

RESEARCH ARTICLE

Stranding records of Mediterranean monk seal *Monachus monachus* (Hermann, 1779) on the Aegean and Mediterranean Sea coasts of Turkey between 2012 and 2018

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Abstract

The Mediterranean monk seal, *Monachus monachus* (Hermann, 1779), is an endangered species according to International Union for the Conservation of Nature (IUCN) Red List. Therefore it is of high importance to monitor mortality/survival of all individuals to ensure the sustainability of the population. Eighteen monk seals were found dead on the Turkish coasts of the Aegean and Mediterranean Seas between February 2012 and April 2018. This paper reviews those strandings during the seven-year period with the preliminary necropsy findings of three new records; a female pup found in Antalya on 25 November 2017, an adult female found in Muğla on 7 March 2018, and an adult female stranded on 16 April 2018 on the coast of İzmir. There are various illness causes, virological, parasitological, or microbiological, which effect monk seals, thus systematic necropsies must be performed as soon as possible on carcasses.

Keywords: *Monachus monachus*, species protection, stranding network, Turkish coasts

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Introduction

The Mediterranean monk seal, *Monachus monachus* (Hermann 1779), historically observed throughout the Mediterranean including the Marmara and Black Sea coasts of Turkey, are mostly observed on the Aegean and

Mediterranean coasts in more recent time, while some seals have still been occasionally spotted in the Marmara and Black Sea (Dede *et al.* 2015). Monk seals are one of the endangered marine mammal species according to IUCN Red List (Karamanlidis and Dendrinis 2015). The number of identified seals in the northeastern Mediterranean Sea was given as 42 by Gücü *et al.* (2009). It is estimated that there are about 350-450 individuals in the eastern Mediterranean Sea (Karamanlidis and Dendrinis 2015). The world population, including those in the Atlantic Ocean, has been estimated as less than 700 individuals (Karamanlidis *et al.* 2015). Pollution, overfishing, bacterial, fungal and viral infectious diseases are main reasons to have caused the decline of the population (Öztürk 1992; Androukaki *et al.* 1999).

Besides, fishermen and fish farmers use various ways to keep seals away from fishing cages and nets, such as using lights, feeding with pesticide-injected fish, noise generation, warning and direct shots with rifles and physical exclusion of seals (Güçlüsoy and Savaş 2003). Deliberate killing, entanglement in fishing gear, loss of suitable habitats, poor nutritional condition and reduced fecundity are also the main threats of the monk seal population (Dede *et al.* 2015).

Since 1994 till 2014, 32 entanglement and 49 deliberate killing cases were reported (Güçlüsoy *et al.* 2004; Öztürk 2007; Danyer *et al.* 2013a, b; 2014). As it is not always possible to reach the stranding sites, the reports in media such as newspaper, TV, and online news, can be used as a source of the information to estimate mortality.

It is well known that the cause of strandings is not related only to human interactions, but also to natural factors. In wild animals, one of the main causes for death is parasitological disease. Parasites can be found even in a highly decomposed carcass. Parasitic prophylaxis is one of the first steps in rescuing monk seals, thus every piece of information is vital for developing such procedure. In this paper the stranding records of 18 individuals of the Mediterranean monk seal are summarized.

Materials and Methods

The information of stranding date, location, decomposition code, growth, sex, total body length in cm, potential cause of death were collected. Decomposition codes were determined according to Rowles *et al.* (2001).

Necropsies were performed on three individuals (Nos. 12, 16, 17 in Table 1) following the guidelines of Jauniaux *et al.* (2009). Pathological, parasitological, virological and life history samples were collected from the individuals which were not at the advanced stage of decomposition (Nos. 4, 5, 12, 16 in Table 1). Parasitological examination and specimen collection was

done according to Dailey (2001). Nematodes and cestodes were fixed and preserved in 70% ethanol or alcohol–formalin–acetic acid solution (AFA).

Results

Information of monk seal strandings found in media such as TV, online news, and newspapers, as well as the most recent ones reported in this study are summarized in Table 1 and their locations are shown in Figure 1. The available photos of these individuals are compiled in Figure 2.

Table 1. Strandings of the Mediterranean monk seals on the Turkish coast (2012-2018)

No	Date	Location	Dec. Code [#]	Growth stage	Sex	Body Length (cm)	Nutritive Condition	Potential cause of death
1	21.02.2012	İzmir/Mordoğan ¹	3	Pup	-	130	Good	Unk.
2	05.12.2012	Hatay/Meydan Köyü ²	3	Juvenile	F	-	Moderate	D.K.
3	30.04.2013	Antalya/Alanya ^{3*}	3	Adult	M	238	Moderate	D.K.
4	15.08.2013	Antalya/Gazipaşa ^{2*}	3	Adult	F	229	Poor	Nat.
5	28.02.2014	Mersin/ Yeşilovacık ^{4*}	2	Pup	M	123	Poor	Nat.
6	03.03.2014	Mersin/ Yeşilovacık ⁵	2	Pup	-	-	Poor	Unk.
7	17.04.2014	Aydın/Kuşadası ⁶	4	Adult	-	-	Moderate	Unk.
8	10.12.2015	Antalya/Kemer ⁷	4	Pup	-	-	Moderate	Unk.
9	14.04.2016	Bodrum/Salih Ad. ⁸	4	Juvenile	-	-	Good	Unk.
10	26.09.2016	Antalya/Gazipaşa ⁹	3	Pup	-	-	Moderate	Unk.
11	07.01.2017	Antalya/Alanya ¹⁰	4	Juvenile	-	-	Moderate	Unk.
12	25.11.2017	Antalya/Kaleiçi ^{11*}	3	Pup	F	124	Moderate	Nat.
13	26.11.2017	Antalya/Kaleiçi ¹²	3	Pup	-	-	Moderate	Unk.
14	01.02.2018	İzmir/Karaburun ¹³	3	Pup	F	150	Poor	Unk.
15	02.04.2018	Mersin/Anamur/Pullu ¹⁴	3	Juvenile	-	-	Moderate	Unk.
16	07.03.2018	Muğla/Datça ^{15*}	3	Adult	F	240	Moderate	Nat.
17	16.04.2018	İzmir/Seferihisar ^{16*}	2	Adult	F	227	Poor	Nat.
18	16.04.2018	Muğla/Akyaka ¹⁷	4	Adult	-	226	Poor	Unk.

Decomposition Code[#]: 2 Freshly dead, 3 Moderate decomposition, 4 Advanced decomposition, 5 Severe decomposition (Rowles *et al.* 2001).

Source: 1. Karaburun Kent Konseyi 2012, 2. Danyer *et al.* 2013a, 3. Danyer *et al.* 2013b, 4. Danyer *et al.* 2014, 5. Mynet 2014, 6. Haberturk 2014, 7. Akdeniz Gazetesi 2015, 8. Milliyet 2016, 9. İHA 2016, 10. Milliyet 2017, 11. Present study, 12. Hurriyet 2018, 13. CNN TÜRK 2018, 14. Mynet 2018, 15. Present study, 16. Present study, 17. Sabah 2018.

*: Necropsy was made.

D.K. Deliberate killing, Nat: Natural, Unk.: Unknown

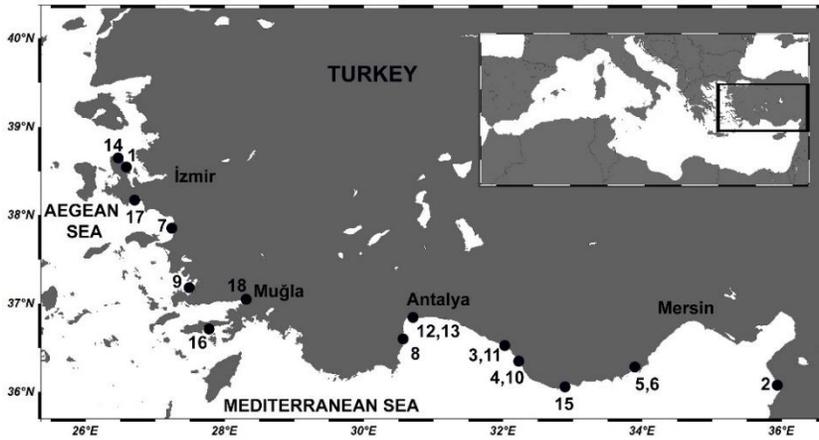


Figure 1. Locations of the Mediterranean monk seal strandings between 2012 and 2018. See Table 1 for the numbers.

It was found that 33.3% of the strandings occurred in April. The decomposition code 2 (freshly dead) was recorded only in 16% of the carcasses. Concerning growth stage, 44.4% were pup, 22.2% juvenile, 33.3% adult. As for the area, 38.9 % of the strandings were found in Antalya. Only 11.1% were determined as in good nutritive condition. The cause of death for totally 61 % was unknown due to advanced stage of decomposition, while 11.1% of the stranded seals were deliberately killed.

First Necropsy

The first necropsy (Figure 3; No.12 in Table 1) was carried out on 27 November 2017 at Fisheries Faculty, Akdeniz University. Until necropsy, the carcass was preserved in the deep freezer at -20°C. Consequently, it was not possible to make detailed pathological examination. Body length was 124 cm from nose to hind flipper end and 113 cm from nose to tail end. Body weight was 24.5 kg and the blubber thickness was 1.3 cm. The second left incisive tooth was visible. Based on the findings, the seal was estimated to be less than 3 months old. Some skin lesions were found around the head and flippers, which might be caused by nets. Its stomach was empty and the intestinal content was milky. All the organs were examined for parasites and heavy nematode infestation was observed in the intestines.

On 26 November 2017, another stranded pup was reported from the same area (No.13 in Table 1, Figure 2). Based on the photos obtained from the media, the pup was similar in age and size with the first stranding described above. For the concern of public health, local municipality buried the carcass. Therefore, necropsy was not carried out.



Figure 2. Photographs of the stranded individuals of the Mediterranean monk seal (2012-2018). Numbers refer to Table 1. (All photos taken from the sources shown in Table 1.)



Figure 3. First necropsy on a female pup (No.12 in Table 1).

Second Necropsy

The second necropsy was performed on a stranded seal (Figure 4; No. 16 in Table 1) on 9 March 2018 in Datça. Body length was 240 cm from nose to hind flipper end, the body weight was approximately 100-150 kg, and the blubber thickness was 2.8 cm. In the external examination, scratches made by rocks on the dorsal part and hemorrhagic areas around the genital aperture and around the head were observed. Gums of teeth were massively eroded and gingivitis was observed. It was not possible to perform a detailed necropsy due to its advance decomposition, however, in the stomach a piece (approx. 40 cm²) of fishing net was found. Ulcerative and hemorrhagic areas were also observed in the stomach mucosa. In the parasitological examination, cestodes were found in the intestines. The stomach was clean of parasites.



Figure 4. Second necropsied (No.16 in Table 1), female adult monk seal
(Photo: İlker Curacı)

Third Necropsy

The third necropsy (Figure 5; No. 17 in Table 1) was performed on 16 April 2018 at Veterinary Faculty, Adnan Menderes University. Municipality of Seferihisar preserved the carcass until necropsy. Body length was 227 cm from nose to hind flipper end, 201 cm from nose to tail end. Chest girth was 84 cm around axillary lines, body weight was approximately 150 kg and blubber thickness was 0.5 cm. The animal was cachectic, and her nutritive condition was poor. Lungs were hemorrhagic due to the massive mite infestation. Moreover, cestode and nematode infestation in the stomach, cestode, nematode and acanthocephalan infestation in the intestines were observed in the necropsy.

On the same day, another monk seal was washed up in Akyaka, Muğla (No.18 in Table 1 and Figure 2). However, the individual was not examined due to the advanced stage of decomposition (Decompositon Code: 4).



Figure 5. The third necropsied adult female monk seal (No.17 in Table 1)

Discussion

Parasitic diseases have been recognized as causing or being related to significant morbidity and mortalities in pinnipeds, especially in free-ranging populations (Lee Miller *et al.* 2001). Hookworms are one of those parasites and probably affect pinniped populations since they infect high numbers of individuals and may increase mortality rates (Acevedo-Whitehouse *et al.* 2009). Previously *Uncinaria* sp. had been reported from the Mediterranean monk seals (Castinel *et al.* 2006; Nadler *et al.* 2013; Ramos *et al.* 2013). Larval and adult forms of *Anisakis* sp. were seen together in the stomach and intestine. Anemia, diarrhea, gastritis, ulcerative lesions, enteritis, dehydration can be observed (Dailey 2001). *Diphyllobothrium* sp. is frequently reported from captive pinnipeds and can make pathogenic effects (Dailey 2001). In the starting of a rehabilitation program, *Diphyllobothrium* sp. can be treated prophylactically with praziquantel and hookworms can be treated with

fenbendazole (Dailey 2001). Monk seal rehabilitation is not a common practice with an established protocol, thus medication dosage must be decided carefully. Parasites which were found in our researches should be examined in detail to reveal their roles on the monk seal mortality.

Monk seals can be unknown reservoirs of some zoonotic diseases (especially vector-borne diseases) and can contaminate terrestrial animals which contact with carcasses. Detailed necropsies on the monk seals carcasses to understand the pathological characteristics should be performed as soon as possible for public health, both for humans and terrestrial animals. Besides, further studies on the monk seal parasites are needed to develop possible anthelmintic usage strategies in rehabilitation programs.

No evidence of deliberate killing was observed in the postmortem examination of three individuals in the last three necropsies although the first stranded seal (No. 12) had possible net marks. Besides, two of 18 stranded seals were deliberately killed. The number of such human-related cases can be increased by reaching more animals. Deliberate killing is one of the most significant factors for the decrease of the population according to Karamanlidis and Dendrinis (2015), which is also supported by our findings.

In this study, we were able to reach only eight carcasses out of 18. For more detailed studies, it is crucial to find fresh carcasses, ensuring the collection of all necessary samples, which will help to accurately determine the cause of death. In this way, factors affecting the incidence, morbidity and mortality of monk seals can be further assessed. To make this possible, strengthening the stranding networks and raising public awareness is essential. Results of necropsies, such as this paper, as well as the details of rehabilitation process must be clearly documented using the standard protocol, so that all experts in this field can use the information more easily and concisely to ensure the existence of the endangered Mediterranean monk seals.

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2012 – 2018 arasında Türkiye kıyılarında Akdeniz Foku *Monachus monachus* (Hermann, 1779) karaya vurma kayıtları

Öz

Akdeniz Foku *Monachus monachus* (Hermann, 1779) Uluslararası Doğayı Koruma Birliği (IUCN) kırmızı listesine göre dünyada nesli tehlikede olan türlerden biridir. Türkiye'nin Akdeniz ve Ege kıyılarında, Şubat 2012 ve Nisan 2018 tarihleri arasında karaya vuran 18 Akdeniz fokü rapor edilmiştir. Bu çalışma; 2012-2018 yılları arasında karaya vuran Akdeniz fokülerindeki bulguları 25 Kasım 2017'de Antalya'da bulunan dişi yavru, 07 Mart 2018'de Muğla'da bulunan yetişkin dişi ve 16 Nisan 2018'de İzmir'de bulunan yetişkin dişi olmak üzere üç bireyin ilk nekropsi bulguları ile özetlemektedir. Akdeniz fokü ölümleri virolojik, parazitolojik ve mikrobiyolojik çeşitli sebeplerle oluşabilmektedir. Bu sebeple mümkün olan en çabuk şekilde nekropsi gerçekleştirilmelidir.

Anahtar kelimeler: *Monachus monachus*, tür koruma, karaya vurma ağı, Türkiye kıyıları

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