 20(4), 368-377.

Yığın, C.Ç., Özalp, H.B., Çelik, E.Ş., Ak, İ., Ayaz, A., Altınağaç, U., Kedioğlu, Ç., Çolakoğlu, F., Öztekin, A. (2022). Bozcaada (Çanakkale, Türkiye) Denizel Biyoçeşitliliği Üzerine Bir Araştırma. Ejons International Journal 6(21), 136-149.

Yokeş, M.B., Demir, V. (2013). Ayvalık Adaları Tabiat Parkı Denizel Biyolojik Çeşitlilik Çalışması Final Raporu. Türkiye'nin Deniz ve Kıyı Koruma Alanları Sisteminin Güçlendirilmesi Projesi. T.C.Çevre ve Şehircilik Bakanlığı [Ministry of Environment and Urbanization]. Ankara.

Birds

BirdLife International. (2018). *Puffinus yelkouan*. The IUCN Red List of Threatened Species 2018: e.T22698230A132637221. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698230A132637221.en. [Accessed on January 2024].

BirdLife International (2024) Species factsheet: *Puffinus yelkouan*. Downloaded from https://datazone.birdlife.org/species/factsheet/yelkouan-shearwater-puffinus-yelkouan on 11/06/2024

Boyla, K.A., Sinav, L. ve Dizdaroğlu D.E. (2019). Türkiye Üreyen Kuş Atlası. WWF-Türkiye, Doğal Hayatı Koruma Vakfı. İstanbul.

Kirwan, G., Demirci, B., Welch, H., Boyla, K., Özen, M., Castell, P., Marlow, T. (2010). The Birds of Turkey. Bloomsbury Publishing.

Onmuş, O. (2015). Birds in the Aegean Sea. In: The Aegean Sea: Marine Biodiversity, Fisheries, Conservation and Governance. Katağan, T., Tokaç, A., Beşiktepe, Ş., Öztürk, B. (eds). TUDAV Publication No: 41. pp. 258-274.

Onmuş, O., Gönülal, O. (2019). A newly identified breeding site in the Aegean Sea and a status update for Audouin's Gull *Larus audouinii* in Turkey (Aves: Laridae). Zoology in the Middle East 65(2), 186-188.

Yaylalı, Ö., Arslan, S., Özuslu, S. (2023). Türkiye'deki Ada Martısı (*Ichthyaetus audouinii* Payraudeau, 1826) Çalışmaları. Doga Dernegi. İzmir. 20 pages.

Mediterranean Fan Mussel

Cabanellas-Reboredo, M., Vázquez-Luis, M., Mourre, B., Álvarez, E., Deudero, S., Amores, Á., ... & Hendriks, I.E. (2019). Tracking a mass mortality outbreak of pen shell *Pinna nobilis* populations: A collaborative effort of scientists and citizens. Scientific Reports 9(1), 13355 https://doi.org/10.1038/s41598-019-49808-4

Kersting, D., Benabdi, M., Čižmek, H., Grau, A., Jimenez, C., Katsanevakis, S., Öztürk, B., Tuncer, S., Tunesi, L., Vázquez-Luis, M., Vicente, N., Otero Villanueva, M. (2019). *Pinna nobilis*. The IUCN Red List of Threatened Species2019: e.T160075998A160081499. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T160075998A160081499.en [Accessed on June 2024].

Öndes, F., Alan, V., Akçalı, B., & Güçlüsoy, H. (2020). Mass mortality of the fan mussel, *Pinna nobilis* in Turkey (eastern Mediterranean). Marine ecology, 41(5), e12607.

Pensa, D., Fianchini, A., Grosso, L., Ventura, D., Cataudella, S., Scardi, M., Rakaj, A. (2022). Population status, distribution and trophic implications of *Pinna nobilis* along the South-eastern Italian coast. npj Biodiversity 1(1), 3.

Trigos, S., García-March, J. R., Vicente, N., Tena, J., Torres, J. (2014). Utilization of muddy detritus as organic matter source by the fan mussel *Pinna nobilis*. Mediterranean Marine Science 15(3), 667-674.

©2019 International Union for Conservation of Nature, The Noble Pen Shell (*Pinna nobilis*) Now Critically Endangered.

Areas of High Biodiversity Importance

CORINE Land Cover Data. 2018. Accessed through the European Union's Copernicus Land Monitoring Service <https://doi.org/10.2909/71c95a07-e296-44fc-b22b-415f42acfdf0>

Eken, G., Bozdoğan, M., İsfendiyaroğlu, S., Kılıç, D.T., Lise, Y. (eds). (2006). Türkiye'nin Önemli Doğa Alanları. Doğa Derneği, Ankara, Türkiye.

Karaçetin, E., Welch, H.J., Turak, A., Balkız, Ö., Welch, G. (2011). Conservation Strategy for Butterflies in Türkiye. Nature Conservation Centre. Ankara. [Accessed from www.dkm.org.tr]

OpenStreetMap. (2024). Waterways Data. https://www.openstreetmap.org/copyright

Özhatay, N., Byfield, A., Atay, S. (2003). Türkiye'nin Önemli Bitki Alanları. WWF-Türkiye (Doğal Hayatı Koruma Vakfı).

Protected Areas

Dudley, N. (editor) (2008). Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN. x + 86pp. WITH Stolton, S., P. Shadie and N. Dudley (2013). IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No. 21, Gland, Switzerland: IUCN. 143 p.

Density of Threatened Marine Animals

Deniz Koruma Alanları. https://www.wwf.org.tr/kesfet/denizler/deniz_koruma_alanlari/ [Accessed on January 2024].

Doğa Koruma ve Milli Parklar Genel Müdürlüğü Sulak Alanlar Harita Uygulaması. https://www.arcgis.com/apps/View/indexhtml?appid=5f3978146c4643438ab446620e2752 69 [Accessed on January 2024].

IUCN. (2023). The IUCN Red List of Threatened Species. Version 2023-1. https://

www.iucnredlist.org [Accessed on September 2023].
Özel Çevre Koruma Bölgeleri. https://ockb.csb.gov.tr [Accessed on January 2024].
Türkiye İstatistik Kurumu (TÜİK) [Turkish Statistical Institute TURKSTAT]. (2021). Su Ürünleri İstatistikleri Mikro Veri Seti - 2021. Ankara, Türkiye.

Species Density & Richness

ACCOBAMS. (2021b). Estimates of abundance and distribution of cetaceans, marine mega-fauna and marine litter in the Mediterranean Sea from 2018-2019 surveys. By Panigada S., Boisseau O., Canadas A., Lambert C., Laran S., McLanaghan R., Moscrop A. Ed. ACCOBAMS - ACCOBAMS Survey Initiative Project, Monaco, 177 pp. data in the publication was digitized by the Yolda Initiative.
Kaschner, K., Kesner-Reyes, K., Garilao, C., Segschneider, J., Rius-Barile, J. Rees, T., & Froese, R. (2019). AquaMaps: Predicted range maps for aquatic species. Retrieved from https://www.aquamaps.org [Accessed on January 2024].

Marine Priority Areas

Sala, E., Mayorga, J., Bradley, D., Cabral, R.B., Atwood, T.B., Auber, A., Cheung, W., Costello, C., Ferretti, F., Friedlander, A.M., Gaines, S.D., Garilao, C., Goodell, W., Halpern, B.S., Hinson, A., Kaschner, K., Kesner-Reyes, K., Leprieur, F., McGowan, J., Morgan, L.E., Mouillot, D., Palacios-Abrantes, J., Possingham, H.P., Rechberger, K.D., Worm, B., Lubchenco, J., (2021). Protecting the global ocean for biodiversity, food and climate. Nature. 2021 Apr; 592(7854), 397-402. doi: 10.1038/s41586-021-03371-z.
UN Biodiversity Lab Database. https://map.unbiodiversitylab.org/earth [Accessed on January 2023].

Habitat Diversity

Acarlı, D., Kale, S., Kocabaş, S. (2020). TCSG-132 Gemi batığı yapay resifinin (Gökçeada, Kuzey Ege Denizi) biyoçeşitliliği. Acta Aquatica Turcica 16(3), 313-329.
Charbonnel, E., Serre, C., Ruitton, S., Harmelin, J.G., Jensen, A. (2002). Effects of increased habitat complexity on fish assemblages associated with large artificial reef units (French Mediterranean coast). ICES Journal of Marine Science 59 (suppl), S208-S213.
European Commission Marine Observation and Data Network (EMODnet) Seabed Habitats Initiative database. (www.emodnet-seabedhabitats.eu). Licensed under CC-BY 4.0.
GEBCO Compilation Group. (2023). GEBCO 2023 Grid (doi:10.5285/f98b053b-0cbc-6c23- e053-6c86abc0af7b)
Gül, B., Lök, A., Ulaş, A., Düzbastılar, F.O. (2006). Ürkmez Kıyılarında Farklı Substratlara Yerleştirilmiş Yapay Resiflerdeki Balık Kompozisyonunun Belirlenmesi. Ege Journal of Fisheries and Aquatic Sciences 23(3), 431-434.
Gül, B., Lök, A., Özgül, A., Ula, A., Düzbastilar, F. O., Metrin, C. (2011). Comparison of fish community structure on artificial reefs deployed at different depths on Turkish Aegean Sea coast. Brazilian Journal of Oceanography 59, 27-32.
Jensen, A. (2002). Artificial reefs of Europe: perspective and future. ICES Journal of Marine Science 59 (suppl), S3-S13.
Kemer, A.Y. (2022). Kuşadası körfezi Pamucak yapay resif alanında balık tür çeşitliliğinin izlenmesi. Aydın Adnan Menderes Üniversitesi, Fen Bilimleri Enstitüsü Yüksek Lisans Tezi. Aydın.
Lazarus, M., Belmaker, J. (2021). A review of seascape complexity indices and their performance in coral and rocky reefs. Methods in Ecology and Evolution 12(4), 681-695.
Lök, A., Metin, C., Ulaş, A., Düzbastilar, F.O., Tokaç, A. (2002). Artificial reefs in Tur-

key. ICES Journal of Marine Science 59 (suppl), S192-S195.
Lök, A., Gül, B. (2005). İzmir Körfezi Hekim Adası'ndaki Deneysel Amaçlı Yapay Resiflerde Balık Faunasının Değerlendirilmesi. Ege Journal of Fisheries and Aquatic Sciences 22(1), 109-114.
Lök, A., Özgül, A., Ünal, V. (2022). An Overview of the First National Artificial Reef Project of Turkey. Impact of Artificial Reefs on the Environment and Communities, 110-125.
Özalp, H.B. (2009). Çanakkale Boğazı Çanakkale sualtı ve can kurtarma spor kulübü sualtı istasyonuna bırakılan fiberglas, ahşap, lastik, demir ve seramik malzmelerin cezbettiği balık türlerinin incelenmesi. Çanakkale Onsekiz Mart University, School of Graduate Studies, Master's thesis, Çanakkale.
Özgül, A., Lök, A. (2017). Türkiye'de Yapay Resif Çalışmaları. In: Erkanal, H., Şahoğlu, V., Tuğcu, İ. (eds.). Su Altı Bilim ve Teknoloji Toplantısı Bildirileri 20. Bilgin Kültür Sanat Yayınları. Ankara.
Özgül, A. (2010). Ege Denizi'nde Pelajik Balık Avcılığı İçin Yüzen Yapay Resif Teknolojisinin Geliştirilmesi. Ege University, Graduate School of Natural and Applied Sciences, Doctoral thesis. İzmir.
Riley, S. J., DeGloria, S. D., Elliot, R. (1999). Index that quantifies topographic heterogeneity. Intermountain Journal of Sciences 5(1-4), 23-27.
Sala, E., Knowlton, N. (2006). Global marine biodiversity trends. Annual Review of Environment and Resource 31, 93-122.
Shannon, C.E. (1948). A Mathematical Theory of Communication. Bell System Technical Journal 27(3), 379-423.
Tittensor, D. P., Mora, C., Jetz, W., Lotze, H. K., Ricard, D., Berghe, E. V., Worm, B. (2010). Global patterns and predictors of marine biodiversity across taxa. Nature 466(7310), 1098-1101.
Ulaş, A., Lök, A., Metin, C., Düzbastılar, F.O., Özgül, A., Gül, B., Başaran, F., Duman, Ü. (2008). Yapay Resiflerde Bazı Balık Türleri Üzerine Markalama Denemeleri. Ege University, Bilimsel Araştırma Projesi (BAP) Kesin Raporu. İzmir.
Walker, B.K., Jordan, L.K., Spieler, R.E. (2009). Relationship of reef fish assemblages and topographic complexity on southeastern Florida coral reef habitats. Journal of Coastal Research (10053), 39-48.
Zawada, D.G., Piniak, G.A., Hearn, C.J. (2010). Topographic complexity and roughness of a tropical benthic seascape. Geophysical Research Letters 37(14).
Web Sources
http://www.estab.gov.tr/yapay-resif/ [Accessed on December 2023].

Fishing Gear Selectivity

Aydın, M., & Düzgüneş, E. (2007). Bodrum Yarımadasında Kullanılan Galsama Ağlarının Seçiciliği. Ulusal Su Günleri Sempozyumu (16-18 May 2007), pp.456-466.
Bjordal, Å. (2009). Regulation of fishing gears and methods. In K. L. Cochrane & S. M. Garcia (eds.), A Fishery Manager's Guidebook. John Wiley & Sons.
Coll, M., Libralato, S., Tudela, S., Palomera, I., & Pranovi, F. (2008). Ecosystem overfishing in the ocean. PLoS One, 3(12), e3881.
FAO. (2020). The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome. https://doi.org/10.4060/ca9229en
McClanahan, T. R., & Mangi, S. (2004). Gear-based management of a tropical artisanal fishery based on species selectivity and capture size. Fisheries Management and Ecology, 11(1), 51-60.
Pauly, D., & Zeller, D. (2016). Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining. Nature Communications, 7, 10244.
Türkiye İstatistik Kurumu (TÜİK) [Turkish Statistical Institute TURKSTAT]. (2021). Su

Ürünleri İstatistikleri Mikro Veri Seti - 2021. Ankara, Türkiye.

Organizational Capacity

Agrawal, A., & Gibson, C. C. (1999). Enchantment and disenchantment: The role of community in natural resource conservation. World Development, 27(4), 629-649.

Berkes, F. (2004). Rethinking Community-Based Conservation. Conservation Biology, 18(3), 621-630. doi: 10.1111/J.1523-1739.2004.00077.X

Borrini-Feyerabend, G., Kothari, A., & Oviedo, G. (2004). Indigenous and Local Communities and Protected Areas: Towards Equity and Enhanced Conservation. IUCN.

Pretty, J., & Smith, D. (2004). Social capital in biodiversity conservation and management. Conservation Biology, 18(3), 631-638.

T.C. İçişleri Bakanlığı Sivil Toplumla ilişkiler Genel Müdürlüğü [General Directorate for Relations with Civil Society of the Ministry of Interior of the Republic of Türkiye] (n.d.). İllere ve faaliyet alanlarına göre dernekler. https://www.siviltoplum.gov.tr/illere-ve-faaliyet-alanlarina-gore-dernekler

T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change]. (2023). 2000-2023 Yatırım İzleme ve Değerlendirme Raporları. https://strateji.csb.gov.tr/yatirim-programi-izleme-ve-degerlendirme-raporlari-i-5688

Yolda Initiative. (2023). Ege Kıyılarında Doğa ve Kültür Birlikteliği Projesi Anketi [Conservation Investments Questionnaire]. https://www.surveymonkey.com/r/7ZL35Y5.

Reversible & Irreversible Threats (BD & SSFs) - Expert opinions from the national workshop

Salafsky, N., Salzer, D., Stattersfield, A. J., Hilton-Taylor, C. R. A. I. G., Neugarten, R., Butchart, S. H., ... & Wilkie, D. (2008). A standard lexicon for biodiversity conservation: unified classifications of threats and actions. Conservation Biology, 22(4), 897-911.

Reversible Threats (BD & SSFs) - Level of water pollution

Balkız, Ö., Ateş, B., Orhon, A., Yılmaz, E., Kartal, E., Ceyhan, T., Tosunoğlu, Z., Bilgin, G. D., Öztepe, İ., İloğlu, G., Türkozan, B. (2023). Ege Kıyılarında Doğa ve Kültür Birlikteliği Çalıştayı Raporu. Yolda Girişimi

Chaudhry, F. N., & Malik, M. F. (2017). Factors affecting water pollution: a review. J. Ecosyst. Ecography, 7(1),225-231.

Teuten, E. L., Saquing, J. M., Knappe, D. R., Barlaz, M. A., Jonsson, S., Björn, A., ... & Takada, H. (2009). Transport and release of chemicals from plastics to the environment and to wildlife. Philosophical transactions of the royal society B: biological sciences, 364(1526), 2027-2045

Florescu, D., Ionete, R. E., Sandru, C., Iordache, A., & Culea, M. (2011). The influence of pollution monitoring parameters in characterizing the surface water quality from Romania Southern area. Rom. J. Phys, 56(7-8), 1001.

Gregory, M. R. (2009). Environmental implications of plastic debris in marine settings—entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. Philosophical transactions of the royal society B: Biological Sciences, 364(1526), 2013-2025.

Pedrotti ML, Petit S, Elineau A, Bruzaud S, Crebassa JC, et al. (2016) Changes in the Floating Plastic Pollution of the Mediterranean Sea in Relation to the Distance to Land. PLoS One 11(8): e0161581. https://doi.org/10.1371/journal.pone.0161581.

T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment and Urbanization], Çevresel Etki Değerlendirmesi İzin ve Denetim Genel Müdürlüğü (2022). Deniz Kalitesi Bülteni - Ege Denizi. [Accessed from: https://ced.csb.gov.tr/deniz-kalitesi-bulteni-i-84199].

Reversible Threats (BD) - Concentration of Marine Litter

ACCOBAMS. 2021. Estimates of abundance and distribution of cetaceans, marine mega-fauna and marine litter in the Mediterranean Sea from 2018-2019 surveys. Data digitized by the Yolda Initiative, from: By Panigada S., Boisseau O., Canadas A., Lambert C., Laran S., McLanaghan R., Moscrop A. Ed. ACCOBAMS - ACCOBAMS Survey Initiative Project, Monaco, 177 pp.

Law, Kara & Morét, Skye & Maximenko, Nikolai & Proskurowski, Giora & Peacock, Emily & Hafner, Jan & Reddy, Christopher. (2010). Plastic Accumulation in the North Atlantic Subtropical Gyre. Science (New York, N.Y.). Vol.329, 1185-1188. doi: 10.1126/science.1192321.

Maximenko N, Hafner J, Niiler P. (2012). Pathways of marine debris derived from trajectories of Lagrangian drifters. Mar Pollut Bull. 2012; 65(1–3), 51–62.

Pedrotti ML, Petit S, Elineau A, Bruzaud S, Crebassa JC, et al. (2016). Changes in the Floating Plastic Pollution of the Mediterranean Sea in Relation to the Distance to Land. PLoS One 11(8): e0161581. https://doi.org/10.1371/journal.pone.0161581

Bycatch Probability of Animal Species

Carpentieri, P., Nastasi, A., Sessa, M., Srour, A. (eds). (2021). Incidental catch of vulnerable species in Mediterranean and Black Sea fisheries – A review. Studies and Reviews No. 101 (General Fisheries Commission for the Mediterranean). Rome, FAO.

Genovart, M., Doak, D.F., Igual, J.M., Sponza, S., Kralj, J., Oro, D. (2017). Varying demographic impacts of different fisheries on three Mediterranean seabird species. Global Change Biology 23(8), 3012–3029. https://doi.org/10.1111/gcb.13670

Lewison, R. L., Crowder, L. B., Wallace, B. P., Moore, J. E., Cox, T., Zydelis, R., ... & Safina, C. (2014). Global patterns of marine mammal, seabird, and sea turtle bycatch reveal taxa-specific and cumulative megafauna hotspots. Proceedings of the National Academy of Sciences 111(14), 5271-5276.

Otero, M., Serena F., Gerovasileiou, V., Barone, M., Bo, M., Arcos, J.M., Vulcano A., Xavier, J. (2019). Identification guide of vulnerable species incidentally caught in Mediterranean fisheries. IUCN, Malaga, Spain, 204 pages.

Şahin, D. (2017). Initiating a By-Catch Monitoring Programme for Seabirds in the Aegean Sea - Turkey Project Final Report. Conservation Leadership Programme.

Türkiye İstatistik Kurumu (TÜİK) [Turkish Statistical Institute TURKSTAT]. (2021). Su Ürünleri İstatistikleri Mikro Veri Seti - 2021. Ankara, Türkiye.

Presence of Aquafarms

Akyol, O., Özgül, A., Şen, H., Düzbastılar, F. O., & Ceyhan, T. (2019). Determining potential conflicts between small-scale fisheries and sea-cage fish farms in the Aegean Sea. Acta Ichthyologica et Piscatoria, 49, 365-372.

Balas, C.E., İnan, A. (2023). Aydin-Muğla İlleri (TR32 Düzey-II Bölgesi) Bütünleşik Kıyı Alanları Planlaması İşi, Turizm ve Balıkçılık Kıyı Yapıları ve Su Ürünleri Uzmanlık Raporu. T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change] (https://webdosya.csb.gov.tr/db/mpgm/icerikler/-5.4.4.-tur-zm-ve-balikcilik-kiyi-yapilari-ve-su-urunler--uzmanlik-raporu-20201217141117.pdf)

Çöteli, F.T. (2023). Ürün Raporu – Su Ürünleri 2023. Tarımsal Ekonomi ve Politika Geliştirme Enstitüsü. Ankara.

Özden, O. (2015). Aquaculture in the Aegean Sea. In: The Aegean Sea: Marine Biodiversity, Fisheries, Conservation and Governance. Katağan, T., Tokaç, A., Beşiktepe,

Ş., Öztürk, B. (eds). TUDAV Publication No: 41.
Tür, R. (2023). Balıkesir - Çanakkale İlleri (TR22 Düzey - II Bölgesi) Bütünleşik Kıyı Alanları Planlaması Araştırma Raporu - Su Ürünleri Balıkçılık Kıyı Yapıları Uzman Değerlendirme Raporu. T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change] (https://webdosya.csb.gov.tr/db/mpgm/icerikler/5.4.4.1-su-urunleri-balikcilik-kiyi-yapilari-20201218094951.pdf)

Conservation Investments (BD& SSFs)

Balkız, Ö., Ateş, B., Orhon, A., Yılmaz, E., Kartal, E., Ceyhan, T., Tosunoğlu, Z., Bilgin, G. D., Öztepe, İ., İloğlu, G., Türkozan, B. (2023). Ege Kıyılarında Doğa ve Kültür Birlikteliği Çalıştayı Raporu. Yolda Girişimi.
FAO (Food and Agriculture Organization of the United Nations). (2023). FAO & Türkiye Partnership: https://www.fao.org/in-action/fao-turkey-partnership/projects/table-projects/en/?- no_cache=1 [Accessed on June 2023].
Global Environment Facility. (2023). Project Database: https://www.thegef.org/projects-operations/database [Accessed on January 2023].
T.C. Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı [Presidency of Strategy and Budget]. (2023). 2000-2023 Kamu Yatırım Programları. https://www.sbb.gov.tr/kamu-yatirim-programlari/
T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change]. (2023). 2000-2023 Yatırım İzleme ve Değerlendirme Raporları. https://strateji.csb.gov.tr/yatirim-programi-izleme-ve-degerlendirme-raporlari-i-5688 [Accessed on January 2023].
Yolda Initiative. (2023). Ege Kıyılarında Doğa ve Kültür Birlikteliği Projesi Anketi. https://www.surveymonkey.com/r/7ZL35Y5.

Enforced Protection

T.C. Çevre ve Orman Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü. [Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks]. (2016). 1958-2016. https://www.tarimorman.gov.tr/DKMP/Belgeler/dkmp%2520resmi%2520istatistik/resmiistatistikler/korunanalanistatistikleri/2016/istatistikitablolar/milliparklar.xlsx&ved=2ahUKEwiV47yb0dOHAxVaSfEDHcDdAPY4ChAWegQILRAB&usg=AOvVaw2nshzHOeSLVoE8quGBMAl_

Human impact to marine ecosystems

Halpern, B., Frazier, M., Potapenko, J., Casey, K., Koenig, K., Longo, C., Lowndes, J., Rockwood, C., Selig, E., Selkoe, K., & Walbridge, S. (2015). Cumulative human impacts: Supplementary data. Knowledge Network for Biocomplexity. https://doi.org/10.5063/F19Z92TW
Halpern, B. S., Walbridge, S., Selkoe, K. A., Kappel, C. V., Micheli, F., D'Agrosa, C., ... & Fujita, R. (2008). A global map of human impact on marine ecosystems. Science, 319(5865), 948–952. https://doi.org/10.1126/science.1149345
Kappel, C. V. (2005). Losing pieces of the puzzle: Threats to marine, estuarine, and diadromous species. Frontiers in Ecology and the Environment, 3(5), 275–282. https://doi.org/10.1890/1540-9295(2005)003[0275:LPOTPT]2.0.CO;2
UN Biodiversity Lab database. http://unbiodiversitylab.org [Accessed on January 2023].
Cumulative human impacts: Supplementary data. https://knb.ecoinformatics.org/view/doi%3A10.5063%2FF19Z92TW [Accessed on January 2023].

Small-scale Fishing Grounds

Akyol O, Özgül A, Şen H, Düzbastılar F, Ceyhan T. (2019). Determining potential conflicts between small-scale fisheries and sea-cage fish farms in the Aegean Sea. Acta Ichthyologica et Piscatoria 49(4), 365-372. https://doi.org/10.3750/AIEP/02681

Anonymous. (2020). 5/1 Numaralı Ticari Amaçlı Su ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (Tebliğ No: 2020/20) [Notification No. 5.1 of the Commercial Fishing Regulations], T.C. Tarım ve Orman Bakanlığı, Balıkçılık ve Su Ürünleri Genel Müdürlüğü [Ministry of Agriculture and Forestry, General Directorate of Fisheries and Aquaculture] https://www.resmigazete.gov.tr/eskiler/2020/08/20200822-8.pdf

Güçlüsoy, H., Ünal, V. Tosunoğlu, Z., Bilecenoğlu, M, Tıraşın, E.M. (2024). Foça Özel Çevre Koruma Bölgesinde Ekosistem Yaklaşımlı Balıkçılık Yönetimi Temel Rapor - Temel Rapor. [Küçük Ölçekli Balıkçılık Ortak Yönetimi Projesi]. Doğal Hayatı Koruma Vakfı (WWF-Türkiye) Yayınları. Istanbul (in press).

Navionics. (n.d.). Navionics Boating Map - Chart Viewer. https://webapp.navionics.com [Accessed on January 2023].

GEBCO Compilation Group. (2023). GEBCO 2023 Grid (doi:10.5285/f98b053b-0cbc-6c23- e053-6c86abc0af7b)

Ünal, V., Tosunoğlu, Z., Tıraşın, E.M., Vasconcellos, M. (2022). The implementation of the ecosystem approach to fisheries management in Gökçeada, Turkey – Baseline report. Rome, FAO. https://doi.org/10.4060/cb9174en

Fishing Bans Towards Large-Scale Fisheries

Akbaş, H., Kösoğlu, S.T., Üstündağ, E., Veske, Ş., Erdem, E. (2023). Su Ürünleri İstatistikleri 2023. Balıkçılık ve Su Ürünleri Genel Müdürlüğü [General Directorate of Fisheries and Aquaculture] Ankara.

Anonymous. (2020). 5/1 Numaralı Ticari Amaçlı Su ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (Tebliğ No: 2020/20) [Notification No. 5.1 of the Commercial Fishing Regulations], T.C. Tarım ve Orman Bakanlığı, Balıkçılık ve Su Ürünleri Genel Müdürlüğü [Ministry of Agriculture and Forestry, General Directorate of Fisheries and Aquaculture] https://www.resmigazete.gov.tr/eskiler/2020/08/20200822-8.pdf

Prestrelo, L., Oliveira, R., and Vianna, M. (2019). A new proposal to classify small fishing vessels to improve tropical estuarine fishery management. Fish Res 211, 100–110. doi: 10.1016/j.fishres.2018.11.010

Volume of the SSFs Fleet

General Fisheries Commission for the Mediterranean – GFCM. Regional Fleet Register Database (GFCM-RFR). https://www.fao.org/gfcm/data/fleet/register. [Accessed on July 2024].

Türkiye İstatistik Kurumu (TÜİK) [Turkish Statistical Institute TURKSTAT]. (2021). Su Ürünleri İstatistikleri Mikro Veri Seti - 2021. Ankara, Türkiye.

Diversity of Fishing Gear

Cochrane, K. L., Garcia, S. M. (eds.). (2009). A fishery manager's guidebook. John Wiley & Sons.

Göktürk, D., Deniz, T., Dinçer, C.T. (2022). Sürdürülebilir Küçük Ölçekli Balıkçılık İçin "Ortak Yönetim". Doğal Hayatı Koruma Vakfı WWF-Türkiye. Türkiye.

Tokaç, A., Ünal, V., Tosunoğlu, Z., Akyol, O., Özbilgin, H., Gökçe, G. (2010). Ege Denizi Balıkçılığı. IMEAK Deniz Ticaret Odası İzmir Şubesi Yayınları. İzmir. 390 pages.

Tosunoğlu, Z., Ünal, V. (2021). The effect of landing decrease on fishing gears: a

case of Gökçeada fishery. COMU J. Mar. Sci. Fish, 4(1),11-19. DOI: 10.46384/jmsf.892450
Ünal, V., Tosunoğlu, Z., Kartal, E. (2022). Balıkçılar için Yönetişim ve Katılımcılık Rehberi. Balıkçıların Su Ürünleri Politikalarına Aktif Katılımının Güçlendirilmesi Projesi. Doğal Hayatı Koruma Vakfı (WWF-Türkiye) Yayınları, İstanbul, 88 p.

Presence of Fishing Facilities

Balas, C.E., İnan, A. (2023). Aydin-Muğla İlleri (TR32 Düzey-II Bölgesi) Bütünleşik Kıyı Alanları Planlaması İşi, Turizm ve Balıkçılık Kıyı Yapıları ve Su Ürünleri Uzmanlık Raporu. T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change] (https://webdosya.csb.gov.tr/db/mpgm/icerikler/-5.4.4.-tur-zm-ve-balikcilik-kiyi-yapilari-ve-su-urunler--uzmanlik-raporu-20201217141117.pdf)
Balas, C.E. (2023). Aydın-Muğla İlleri (TR32 Düzey – II Bölgesi) Bütünleşik Kıyı Alanları Planlaması İşi – Kıyı Yapıları Uzman Değerlendirme Raporu. T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change] (https://webdosya.csb.gov.tr/db/mpgm/icerikler/kiyi-yapilari-uzman-degerlend-rme-raporu--kasim-2022-20230404130939.pdf)
Tür, R. (2023). Balıkesir - Çanakkale İlleri (TR22 Düzey - II Bölgesi) Bütünleşik Kıyı Alanları Planlaması Araştırma Raporu - Su Ürünleri Balıkçılık Kıyı Yapıları Uzman Değerlendirme Raporu. T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [Ministry of Environment, Urbanization and Climate Change] (https://webdosya.csb.gov.tr/db/mpgm/icerikler/5.4.4.1-su-urunleri-balikcilik-kiyi-yapilari-20201218094951.pdf)
Ünal, V., Güçlüsoy, H., and Franquesa, R. (2009). A comparative study of success and failure of fisheries cooperatives in the Aegean, Turkey. Journal of Applied Ichthyology 25, 394–400. doi: 10.1111/j.1439-0426.2009.01241.x
Yapanto, L. M., Musa, D. T., Tanipu, F., and ... (2020). The Effectiveness of Fishery Cooperative Institutions. Palarch's Journal of Archaeology Of Egypt/Egyptology 17, 1329–1338.

Catch Per Unit Effort

Akyol, O., & Ceyhan, T. (2007a). Datça-Bozburun Yarımadası (Ege Denizi) kıyı balıkçılığı ve sorunları üzerine bir araştırma. Ege Journal of Fisheries and Aquatic Sciences, 24(1), 121-126.
Akyol, O., & Ceyhan, T. (2007b). Datça-Bozburun Yarımadası'nda (Ege Denizi) kullanılan uzatma ağlarının teknik özellikleri. Ege Journal of Fisheries and Aquatic Sciences, 24(1), 117-120.
Akyol, O., & Ceyhan, T. (2007c). İzmir Körfezi'nde (Ege Denizi) kullanılan sürüklenen pelajik uzatma ağlarının teknik özellikleri. Su Ürünleri Dergisi, 24(1),179-183.
Akyol, O., & Ceyhan, T. (2009). Catch per unit effort of coastal prawn trammel net fishery in İzmir Bay, Aegean Sea. Mediterranean Marine Science, 10(1), 19-24.
Akyol, O., & Ceyhan, T. (2010a). Enez Dalyanı (Edirne, Kuzey Ege) balıkçılığı. Ege Journal of Fisheries and Aquatic Sciences, 27(1), 31-34.
Akyol, O., & Ceyhan, T. (2010b). Gökçeada (Ege Denizi) kıyı balıkçılığı ve balıkçılık kaynakları. Ege Journal of Fisheries and Aquatic Sciences, 27(1), 1-5.
Akyol, O., & Ceyhan, T. (2011a). Bozcaada (Ege Denizi) kıyı balıkçılığı ve balıkçılık kaynakları. Journal of Fisheries Sciences, 5(1), 64.
Akyol, O., & Ceyhan, T. (2011b). Prens Adaları (İstanbul) kıyı balıkçılık av araçları. Ege Journal of Fisheries and Aquatic Sciences, 28(4), 117-125.
Akyol, O., Ceyhan, T., İlkyaz, A., & Erdem, M. (2007). Gökova Körfezi (Ege Denizi) uzatma ağları balıkçılığı üzerine araştırmalar. Anadolu University Journal of Sciences & Technology, 8(1).
Akyol, O., Ceyhan, T., & Erdem, M. (2012). Turkish pelagic gillnet fishery for sword-

fish and incidental catches in the Aegean Sea. Journal of the Black Sea Mediterranean Environment, 18(2).

Akyol, O., Ceyhan, T., & Sağlam, C. (2016). Bodrum Yarımadası (Ege Denizi) küçük ölçekli kıyı balıkçılığında kullanılan bazı av araçlarının teknik özellikleri. Journal of Maritime and Marine Sciences, 2(2), 20-35.

Akyol, O., Karakulak, F. S., Ceyhan, T., & Ayhan, D. (2008). Türkiye denizlerinde kullanılan sürüklenen pelajik uzatma ağları ve yasal düzenlemeler. Ege Journal of Fisheries and Aquatic Sciences, 25(2).

Altınağaç, U., Ayaz, A., Özekinci, U., & Öztekin, A. (2008). Edremit Körfezi dip uzatma ağlarının teknik özellikleri ve yapısal farklılıkları. Journal of Fisheries Sciences, 2(3), 432-439.

Ayaz, A., Öztekin, A., & Cengiz, Ö. (2012). Gökçeada ve Bozcaada'da (Kuzey Ege Denizi) kullanılan uzatma ağlarının yapısal özellikleri. Gümüşhane Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 2(2), 104-111.

Ceyhan, T., & Akyol, O. (2005). Gökova Körfezi (Ege Denizi)'nde kullanılan uzatma ağlarının teknik özellikleri. Ege Journal of Fisheries and Aquatic Sciences, 22(3), 269-272.

Ceyhan, T., & Akyol, O. (2006). Edremit Körfezi (Ege Denizi) kıyı balıkçılığı üzerine bir araştırma. Ege Journal of Fisheries and Aquatic Sciences, 23(3).

FAO. (1998). Guidelines for the routine collection of capture fishery data. FAO Fisheries Technical Paper No. 382. Rome, FAO. 113 p.

Gulland, J. A. (1983). Fish stock assessment: A manual of basic methods. John Wiley & Sons.

Hinton, M. G., & Maunder, M. N. (2004). Methods for standardizing CPUE and how to select among them. ICCAT Collective Volume of Scientific Papers, 56(1), 169-177.

Karakulak, F. S., & Ceyhan, T. (2024). The influences of temporal-spatial parameters on CPUE of the Atlantic bluefin tuna purse seine fishery in eastern Mediterranean. Journal of the Marine Biological Association of the United Kingdom 104, e6. https://doi.org/10.1017/S002531542400002X

Kaykaç, H., Aydın, C., & Tosunoğlu, Z. (2020). Fethiye Körfezi uzatma ağları balıkçılığı. Journal of Anatolian Environmental and Animal Sciences, 5(4), 506-515.

Kaykaç, M. H., & Tosunoğlu, Z. (2015). Artisanal fisheries in Karina and Akköy coastal lagoons. Ege Journal of Fisheries and Aquatic Sciences, 32(4), 173-182.

Kınacıgil, H. T., Atar, H. H., Metin, G., & İlyaz, A. T. (2013). Ege Denizi ticari trol av sahaları demersal balıklarının yoğunluk dağılımı ve hedef dışı av miktarının tespiti. TÜBİTAK Proje No: 109Y274 Raporu. Ankara.

Martell, S. J. D. (2008). Fisheries management. In S. E. Jørgensen & B. D. Fath (eds.), Encyclopedia of ecology (pp. 1572-1582). Oxford: Academic Press.

Maunder, M. N., & Punt, A. E. (2004). Standardizing catch and effort data: A review of recent approaches. Fisheries Research, 70(2–3), 141-159. https://doi.org/10.1016/j.fishres.2004.08.002

Maunder, M. N., Sibert, J. R., Fonteneau, A., Hampton, J., Kleiber, P., & Harley, S. J. (2006). Interpreting catch per unit effort data to assess the status of individual stocks and communities. ICES Journal of Marine Science, 63(8),1373-1385. https://doi.org/10.1016/j.icesjms.2006.05.008

Nishida, T., & Chen, D.-G. (2004). Incorporating spatial autocorrelation into the general linear model with an application to the yellowfin tuna (*Thunnus albacares*) longline CPUE data. Fisheries Research, 70, 265-274.

Rodríguez-Marín, E., Arrizabalaga, H., Ortiz, M., Rodríguez-Cabello, C., Moreno, G., & Kell, L. T. (2003). Standardization of bluefin tuna, *Thunnus thynnus*, catch per unit effort in the baitboat fishery of the Bay of Biscay (Eastern Atlantic). ICES Journal of Marine Science, 60(6), 1216-1231. https://doi.org/10.1016/S1054-3139(03)00139-5

Sağlam, C., Akyol, O., & Ceyhan, T. (2015). Güllük Dalyanı balıkçılığı. Ege Journal of Fisheries and Aquatic Sciences, 32(3), 145-149.

Skalski, J. R., Ryding, K. E., & Millspaugh, J. (2005). Estimating population abundance. In J. R. Skalski, K. E. Ryding, & J. Millspaugh (eds.), Wildlife demography (pp. 435-539). Academic Press. https://doi.org/10.1016/B978-012088773-6/50010-9

Su, N. J., Yeh, S. Z., Sun, C. L., Punt, A. E., Chen, Y., & Wang, S. P. (2008). Standardizing catch and effort data of the Taiwanese distant-water longline fishery in the western and central Pacific Ocean for bigeye tuna, *Thunnus obesus*. Fisheries Research 90(1–3), 235-246

Tokaç, A., Ünal, V., Tosunoğlu, Z., Akyol, O., Özbilgin, H., Gökçe, G. (2010). Ege Denizi Balıkçılığı. IMEAK Deniz Ticaret Odası İzmir Şubesi Yayınları. İzmir. 390 pages.

Tosunoğlu, Z., Onmuş, O., Kaykaç, H.M, Göncüoğlu-Bodur, H. (2019). Gediz Deltası Balıkçılığı. İzmir, Ege Üniversitesi Yayınları, Su Ürünleri Fakültesi Yayın No:85, Bornova/İzmir.

Türkiye İstatistik Kurumu (TÜİK) [Turkish Statistical Institute TURKSTAT]. (2021). Su Ürünleri İstatistikleri Mikro Veri Seti - 2021. Ankara, Türkiye.

Young Fishers

FAO. (2020). The State of World Fisheries and Aquaculture 2020: Sustainability in Action. Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/3/ca9229en/ca9229en.pdf

Tam, J., Govan, H., Jupiter, S. (2018). Gone fishing? Intergenerational cultural shifts can undermine common property co-managed fisheries. Marine Policy, 96, 122–130. https://doi.org/10.1016/j.marpol.2018.08.026

T.C. Tarım ve Orman Bakanlığı. (2019). Su Ürünleri İstatistikleri 2023. Balıkçılık ve Su Ürünleri Genel Müdürlüğü [Ministry of Agriculture and Forestry, General Directorate of Fisheries and Aquaculture]. Ankara. Retrieved from https://www.tarimorman.gov.tr

Türkiye İstatistik Kurumu (TÜİK) [Turkish Statistical Institute TURKSTAT]. (2021). Su Ürünleri İstatistikleri Mikro Veri Seti - 2021. Ankara, Türkiye.

UNTCAD (United Nations Conference on Trade and Development). (2023). Handbook of Statistics 2023. United Nations Publications, New York. https://unctad.org/publication/handbook-statistics-2023

Ünal, V., Göncüoğlu, H. (2012). Fisheries Management in Turkey. 263-288 pp. A. Tokaç, A.C.Gücü, B. Öztürk [eds.], The State of The Turkish Fisheries. Turkish Marine Research Foundation. Pub.number: 35, 516 p.

Women Fishers

FAO (Food and Agriculture Organization of the United Nations). (2013). Good practice policies to eliminate gender inequalities in fish value chains. Food and Agriculture Organization of the United Nations.

FAO (Food and Agriculture Organization of the United Nations). (2020). Empowering women in small-scale fisheries for sustainable food systems. Food and Agriculture Organization of the United Nations. https://doi.org/10.4060/ca9212en

House, B., Kleiber, D., Frangoudes, K., Snyder, H. T., Porras, M., Gallardo, G. (2023).

A synthesis of women's participation in small-scale fisheries management and related impacts. Ambio, 53(1), 49–65. https://doi.org/10.1007/s13280-023-01950-2

Kartal, E., Ünal, V., Tosunoğlu, Z. (2022). Su ürünleri kooperatifleri kadın balıkçı durum raporu. Su Ürünleri Kooperatifleri Merkez Birliği (SÜR-KOOP) (https://www.surkoopekutuphane.org/kadin-balikci-komisyonu/su-urunleri-kooperatifleri-kadin-balikci-durum-raporu-2022.pdf)

Türkiye İstatistik Kurumu (TÜİK) [Turkish Statistical Institute TURKSTAT]. (2021). Su Ürünleri İstatistikleri Mikro Veri Seti - 2021. Ankara, Türkiye.

Proximity to Biodiversity-Rich Areas

Tosunoğlu, Z., Ünal, V., Kaykaç, M.H. (2017). Ege Dalyanları. Su Ürünleri Kooperatifleri Birliği Yayınları - 3. Bornova.

Route & Vessel Density

Kavadas, S., Maina, I., Damalas, D., Dokos, I., Pantazi, M., & Vassilopoulou, V. (2015). Multi-criteria decision analysis as a tool to extract fishing footprints: Application to small scale fisheries and implications for management in the context of the maritime spatial planning directive. Mar. Sci, 16(2), 294-304.

Route Density maps within the European Union have been prepared for European Marine Observation and Data Network (EMODnet) by Cogea since 2019. The database is updated every year and can be viewed and downloaded from EMODnet Human Activities portal (https://emodnet.ec.europa.eu/en/human-activities). The maps are based on AIS data obtained yearly from Collecte Localisation Satellites (CLS) and ORBCOMM.

Vessel Density maps within the European Union have been prepared for European Marine Observation and Data Network (EMODnet) by Cogea since 2019. The database is updated every year and can be viewed and downloaded from EMODnet Human Activities portal (https://emodnet.ec.europa.eu/en/human-activities). The maps are based on AIS data obtained yearly from Collecte Localisation Satellites (CLS) and ORBCOMM.

Large-scale vs small-scale fisheries potential conflict hotspots

Akbaş, H., Kösoğlu, S.T., Üstündağ, E., Veske, Ş., Erdem, E. (2023). Su Ürünleri İstatistikleri 2023. Balıkçılık ve Su Ürünleri Genel Müdürlüğü [General Directorate of Fisheries and Aquaculture]. Ankara.

Anonymous. (2020). 5/1 Numaralı Ticari Amaçlı Su ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (Tebliğ No: 2020/20) [Notification No. 5.1 of the Commercial Fishing Regulations], T.C. Tarım ve Orman Bakanlığı, Balıkçılık ve Su Ürünleri Genel Müdürlüğü [Ministry of Agriculture and Forestry, General Directorate of Fisheries and Aquaculture] https://www.resmigazete.gov.tr/eskiler/2020/08/20200822-8.pdf

General Fisheries Commission for the Mediterranean – GFCM. Regional Fleet Register Database (GFCM-RFR). https://www.fao.org/gfcm/data/fleet/register. [Accessed on July 2024].

Seasonal bans towards small-scale fisheries

Anonymous. (2020). 5/1 Numaralı Ticari Amaçlı Su ürünleri Avcılığının Düzenlenmesi Hakkında Tebliğ (Tebliğ No: 2020/20) [Notification No. 5.1 of the Commercial Fishing Regulations], T.C. Tarım ve Orman Bakanlığı, Balıkçılık ve Su Ürünleri Genel Müdürlüğü [Ministry of Agriculture and Forestry, General Directorate of Fisheries and Aquaculture] https://www.resmigazete.gov.tr/eskiler/2020/08/20200822-8.pdf

Saros Bay Priority Area

Öz, M.İ., & İşmen, A. (2017). Saros Körfezi Derin Deniz Balıkları. In 1. Türkiye Derin Deniz Ekosistemi Çalıştayı Bildiriler Kitabı, 19 Haziran 2017, 101 p.

Sayın, E., Eronat, C., Uçkaç, Ş., & Beşiktepe, Ş. T. (2011). Hydrography of the eastern part of the Aegean Sea during the Eastern Mediterranean Transient (EMT). Journal of Marine Systems, 88(4), 502-515.

TVKGM (Tabiat Varlıklarını Koruma Genel Müdürlüğü). (2014). Saros Körfezi Özel

Çevre Koruma Bölgesi Karasal ve Denizel Biyolojik Çeşitliliğin Tespiti Projesi. T.C. Çevre ve Şehircilik Bakanlığı Yayınları. Ankara.

TVKGM (Tabiat Varlıklarını Koruma Genel Müdürlüğü). (2018). Saros Körfezi Özel Çevre Koruma Bölgesi Yönetim Planı 2018-2022. T.C. Çevre ve Şehircilik Bakanlığı Yayınları. Ankara.

Annex 1 – Small-scale Fisheries Cooperative List

No	Cooperative Name
1	Enez Fisheries Cooperative
2	Sultaniçe Fisheries Cooperative
3	Yayla Köyü Fisheries z Cooperative
4	Mecidiye Fisheries Cooperative
5	Kavak Fisheries Cooperative
6	Güneyli Fisheries Cooperative
7	Gelibolu Yeniköy Fisheries Cooperative
8	Karainebeyli Köyü Fisheries Cooperative
9	Kepez Fisheries Cooperative
10	Beşyol Fisheries Cooperative
11	Anafartalar ve Çevre Köyleri Fisheries Cooperative
12	Eceabat Fisheries Cooperative
13	Kilitbahir Köyü Fisheries Cooperative
14	Çanakkale Merkez-1 Fisheries Cooperative
15	Kumkale Fisheries Cooperative
16	Yeniköy Fisheries Cooperative
17	Dalyan Fisheries Cooperative
18	Gülpınar Fisheries Cooperative
19	Babakale Fisheries Cooperative
20	Bektaş-Balabanlı-Korubaşı Köyleri Fisheries Cooperative
21	Küçükkuyu Fisheries Cooperative
22	Gökçeada Fishery Cooperative
23	Bozcaada Fisheries Cooperative
24	Altınoluk Fisheries Cooperative
25	Burhaniye Fisheries Cooperative
26	Ayvalık Fisheries Cooperative
27	Dikili Fisheries Cooperative
28	Dikili Bademli Fisheries Cooperative
29	Çandarlı Fisheries Cooperative
30	Yenişakran Fisheries Cooperative
31	Aliağa Fisheries Cooperative
32	Çakmaklı Fisheries Cooperative
33	Yeni Foça Fisheries Cooperative
34	Foça Merkez Fisheries Cooperative
35	Tuzcullu ve Çevre Köyleri Fisheries Cooperative
36	Sasalı Fisheries Cooperative
37	Şemikler Fisheries Cooperative
38	Karşıyaka Fisheries Cooperative

No	Cooperative Name
39	Balçova Fisheries Cooperative
40	Narlıdere Fisheries Cooperative
41	Güzelbahçe Fisheries Cooperative
42	Ildır Köyü Fisheries Cooperative
43	Ilıca Fisheries Cooperative
44	Dalyanköy Fisheries Cooperative
45	Çiftlikköy Fisheries Cooperative
46	Alaçatı Fisheries Cooperative
47	Kalabak Fisheries Cooperative
48	Urla İskele Fisheries Cooperative
49	Balıklıova Fisheries Cooperative
50	Özbek Fisheries Cooperative
51	Çeşmealtı Fisheries Cooperative
52	Mordoğan Fisheries Cooperative
53	İnecik Fisheries Cooperative
54	Amberseki Fisheries Cooperative (Esendere)
55	Saip Fisheries Cooperative
56	Karaburun Merkez Fisheries Cooperative
57	Tepeboz Fisheries Cooperative
58	Sığacık Fisheries Cooperative
59	İzmir-Seferihisar-Ürkmez Fisheries Cooperative
60	Seferihisar Fisheries Cooperative
61	Gümüldür Mahallesi Fisheries Cooperative
62	Özdere Ahmetbeyli Fisheries Cooperative
63	Kuşadası Fisheries Cooperative
64	Davutlar Sevgi Plajı Fisheries Cooperative
65	Güzelçamlı Fisheries Cooperative
66	Doğanbey Tuzburgazı Fisheries Cooperative
67	Didim Akköy Fisheries Cooperative
68	Akbük Fisheries Cooperative
69	Didim Fisheries Cooperative
70	Kıyıkışlacık Fisheries Cooperative
71	Güllük 1 Fisheries Cooperative
72	Güllük 2 Fisheries Cooperative
73	Boğaziçi Fisheries Cooperative
74	Türkbükü Gölköy Gökçebel Köyleri Fisheries Cooperative
75	Gündoğan Fisheries Cooperative
76	Yalıkavak Fisheries Cooperative
77	Gümüşlük Fisheries Cooperative

No	Cooperative Name
78	Turgut Reis Fisheries Cooperative
79	Akyarlar Fisheries Cooperative
80	Torba Fisheries Cooperative
81	Akyaka Fisheries Cooperative
82	Gökova Akçapınar Fisheries Cooperative
83	Akbük Fisheries Cooperative
84	Marmaris Fisheries Cooperative
85	Bozburun Fisheries Cooperative
86	Selimiye Fisheries Cooperative
87	Söğüt Fisheries Cooperative
88	Datça Merkez Fisheries Cooperative
89	Karaköy Fisheries Cooperative
90	Cumalı Fisheries Cooperative
91	Mesudiye Fisheries Cooperative
92	Dalko Dalyan Fisheries Cooperative
93	Ortaca Fisheries Cooperative

GEAR TYPE (EN)	GEAR TYPE (TR)	DEFINITION
SURROUNDING NETS	ÇEVİRME AĞLARI	A surrounding net is a long net made up of mostly rectangular sections, framed by ropes, that captures fish by enclosing a school of fish. In a surrounding net, a headrope (or float line) with many floats runs along the top of the net, while a weighted footrope (or fishing line) runs along the bottom edge. The netting is usually made with small mesh sizes to prevent fish from getting tangled. There are two main types: purse seines, which have a purse line, and other surrounding nets that do not use a purse line.
Purse seines	Gırgır Ağları	A purse seine is a type of net used to encircle a school of surface-dwelling pelagic fish. It includes a purse line that is threaded through rings along the bottom edge of the net. When the purse line is tightened, it closes the bottom of the net, trapping the fish inside, which is why it's called a "purse seine."
TRAWLS	SÜRÜKLEME AĞLARI	A trawl is a cone-shaped net, typically with a single codend, towed behind one or two boats to catch fish through herding and filtering. Trawls can be used on the seabed (bottom trawls) or in midwater (midwater trawls). A semipelagic trawl is a hybrid that can fish both on and off the seabed. A single boat usually tows one trawl, but can also tow two (twin trawl) or more (multi-rig trawls). A single trawl can be towed by either one boat (the most common method) or two boats (pair trawling).
Beam trawls*	Algarna	A beam trawl is a type of trawl that uses a rigid beam to keep the net mouth open horizontally. It consists of a heavy steel beam, often supported by beam heads, with wide shoes at the bottom to help it slide over the seabed. Beam trawls are typically towed along the seabed and are used to catch fish that live on or near the bottom, such as flatfish and shrimp.
Single boat bottom otter trawls	Tek tekne ile çekilen kapılı dip trolleri	A single boat bottom otter trawl is a cone-shaped net towed along the seabed by one boat. It uses a pair of otter boards to maintain its horizontal spread. This type of trawl is commonly known as a "bottom otter trawl," "otter trawl," or "bottom trawl." The otter boards keep the net open horizontally, while floats along the headrope (or headline) help keep it open vertically, or the height of the otter boards can serve this purpose. The trawl's ground contact is maintained by a weighted groundgear (also called groundrope or footrope), which also helps protect the net from damage.

GEAR TYPE (EN)	GEAR TYPE (TR)	DEFINITION
Midwater pair trawls*	Çift tekne ile çekilen ortasu trolleri	A midwater trawl is a cone-shaped net towed in midwater by one or two boats to catch pelagic or semi-demersal fish. These trawls, also known as pelagic trawls, are designed to avoid contact with the seabed. They often target schooling species like Clupeids and scombrids, and can have very high catch rates. As fish become tired, they drift back and are captured by the smaller meshes in the rear sections of the net and the codend. The codend is usually reinforced with strengthening ropes to handle large catches and prevent bursting, especially when fish with expanded swim bladders reach the surface.
DREDGES	DREÇLER	A dredge is a cage-like device, often with a scraper blade or teeth on its lower part, used to dig animals out of the substrate and lift them into the cage or bag. Since dredges come into heavy contact with the seabed, their bottom parts, and sometimes the entire cage, are made of metal rods or chain mesh to withstand wear and tear. Synthetic mesh bags may also be used. Dredges can be operated manually, either by wading in shallow water or from a small boat, or towed behind a boat in deeper water. On larger boats, there are two types of dredges: towed dredges and mechanized (hydraulic) dredges.
Hand dredges*	El Dreçleri	A hand dredge is a small, lightweight dredge operated by hand. It has a handle and a metal frame, often with teeth on its lower edge. Attached to the frame is a bag made of synthetic netting or wire mesh. The hand dredge can be used manually by wading in shallow water or from a small boat. It is commonly used to target species like clams, oysters, and mussels.
Hydraulic dredges*	Hidrolik Dreçler	The mechanized or hydraulic dredge is a metal cage-like device towed by a vessel, either using its propeller or an anchor. It operates by using high-pressure water jets to dislodge target species from the sediment and facilitate their capture. In the Mediterranean and Black Sea, the primary targets include striped venus clams, razor clams (such as Ensis minor and Solen marginatus), and smooth clams. The hydraulic dredge features a metal cage, typically 2.5–3 meters wide, with its lower part constructed from metal rods. It is mounted on two sledge runner skids to prevent it from sinking too deeply into the sediment.
LIFT NETS	KALDIRMA AĞLARI	A lift net is a net attached to a frame that is lowered into the water to let fish swim into the area above it. Once the fish have gathered, the net is lifted or hauled up to collect them. The net can be a series of simple horizontal sheets or a bag-shaped panel, such as a funnel or cone, with the opening facing upward. The netting is typically stretched over a frame made of bamboo, wood, plastic, or metal. Fish may be attracted to the net by lights or bait, or they may drift over it with the current. Lift nets can be small and portable, operated by hand, or large and operated with a winch or other mechanical device. They can be used from the shore, a structure extending from the shore (like a pier), or from a boat.
FALLING GEARS	KAPAMA AV ARAÇLARI	Falling gear is a net or basket-like structure that is cast, pushed down, or allowed to drop from above to catch fish underneath. It's typically used in shallow waters, but some larger falling nets can operate in deeper waters from boats, often using lights to attract and concentrate the fish.

GEAR TYPE (EN)	GEAR TYPE (TR)	DEFINITION
Cast nets	Serpmeler	A cast net is a cone-shaped net made from sections of netting joined together, with weights and a drawstring around the edge. It is thrown by the fisher to catch fish. The netting at the funnel end can be arranged in sculpted pockets to help retain fish. More complex cast nets have brail lines attached to the lower edge, which fishers hold and draw together to form large pockets in the net. The line attached to the top of the cone helps with casting, retrieving the net, and tightening the brail lines.
GILLNETS AND ENTANGLING NETS	UZATMA AĞLARI	Gillnets and entangling nets are long rectangular pieces of netting that catch fish by gilling, wedging, snagging, entangling, or trapping them in pockets. They are kept open vertically by floats attached to the head rope (or float line, or cork line) and weights added to the footrope. Alternatively, they can be held open by hanging the net from stakes. These nets are typically used in long fleets, where multiple nets are tied together to form a long string that can extend several kilometers, but they can also be used individually.
Set gillnets (anchored)	Galsama uzatma ağları	A set gillnet is a long, rectangular net that is anchored or fixed to the seabed. It catches fish when they come into contact with it. The net is kept open vertically in the water by a headrope with floats and a footrope weighted with sinkers. The floatation and lead weights may be integrated into the ropes, known as floatrope and leadrope. The net is held in place by anchors or other weights at both ends and marked on the surface with buoys and/or highflyers.
Encircling gillnets	Çevirme uzatma ağları (Alamana, Voli ağları)	An encircling gillnet is a long net set in a circular shape around a group of fish, using noise or other methods to drive the fish into the net where they become gilled or entangled. These nets are typically used in shallow waters, with the headrope floating on the surface and the footrope resting on the seabed. Fish are often driven toward the net by sounds, such as knocking on the boat, or visual cues.
Trammel nets	Fanyalı uzatma ağları	A trammel net is a type of gillnet that consists of three layers of netting: two outer layers with large mesh and an inner layer of small-mesh netting that is loosely hung. This design either traps fish in pockets or entangles them. When a fish pushes the small-mesh netting through one of the large-mesh outer layers, the netting forms a bag that holds the fish. Trammel nets are typically set on the seabed, similar to set gillnets.
Combined gillnets-trammel nets	Karma uzatma ağları	A combined gillnet-trammel net is a bottom-set net designed with a regular gillnet in the upper part to catch semi-demersal or pelagic fish, and a trammel net in the lower part to catch fish near the seabed. The size and position of the gillnet and trammel net can be adjusted based on the target species and their distance from the seabed. This net is deployed and retrieved in the same way as a standard set gillnet.

GEAR TYPE (EN)	GEAR TYPE (TR)	DEFINITION
Veranda net	Kargılı ağlar (Kargılı kefal ağları, vd.)	This technique of making fish jump into a trap—referred to as an aerial trap—can also be implemented with stationary gear. Essentially, this fishing setup is similar to the boat traps described earlier, but without the whiteboard component. A variation of this method is known as the 'veranda net,' a technique used in the Mediterranean region, as well as in China, former Indo-China, India, and parts of Africa. In this method, the barrier netting and the collection bags are crafted from a single piece of netting. The net acts as a vertical barrier that encourages fish to leap, and also functions as an almost horizontal apron or veranda where the fish fall. The barrier can be arranged in a straight line or in a more open circular formation.
TRAPS	TUZAKLAR	Traps are usually not baited but work by guiding fish and other creatures into the trap, where they are eventually funneled into a holding area. This compartment is designed to keep the fish inside with little chance of escape.
Stationary uncovered pound nets	Ağ dalyanlar	A stationary uncovered pound net is a large net, divided into one or more chambers, that is anchored or fixed on stakes to intercept and trap fish during migration or daily movements. It often includes one or more long leaders, which are set across the fish's path to guide them into the holding chambers. These chambers, also called the "pound," "bag," or "codend," depending on design and local customs, are where the fish are ultimately trapped.
Shore operated stationary lift nets (Traditional blanket net)	Çökeltme dalyanı	Shore operated stationary lift net fishing is a technique based on the principle of lifting the edges of a rectangular or square-shaped net spread horizontally along the sea bottom using pull ropes as fish pass over it. The goal of this method is to catch fish schools that migrate seasonally and daily along the coast. Although the species of fish caught varies over time, they generally include pelagic and demersal species. The main species caught using sedimentary pound nets include mullet, sea bass, striped seabream, bluefish, mackerel, gilthead seabream, black seabream, white seabream, horse mackerel, cuttlefish, and octopus.
Pots	Sepetler	A pot is a small trap designed to lure fish inside through one or more openings that permit entry but make it difficult for them to escape. These traps are typically baited and placed on the seabed, either individually or in groups linked together by a rope that is attached to a surface marker. Pots can be pulled up manually or with the help of a mechanized pot hauler. While they are often cage- or beehive-shaped, pots can come in various forms and be made from different materials.
Fyke nets	Pinterler	A fyke net is a net that can be rectangular, cylindrical, or semi-cylindrical, supported by rings or hoops. It typically includes wings or a leader and is secured to the seabed using anchors, weights, or stakes. Fyke nets are often equipped with multiple non-return mechanisms to stop fish from escaping. They are commonly used in shallow coastal waters, estuaries, rivers, or lakes, either individually or in groups.
Barriers, fences, weirs, etc.	Çit dalyanı	Coastal lagoon weirs are mostly set up along the shores of seas with wide coastal areas, in semi-enclosed coastal lagoons, and river mouths. The material used for the trap section of the barrier fence may be the same as or different from that used for the guiding section. Bamboo and reeds are the most commonly used materials. The reeds are tied together side by side with string or plant fibers. At regular intervals, stakes are placed along this barrier. These stakes ensure that the reed fence is fixed vertically to the ground. Additionally, the reeds are lightly driven into the ground to bury the bottom part into the mud, and other measures are taken to reinforce the structure, preventing it from being damaged by wind or water.

GEAR TYPE (EN)	GEAR TYPE (TR)	DEFINITION
HOOKS AND LINES	OLTALAR	Different fishing methods use hooks, such as longlining, trolling, and handlining techniques like jigging (where a vertical line with lures is moved up and down to attract and catch fish). The basic idea behind hook fishing is to lure the fish to the hook, encouraging it to bite or swallow the hook, so it gets caught and stays on the line.
Handlines and hand-operated pole-and-lines	El oltaları ve elle opere edilen kamışlı oltalar	Handlines and hand-operated pole-and-lines encompass all hook-and-line methods that are managed and used by a fisher. These methods can be employed from the shore, on ice, or from a boat, using either hooks attached to a line or an additional pole. Handlining involves using one or more baited hooks (either natural or artificial) on a single line, with fish needing to take the bait to be caught. Hand-operated jigging lines are a type of handline that uses fish-shaped lures instead of natural bait. Jigging involves moving the lures in specific patterns to attract and hook fish. During jigging, fish may be caught by their mouth or body. Manual hand reels are also utilized to minimize labor when fishing in deep waters.
Mechanized lines and pole-and-lines	Mekanize el oltaları ve kamışlı oltalar	Mechanized lines and pole-and-lines are hook-and-line fishing methods that use powered reels or drums to operate mechanically. These systems can involve hooks attached to a line or an additional pole. In mechanized setups, the movement of the line or pole—such as depth setting, retrieval actions, and speed—can be automated. Automatic retrieval is also possible when a tension sensor detects a fish on the line. Similarly, mechanical controls are used in jigging, particularly for offshore squid fishing, which employs automatic jigging machines and light to attract the squid. Mechanized lines and pole-and-lines are typically used on boats, where multiple units may be managed by a single fisher.
Set longlines	Dip paraketası	A set longline is a type of longline gear anchored or fixed to the seabed at both ends. Typically used for fishing on or near the bottom, these are also known as bottom longlines or demersal longlines. However, set longlines can also be positioned with the mainline and hooks off the bottom or near the surface in shallow waters. A typical set longline features a mainline that may lie on the seabed or float above it, snoods (each with a hook and bait) attached at regular intervals (usually 1–2 meters), anchors or weights at both ends, and a buoy line that extends to the surface for marking the location and assisting in retrieval.
Vertical lines	Çapariler	A vertical line is a fishing line set up vertically with one or more baited hooks attached. Also known as drop lines or buoy gears, these lines typically have a buoy at the surface to mark their position, although they can also be attached directly to a boat. A weight is attached to the bottom end of the line. This weight can either rest on the seabed to keep the line in place or be rigged to drift in the water without touching the seabed.
Trolling lines	Sırtılar	A trolling line is a fishing line with one or more baited hooks or lures that is towed behind a boat. The boat can tow multiple lines, often from outriggers, or just a single line managed by a small crew in a dinghy. The depth at which the lines are towed can vary, depending on where the fish are congregating in the water column. This depth is adjusted by changing the weight on the line, the length of the line, and the speed at which the boat is towing.
Hand lines with umbrella jig hooks for Squids	Şemsiye oltalar	Umbrella jig hooks, commonly known as squid jigs, are specialized lures designed for catching squid. These jigs feature multiple sharp hooks arranged in a circular pattern, resembling an umbrella, which allows squid to latch on with their tentacles. The body of the jig is typically made of plastic or metal, often brightly colored or glow-in-the-dark to attract squid in low-light conditions. Weighted for optimal sinking, these jigs are jerked to mimic the movement of small prey, enticing the squid to strike and get caught on the hooks.

GEAR TYPE (EN)	GEAR TYPE (TR)	DEFINITION
Special hand line with treble hooks for Octopus	Parangula	The special hand line with treble hooks used for octopus fishing is made by attaching bright plastic or metal materials to the end of the line, with 4-5 hooks mounted onto a shiny tube at the bottom, and a weight added to the very end. These bright materials attract the attention of the octopus, and as it approaches, it gets caught on the hooks while investigating the bait.
MISCELLANEOUS GEAR	DİĞER AV ARAÇLARI	
Harpoons	Zıpkın	A harpoon is a spear-like tool with a long shaft and a sharp, detachable point, connected by a line for retrieving the catch. Harpoons can be used manually by pushing or throwing, or they can be fired from a cannon or gun. The point of the harpoon is designed to detach from the shaft upon penetrating the target, and it often features barbs—either fixed or retractable—to help secure it in the animal's flesh.
Hand implements (Wrenching gear, Clamps, Tongs, Rakes, Spears)*	Kabuklu hasat el araçları (kelepçe, kıskaç, tırmık, mızrak, elek-kürek, vd.)	Hand implements are tools used for fishing in shallow waters, either from a boat or while wading. These small-scale gears are commonly employed for recreational or subsistence fishing and include items such as wrenches, clamps, tongs, rakes, and spears.
Scoopnets*	Kepçe ağlar	A scoopnet is a small net bag used to collect or sift through catch from the water. It is typically operated by hand, either by one person or by multiple people. The net is often supported by a frame made of metal, plastic, or wood, which may or may not have handles. Scoopnets can be used while wading in shallow water, from rocks in a river, or from a boat.
Diving	Dalarak	Strictly speaking, diving itself is not a fishing method but a means for a fisher to approach fish and other aquatic animals they want to collect. If a diver manually collects fish (usually stationary) underwater, the catch should be reported as "Diving." If the diver uses fishing tools such as a harpoon, tongs, or nets, the catch should be attributed to those specific tools rather than to diving. Diving can be done freely with just a mask and snorkel or with assistance from scuba gear, surface air supply, or other equipment.

Gear type not used in the Aegean region in Türkiye.

Annex 3 - IUCN Threat Classification Scheme

1 Residential & commercial development
1.1 Housing & urban areas
1.2 Commercial & industrial areas
1.3 Tourism & recreation areas

2 Agriculture & aquaculture
2.1 Annual & perennial non-timber crops
2.1.1 Shifting agriculture
2.1.2 Small-holder farming
2.1.3 Agro-industry farming
2.1.4 Scale Unknown/Unrecorded
2.2 Wood & pulp plantations
2.2.1 Small-holder plantations
2.2.2 Agro-industry plantations
2.2.3 Scale Unknown/Unrecorded
2.3 Livestock farming & ranching
2.3.1 Nomadic grazing
2.3.2 Small-holder grazing, ranching or farming
2.3.3 Agro-industry grazing, ranching or farming
2.3.4 Scale Unknown/Unrecorded
2.4 Marine & freshwater aquaculture
2.4.1 Subsistence/artisanal aquaculture
2.4.2 Industrial aquaculture
2.4.3 Scale Unknown/Unrecorded

3 Energy production & mining
3.1 Oil & gas drilling
3.2 Mining & quarrying
3.3 Renewable energy

4 Transportation & service corridors
4.1 Roads & railroads
4.2 Utility & service lines
4.3 Shipping lanes
4.4 Flight paths

5 Biological resource use
5.1 Hunting & collecting terrestrial animals
5.1.1 Intentional use (species being assessed is the target)
5.1.2 Unintentional effects (species being assessed is not the target)
5.1.3 Persecution/control
5.1.4 Motivation Unknown/Unrecorded
5.2 Gathering terrestrial plants
5.2.1 Intentional use (species being assessed is the target)
5.2.2 Unintentional effects (species being assessed is not the target)
5.2.3 Persecution/control
5.2.4 Motivation Unknown/Unrecorded
5.3 Logging & wood harvesting
5.3.1 Intentional use: subsistence/small scale (species being assessed is the target [harvest]
5.3.2 Intentional use: large scale (species being assessed is the target)[harvest]

5.3.3 Unintentional effects: subsistence/small scale (species being assessed is not the target)[harvest]
5.3.4 Unintentional effects: large scale (species being assessed is not the target)[harvest]
5.3.5 Motivation Unknown/Unrecorded
5.4 Fishing & harvesting aquatic resources
5.4.1 Intentional use: subsistence/small scale (species being assessed is the target)[harvest]
5.4.2 Intentional use: large scale (species being assessed is the target)[harvest]
5.4.3 Unintentional effects: subsistence/small scale (species being assessed is not the target)[harvest]
5.4.4 Unintentional effects: large scale (species being assessed is not the target)[harvest]
5.4.5 Persecution/control
5.4.6 Motivation Unknown/Unrecorded

6 Human intrusions & disturbance
6.1 Recreational activities
6.2 War, civil unrest & military exercises
6.3 Work & other activities

7 Natural system modifications
7.1 Fire & fire suppression
7.1.1 Increase in fire frequency/intensity
7.1.2 Suppression in fire frequency/intensity
7.1.3 Trend Unknown/Unrecorded
7.2 Dams & water management/use
7.2.1 Abstraction of surface water (domestic use)
7.2.2 Abstraction of surface water (commercial use)
7.2.3 Abstraction of surface water (agricultural use)
7.2.4 Abstraction of surface water (unknown use)
7.2.5 Abstraction of ground water (domestic use)
7.2.6 Abstraction of ground water (commercial use)
7.2.7 Abstraction of ground water (agricultural use)
7.2.8 Abstraction of ground water (unknown use)
7.2.9 Small dams
7.2.10 Large dams
7.2.11 Dams (size unknown)
7.3 Other ecosystem modifications

8 Invasive & other problematic species, genes & diseases
8.1 Invasive non-native/alien species/diseases
8.1.1 Unspecified species
8.1.2 Named species
8.2 Problematic native species/diseases
8.2.1 Unspecified species
8.2.2 Named species
8.3 Introduced genetic material
8.4 Problematic species/diseases of unknown origin
8.4.1 Unspecified species
8.4.2 Named species
8.5 Viral/prion-induced diseases
8.5.1 Unspecified "species" (disease)
8.5.2 Named "species" (disease)
8.6 Diseases of unknown cause

9 Pollution
9.1 Domestic & urban waste water
9.1.1 Sewage
9.1.2 Run-off
9.1.3 Type Unknown/Unrecorded
9.2 Industrial & military effluents
9.2.1 Oil spills
9.2.2 Seepage from mining
9.2.3 Type Unknown/Unrecorded
9.3 Agricultural & forestry effluents
9.3.1 Nutrient loads
9.3.2 Soil erosion, sedimentation
9.3.3 Herbicides & pesticides
9.3.4 Type Unknown/Unrecorded
9.4 Garbage & solid waste
9.5 Air-borne pollutants
9.5.1 Acid rain
9.5.2 Smog
9.5.3 Ozone
9.5.4 Type Unknown/Unrecorded
9.6 Excess energy
9.6.1 Light pollution
9.6.2 Thermal pollution
9.6.3 Noise pollution
9.6.4 Type Unknown/Unrecorded

10 Geological events
10.1 Volcanoes
10.2 Earthquakes/tsunamis
10.3 Avalanches/landslides

11 Climate change & severe weather
11.1 Habitat shifting & alteration
11.2 Droughts
11.3 Temperature extremes
11.4 Storms & flooding
11.5 Other impacts

12 Other options
12.1 Other threat

Annex 4 - Conservation Investments Questionnaire

Ege Kıyılarında Doğa ve Kültür Birlikteliği Proje Anketi

1.

Sayın Yetkili,

Bu anketi sizlere Yolda Girişimi olarak gönderiyoruz. Yolda Girişimi doğa koruma alanında faaliyet gösteren bir sivil toplum örgütüdür. İnsanlığın, tüm kültürel çeşitliliği ile, ekolojik sistemlerin asli bir unsuru olması gerçeğinden hareket eden Yolda'nın çalışmaları biyolojik çeşitliliğe ve iklim değişikliği ile mücadeleye katkı sağlayan yerel alan kullanımı ve üretim sistemlerine odaklanır. Kurumla ilgili ayrıntılı bilgiye şu linkten ulaşabilirsiniz: https://yolda.org.tr/tr/

Yolda olarak yürüttüğümüz **Kültürel Peyzaj Temelli Bir Değerlendirme: Ege Kıyılarında Doğa ve Kültür Birlikteliği** projesi kapsamda sizlere ulaşıyoruz. Projenin amacı, Ege Denizi'nin Türkiye kıyılarında yerel alan yönetimi sistemleri/pratikleri ve biyolojik çeşitlilik arasındaki ilişkiye dair mekânsal bir değerlendirme yapmak. Temel olarak kendimizi odakladığımız pratik de geleneksel ve küçük ölçekli balıkçılık faaliyetleri. Projeyle hem biyolojik çeşitlilik hem de küçük ölçekli balıkçılık anlamında önemli alanları belirleyip, gelecek koruma yatırımlarının öncelikli olarak hangi alanlara odaklanması gerektiğini ortaya koymayı hedefliyoruz. Projemizde alan kullanıcıları, kamu kurum temsilcileri, akademisyenler ve sivil toplum kuruluşlarının temsilcileri ile çalışıyoruz. Projenin coğrafi kapsamıysa Edirne ili Enez ilçesi ile Muğla ili Dalaman ilçesi arasında tüm kıyı ve denizel alanı içeriyor. Haritada çalışma alanı kapsamını görebilirsiniz.

Proje kapsamında yapacağımız önceliklendirme çalışmasında, bugüne kadar bölgede hayata geçirilmiş tür koruma, habitat/alan koruma ve küçük ölçekli balıkçılığı destekleme konularında projeleri/yatırımların ölçeğini belirlemeyi amaçlıyoruz. **5-10 dakika** sürmesini öngördüğümüz bu anketle, sizlerin yürüttüğü veya ortağı olduğu projelerin sayısı ve yaklaşık finansal ölçekleriyle ilgili birkaç soru sormaktayız. Bu bilgilerle yapılacak analizin sonucunda; biyolojik çeşitliliğin ve tehditlerin yüksek, koruma çalışmaları ve yatırımların düşük olduğu alanların belirlenmesini amaçlıyoruz. **Bu proje sonucunda biyolojik çeşitlilik ve küçük ölçekli balıkçılık konularında çalışan kurumlar ve uzmanlar için öncelikli alanları belirten bir kaynak ortaya konabilecektir.**

Bu **ankete katılımınız tamamen isteğe bağlı** olup, düşüncelerinizi öğrenmek için bizim için çok değerlidir. Cevaplarınız gizli kalacak ve sadece verilerin değerlendirme sonuçları raporlanacaktır. Kişisel bilgileriniz Kişisel Verilerin Korunması Kanunu'na sadık kalınarak gizli tutulacaktır. Anket veya süreçle ilgili görüş ve sorularınız için info@yolda.org.tr e-posta adresinden bize ulaşabilirsiniz.

Vaktiniz ve desteğiniz için çok teşekkürler.
Yolda Girişimi Ekibi

Kültürel Peyzaj Temelli Bir Değerlendirme: Ege Kıyılarında Doğa ve Kültür Birlikteliği projesi, Yolda Girişimi tarafından Fransa'nın Türkiye Büyükelçiliği, Conservation Collective, Turkuaz Kıyı Çevre Fonu ve Sivil Toplum Destek Vakfı'nın desteği ile yürütülmektedir.

www.yolda.org.tr / Sosyal Medya: @yoldainitiative

* 1. Adınızı Soyadınız

* 2. E-posta adresiniz

* 3. Anketi hangi kurum için dolduruyorsunuz?

* 4. Projenizin adı

* 5. Proje yürütücüsü kurumun adı

6. Proje ortaklarının adları

7. Proje alanının adı (örn. Gediz Deltası)

* 8. Projeniz hangi il (ve ilçeleri) kapsıyor?
Lütfen aşağıdaki haritalardan yararlanarak, proje sınırıyla örtüşen ilgili tüm ilçeleri seçiniz. Proje sınırı kırmızı ile gösterilmekte.

☐ **Aydın ili tüm ilçeleri**
☐ Didim
☐ Kuşadası
☐ Lapseki
☐ **Edirne ili tüm ilçeleri**
☐ Enez
☐ Menderes
☐ Menemen
☐ Narlıdere

- [ ] Söke
- [ ] **Balıkesir ili tüm ilçeleri**
- [ ] Ayvalık
- [ ] Burhaniye
- [ ] Edremit
- [ ] Gömeç
- [ ] **Çanakkale ili tüm ilçeleri**
- [ ] Ayvacık
- [ ] Biga
- [ ] Bozcaada
- [ ] Çanakkale Merkez
- [ ] Eceabat
- [ ] Ezine
- [ ] Gelibolu
- [ ] Gökçeada
- [ ] Keşan
- [ ] **İzmir ili tüm ilçeleri**
- [ ] Aliağa
- [ ] Balçova
- [ ] Bayraklı
- [ ] Bergama
- [ ] Çeşme
- [ ] Çiğli
- [ ] Dikili
- [ ] Foça
- [ ] Güzelbahçe
- [ ] Karabağlar
- [ ] Karaburun
- [ ] Karşıyaka
- [ ] Konak
- [ ] Seferihisar
- [ ] Selçuk
- [ ] Urla
- [ ] **Muğla ili tüm ilçeleri**
- [ ] Bodrum
- [ ] Dalaman
- [ ] Datça
- [ ] Köyceğiz
- [ ] Marmaris
- [ ] Milas
- [ ] Muğla
- [ ] Ortaca
- [ ] Ula

* 9. Projenizin uygulama yılları
Yalnızca Başlangıç ve Bitiş Yılını belirtmeniz yeterlidir. Devam etmekte olan projelerde bitiş yılına devam ediyor şeklinde belirtebilirsiniz.

Başlangıç Yılı: ____________

Bitiş Yılı: ____________

* 10. Projenizin uygulama bütçesi. Lütfen yaklaşık bütçeyi belirtir misiniz?
Proje bütçeniz başka bir para birimi üzerindense ve/veya bütçe herhangi bir fondan bağımsız olarak üye ve destekçileriniz tarafından sağlandıysa bunları “Diğer” seçeneğinde belirtebilirsiniz.)

○ <5.000$

○ 5.001-50.000$

○ >50.000$

○ Diğer

[ ]

* 11. Proje Konusunun ne olduğunu aşağıdaki seçeneklerle belirtir misiniz? Birden çok seçim yapabilirsiniz.

☐ Küçük Ölçekli Balıkçılığı Destekleme

☐ Tür Koruma

☐ Habitat/Alan Koruma

☐ Diğer

[ ]

* 12. Eğer eklemek istediğiniz ikinci bir projeniz varsa lütfen Evet seçeneğine basınız.

○ Evet

○ Hayır

info@yolda.org.tr