

RESEARCH ARTICLE

**Stranding records of sperm whale
(*Physeter macrocephalus*) on the Turkish coast in 2019-
2020 with a note on the opportunistic sampling of
stomach content**

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Abstract

Three sperm whale (*Physeter macrocephalus*) strandings are reported from the Turkish Mediterranean coast between 2019 and 2020. The first individual was a juvenile found in July 2019 near Fethiye, in the west. The second individual, a neonate, stranded in Adana in the east, on 10 August 2020. The third case, a sub-adult/adult, stranded on the beach of Antalya, in the west on 14 August 2020. It was buried on the beach and excavated about two months later. During the excavation, a hard plastic food container was found, which contained cephalopod beaks and other plastics providing an opportunity for partial stomach content analysis. A total of 60 lower beaks were identified belonging to eight species. Umbrella squid *Histioteuthis bonnellii* was dominant, representing 30% of beaks encountered. Dry total weight of four plastics (hard plastic container, nylon bag, 1.5L PET bottle and packaging item) was 197.2 g. This opportunistic sampling allowed us to collect information on the stomach contents of this creature, which is rarely stranded on the Turkish and eastern Mediterranean coasts. Dietary studies on stranded marine animals are of great importance in monitoring environmental plastic levels and impacts on wildlife in this region. In the last 50 years, six sperm whales stranded on the Turkish coasts, five of them in the eastern Mediterranean Sea, which implies that this area is probably close to sperm whale habitats. Improvement of the stranding network as well as surveys for the distribution and abundance of this species to elaborate and implement effective conservation measures are recommended.

Keywords: Sperm whale, cetacean stranding, stomach content, plastics, eastern Mediterranean Sea, Levantine Sea

Received: 17.08.2021, **Accepted:** 15.10.2021

Introduction

The sperm whale (*Physeter macrocephalus*) is a cosmopolitan species and known to occur in the Mediterranean Sea, which includes the Turkish waters of the Aegean and the Levantine Sea (Öztürk 1996). Sperm whales prefer deep seas off the continental slope with rich resources of mesopelagic cephalopods, as well as deeper offshore waters of the Mediterranean Sea (Notarbartolo di Sciara and Birkun 2010). Endangered Mediterranean sperm whales, which are estimated to comprise around 1800 individuals, are genetically differentiated and constitute a separate subpopulation (Notarbartolo di Sciara *et al.* 2012; Lewis *et al.* 2018).

In the eastern Mediterranean, sperm whales are most commonly recorded in the Ionian Sea and along the Hellenic Trench from the northern Ionian Sea to the western Levantine Sea, including the Anatolian submarine canyons around the Rhodes Basin and from Rhodes to Cyprus (Öztürk *et al.* 2013; Frantzis *et al.* 2014, 2019; Lewis *et al.* 2018). Around the 1000 m depth contour, a pronounced peak in sperm whale density was discovered along the Hellenic Trench (Frantzis *et al.* 2014), in the western part of this study area. In addition, sightings and acoustic detections have been reported in the Aegean Sea (Frantzis 2009, Öztürk *et al.* 2013; Ryan *et al.* 2014; Kesici *et al.* 2021).

Every cetacean stranding event should be considered a potentially unique opportunity to learn something, especially in the case of scarce and threatened species. Besides the utility of monitoring and systematic recording of stranded cetaceans to understand their distribution and threats, there may be opportunities to provide for the welfare and rehabilitation of live animals, minimize risk to public health and safety, support scientific investigation, and advance public education (Perrin and Geraci 2009).

As a historical record, in Turkish seas, Toynebee (1985) reported the oldest specimen of a 45-foot (13.7m)-long whale in Istanbul in the late Roman period (AD 556c.), which was possibly identified as a sperm whale by Kinzelbach (1986). In the last 50 years, three sperm whale have been reported in the Turkish coast. A single stranding was reported in Karataş, Adana in 1972 on the eastern part of Turkey's Mediterranean coast. The skeleton of this individual has been displayed at the Natural History and Application Centre, Ege University, Izmir (Öztürk 1996; Redman 2014). Another stranded sperm whale was found in Seferihisar on the central Aegean Sea coast in 1990 (Öztürk and Öztürk 1998). After 20 years, another animal stranded in Arsuç, Iskenderun, in 2017 on the eastern Mediterranean coast (Anonymous 2017) (Figure 1).

The aim of this study is to report the most recent (2019-2020) cases of strandings of sperm whales on the Turkish coast, to provide additional information on the presence of the species. Besides, opportunistic sampling of partial stomach content analysis was made on one of them to understand the feeding preference and plastic occurrences for this species in the eastern Mediterranean.

Materials and Methods

Stranding data of sperm whales were collected from media and through the Turkish Marine Research Foundation (TUDAV) Cetacean Stranding Network between 2019 and 2020 (Figure 1). Decomposition codes (DC) were given according to Rowles *et al.* (2001). Life stages are classified according to Jefferson *et al.* (2015).

Cephalopod beaks found in the partial stomach content of a stranded sperm whale were identified, according to Clarke (1986), Lu and Ickeringill (2002), Xavier and Chérel (2009), Salman and Çelik (2017). All the beaks were collected and stored in 70% ethanol. The size and colour of the ingested plastics were reported following the standardized protocol by Provencher *et al.* (2017).

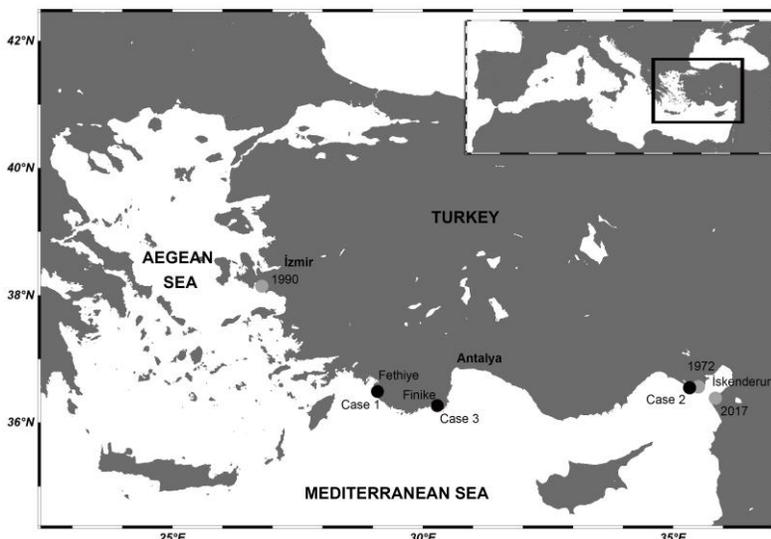


Figure 1. Location of sperm whale strandings in Turkish waters between 1972-2021. Cases 1-3 refer to those mentioned in the current study, other historical strandings are referred to by year and grey dots.

Result

Three sperm whale strandings are reported in this study;

Case 1

The carcass of an individual was seen floating on 8 July 2019 and stranded two days later in Kıdrak Bay, Ölüdeniz, Fethiye (Figure 1). It was identified as a juvenile based on the body length, approximately 590cm and DC was 3 (Figure 2A). Later it was buried at the beach by the municipality with no opportunity for post-mortem or sampling.

Case 2

Another juvenile individual was found stranded dead near the month of the Ceyhan River, Karataş, Adana, on 10 August 2020 (Figures 1, 2B). It can be considered a neonate because no teeth were visible on the lower jaw, and as it has folds on the body and the body length was around 4-5m. The DC was 2. Next day, the carcass drifted away and was not found.

Case 3

A subadult/adult whale (approximately 13-14m in body length, DC 4) stranded on the beach of Kumluca, Finike, Antalya, on 14 August 2020 and was buried by the local authorities because it was a public health issue (Figures 1, 2C). On 6 October 2020, the skeleton was excavated (Figure 2D), then transported to Istanbul, approximately 700km away, for preparing a skeleton for scientific studies.



Figure 2. Photos of stranding cases of sperm whales, A) Case 1, B) Case 2, C) Case 3 before burial, D) Case 3 during excavation.

During the excavation, we found a yellow plastic container where the carcass was buried (Figure 2D) It was assumed that the container was in the stomach of the specimen when buried, then appeared at the excavation after the soft tissues decomposed. This contained three further plastic debris items and 60 cephalopod beaks, all of which were well preserved and so retained opportunistically for stomach content analysis (Figures 3, 4).



Figure 3. Plastic debris found in the stomach content of the stranded sperm whale. The food container indicated with an arrow had cephalopod beaks and the other plastics inside.



Figure 4. A, B) Cephalopod beaks found in the plastic containers, C) the upper and lower beaks cleaned and separated in the lab.

The four plastics were carefully washed and dried. They were identified as a 5 L traditional Turkish cheese hard plastic container in yellow colour, piece of a black nylon bag, a 1.5 L PET water bottle and another unidentified white clear colour packaging item. The former three items were megaplastics (>100 mm) while the unidentified packaging item was macroplastic (>20–100 mm), according to Provencher *et al.* (2017). Their total dry weight was 197.2g.

A total of 60 lower beaks (Figure 4C) were examined and eight species were identified. *Histioteuthis bonnellii* was determined as the dominant species, representing 30% of the cephalopod beaks examined. (Table 1).

Table 1. Cephalopod species identified from lower beaks in the stomach content of the sperm whale stranded (Case 3) in Kumluca, Antalya.

*LRL lower rostral length of beaks, **ML: estimated mantle length of the cephalopod

Species	LRL* (mm)	N	% N Occurrence	Mean ML** (mm)
<i>Histioteuthis bonnellii</i>	6.5-13.8	18	30	204
<i>Histioteuthis reversa</i>	3.1-4.4	14	23	62
<i>Chiroteuthis verany</i>	7.0-11.5	10	17	251
<i>Octopoteuthis sicula</i>	11.8-14.9	9	15	235
<i>Ancistroteuthis lichtensteinii</i>	5.2-6.7	6	10	337
<i>Ancistrocheirus lesueurii</i>	5.2	1	2	170
<i>Pyroteuthis margaritifera</i>	1.0	1	2	39
<i>Brachiooteuthis riisei</i>	1.7	1	1	51
Total		60	100	

Discussion

In the last 50 years, six stranded sperm whales were reported in the Turkish waters, five of which were on the eastern Mediterranean Sea coast; from Fethiye-Finike in the west to Iskenderun in the east, which implies that this area is probably close to sperm whale habitats. In the eastern Mediterranean Sea, several sightings and acoustic detections have been reported (Boisseau *et al.* 2010; Dede *et al.* 2012; Ozturk *et al.* 2013; Ryan *et al.* 2014; Akkaya *et al.* 2020; Snape *et al.* 2020; ACCOBAMS 2021). Although these regions are not as well-known as the places where the species is observed more commonly, such as the Hellenic Trench (Frantzis *et al.* 2014, 2019), they are potentially important habitats for the Mediterranean sperm whale population. The calving season of the sperm whale is mid-summer in the Hellenic Trench (Frantzis *et al.* 2014), which supports our observation that one of the stranded animals was possibly a neonate.

Although the stomach content studies conducted in the eastern Mediterranean are few, the diet of the sperm whale in the western Mediterranean is well studied in general. It consists almost exclusively of cephalopods, with rare occurrences of fish and octopus (Roberts 2003; Mazzariol *et al.* 2011; Garibaldi and Podestà 2014; Rendell and Frantzis 2016; Foskolos *et al.* 2020). All the species detected in the hard plastic food container in the stomach of Case 3 are oceanic species, showing wide vertical distribution from shallow to deep seas and making diurnal migration from shallow to deep seas. Most of them (*Ancistrocheirus lesueurii*, *Chiroteuthis verany*, *Histioteuthis bonnellii*, *Histioteuthis reversa*, *Octopoteuthis sicula*, *Pyroteuthis margaritifera*) show bioluminescence properties. Roberts (2003), in the first study on the sperm whale stomach contents in the Aegean Sea, reported 2177 lower beaks in one stomach and identified all of the species that were found in the present study, except *Pyroteuthis margaritifera*. *Histioteuthis bonnellii* was also found to be the most common species in the stomach in the Roberts (2003) case. Foskolos *et al.* (2020) reported 18 prey species (17 cephalopods and one teleost) in the stomachs of nine individuals in Greek waters. Again *H. bonnellii* was the most important prey and *P. margaritifera* was found for the first time in the stomach content of sperm whale in the Mediterranean with the occurrence of 26%.

Compared to stomach content studies on other cetacean species in eastern part of Turkish Mediterranean waters, Öztürk *et al.* (2007) found that the Risso's dolphin, *Grampus griseus*, also preferred Histioteuthidae, but the striped dolphin, *Stenella coeruleoalba*, preferred *Abralia* spp., which are living near the surface, while Dede *et al.* (2016), reported that striped dolphins generally prefer the species of the Onychoteuthidae and Enopteuthidae.

Fewer beaks were collected in this study, compared to previous cases. The reason for this was that we were unable to examine the carcass in its fresh condition and thus the stomach was not intact due to decomposition. This opportunistic sampling, however, allowed us to examine the stomach contents of this creature, which rarely strand ashore on the Turkish coasts and eastern Mediterranean. This study contributes to the regional knowledge of the foraging preferences of sperm whales and the potential threats faced by ingestion of macroplastics. It was a unique case implying that special attention should be given to stomach content in this type of burial and excavation. Attention should be paid to all plastics that come out during excavation and should be examined one by one.

Occurrence of plastics in the stomachs of sperm whales has been reported widely (e.g. De Stephanis *et al.* 2013; Alexiadou *et al.* 2019). Macroplastics were found in the stomach content with the highest frequency in the sperm whales (60%) of Greek waters (Alexiadou *et al.* 2019). Moreover, sperm whales have one of the highest rates of plastic consumption in cetaceans (Poeta *et al.* 2017). Plastic pollution is one of the serious threats for the endangered Mediterranean subpopulation of sperm whales (Alexiadou *et al.* 2019), which also suffer from

bycatch, ship strikes, noise pollution from oil and gas exploration (Notarbartolo di Sciara *et al.* 2012). And as the Cilician Sea that runs between Cyprus and the Mediterranean coast of Turkey has been identified as a regional marine plastic hotspot, where plastic threats to marine megavertebrates may be particularly acute (Liubartseva *et al.* 2018; Duncan *et al.* 2019), dietary studies on stranded marine animals are of great importance in monitoring environmental plastic levels and impacts on wildlife in this region. It was not possible to understand the effects of plastics on the individual's health due to decomposition in Case 3. To better understand the causes of death and interpret the effects of marine litter ingestion on the animals' health, it is important to access stranded animals on time and carry out post-mortem studies by all means.

Two strandings were recorded near the Rhodes Basin and Anatolian Canyons which are deep-sea upwelling canyon zones providing feeding grounds for cetaceans (Öztürk *et al.* 2012). Four areas have been suggested as High Sea Marine Protected Areas (HSMPAs) in the eastern Mediterranean Sea by Öztürk (2009). One of them is between Rhodes and Finike where the most distinctive features are submarine canyons and the Finike (Anaximander) Mountains, which was declared as a Special Environment Protected Area (SEPA) since 2013 by Turkey. Besides, submarine canyons serve as feeding grounds and breeding sites for many migratory species, including many pelagic top predators (i.e. swordfish, tunas, tuna-like species, sharks, sea turtles and birds) (Simard and Würtz 2012). Further research in this important area is advised, as the existing SEPA can be expanded to encompass the whole canyon region. The strandings given here, sperm whale records and the occurrence of other cetaceans in the region (Boisseau *et al.* 2010; Dede *et al.* 2012; Ozturk *et al.* 2013; Ryan *et al.* 2014; Akkaya *et al.* 2020; Snape *et al.* 2020; ACCOBAMS 2021), suggest that more ship-based surveys, both visual and acoustic, and improvement of the stranding network are required in Turkish Mediterranean waters. This will enable more efficient marine spatial planning and MPA delineation, thus better prioritisation of conservation resources in the pursuit of a blue economy.

Acknowledgment

We would like to thank Kumluca Municipality for the logistic help during the excavation, Zeynep Gülenç, Beril Gül, Tancrede Barraud, Ömer Cem Aksüt for their help during the field study and Turkish Marine Research Foundation for their financial support. The authors are also grateful to reviewers who contributed greatly to the improvement of this paper.

Kaşalot balinalarının 2019-2020 yılları arasında Türkiye kıyılarında karaya vurma kayıtları ve fırsatçı örneklenen mide içeriği hakkında bir not

Öz

2019 ve 2021 yılları arasında Türkiye'nin Akdeniz kıyılarında karaya vuran üç kaşalot (İspermeçet) balinası bildirilmiştir. Genç olan ilk birey Temmuz 2019'da Fethiye'de Türkiye'nin batı kıyısında karaya vurmuştur. Yenidoğan ikinci birey, 10 Ağustos 2020 tarihinde Adana'da Türkiye'nin doğu kıyısında karaya vurmuştur. Yaklaşık erin veya yetişkin olan üçüncü birey ise, 14 Ağustos 2020'de Antalya'da Türkiye'nin batı kıyısında karaya vurmuştur. Gömülen balina, iki ay sonra gömüldüğü yerden çıkarılmıştır. Bu kazı sırasında, sert plastik yiyecek kabı içerisinde diğer plastikler ile birlikte kafadanbacaklı gagaları bulunmuş bu şekilde mide içeriğinin bir kısmının örnekleme fırsatı yakalanabilmiştir. Toplam 8 türe ait 60 alt gaga tespit edilmiştir. *Histioteuthis bonnellii* dominant tür olarak gözlenmiş olup elde edilebilen mide içeriğinin %30'luk kısmını oluşturmuştur. Dört plastik parçanın (sert plastik kap, naylon poşet, 1.5L PET şişe ve plastik ambalaj) kuru toplam ağırlığı 197.2g olarak kaydedildi. Tüm mide içeriği örneklenememiş olsa da bulgular Türkiye denizlerinde ve Akdeniz'in doğusunda nadiren karaya vuran bu türün mide içeriği konusunda fikir vermektedir. Karaya vuran deniz hayvanları üzerinde yapılan diyet çalışmaları, bölgedeki çevresel plastik seviyelerinin ve yaban hayatı üzerindeki etkilerin izlenmesinde büyük önem taşımaktadır. Son 50 yılda, Türkiye sularında, karaya vuran altı kaşalotun beşinin doğu Akdeniz kıyılarında kaydedilmesi ihtimalle bu bölgelerin kaşalot balinalarının habitatlarına yakın olduğunu göstermektedir. Etkili koruma önlemlerinin oluşturulması ve uygulanması için türün dağılımı ve bolluğu hakkında araştırmaların artırılmasının yanı sıra karaya vurma ağının iyileştirilmesi tavsiye edilmektedir.

Anahtar kelimeler: İspermeçet balinası, setase karaya vurma, mide içeriği, plastikler, Akdeniz, Doğu Akdeniz

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