

FROM SMALL CETACEANS TO THE GREAT WHALES OF THE EAST

USING SCIENTIFIC KNOWLEDGE TO STRENGTHEN MANAGEMENT AND CONSERVATION
STRATEGIES FOR CETACEANS WITHIN THE TURKISH MEDITERRANEAN SEA

FINAL REPORT of RUFFORD 2nd BOOSTER GRANT

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DMAD - Marine Mammals Research Association
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1. SUMMARY

Despite the critical roles that cetaceans hold in the marine realm, they are one of the least studied species within the Eastern and Southern Mediterranean Sea. While the majority of the knowledge was gathered from opportunistic platforms, stranding and occasional surveys, dedicated research effort was absent within the Eastern Mediterranean Sea since 2015. DMAD was aware of this gap with its negative consequences to marine protection, therefore it established the first and only dedicated research effort within the Eastern Mediterranean Sea of Turkey, targeting both coastal and deep sea cetacean species. DMAD set its roots for the beginning of a long-lasting survey effort for the goal of filling important knowledge gaps and assessing the human pressure and threats on the species and their habitat.

DMAD has conducted over 318 days of survey, covering 19 seasons, in the Eastern Mediterranean Sea of Turkey. While the first project funded by Rufford Small Grant was started in the coastal waters of the city of Antalya in 2015, it expanded to the entire territorial and high sea waters of the Eastern Mediterranean Sea of Turkey in 2021. Not only the survey coverage showed an expansion but also the survey methodology improved from traditional visual effort to acoustic protocols.

Overall, 132 groups of bottlenose dolphins, four groups of Cuvier's beaked whales and two groups of striped dolphins were detected in Antalya Bay while there were 377 cetacean sightings detected during the "Giant Guardians of Deep Seas". The dedicated research effort highlighted the presence of not only coastal species but also deep-divers within these data deficient waters. While bottlenose dolphins were regularly present throughout the coastal waters from west to east, their presence in the deep waters were also recorded frequently, which is contrary to the general distribution knowledge of the species within the Mediterranean Sea. Striped dolphins and common dolphins were sighted mainly within the western boundaries of the study area, with a similar distribution pattern of Sperm whales. Four groups of Cuvier's beaked whales were sighted as solitary individuals and mother-calf pairs on occasion within the Antalya Bay between 2015 and 2017. Since 2018, no individuals have been sighted in the Bay. In addition to the research effort, 50 local students participated in our projects where they gained both theoretical and practical skills since DMAD is aware of the importance of local empowerment.

Trusting on the collected knowledge, DMAD has published annual reports each year and also published twenty two articles in peer-reviewed journals, eight conference papers, organised workshops in any opportunities and prepared bilingual SEISMIC guidelines. Through our contribution to research, Antalya Bay was identified as an "Area of Interest" while the Turkish Strait System was selected as an Important Marine Mammal Area by the Marine Mammal Task Force.

Stakeholder involvement was one of the primary goals of DMAD, acknowledging the strong tool of positive changes on individual perspective on nature protection while valuing the bottom to top conservation strategies where local communities are on the base of conservation actions. For this purpose, DMAD has organised countless formal and informal meetings with fishers. Additionally, education of future generations were prioritised, resulting with five general workshops for 100 students and also ACCOBAMS High Quality Marine Mammal Observer and Passive Acoustic Monitoring" certification workshop for 16 local students and early career researchers. The initiatives for Cetacean Sighting Network were started and later on it was strengthened by partnering up with Setur Marinas, a marine company that trusts on Blue Economy, to increase our reach through the sailors.

Rufford Small Grant Foundation formed the first strong pillar on our initiatives not only through the resources that were provided but also the trust they showed to our newly established NGO back in 2015. Through this significant support, DMAD has established the first and only dedicated research and conservation effort of the Eastern Mediterranean Sea to increase the scientific knowledge, local capacities and to guide the mitigation and conservation strategies.

2. INTRODUCTION

While globally over 60% of cetacean species revealed a worrying decline on their population sizes within the last couple of decades, all the Mediterranean subpopulations of cetaceans hold this negative trend thus are classified either threatened or data deficient by the IUCN Red List (Bearzi et al. 2008; Lusseau, 2004; Lusseau and Bejder 2007; Hoyt, 2014). Considering the basinwide population size estimations are highly skewed to the data collected from western and central Mediterranean Sea, it is likely that the error margins of these estimations could be high due to the lack of knowledge from the eastern and southern Mediterranean. Further, the previous and existing research effort favours the summer months due to its favourable weather conditions within the entire basin, resulting with lack of understanding on temporal variation on species distribution.

Despite the existing data gap, even on species baseline knowledge, human pressure rapidly increased on marine environments with cumulative negative consequences where its dimension is hard to assess. While habitat destruction, overfishing, entanglement on fishing nets, marine traffic, chemical and noise pollution and climate change is known to have a negative effect on the populations, only few of these threats have existing mitigation measures. Each and all of the above identified threats are also present in the Eastern Mediterranean Sea of Turkey, with a recent rise in loud and impulsive noise originating from oil and gas explorations and navy practices. The negative consequences of loud and impulsive noises on the species can be ranged from behavioural changes, habitat alterations, injuries and mortality (Jepson et al., 2003; Fernández et al., 2005; Castellote et al., 2012; Halvorsen et al., 2012; Aguilar de Soto et al., 2016; Southall et al., 2016).

Additionally, large clusters of marine debris were notably present in the Eastern Mediterranean. A study has reported that six out of 10 stranded sperm whales revealed a large number of plastics in their stomach with one young sperm whale having 135 items of plastic and being the most probable cause of death (Alexiadou, 2019).

Marine traffic is another problem threatening cetaceans directly or indirectly in many ways. Such busy waterways as Istanbul Strait, which is one of our areas of interest, with more than 2000 vessels circulating per a day, it is very likely for cetaceans to directly encounter the vessels physically. This can cause continuous stress, even injury or fatal damages to these animals. As a physical effect of the noise pollution created by a variety of vessels can confuse and may lead cetaceans to behave abnormally. It has been suggested that bottlenose dolphins showed avoidance of certain areas during the fishing seasons favouring the less crowded waters and altered their behaviours such as foraging and socialising in locations with high marine traffic density. There are also serious indirect consequences of busy marine traffic by ruining the ecosystem they live in such as oil leakage and marine pollution.

Another man made hazard threatening the ecosystem is habitat destruction through coastal infrastructure developments. These activities damage the ecosystem by ruining the coastal lifeforms and changing the habitat leading to the accumulated effects on the fish stocks that the cetacean fed on.

To minimise the negative trend those species are facing, DMAD conducts dedicated research and conservation effort that employs visual and acoustic survey techniques with temporal replicates within the Eastern Mediterranean Sea with the goal of filling the critical knowledge gap and accurate threat assessment which forms the backbone of any mitigation and conservation strategies that are essential for the survival of the species.

3. METHODS

3.1. SCIENTIFIC SURVEYS

Systematically designed surveys were employed throughout our survey effort in 2021. 12 strata are placed to the Eastern Mediterranean Sea of Turkey with overall more than 50 transects sampled covering the survey area consisting of 1,455 km of track line. The survey areas were first covered by the vessel travelling in a west to east direction. On the return trip the boat either sailed a course close to the shelf break, returned to complete transect legs missed due to poor weather or sailed passages towards a required destination. The survey crew comprised 4 researchers and 4 students.

Double platform techniques were used both during on and off-effort. While primary observers scanned the sea with naked eye, the tracker observer searched ahead of the vessel using binoculars. A data logger was placed next to the tracker observer with Logger 2010 software running to log the boat route and sighting information. Spatial information of the focal group was reported by the tracker observer while primary observers provided the behavioural information of the group. The data logger was responsible to log which platform had detected the focal group first, enter the group information as accurately as s/he could and identify duplicate records between the primary and tracker observers.

During visual data collection, species identification, group size, group composition, sub adult presence, and information on human presence and activities in the area was recorded. In addition, whether the sighting was made first by the primary or tracker observers and the time and location of duplicate sightings were recorded. The survey was conducted in closing mode so, once a sighting had passed a beam the sighting could be approached to allow photo-identification and better group composition data to be collected. In addition, this allowed opportunities for collecting better acoustics recordings to be made from confidently identified and characterised groups.

Acoustic data were collected round the clock. In addition, every 15 minutes the acoustic operator noted the strength of a range of cetacean acoustic signals as well as level several types of background noise (environmental, engine noise, seismic, sonar, construction etc.) using a scale from 0 (nothing heard) to 5 (nothing else can be heard).

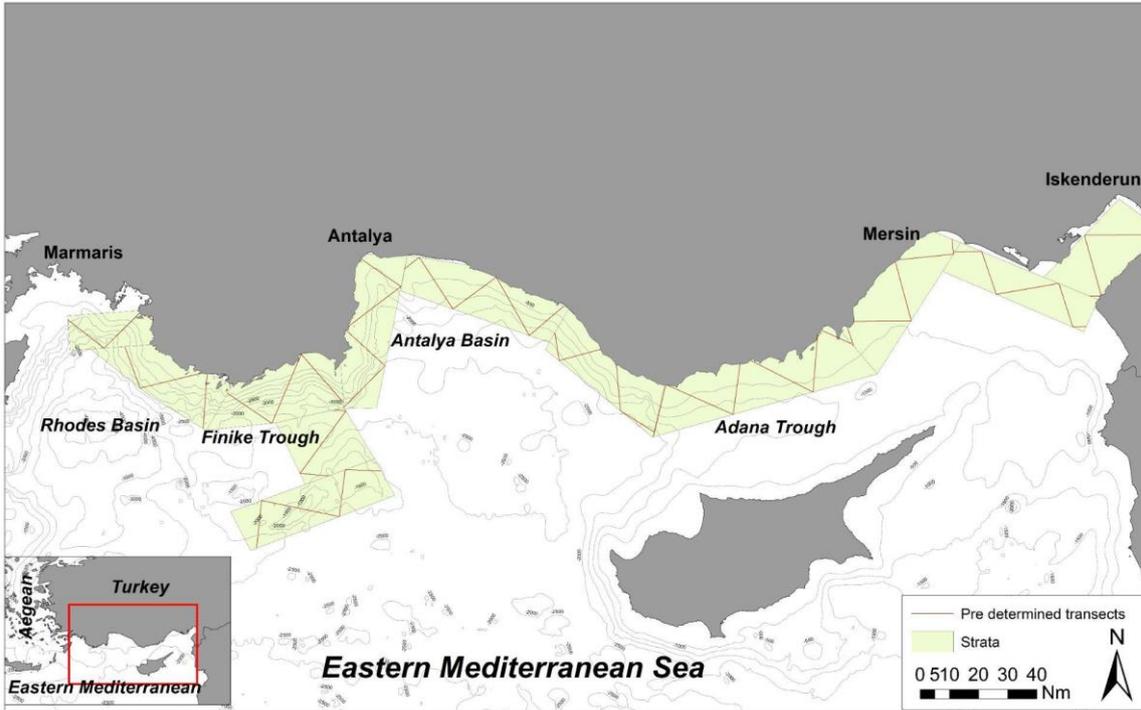


Figure 1. Survey area in the Eastern Mediterranean Sea of Turkey

3.2. LOCAL CAPACITY ENRICHMENT

Capacity enrichment activities include theoretical and practical approaches. While in person and remote workshops are organised to enrich the theoretical knowledge, practical skills are gained through the involvement of participants to the research crew during the scientific surveys. The target groups were students and early career researchers, prioritising female researchers.

3.3. PUBLIC OUTREACH

From DMAD's point of view the conservation actions can not be complete without public awareness and involvement of the local people. DMAD values the contribution of the local people and the public as much as values the dedicated scientific research. Therefore it is aimed to inform, train and engage citizens actively for both the conservation actions and the research itself.

3.4. DECISION-MAKERS

One of the main goals of the current project is to start the initiatives for a "Species Conservation Action Plan" that involves the local stakeholders and decision-makers. For this reason, DMAD produced a mailing list, used social media to create an information flow while actively joining to the workshops and meetings that are organised by the Ministries and related institutes.

4. RESULTS

4.1. SCIENTIFIC SURVEYS

Overall four surveys were conducted between 26th February 2021 and 17th March 2022 with 70 days of surveys (708 hours) actively searching for cetaceans at sea (Figure 2). Overall four seasons were surveyed with the winter season being surveyed in 2021 and 2022 and spring season being absent from the data collection.

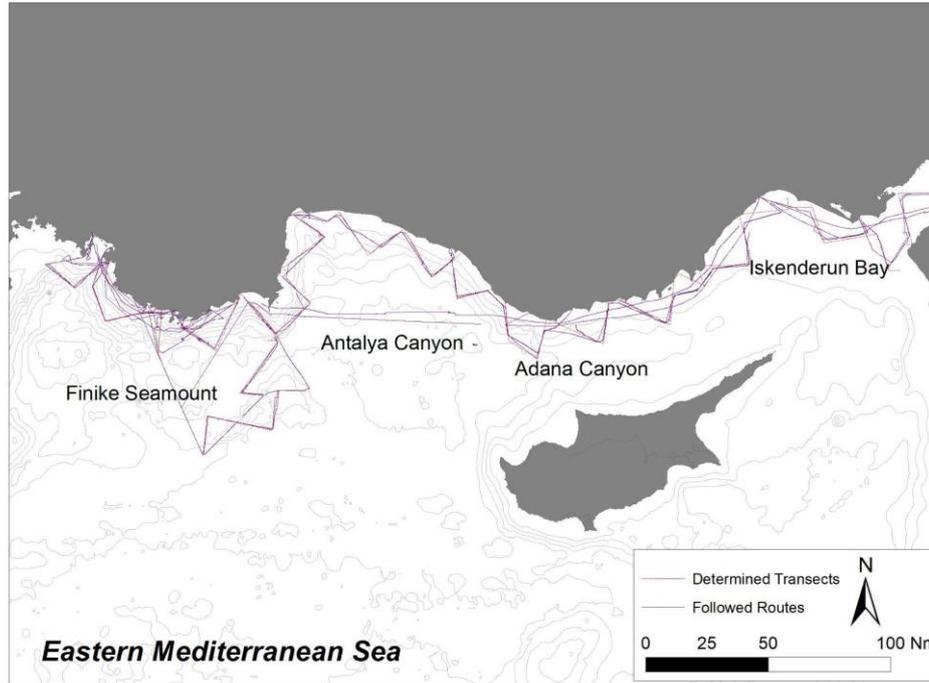


Figure 2. The predetermined transect

Cetaceans were detected in 217 occasions while marine turtles were recorded in 9 encounters (Table 1). 71% of the detections were recorded acoustically under the family of Delphinids. Bottlenose dolphins were the most frequently sighted species. Striped dolphins were only recorded on 6 occasions with no summer sighting. On the other hand, Sperm whales were detected on 20 occasions where summer had the majority of the detections with no winter detections.

Table 1. Detected cetaceans and marine turtles under different seasons

Species	Season			Overall
	Winter	Summer	Autumn	
Delphinids	89	38	34	161
Bottlenose dolphins	19	8	3	30
Striped dolphins	5	0	1	6
Sperm whales	0	16	4	20
Marine turtles	7	2	0	9
Overall	120	64	42	226

The spatial distribution of sighted animals revealed that sperm whales were frequent on the eastern extension of the Rhodes Basin and the Finike Canyon, as solitary males, juvenile groups and social units. Yet, they were acoustically detected until Adana Canyon. Striped dolphins showed similar distribution with sperm whales, with mainly western distribution. Delphinids were detected throughout the survey area with bottlenose dolphins being the only species where their distribution extended the entire survey area with both coastal and offshore distributions. Marine turtles were also detected up until Finike Seamount (Figure 3)

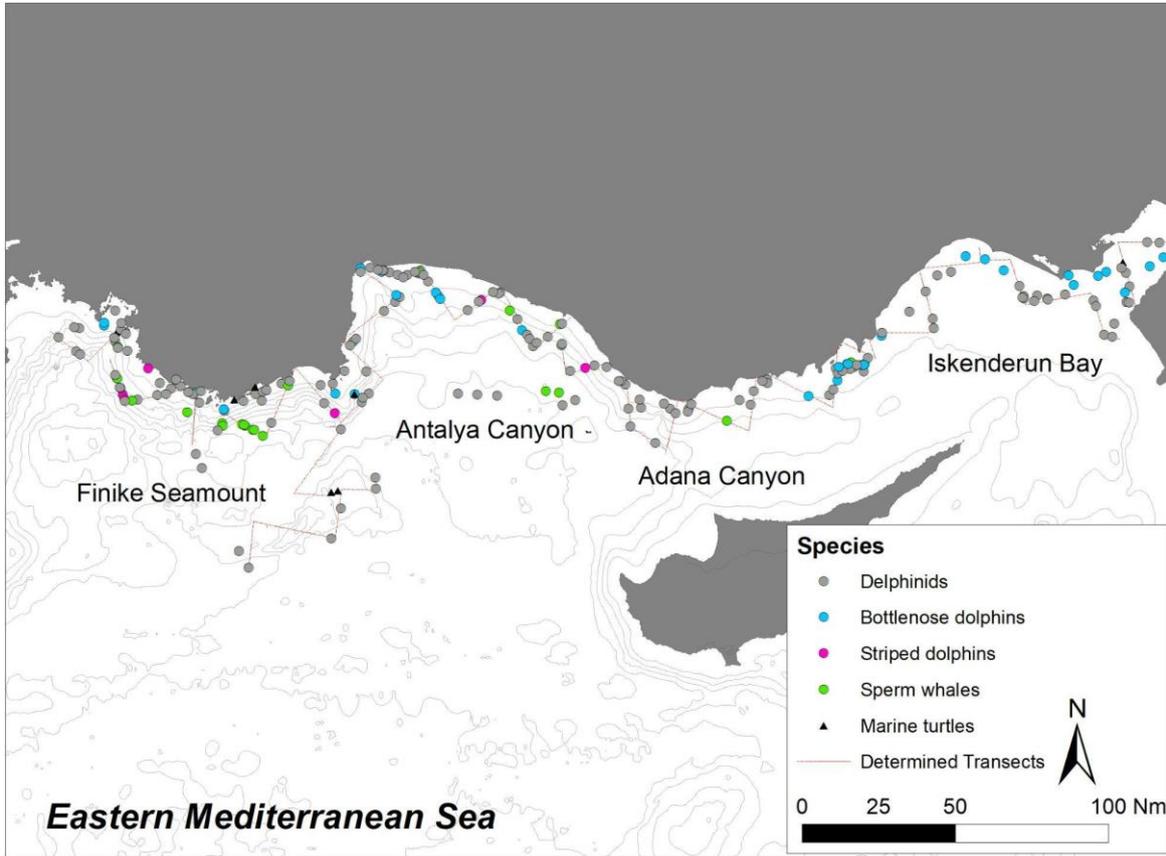


Figure 3. Species distribution within the study area

The spatial-temporal distribution map of cetaceans and human pressures revealed a high overlap. While coastal waters were under the pressure of marine traffic and pollution, loud and impulsive noise continued throughout the surveys. Dedicated long-term seasonal survey efforts on cetaceans form the main tool not just to collect accurate baseline data but also to assess the impact level of human activities. This provides the necessary information for decision-makers to take the right step towards protecting threatened species.

4.2. LOCAL CAPACITY ENRICHMENT

- Four workshops are organised on visual and acoustic survey techniques in DMAD-Antalya Office, reaching 30 students
- Four virtual courses under “Remote Internship” were organised on data collection, data analysis, report and manuscript writing skills that reached over 100 students in 2021.
- The tutorials on Geographic Information Systems on youtube have been viewed more than 60,000 times so far.
- Overall 20 students joined the scientific surveys to enrich their theoretical knowledge through practical implementations.

4.3. PUBLIC OUTREACH

- An Art Exhibition “Cetaceans of Turkey” was organised at Cesme Marina in September 2021. More than 200 people visited this highly acclaimed art exhibition (Picture 1).



Picture 1. Exhibition in Cesme Marina

- Being founder and a senior scientist of DMAD as an established organisation, Dr Aylin Akkaya was invited to NTV Radio talk.
- DMAD also keeps informing and makes updates through its social media accounts actively.
- Several written media channels have produced news on our project (Picture 2).
 - <https://www.trthaber.com/foto-galeri/dogu-akdenizde-balina-ve-yunuslarin-yasadigi-bolgeler-arastiriliyor/44502/sayfa-3.html>
 - <https://www.aa.com.tr/tr/yasam/dogu-akdenizde-balina-ve-yunuslarin-yogun-yasadigi-bolgeler-arastiriliyor/2535529>
 - <https://www.youtube.com/watch?v=LsmL4kXNWZs>
 - <https://www.aydinlik.com.tr/haber/dogu-akdenizin-memelileri-arastiriliyor-305929>

- <https://www.mynet.com/dogu-akdenizde-balina-ve-yunuslarin-yogun-yasadigi-bolgeler-arastiriliyor-180105491332>

○



Doğu Akdeniz'de balina ve yunusların yoğun yaşadığı bölgeler araştırılıyor



Adana

Deniz Memelileri Araştırma Derneği (DMAD), Doğu Akdeniz'de balina ve yunusların yoğun yaşadığı bölgelerin tespiti, deniz memelilerinin yaşam özellikleri ve koruma alanlarının oluşturulması için çalışmalarını sürdürüyor.

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Picture 2. Some examples of the media news

- DMAD has organised school talks for primary and secondary years.
- Posters, stickers and brochures were distributed to five different marinas in the Eastern Mediterranean Sea of Turkey.



4.4. DECISION-MAKERS

- **“Preparation, Implementation and Monitoring of Species Action Plans for Endangered Species in Turkey within the Concept of a New Methodology”** Workshop has been joined between 20-22 October 2021
- **“Deniz Koruma Alanları İşbirliği Çalıştayı (Workshop on the Cooperation of Marine Protected Areas)”** by WWF-Turkey has been joined between 22-23 November 2021.
- DMAD was invited to the conferences under the EU project of **“Doğaya Güç Kat Ağı (Empower the Nature Network)”** between 27-29 December in 2021. The project aims to strengthen the civil society and active citizenship for active involvement in protection and conservation of environment and nature locally in Turkey.
- **“2021 Annual report of DMAD”** and **“2021 Action report of DMAD”** were released and distributed both of the reports to the related ministries and municipalities.
- **“Its too Loud Now; the ignored consequences of noise pollution in the Mediterranean Sea”** report to mitigate the negative impacts of seismic practices were released and distributed to the related institutions, ministries and municipalities.

4.4. SCIENTIFIC PUBLICATIONS

- Akkaya A., Awbery T., Lyne P., Yalcın D.G., Usta C. (2022). *The Importance of Long-Term Monitoring of Cetaceans in the Data Deficient Regions of the Mediterranean Sea*. 33rd Conference of the European Cetacean Society. ECS ASHDOD 2022.
- Akkaya A., Awbery T., Lyne P., Yalcın D.G., Usta C. (2022). *Systematic Monitoring of Cetaceans with Temporal Replicates in the Eastern Mediterranean Sea of Turkey*. ABIOMMED. Support Coherent and Coordinated Assessment of Biodiversity and Measures Across Mediterranean for the Next 6-year Cycle of MSFD Implementation 2022.

5. DISCUSSION

We are in an era where knowledge is our only source of strength to minimise and mitigate the negative trend of the cumulative impacts of human threats on the species decline. Therefore, there was a significant increase on the research effort globally, while there was not much change on the number of in-situ conservation actions due to the unwillingness of decision makers on the protection of our blue planet.

DMAD has started the first and only dedicated research effort on cetaceans within the Eastern Mediterranean Sea of Turkey under the name of “Giant Guardians of the Deep Seas (GGDS)”. The project employed not only traditional visual survey techniques but also the advanced acoustic survey protocols to get a better insight into the cetacean distribution of Turkey. GGDS has two primary objectives; increase the baseline knowledge on cetaceans within the data deficient regions of the Mediterranean Sea and enhance the local research capacities (prioritising women) for one and only ultimate goal; building effective and practicable conservation and mitigation actions for the marine protection which is embraced by the general public.

Although DMAD is relatively a new NGO with limited resources, it succeeded in bringing attention to the long-ignored region of the Mediterranean and raised the scientific knowledge on cetaceans from the Eastern Mediterranean while reaching over 100 students (most of it being women) to emphasise the importance of local research effort.

The project resulted with regular sightings of delphinid species, mainly bottlenose dolphins, throughout the both coastal and offshore waters of the Eastern Mediterranean Sea. Contrary to the bottlenose

dolphins, common dolphins (identified as endangered with rapid population decline within the last decades in the Mediterranean) were not detected in the region during the study. Additionally, striped dolphins-a species that is known as the most common delphinids of the Mediterranean- was also rarely detected in the region.

On the other hand, sperm whales-a species that was thought to be occasionally present in the Eastern Mediterranean Sea of Turkey-was regularly detected specifically in the warmer seasons. Their sighting not only included solitary individuals but also social units and juvenile groups specifically within the Finike Canyon. Above results once again pinpointed the importance of the Eastern Mediterranean Sea of Turkey for the cetacean species while the area is under the unmitigated cumulative impact of human pressure from marine pollution to the presence of loud and impulsive noise.