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# ADVANCING KNOWLEDGE FROM COASTAL TO PELAGIC WATERS FOR THE "SPECIES CONSERVATION ACTION PLAN OF TURKEY"

*A Tool to Prioritize Measures Against Population Decline*

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JANUARY 13, 2019

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The Rufford Foundation logo features a stylized tiger in orange and black stripes, positioned to the right of the text "The Rufford Foundation".

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SHEDDING LIGHT ON THE SEASONAL VARIATION IN THE DISTRIBUTION OF  
CETACEANS AND THE MAJOR THREATS TO EACH SPECIES IN THE EASTERN  
MEDITERRANEAN SEA OF TURKEY

*“Cetaceans are going through drastic declines and for some populations this has reached up to a 70% loss in the last 50 years. The only way to reverse this pattern is through enhancing knowledge from the bottom to the top!”*

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## SUMMARY

The Mediterranean Sea has been described as a biodiversity hotspot and yet is under ever increasing pressures from uncontrolled and unregulated human activities. The Basin holds 23 cetacean species, all of which are identified as threatened and are showing considerable population declines with patchy distributions. Whilst scientific knowledge is the most important tool for species protection, dedicated cetacean research effort is scarce, specifically in the eastern and southern Mediterranean Sea. The most commonly identified threats to cetaceans are habitat degradation, pollution, marine traffic, unregulated and uncontrolled fisheries and climate change. Yet, the magnitude of these threats on each species are largely unknown. Marine protected areas are known to be the strongest defense strategy for the species and habitats of interest, yet so few of them have an in-situ management and/or conservation strategy, ultimately resulting in them being “paper parks”. The goal of our project were to gather previous scientific knowledge on cetaceans and to continue our dedicated survey effort in one of the least studied location in the Mediterranean Sea in order to fill the baseline knowledge gap as well as to determine cetacean habitat usage and the magnitude of human pressure cetaceans face, focusing on marine traffic and fishing impacts. While collecting vital data for cetacean conservation, stakeholders were also engaged to ensure that the concept of protection arising from bottom to top was utilized to maximize project sustainability. Consequently, the ultimate goal of the project was to develop the first Conservation Action Plan of Cetaceans of the Eastern Mediterranean Sea.

During the project, **29 days (524 hours)** were spent at sea in search of cetaceans between November 2018 and November 2019. Overall, cetaceans were recorded on 16 days, resulting in 101 encounters. While Delphinidae species were the most common encounters, sperm whales and beaked whales were also recorded in the study area. The data revealed no significant importance of time of the day and/or season on the sighting probability of each species. The results of the current project have already prepared for a publication for a peer-reviewed journal and were presented at the ACCOBAMS Meeting of the Parties and the MedPAN workshop in November 2019 and also at the “World Marine Mammal Conference” as two different presentations in December 2019.

In addition to the scientific data collection, informal interviews were carried out in Antalya, Finike, Kalkan, Kas and Fethiye targeting small-scale fisheries. These revealed a low entanglement rate of cetaceans in small scale fisheries, with an awareness of high marine conservation morality evident at small-scale fisheries in Antalya, Finike and Kalkan. The fishing community in Fethiye and Kas were a lot more guarded and so unfortunately theses questionnaires revealed little insight. Each member of the fishing community reported depredation to nets caused by dolphins and called on policy makers to act to compensate for fishing net loss. The collected data has also been shared with the Ministry of Forestry to strengthen regional knowledge and was reported to the

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international agreements as in ACCOBAMS and MedPAN as well as platforms as in “TursioMed” and “OBIS SeaMap” to ensure the acquired knowledge was disseminated to its maximum potential.

Through the capacity development activities, “Habitat modelling” alongside “ACCOBAMS Marine Mammal Observer and Passive Acoustic Monitoring Operator” workshops were carried out in Marmara University and the Marmaris Art and Culture Hall, involving over 40 participants, including but not limited to students, researchers of the universities, and NGOs, for example WWF Turkey, TUDAV, Cukurova University, Istanbul University, Marmara University, ODTU, and Fishery Observers. This resulted in, not only capacity building, but also strengthening the network between researchers serving in different institutes. Moreover, we further spread our capacity building by encouraging the active participation of university students to our research surveys with four of them showing a promising interest and joining the DMAD team.

The support of the Rufford Booster Grant immensely helped DMAD in becoming a partner of MedPAN (Mediterranean Protected Area Network) and strengthening the relationships with ACCOBAMS and WWF. This led us to extend our survey coverage from the Levantine Sea to one of the oldest National Parks of Turkey, the Dilek Peninsula in the Central Aegean Sea, which is eventually discovered as “nursing and breeding ground” for common dolphins (*Delphinus delphis*), categorised as endangered by the IUCN, by DMAD and the WWF-Turkey team. Further, we have developed mutually respectful relationships with all the local partners, from universities to local and international NGOs. On the contrary, our several attempts for the “Management of human noise on the critical habitats of cetaceans” involving policy makers and Turkish Oil and Gas Companies weren’t as successful as we planned, leaving room for improvement. Nonetheless, DMAD has designed a brochure entitled, “IT’S TOO LOUD!” to serve as a guide on what seismic is, its denied and ignored consequences and how it can be minimized. The brochure will be shared with the companies, policy makers and the public with further requests for meetings until the seriousness of the subject, not only for cetaceans, but for all marine fauna has been understood.

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## INTRODUCTION

The Eastern Mediterranean Sea is currently home to a diverse assemblage of different cetacean species, most of which are known to be in decline and classified either as at risk or data deficient (Frantzis, 2009; IUCN 2012). Whilst 8 species are classified as “common”, 1 species is classified as “visitor” in the region;

### *Common species*

- Bottlenose Dolphin (*Tursiops truncatus*) - vulnerable (Mediterranean subpopulation)
- Short-Beaked Common Dolphin (*Delphinus delphis*) - endangered (Mediterranean subpopulation)
- Striped Dolphin (*Stenella coeruleoalba*) - vulnerable (Mediterranean subpopulation)
- Sperm Whale (*Physeter macrocephalus*) - endangered (Mediterranean subpopulation)
- Cuvier’s Beaked Whale (*Ziphius cavirostris*) - data deficient (all species)
- Risso’s dolphin (*Grampus griseus*) - data deficient (Mediterranean subpopulation)
- Long-finned pilot whale (*Globicephala melas*) - data deficient (Mediterranean subpopulation)
- Rough-toothed dolphin (*Steno bredanensis*) - not applicable (Mediterranean individuals last reviewed in 2007)

### *Visitor species*

- False killer whale (*Pseudorca crassidens*) - not applicable (Mediterranean individuals last reviewed in 2007)

Despite the high number of species present, little is known about the ecology, abundance and distribution of cetaceans in the Levantine Sea (Ryan et al. 2014). Short-beaked common dolphins, once known to be the most common species in the Mediterranean Sea, are now fragmented and have suffered a loss in distribution and a decrease in population size by 70% in the last 50 years (Bearzi et al. 2003) with the Aegean Sea possibly being one of the few remaining strongholds for the species (Frantzis et al. 2003). Bottlenose dolphins and striped dolphins are believed to have declined by 50% and 30% respectively over the past half century, despite being the most sighted species in the Mediterranean (Bearzi et al. 2008). Regarding the deep diving species, sperm whales are thought to have less than 2500 adult individuals in the entire Mediterranean Sea whereas there is no estimation for Cuvier’s beaked whales or Risso’s dolphins. The majority of the threats for each of the aforementioned species were common between species with varying magnitudes and mainly consisted of habitat destruction, shipping lanes, overfishing, recreational activities, military exercises, seismic practices for oil and gas, invasive species, disease outbreaks, pollution and climate change (Bearzi et al. 2008; Lusseau, 2004; Lusseau and Bejder 2007; Hoyt, 2014).

Throughout the Mediterranean Basin, dedicated survey efforts started in the early 1990s (Forcada et al. 1996; Gordon et al. 2000; Canadas et al. 2006; Boisseau et al. 2010; Frantzis et al. 2003; 2014) and most information previous to this originated from opportunistic sightings and stranding reports (Marchessaux 1980; Kinzelbach 1985). Since the 1990s, the Western Mediterranean Sea hosts a comparably higher research effort than the Eastern

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Mediterranean Sea, including the Aegean Sea, resulting in a skewed knowledge of the western basin and leaving the Eastern Mediterranean Sea mostly blank on Mediterranean maps. Indeed, the Levantine Sea and Aegean Sea sub-regions received only 2.1% of the survey effort each when compared to the northwestern basin (Mannocci et al. 2018).

Therefore both continuous and consistent long-term surveys are necessary to fill the existing gaps in baseline knowledge including encounter rates, population sizes, residency and movement patterns as well as assessing the threats for species based on the defined critical habitats. This will help to determine species' regional status and thus guide conservation efforts to ensure that protected areas do not only exist on paper, but that in-situ protections are in place. For this same purpose, the current project supported by Rufford Small Grant Foundation has carried on its dedicated and systematic survey efforts and conservation actions within one of the least studied regions of the Mediterranean Sea.

#### *COMMON SPECIES IN DETAIL*

**The Mediterranean subpopulation of bottlenose dolphins** are currently considered vulnerable under IUCN criterion and the population is believed to be decreasing with only 10,000 mature individuals left in the Mediterranean (Bearzi, Fortuna and Reeves, 2012). They are thought to have had a reduction in population size of more than 30% since 1940 due to extermination campaigns and bycatch in fisheries (Bearzi, Fortuna and Reeves, 2012). There are genetic distinctions between the Mediterranean subpopulation and populations of dolphins within the contiguous Atlantic. These distinctions are also present between the Mediterranean basin and the Black Sea (Natoli et al. 2005; Bearzi, Fortuna and Reeves, 2012).

**The Mediterranean subpopulation of striped dolphins** are also currently considered vulnerable under IUCN criterion (Aguilar and Gaspari 2012). The current population trend of striped dolphins is unknown (Aguilar and Gaspari 2012) however thousands of striped dolphins were thought to have died between 1990 and 1992 (Bortolotto et al. 1992, Aguilar and Raga 1993). The main reason behind the mass death event was thought to be due to morbillivirus infections (Domingo et al. 1990) and there are suggestions that PCBs and other pollutants may have suppressed the immune systems of the dolphins and increased the effects of the morbillivirus (Aguilar and Borrell 1994). Their distribution had been recorded throughout the Mediterranean but they have not been recorded in the Black Sea (Aguilar and Gaspari 2012).

**The short-beaked common dolphin** is considered vulnerable in the Mediterranean with numbers thought to be decreasing and the limited data available suggests a reduction of over 50% in the last 30-45 years (i.e. 3 generations) (Bearzi 2003). Although no formal abundance estimates are available, numbers are assumed to have declined due to a progressive disappearance in the Adriatic, Balearic, and Ligurian Seas and the Provençal Basin

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alongside decreases in encounter rates in areas such as the Ionian Sea (Bearzi 2003). There have been few signs of movement by common dolphins between the Aegean and the Marmara and Black Seas through the Dardanelles Strait (Öztürk and Öztürk 1997) and there is contrasting evidence of genetic differences between the Mediterranean and Black Sea populations (see Amaha 1994 and Natoli et al. 2003).

**Risso's dolphin** are data deficient with no large-scale surveys to estimate their distribution, range or abundance (Gaspari & Natoli 2012). They are found throughout the Mediterranean basin but the majority of reported sightings are in the western Mediterranean (Gaspari & Natoli 2012). There is an apparent scarcity of Risso's dolphins in the eastern Mediterranean although this may be to do with the number of surveys conducted in this region (Gaspari & Natoli 2012). There has been a few strandings on the coast of Israel, the coast of the northern Adriatic sea and Sicily (Gaspari & Natoli 2012). Bycatch from longlines and gillnets has been found in Spain and Italy (Notarbartolo di Sciara 1990; Valeiras and Camiñas 2001)

**Sperm whales** are considered endangered in the Mediterranean with numbers thought to be decreasing (Notarbartolo di Sciara et al. 2012). The Mediterranean subpopulation is thought to be one undivided subpopulation and contains less than 2500 mature individuals making up only 45% of the current population, as opposed to up to 85% of populations in other parts of the world (Notarbartolo di Sciara et al. 2012). The decline in population (which is of unknown size) is thought to be due to entanglement in fishing gear, ship strikes and disturbance from the intense maritime traffic in the Mediterranean Sea (Notarbartolo di Sciara et al. 2012). Sperm whales are thought to be widely distributed within the Mediterranean Sea from the Strait of Gibraltar to the Levantine Sea but are not believed to be present in the Black Sea (Notarbartolo di Sciara et al. 2012).

**Cuvier's beaked whales** are considered vulnerable in the Mediterranean with a decreasing population size and an estimated abundance of between 4,807-7,254 individuals (Cañadas & Notarbartolo di Sciara 2018). Due to differences in distinct haplotype group, it is believed that the Mediterranean population of Cuvier's beaked whales can be defined as a subpopulation as they have less than one migrant per year (Dalebout et al. 2005). This was given greater weight during surveys in all seasons between 1999 to 2006 that found no sightings of Cuvier's beaked whales in the Strait of Gibraltar (de Stephanis et al. 2007). It is important to note however that due to their general low abundance, there were no samples available from the contiguous Atlantic zone to test for differences in haplotypes (Cañadas & Notarbartolo di Sciara 2018). The cause of decline has been linked to mass strandings due to military sonar, entanglement in gillnets, and ingestion of plastic (Cañadas & Notarbartolo di Sciara 2018).

**The long-finned pilot whale** is classed as data deficient under IUCN criterion with an unknown population trend and number of mature individuals (Cañadas, 2012). Within the Mediterranean, long-finned pilot whales occur in the western Mediterranean Sea, including the Strait of Gibraltar (Cañadas, 2012). They are thought to be relatively common in the Alborán Sea and surrounding waters (Cañadas and Sagarminaga, 2000), and fairly common to



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scarce in the rest of the western Mediterranean, but are not recorded in the eastern basin (however there have been unconfirmed sightings in Turkish waters. In the Strait of Gibraltar, a mark-recapture analysis on individuals with distinctive markings gave an estimate of abundance which ranged from 249 to 270 animals (Verborgh 2005, De Stephanis et al. 2005, De Stephanis 2007).

**Rough-toothed dolphins** are classified as least concern globally under IUCN criteria with an unknown population trend (Kiszka et al. 2019). Their distribution is mainly skewed to the Eastern Mediterranean Sea, between Cyprus and Lebanon, with a preference both to neritic and pelagic waters. The main threats on the population has been identified as fisheries but there is still a lack of knowledge of species baseline knowledge and the magnitude of threats on the species (ACCOBAMS, 2018).

## METHODS

### STUDY AREA

The project site covers approximately 22,000 km<sup>2</sup> between Marmaris and Anamur in the Turkish Mediterranean coast with Greek territorial waters being excluded from the study. The targeted area is certainly considered one of the least studied, thus data deficient habitats of the entire Mediterranean Sea. The study area selected as “Ecologically or Biologically Significant Marine Areas (EBSAs)” (under the United Nations’ Convention on Biological Diversity), has five (5) different Specially Protected Areas (SPAs), including the Finike High Sea Marine Protected Area and holds an “Area of Interest for Important Marine Mammal Areas”. Despite all the aforementioned protected status, there is a considerable lack of research on the marine top predators. Therefore, the current project covered coastal zones, continental shelves and the high seas of the north Eastern Mediterranean Sea to fill the existing knowledge gaps on species and their associated threats (Figure 1).

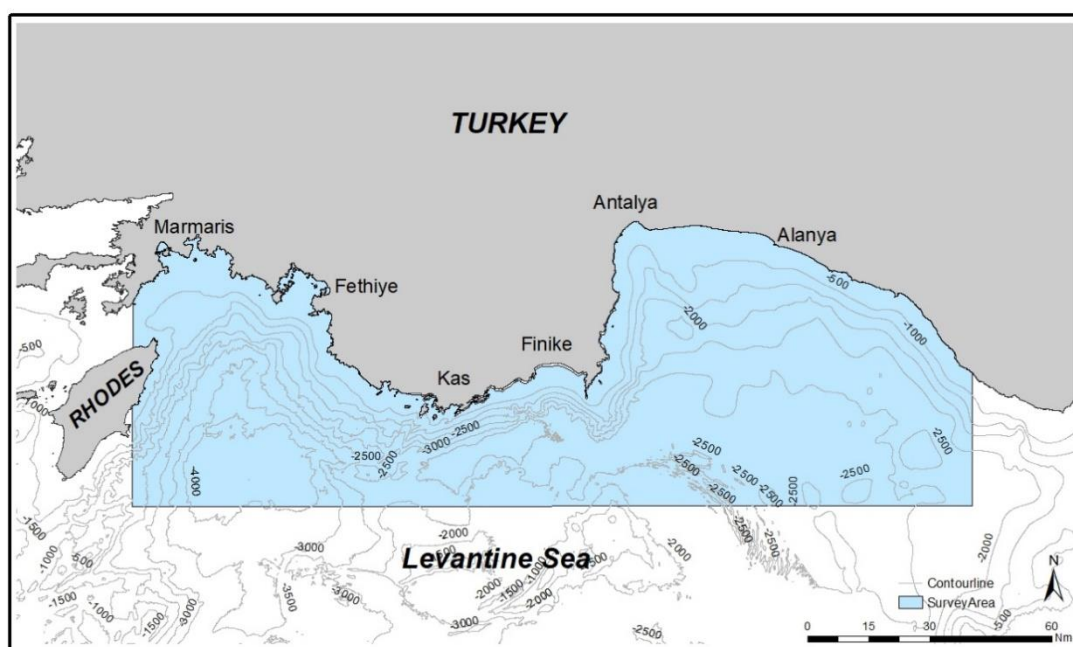


Figure 1. Study Area in the Levantine Sea

### SURVEY PROTOCOL

A 14.98m sailing boat was used during the surveys with a 100hp diesel engine. Both equal spaced zigzag transects designed using DISTANCE software and the 1000m bathymetric contour line were followed by the research vessel. The transect lines comprised of 22 transects, totaling a route of 644 km. The pre-determined routes were inserted into the boat’s navigation system. The average sailing speed chosen was 4 knots. The research vessel was

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only considered 'on effort' when it was travelling at 4 knots and within 2km of the determined transect. If the vessel left the transects, it was recorded as "off effort" by the data logger. The research boat sailed along the transect lines at a speed of between 4-6 knots. The data logging software 'Logger 2000' ran continuously on a PC linked to a GPS. The same software was used to record the survey effort and environmental conditions on an hourly basis and whenever conditions change. Recorded environmental conditions consisted of Beaufort sea state, wave and swell height, weather conditions, cloud cover, visibility, wind speed, wind direction, sun glare angle and intensity. Behavioral data of the focal group was also recorded every five minutes following focal group scan sampling protocol and marine debris, marine traffic and fishery practices were also noted both in the presence and absence of cetaceans to document the anthropogenic pressures in the area.

### Visual surveys

Visual efforts started half an hour before sunrise and finished half an hour after sunset. Two researchers were always on watch. When the Beaufort was lower than 4, observers were on the bow of the research vessel. The two observers were responsible for reporting sightings (bearing and distance) and environmental data to the data logger. Visual observers reported species identification, group size, number of subadults, behaviour, group cohesion, group bearing, distance and any anthropogenic impacts.

The boat approached the focal cetacean group to obtain an accurate data set and photographs of the group. Approach only occurred from the side or rear, with idle speed when possible, and the group would be followed from a minimum distance of 100 m, unless the focal group approached the boat. If the animals happened to move within a very close proximity of the boat, the speed of the research vessel was reduced gradually in accordance. Any changes in the swimming direction of cetaceans due to the presence of the research boat was recorded in order to measure the influence of the research boat.

### Acoustic surveys

Acoustic effort ran continuously 24hours/day for the full duration of the survey using PAMGuard Software, Version 1.15.15 Core (PAMGuard, 2020). The hydrophone array consisted of four omni-directional broadband hydrophone elements for high and low frequency monitoring deployed at the end of a 200m cable. The hydrophone elements had a frequency range of between 10Hz and 200kHz and the acoustic signal was digitized using a Behringer U-Phoria UMC404HD sound card sampling up to 192 kHz. Each PAM operator was responsible for logging detections and making sure the system was continually running. Every 15minutes the operator filled out an acoustic form and every hour the research vessel slowed to under 2 knots for 6 minutes and again the operator filled out the same form. Any type of anthropogenic and environmental noise was also recorded every 15 minutes.

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## Photo Identification

The observer on the bow took images of dorsal fins, if it was a dolphin, and tail flukes if it was a whale during the sightings. The taken photographs were imported to a PC for later analysis after each survey and were analyzed using Discovery software. Photographs were taken using a Canon 7D with a 70-300mm focal length zoom lens.

Each photograph was cropped around the fin and/or fluke and graded 1 to 3 for image quality based on the following criteria (Whitehead et al. 1997; Ingram et al. 2000);

- Photo Grade 1 – Well-lit and focused shots taken perpendicular to the dorsal fin at close range
- Photo Grade 2 – More distant, less well-lit, or slightly angled shots of dorsal fins
- Photo Grade 3 – Poorly lit or out of focus shots taken at acute angles to the dorsal fin.

Once they were graded, they were categorised under their distinctiveness and only Grade 1 and 2 photos were involved in this step (Whitehead et al. 1997; Ingram et al. 2000):

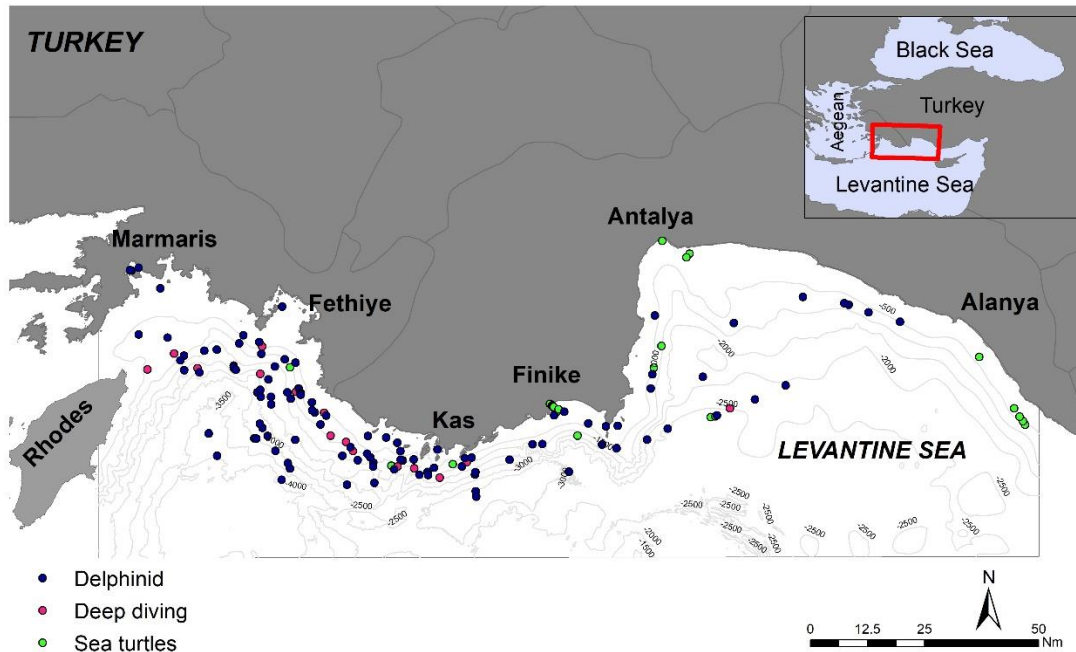
- Distinctive Grade 1– Marks consisting of significant fin damage or deep scarring that are considered permanent
- Distinctive Grade 2 – Marks consisting of deep tooth rakes and lesions with only minor cuts present
- Distinctive Grade 3– Marks consisting of superficial rakes and lesions.

After the above categorization, matching steps were conducted for only Distinctiveness Grade 1 and 2. Following matching, additional information was added to the database, including survey effort, group size, maturity and sightings data (environmental conditions, geographical coordinates and behavior). Lastly, each matched individual was verified by a second judge, independent of the previous stages of matching, to increase the accuracy of the matched or new individuals in the catalogue.

## RESULTS

### Scientific Results

Over all, four seasons were covered between November 2018 and November 2019 with a total survey effort of 29 days (524 hours). Both acoustic and visual survey protocols were followed for each season, except Autumn 2018 due to damage to the acoustic system where a directional hydrophone replaced the PAM hydrophone array. Overall, three species were visually identified; bottlenose dolphins, common dolphins and sperm whales (Figure 2). The majority of the detections were recorded acoustically, accounting for 85% of the total encounters (Figure 2). A high number of delphinid species were acoustically recorded, although couldn't be identified on species level. Even though spring and summer hold the highest species presence, as well as encounters, cetaceans were detected throughout the seasons, indicating the habitat importance year-round. In addition, sea turtles, both green turtle and loggerhead turtles were recorded in spring and summer whilst their coastal presence in Finike and Fethiye was documented year-round, including subadult sightings. Encounter rate calculations revealed a presence of 3 delphinid groups per 100km while it was 1 per 100km for sperm whales. Regarding group sizes, common dolphins held the highest recorded group size with a maximum of 20 individuals in a group, followed by bottlenose dolphins with a maximum of 10 individuals in a given group. Furthermore, the majority of the time, sperm whales were detected as lone subadult males, however, social units of 5, including the presence of calves were documented during the study. It's important to highlight that post-acoustic analysis has yet to be carried out.



*Figure 2.* Cetacean and sea turtle sightings throughout the surveys



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Additionally, photo-identification studies for sperm whales have been completed, revealing a presence of five individuals in the Turkish Levantine Sea of which one of them was identified as subadult (Picture 1).



*Picture 1.* Identified sperm whale individuals

Regarding the human pressure on the cetacean populations, the biggest threat was identified as the human-origin underwater noise followed by the marine pollution in the area. Each season high number of seismic, sonar and construction activities were recorded, though their origin couldn't be identified. ***Sharp vocalisation interruption in the close proximity to the loud and intense noise was documented in several cases with a live beaked whale stranding reported within the same location and time-frame that the high noise activities were documented.***

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## Outreach Results

- **FISHING COMMUNITY INFORMAL INTERVIEWS** were carried out in Antalya, Finike, Kalkan, Fethiye and Kas. All the interview were targeted to the small-scale fishery. Whilst Antalya Fishing Cooperative and each individual fisherman was extremely helpful throughout the process, the least information was gathered from Fethiye and Kas despite several attempts. The gathered conclusions were;
  - Dolphins and Mediterranean Monk Seals were never entangled in their nets. Even though dolphins were frequently reported in competition with fishermen through preying on the fish inside the net, it doesn't result in entanglement but destroys the thin nets. DMAD also documented the damage on the net from top predators.
  - Whilst the main problem was Mediterranean Monk Seal predation on nets in Antalya, further west it was replaced by dolphin predation.
  - Sea turtles were frequently reported entangled but were released alive in most cases.
  - In general, fishermen showed high awareness of the importance of dolphins and seals for the marine ecosystem and mentioned several times that “the sea is their home, it doesn't belong to humans”, “they steal the fish because they are hungry and there is less fish in our seas now”, “dolphins are the guides of fishermen, they show us where the fish is”. Therefore, hostility was never directed to the top marine predators.
  - Instead there was a considerable negative feeling towards commercial fishing activities, specifically to trawling vessels where the small-scale fishery constantly reported that the reason for decline of fish stocks is not the dolphins, but the unregulated and uncontrolled industrial fishing activities.
  - There were also considerable negative comments towards the decisionmakers on the subject of “restriction laws only being binding for small-scale fisheries”. Whilst they were aware of the importance of closed areas for fishing and its necessity to increase the prey stocks, once again, their main note was that “rules must be applied by everyone”.
- **WORKSHOPS** were carried out for two different topics. Both of the workshops were directed to students, researchers of universities and NGOs, such as WWF Turkey, TUDAV, Cukurova University, Istanbul University, Marmara University, ODTU and Fishery Observers. This resulted not only in capacity building but also strengthening the networks between the researchers serving under different institutes.
  - Photo-identification and mapping through ArcGIS workshop was carried out in Marmara University and involved over 20 participants. The workshop was held over two days.
  - ACCOBAMS High Quality MMO and PAM operator course was carried out in Marmaris Culture and Art Centre between 22nd-27th July of 2019. Whilst the first four days were dedicated to the theoretical information described in the ACCOBAMS protocols, the next two days were designed to cover the practical aspect including a survey between Marmaris and Fethiye. Additionally, there were two interesting topics presented by experts on GIS mapping and stranding first aid information. During the workshop, 18 researchers and students were involved,

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of which nine were from Turkey. This increased the local capacity and each of the participants successfully passed the evaluation test and were awarded with the ACCOBAMS MMO/PAM operator certificate which provides them with future job opportunities.

- **MEETINGS** were organized with related Institutes, Universities, NGOs, Municipalities and Ministries.
- We had a formal meeting with Dr. Irfan Uysal who is the Head of the Marine Protected Area Division under **Directorate of Nature Conservation and National Parks** and informed the Division about our continuous and dedicated research and conservation efforts within the Turkish Levantine Sea. Later, we prepared a “**Regional Cetacean Report**” that summarized all our research, conservation and capacity building activities and handed it to Dr. Uysal to be included in the national database that is required for national and international conservation agreements.
- We had two meetings with the **Biology Departments** of Marmara University and Istanbul University to reach more students and to contribute to their research skills.
- We had informal meetings with several **influential NGOs** such as WWF-Turkey, Turkish Marine Research Foundation and Mediterranean Conservation Society that were heavily targeted around the importance of collaborative research effort with constructive contributions from each party.
- We requested a meeting with **Turkish Oil and Gas Companies** to discuss the mitigation measures recommended by the national and international agreements but unfortunately our attempts were declined.
- **INTERNATIONAL CONFERENCES** were also in our agenda to spread our gained knowledge to different platforms and five different conferences were attended;
  - “**5<sup>th</sup> Important Marine Mammal Conference**” in Greece, April 2019
  - “**Adriatic Biodiversity Protection**” in Montenegro, April 2019
  - “**ACCOBAMS Meeting of the Parties**” in Turkey, November 2019
  - “**Mediterranean Protected Areas Network (MedPAN) workshop**” in Turkey, November 2019
  - “**World Marine Mammal Conference**” in Barcelona, December 2019 where two presentations were made on the status of cetaceans in Turkey and the results of our research in the Levantine
- **COLLABORATIONS** were an important topic throughout the project and through the Rufford Booster Grant Fund, our cetacean research effort was recognised and we rewarded by being invited to become PARTNER institutes of ACCOBAMS and MedPAN. Further, we have shared our databases to contribute Mediterranean Basin wide studies on the “TursioMed” platform (A network for bottlenose dolphin photo-identification throughout the Mediterranean Sea) and the “OBIS-SeaMAP platform (Cetacean sighting network throughout the globe)
- **PROMOTIONAL MATERIALS** such as posters and guidebook were printed.



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- **Posters** were designed for schools (Dolphins -Your Friendly Neighbours), fishing cooperatives (Dolphins - Your efficient Co-workers) and ministries (Dolphins -Your Economy Boosters)
  - **A guidebook on** “What seismic is, its denied and ignored consequences and how it can be minimized” was produced under the title, “**IT’s TOO LOUD!**” was prepared and distributed to the Ministry of Energy, Ministry of Forestry and Directorate of Protected Areas with a call for immediate meetings.
  - **Cetacean Conservation Action Plan** is currently under progress and will be finalized in 2020.

#### TO BE DEVELOPED

1. Activities directed towards the decision makers and companies were not as successful as the above activities. We will be strengthening our strategies and requesting official meetings as early as January 2020, considering the ongoing seismic and sonar activities within the selected important cetacean habitats.
2. Cetacean Conservation Action Plan will be completed by the end of February 2020 and proposed to the decisionmakers within the same month.
3. Due to the limitation on the budget, the proposed wooden board for species information was designed but couldn’t be installed. Yet, it is in the agenda of DMAD and will be completed.

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## DISCUSSION

Our research and conservation effort were started in September 2015, through the support of Rufford Small Grant Foundation, focusing on the coastal waters of Antalya in search of bottlenose dolphins. The project has followed up with the second support of Rufford Foundation in 2017, with an additional survey area of Fethiye-Gocek SEPA. In both of the previous studies, we identified the important habitats of bottlenose dolphins and Cuvier's beaked whales for the first time within the Turkish Mediterranean. This resulted in the current project, starting in 2018, which focused on the entire coastline between Marmaris and Antalya Bay with an average of 700km of transects followed in each survey and extended its effort to international waters. It also increased the study to encompass not only coastal species but also deep diving species, such as sperm whales and beaked whales.

Up until now, the cetacean research effort was based on single survey efforts within the Levantine Sea. Furthermore, the overall systematic research effort in the area consists of less than a dozen survey and these were only conducted in summer months - specifically July - leaving a gap in knowledge on the impact of temporal variation. Furthermore, the lack of continuous patterns of the surveys also prevented the understanding of any existing patterns on species diversity, area usage and human impact due to the lack of replicates to minimise the simple "chance" factor. *The current project was the first ever study that employed a seasonal systematic survey design, combining both acoustic and visual techniques, to gather in-depth knowledge on cetaceans and the existing human impacts in the area.*

Total survey effort covered **29 days (524 hours)** between November 2018 and November 2019, during which 101 cetacean encounters were recorded across 16 days. Whilst Delphinidae species were the most encountered species, sperm whales were also frequently recorded in the area with social units. However, only a single beaked whale was recorded throughout the survey. The majority of the encounters were concentrated within the western waters of study area in the Fethiye Canyon and species presence for delphinids were recorded from the coastal zones to a depth of 4000m in the pelagic zones. On the other hand, sperm whales were detected around the 1000m isobath. Even though, species sighting rate was the highest when compared with previous studies, there was a considerable species absence within Antalya Bay, which was highlighted as an important cetacean habitat during our previous effort and was selected as a "Candidate Important Marine Mammal Area" due to the high presence of beaked whales, bottlenose dolphins and Mediterranean Monk Seals by the Marine Mammal Task Force. However, the current project failed to record any delphinid or beaked whales within the previously defined zones. *Notably, the number of human activities within Antalya Bay, specifically in the city of Antalya and its surrounding waters, were considerably increased since 2015. These ranged from coastal habitat destruction to navy exercises and seismic surveys. Since 2015, there has been over 30 sonar and seismic surveys activities which can only be found on online databases within the Turkish Mediterranean waters of which many of them continued for several weeks, even months.* Interestingly there has also been over 20 cases of stranding. *In*

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*addition to the heavy noise pollution, marine transportation cargos and marine debris showed a considerable overlap with the defined important habitats.*

Studies focusing on animals with long lifespans, such as cetaceans, must be carried out for multiple years if not decades for accurate conclusions surrounding population trends. Despite the comparably short span of the current study (3 years), the gained knowledge on species distribution patterns and threat assessment should serve as a stepping stone for effective conservation strategies. *The identified “important cetacean habitats” should gain protected status and mitigations should be applied for noise reduction, shipping control schemes while single-use plastic should be banned globally as marine plastic forms the biggest threat to world wildlife. However, the restrictions alone won’t result in effective conservation in the long run as the “necessity of wildlife conservation” should follow a bottom-up trend and arise from the individual instead of being enforced by policy makers.* For this reason, we have engaged with various stakeholders, from university students to fishing communities and have come to the conclusion that “the awareness is already there, it only needs to be brought to the surface with the correct guidance” with the strongest barrier being the economical limitations of the individuals in developing countries.

Despite the willingness to protect nature by decision-makers, the human foot print is increasing rapidly from the deepest to the highest point of the earth. *Therefore “a will” in itself is not going to be enough to stop the population declines and species extinctions. Decision makers need to be more knowledgeable and involved wildlife conservation projects to prioritise the protection of species as this alone is the key to sustainable nature conservation and economic development.*

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