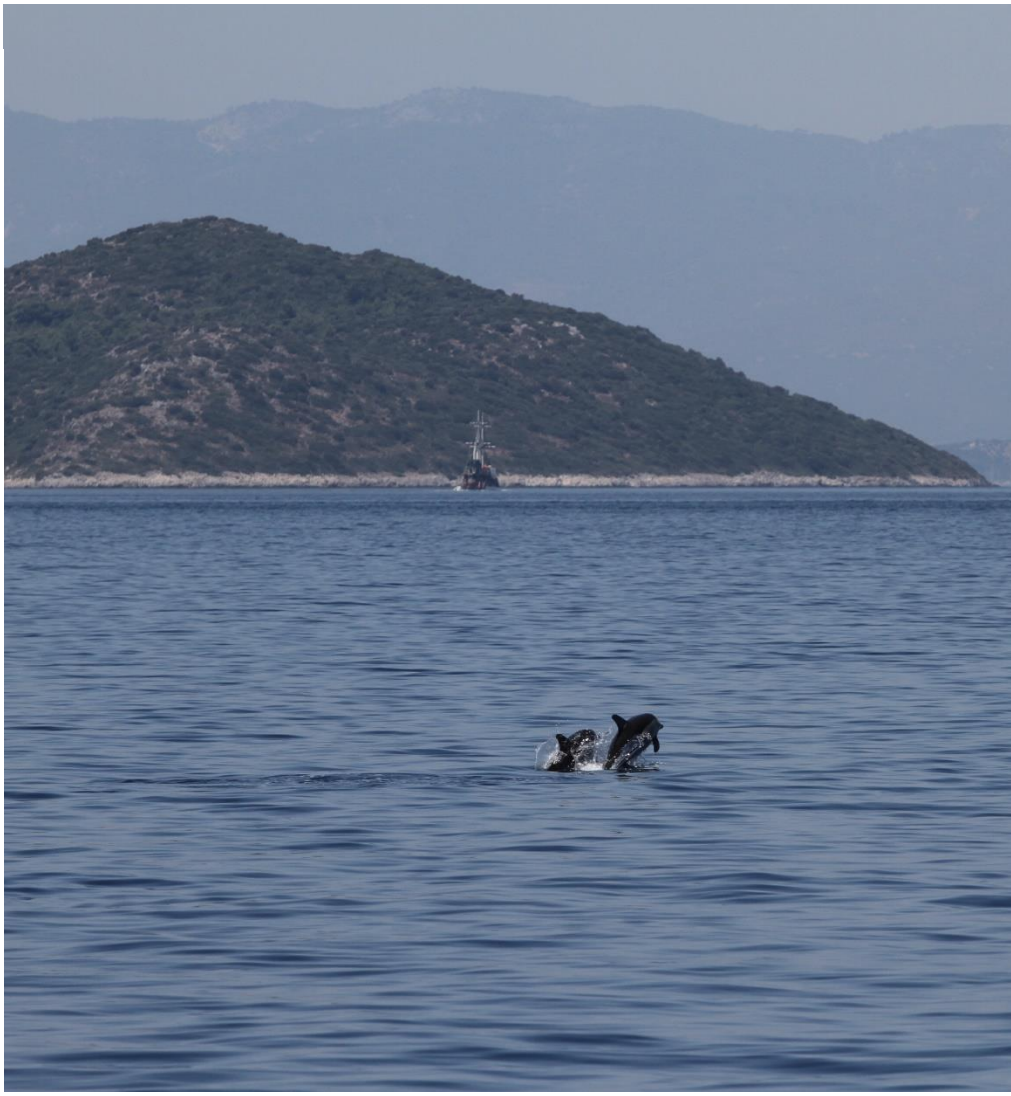
CETACEANS OF THE DILEK PENINSULA 2019-2020



AUGUST 19, 2019

CROSS-EXAMINING CETACEANS IN THE DILEK CHANNEL

ENCOUNTER RATES, POPULATION ESTIMATES, MOVEMENT AND RESIDENCY PATTERNS AND THREAT ASSESSMENT

"Cetaceans are going through drastic decline and for some populations reaching up to 70% loss in the last 50 years. The only way to reverse the pattern is through enhancing the knowledge from the bottom to the top!"

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SUMMARY

The Aegean Sea, a common corridor between two countries, holds the richest-known cetacean habitats in the entire Eastern Mediterranean Basin. Yet, the same area suffers from a lack of dedicated cetacean research effort, resulting with a gap in baseline knowledge. Consequently, forming one of the strongest barriers to the effective conservation and mitigation strategies for populations that are already known to be declining. Cetaceans, known as an umbrella, flagship and keystone species, are under various anthropogenic threats such as habitat degradation, pollution, marine traffic, unregulated and uncontrolled fisheries and climate change. Up until now, 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 turning to be "paper parks". The goal of our project is to fill the knowledge gaps on population statuses, residency patterns, abundance and encounter rates of dolphins as well as to determine their habitat usage and the magnitude of human pressure, focusing on marine traffic and fishing impacts in the Dilek Peninsula Protected Area. The results will be reported to the management bodies of the protected area to develop a Species Conservation Action Plan for one of the oldest protected areas in Turkey, the Dilek Peninsula.

INTRODUCTION

The Aegean Sea is currently home to a diverse assemblage of different marine mammal 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", 4 species are classified as "visitors" 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)
- Harbour porpoise *(Phocoena phocoena relicta)*- endangered (Black Sea subspecies)
- Mediterranean Monk Seals (*Monachus monachus*)- endangered

Visitor species

- Humpback whales (*Megaptera novaeangliae*)
- False killer whale (*Pseudorca crassidens*)
- Minke whale (*Balaenoptera acutorostrata*)
- Sowerby's beaked whale (*Mesoplodon bidens*)

Despite the high number of species presence, little is known about the ecology, abundance and distribution of cetaceans in the Aegean 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 dolphin 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 of the Aegean Sea, 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. Interestingly, the Black Sea harbor porpoise has been increasingly sighted in recent years in the North Aegean Sea with no additional detailed studies or survey effort on the species (Cucknell et al. 2016). The only pinniped species of the Mediterranean, the Mediterranean Monk Seals is a known to have a presence extending to the Aegean Sea. 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).

The Central Aegean Sea, Northern Sporades, Chios and Turkish waters were identified as Important Marine Mammal Habitat due to its importance for the Mediterranean Monk Seals and Thracian Sea-North Aegean Sea- is delineated as an IMMA for the presence of harbor porpoises by the Marine Mammal Protected Areas Task Force (https://www.marinemammalhabitat.org/). Despite the entire region being a candidate of Important Marine Mammal Area (cIMMAs), there is only a handful of dedicated survey efforts existing in the area, with none of them consisting of a year-round effort (Bearzi et al. 2003, Frantzis et al. 2003; Frantzis, 2009; Ryan et al. 2014; Giannoulaki et al. 2016).

Throughout the Mediterranean Basin, dedicated survey efforts started in the early 1990s (Canadas et al. 2006; Forcada et al. 1996; Gordon et al. 2000; Boisseau et al. 2010; Frantzis et al. 2003, 2013) and most information previous to this originated from oppurtunistic sightings and stranding reports (Marchessaux 1980, Kinzelbach 1986). Since the 1990s, the Western Mediterranean Sea hosts a comparabily higher research effort than the Eastern 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).

Theore, 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 patters as well as assessing the threats for species based on the defined critical habitats, as 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!

PREVIOUS STUDIES

Carpentieri et al. (1994) conducted the first dedicated survey effort in the Aegean Sea in 1993 and reported the presence of bottlenose dolphin, Risso's dolphin, striped dolphins, sperm whales, fin whales and beaked whales with bottlenose dolphins being the most commonly encountered species.

Gannier et al. (2002) conducted a survey from the Western to the Eastern Mediterranean Sea between 1997 and 2000 and covered the south Aegean sea in 2000, specifically targeting sperm whales and documented the species presence up until the Hellenic Trench but not within the Aegean Sea.

Frantzis et al. (2003) combined the sighting and stranding reports within the Aegean and Ionian Sea between 1991 and 2002, resulting in 821 sightings and 715 strandings reports and records of 12 cetacean species of which four are classified as visitors to Greek waters. The species encountered most commonly were striped dolphins, common dolphins, bottlenose dolphins, Risso's dolphins, sperm whaless, beaked whales and fin whale whilst harbour porpoises were found regionally in the North Aegean Sea; humpback whales, false killer whale, minke whale, Sowerby's beaked whale were only incidently present in the Greeek waters.

Cucknell et al. (2016) conducted a summer survey effort in 2013 within the Thracian Sea, northern Aegean utilising visual and acoustic survey effort, specifically targeting the distribution of harbour porpoises and found their distribution was highest in the Saros Bay, Thasos Island, southwest of Alexandroupolis.

Ryan et al. (2014), conducted a systematic visual and acoustic survey in the summer of 2013 in the Aegean and Levantine Sea and documented the presence of bottlenose dolphins, striped dolphins and common dolphins, mainly in the Northern Aegean Sea though they were present throughout the Aegean Sea. Harbour porpoises and Risso's dolphins were detected only in the North Aegean Sea. Sperm whale acoustic detection was also reported in the Ikaria Basin, Central Aegean Sea. Bottlenose dolphins were the most frequently encountered species in the North Aegean Sea and were found to be largely coastal. Striped dolphins were mostly found offshore, whereas common dolphins were present in both the neritic and pelagic waters of the Aegean Sea.

Markoglou et al. (2016a, b) and Giannoulaki et al. (2017) used published and opportunistic data collected from 1990 to 2005 and reported that the North Aegean Sea holds a suitable habitat for common dolphins whilst bottlenose dolphins are persistently found throughout the Aegean Sea

Most recently, Inch et al. (2018) conducted a mark-recapture study between South of Samos Island and Northern Dodecanese and encountered bottlenose dolphins and common dolphins. Whilst common dolphin abundance was estimated to be up to 180 in 2017, it was estimated to be 71 for bottlenose dolphins in 2015.

Regarding the research effort based in Turkey, TUDAV formed the pioneering dedicated survey effforts within the Aegean Sea. Öztürk et al. (2001) examined the entangled specimens on swordfisheries between 1999-2000 and reported 6 speciemen of Striped dolphin, 2 speciemen of bottlenose dolphin and 1 speciemen of Risso's dolphin.

Later, Dede and Öztürk (2007) conducted a one month long survey in the Marmara and Aegean Seas in 2005. 13 of the encounters were bottlenose dolphins (56 individuals), five of the encounters were common dolphins (37 individuals) and only one striped dolphins with a group size of 3 individuals. When the encounter rate was calculated for all the delphinidae species, it was found to be 0.011 groups/nm both for Marmara and the Aegean Seas.

Following the 2005 survey, Altuğ et al. (2011), conducted a seasonal survey between 2006 and 2007, specifically targeting the North Aegean Sea. Overall five species were sighted, once again bottlenose dolphin holding the highest sighting record with 35 encounters, followed by common dolphins (15 encounter), striped dolphin (14 encounter), harbour porpoises (5 encounter) and on one occasion a Risso's dolphin. The encounter rate of cetaceans were on average 0.43 groups per 10nm

Later, Öztürk et al. (2009a) conducted two summer survey efforts between 2007 and 2008 in the Aegean Sea, resulting in 26 encounters, with the majority being bottlenose dolphins (15 encounters), common dolphins (6 encounters) and striped dolphins (5 encounters). Whilst the cetacean encounter rate was 0.0062 group/nm in 2007, it increased to 0.034 group/nm in 2008 with the majority of the sightings taking place in the Northern Aegean Sea, Saroz Bay and Çanakkale Strait.

Most recently, Alan et al. (2017) conducted a similar study in the Central Aegean Sea, Foca SEPA in 2013 and reported a resident population of bottlenose dolphins in the area. Additionally, Alan et al. (2018) reported an encounter rate of common dolphins and bottlenose dolphin to be 2 groups per 100km between 2015-2017 in the Nemrut Bay, Izmir.

Regarding the stranding reports, Tonay et al. (2009) investigated the reports between 1999-2008 in the Turkish Strait System and North Aegean Sea, resulting in 54 specimens of five species, including harbour porpoises, common dolphins, bottlenose dolphins and Risso's dolphins. Öztürk et al. (2011) widend the time interval to include the years betwwen 1964 and 2011 and the target location to the Aegean and Mediterranean Sea and reported 9 beaked whales, 1 minke whale, 5 Risso's dolphins and 1 Mesoplodon sp. Later, Dede et al. (2013) reported the first stranding cases of Risso's dolphin in the Marmara Sea and harbour porpoise in the Aegean Sea. Most recently Milani et al. (2018) analysed the stranding reports from the North Aegean Sea since 1998 and investigated the dietry perences of 5 stranded specimen since 2002 with 8 of them being bottlenose dolphins and

common dolphins, 5 of them being harbour porpoises, 4 of them striped dolphins and only one Risso's dolphins. Additionally, Öztürk et al. (2013) collected oppurtunistic reports on sperm whales between 1994 and 2012 in the Aegean and Turkish Mediterranean Sea and reported 43 encounters in total, including reports from the North Aegean Sea (Gökçeada). Later, he focused on the small cetacean distribution in the Aegean and Turkish Mediterranean Sea and reported sightings of 11 cetacean species (Öztürk et al. 2014).

LONG LIVE DOLPHINS BY WWF-TURKEY

WWF-Turkey ran two photo identification projects in 2013; Dilek Peninsula Protected Area, Central Aegean Sea and Kaş Kekova Specially Protected Area, Mediterranean Sea. They have conducted 20 days of survey effort in the Dilek Peninsula between January and May, of which nine of them were boat-based and 11 of them were from land. Overall, they have identified five individual dolphins within the Dilek Peninsula and received one stranding report of a common dolphin.

PROJECT OBJECTIVE

The project objective is to establish the very first seasonal cetacean monitoring project within the Turkish territorial waters of Central Aegean Sea, which will allow an assessment of species distribution and abundance throughout each season of the year. The decline and fragmentation of the sightings rates of endangered common dolphins in the Mediterranean Sea is a cause for concern as it can indicate a reduction in population size. By targeting common dolphins in the species range of the project, we will start to assess the population within the Central Aegean Sea over seasons and years. Theore, our understanding of population size of common dolphins and bottlenose dolphins, their seasonal encounter rates, movement and residency patterns will be greatly enhanced, as well as our understanding of habitat usage and major threats will be identified, allowing subsequent management plans for the area to be developed. The same project will also carry out conservation actions by using the survey vessel as an education platform for different age and culture groups.

METHODS

STUDY AREA

The Aegean Sea is the connection corridor between the Mediterranean and Black Sea through the Turkish Strait System. Whilst it has a 320 nm in length, its narrowest point is betwen Çeşme,Turkey and Euboea in Greece which is 75nm (Öztürk et al. 2002). The region holds over 3,000 island and islets, and hosts significant habitats for marine biodiversity (Coll et al. 2010). Along the Turkish Aegean coast, there are eight Marine and Coastal Protected Areas, five of them being Special Environmental Protection Areas (SEPA), two of them being National Park (NP)and one Nature Parks (NAP) (Güçlüsoy 2015).

Dilek Peninsula falls under the National Park (NP) protection status and was the first declared protected area in 1966, with the addition of the Great Menderes Delta in 1994 by the Ministry of Environment and Forestry (Çelik et al. 2003; Kılıçaslan et al. 2011). The national park is 276.75 km^2 and the peninsula itself consists of 110km^2 with 61 km of coastline. The NP includes forest, coastline and intertidal zones. Dilek Peninsula takes its name from Mount Dilek (Mycale) that reaches 1237 m height. The peninsula also holds one of the narrowest straits (the Dilek strait) in the Aegean Sea being only 1.6km wide at its narrowest point.

Dilek Peninsula holds 28 mammal species, 42 reptiles and 250 bird species in its protected area zones (Kaboğlu et al. 2005). Due to its high biodiversity, the area is also protected under the Ramsar, Bern, Rio and Barcelona conventions and consists of an Important Bird Area, an Important Flora Area and an Important Mammal Area. The protected area has a management plan yet the marine area coverage is unknown and very little has been done to strenghten the protection of its marine environment up until now (Güçlüsoy 2015).

The current project focuses on the territorial waters of Turkey within the Dilek Peninsula. The study area covers only coastal waters up to 200m depth (Figure 1).

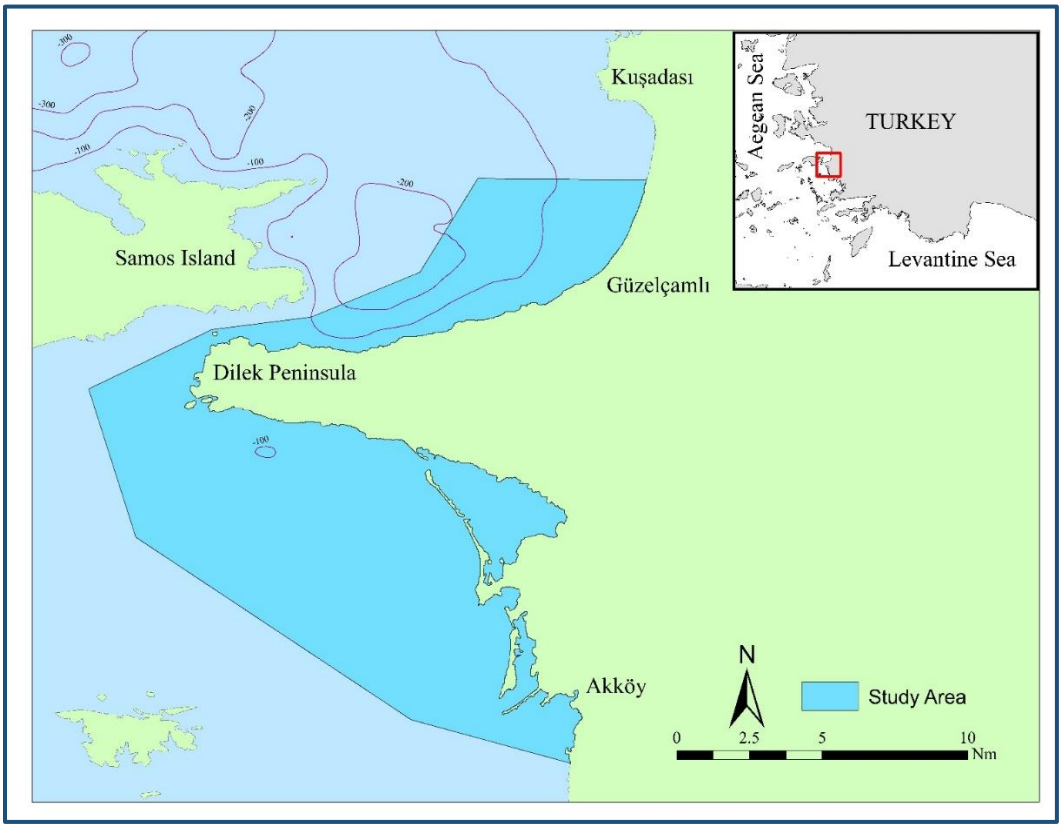

Figure 1. Study Area in the Dilek Peninsula National Park

SURVEY PROTOCOL

Boat surveys will be conducted for summer and autumn of 2019 and winter and spring if 2020. Depending on the weather, the surveys will be carried out over a minimum period of 3 days surveying various routes in each season. Surveys will start at sunrise and continue until there is no more adequate light. The research vessel will sail along the transect lines at a speed of approximately 4 knots. The data logging software 'Logger 2000' will run continuously on a PC linked to a GPS, independent of the research vessel's navigation system to record the followed route. Additionally, Logger 2000 will be used to record the survey effort and environmental conditions on an hourly basis and whenever conditions change. Recorded environmental conditions will consist 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 will be recorded every five minutes following focal group scan sampling protocol and marine debris, marine traffic and fishery practices will also be recorded both in the presence and absence of cetaceans to document the anthropogenic pressures in the area.

VISUAL SURVEYS

The double platform technique will be used to collect the visual data. On each platform, there will be 3 observers. The rota of the survey team is planned in advance with hourly rotation. The team responsibilities are data logger, observers with binoculars, observer with naked eye, photographer, acoustician and video documenter. Whilst the starboard and port observers are primarily responsible for conducting the sightings, the observer situated in the center is responsible for recording data in Logger 2010. The lower platform observers are responsible for scanning the surrounding area with the naked eye up to 500 m, the upper platform observers will use reticular binoculars to scan beyond 500 m. The boat will approach the focal cetacean group to obtain an accurate data set and photographs of the focal group. Approach will only occur from the side or rear, with idle speed when possible, and the group will be followed from a minimum distance of 100 m, unless the focal group approach to the boat. If the animals happen to move within very close proximity of the boat, the speed of the research vessel will be reduced gradually in accordance. Any changes in the swimming direction of cetaceans due to the presence of the research vessel itself will be recorded in order to measure the influence of research vessel. Observers will report identified species, group size, sub-adult number, behavior, group cohesion, focal group angle to the north, their estimated distance and any human impact to the data logger.

ACOUSTIC SURVEYS

Acoustic surveys will be performed at the same time as the visual survey effort. Two minutes of acoustic recordings will be taken at each 15minute interval (speed of 4 knots) and six minutes of recording will be taken at the start of each hour (speed of <2knots). Any type of anthropogenic and environmental noise will also be recorded every 15 minutes. Acoustic efforts will be recorded using PamGuard Software, Version 1.15.15 Core (www.pamguard.org). The hydrophone array consists of four omni-directional broadband hydrophone elements for high and low frequency monitoring deployed at the end of a 200m cable. The hydrophone elements have a frequency range between 10Hz and 200kHz and the acoustic signal is digitised using a Behringer U-Phoria UMC404HD sound card sampling up to 192 kHz.

PHOTO IDENTIFICATION

The photographic images of the animals captured during surveys will be analysed after each trip through the use of Discovery software. The observer on the lower platform will take images of the dorsal fins. Photographs will be taken using a Canon 7D 70-300mm focal length zoom lens, with stabilisers. In an attempt to photograph all individuals within the group, numerous images of both sides will be captured with care taken to avoid bias towards distinctive individuals.

Photographs will be cropped around the fin and graded 1 to 3 for image quality based on the following criteria (Whitehead et al. 1997; Ingram et al. 2003);

- 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 are graded, only Grade 1 and 2 photos will be involved in the secound step, distinctiveness (Whitehead et al. 1997; Ingram et al. 2003):

- 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.

And only individuals with Distinctiveness Grade 1 and 2 will be utilised in the matching step. Each individual will either be matched with the individuals in the photo-ID catalogue or will be entered as a new individual. Following matching, additional information will be added to the database, this includes survey effort and sightings data (environmental conditions, geographical coordinates and behaviour). Lastly, each matched individual will be

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.

EXPECTED RESULTS

The project aims to reach several research and conservation goals;

1. Delineate the species critical habitats within the Dilek Peninsula PA where until now there is almost no marine based research.
2. Assess the encounter rates and residency and movement patterns of each species
3. Assess the population size at a species level
4. Identify the main threats to the species within the PA boundaries
5. Investigate the effect of fisheries and marine traffic on the behavioural patterns of dolphins
6. Create the first online photo-identification catalogue of dolphins and share it with public to support the citizenscience activities
7. Use the boat as an education platform to increase the awareness of keystone species within the protected area
8. Increase the knowledge surrounding marine mammals within the Dilek Peninsula and share it with the decision makers for the goal of its inclusion into the existing management plan!

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