

RESEARCH ARTICLE

Sightings of small delphinids in the southern Çandarlı Bay (Aegean Sea) between 2015 and 2018

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Abstract

This study was performed in the southern part of Çandarlı Bay between May 2015 and May 2018. The aim of the research was to determine the existing cetacean species and their distribution. Cetacean monitoring surveys were conducted biannually for three years, and the presence of bottlenose dolphin *Tursiops truncatus* and common dolphin *Delphinus delphis* were detected by visual observations. Total encounter rate of delphinids in the study was 1.7567 sightings per100 km. The main reason for such a low encounter rate is considered as that the study area is in an industrial zone.

Keywords: Cetacean, monitoring, encounter rate, bottlenose dolphin, common dolphin

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Introduction

In the Aegean Sea, nine cetacean species are known to occur. These include *Balaenoptera physalus* L., 1758, *Physeter macrocephalus* L., 1758, *Ziphius cavirostris* Cuvier, 1823, *Tursiops truncatus* (Montagu, 1821), *Stenella coeruleoalba* (Meyen, 1833), *Delphinus delphis* L., 1758, *Grampus griseus* (G. Cuvier, 1812), *Pseudorca crassidens* (Owen, 1846) and *Phocoena phocoena* (L., 1758). All these species are protected according to respective Turkish legislation (Güçlüsoy *et al.* 2014).

The majority of these occurrences were mainly obtained from stranding events during last four decades. For example, Öztürk and Öztürk (1998) reported 23 cetacean strandings in the Aegean and Mediterranean coasts of Turkey during 1990-1997. Güçlüsoy and Cirik (2007) also reported 20 stranding incidents from 2001 to 2003 in the Aegean Sea, including four strandings of the sperm whale. Further information can be reached from intensive review regarding the Aegean cetacean fauna that was authored by Tonay *et al.* (2015).

Among these identified species, only three small delphinid species, that is, bottlenose dolphin *T. truncatus*, striped dolphin *S. coeruleoalba*, and common dolphin *D. delphis* were reported to have occurred in the central Turkish Aegean Sea (Güçlüsoy *et al.* 2004, 2005; Enül *et al.* 2009). In fact, these species are distributed throughout the Mediterranean Sea; *T. truncatus* mainly in coastal waters and the other two species mainly in pelagic waters (Notarbartolo di Sciara and Birkun 2010). Furthermore, Alan (2015) reported that there is a resident population of *T. truncatus* with ~141 individuals in the outer part of İzmir Bay.

The present study was conducted as part of the biodiversity monitoring programme for the STAR Refinery between 2015 and 2018 in the southern part of Çandarlı Bay. It aimed to assess the presence of cetaceans, to confirm the information provided in the Environmental Social Impact Assessment Report which indicated that *T. truncatus*, *S. coeruleoalba*, and *D. delphis* are potentially present in the study area.

Materials and Methods

The study area (Figure 1) that circumscribes Nemrut Bay (STAR Refinery location) with 8-km zone is already strongly exposed to human activities and modified by coastal infrastructures. The study was carried out twice a year, in total six times. The survey dates, distance scanned and research vessels mobilized are given in Table 1. The technical specifications of research vessels are as follows: R/V K. Piri Reis: 36 m length, 8.5 m width, 630 HP diesel engine. R/V Dokuz Eylül 3: 19.9 m length, 5.9 m width, 462 HP diesel engine.

Table 1. Dates, scanned distance and marine R/V mobilized for six surveys in this study

Survey #	Date	Scanned Distance (km)	Marine R/V mobilized
1	16 June 2015	48.0	Outsourced
2	14 December 2015	81.0	R/V Dokuz Eylül 3
3	26 June 2016	83.6	R/V Dokuz Eylül 3
4	15 December 2016	78.6	R/V K. Piri Reis
5	3 June 2017	81.5	R/V K. Piri Reis
6	6 February 2018	82.7	R/V K. Piri Reis

During the study period, data were collected based on the distance sampling method (Buckland *et al.* 1993). The visual line transect sampling on deck was used. Effort was continued in connection lines between parallel two line transects. The proposed wind strength should not be more than Beaufort 3 (e.g. Jefferson and Leatherwood 1997) for this method. The same line transects were followed for all six surveys in the study area presented in Figure 1. This method enables the evaluation of the encounter density as well as to assess the presence of populations of cetacean species. Two observers were located on the deck of the marine research vessel with a cruising speed of 10 knots to scan port and starboard sides of the line by means of binoculars and range-finder (Nikon Laser 1200S; 7x25) to record encounters. Observation time, location (latitude and longitude), size of observed group (close encounters of dolphin clusters/individuals of same species were considered as a group), species, photographs if available were recorded, as well (Alan *et al.* 2014).

Since the monitoring effort was not sufficient to estimate the dolphin population, only encounter rates were determined. The encounter rates were calculated as sightings per unit effort. The calculation was made according to the ratio n/L , where n is the total number of sightings and L is the total number of kilometres spent on & off effort (Buckland *et al.* 1993). This was also normalized per 100 km for number of sightings.

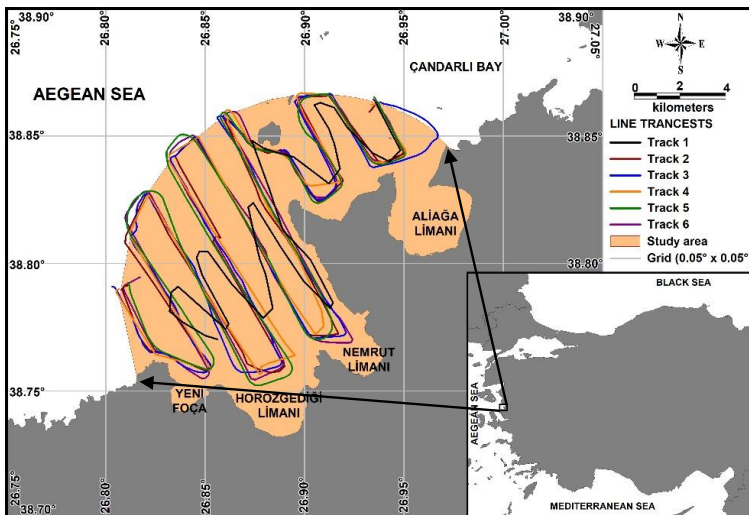


Figure 1. The study area and line transects for the Cetacean survey

Finally, opportunistic cetacean sightings were also recorded during the other activities of the biodiversity monitoring programme.

Results

Cetacean surveys

As shown in the Table 1, six dedicated surveys for the cetacean monitoring were performed during present research. Among these, *T. truncatus*, and *D. delphis* were detected in four surveys (Table 2 and Figures 2 and 3).

Table 2. The encounter details of cetacean surveys from May 2015 to February 2018 (TT: *Tursiops truncatus*, DD: *Delphinus delphis*)

Survey #	Sighting #	Longitude N	Latitude E	Species	Group Size*	Time At First Encounter
2	1	38.8020	26.8392	TT	3	8:27
	2	38.7995	26.8412	TT		
	3	38.8405	26.9424	TT	7	12:12
	4	38.8424	26.9478	TT		
	5	38.8499	26.9461	TT		
3	6	38.8237	26.8446	TT	4	8:58
5	7	38.7691	26.8198	TT	1	7:14
6	8	38.7750	26.8583	DD	4	12:26

Survey # indicated in Table 1.

*Cetaceans sighted in a short period are considered to be from the same group.

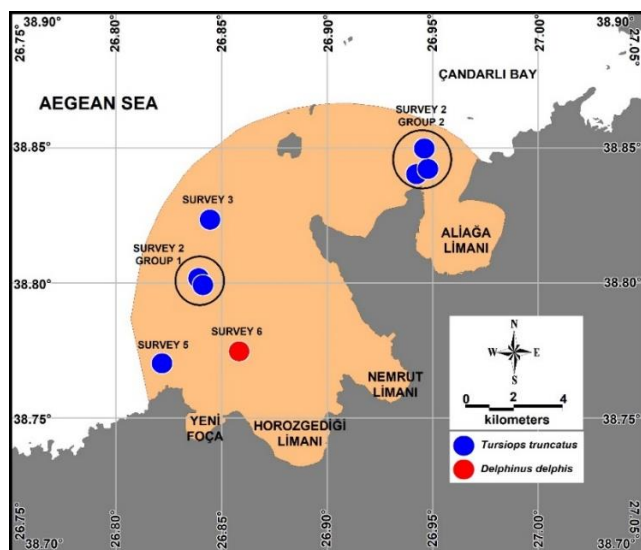


Figure 2. The locations of the *T.truncatus* and *D. delphis* encountered during line transect surveys

Encounter rates

Total encounter rate of delphinids in the study was 1.7567 sightings per 100 km. Among these rates, 1.5371/100 km of sightings belonged to *T. truncatus* whereas 0.2196/100 km of sightings belonged to *D. delphis*. Encounter rates for each survey are shown in Table 3. The locations where dolphins were encountered are shown in Figure 2.

Table 3. The encounter rates of cetaceans per survey

Survey #	Effort (km)	No of Sightings	No of Sightings /100 km
1	48.0	0	0
2	81.0	5	6.1728
3	83.6	1	1.1962
4	78.6	0	0
5	81.5	1	1.2270
6	82.7	1	1.2092



Figure 3. Encountered bottlenose dolphins *T. truncatus* on 14 December 2015 (left) and 26 June 2016 (right)

Opportunistic records

Besides the dedicated visual line transect sampling, opportunistic records of the cetaceans were also collected. For example, a group of bottlenose dolphins were observed at 38.788251° N - 26.902349° E during the seagrass demarcation operations on 8 May 2015 in Nemrut Bay (Figure 4). The first encounter time was at 14:20 from the bow position of the vessel. The dolphin group comprised five individuals among which two of them were juveniles. The dolphins showed slow movement towards the inner part of Nemrut Bay. This group was monitored about 20 minutes before they left the area.



Figure 4. The photographs of the bottlenose dolphins on 8 May 2015 in Nemrut Bay

On 13 and 14 June 2015, two additional opportunistic sightings of *T. truncatus* - groups with 3 and 10 individuals - were made in Nemrut Bay. Both observations were made in the afternoon (at 15:35 and 18:00). In the former case (38.772719° N - 26.916126° E), the group was swimming towards in-shore, while in the latter case (38.779564° N - 26.908190° E) towards off-shore.

There were also two additional opportunistic records; one of which was from Ayson Star boat. The crew encountered two common dolphins which is very rare in Nemrut Bay. Moreover, a calf of *T. truncatus* was also observed by one of the authors while anchoring (38.742475° N - 26.891109° E) on 12 April 2016.

Discussion

Three small delphinid species including *T. truncatus*, *S. coeruleoalba* and *D. delphis* have been reported to occur in earlier studies for Çandarlı Bay (Güçlüsoy *et al.* 2004, 2005; Enül *et al.* 2009).

During the present cetacean surveys, bottlenose dolphin and common dolphin were the only encountered cetacean species. The results from the effort of this monitoring programme were not adequate to assess the population estimate of these taxa due to insufficient number of data to make accurate estimation. However, it is important to verify that these species especially the latter one, since it is classified as endangered by IUCN's Red List for the Mediterranean region (Bearzi 2012), still inhabits in this part of Çandarlı Gulf. Although we expected to encounter the striped dolphin, not a single individual of this species was recorded.

With limited survey effort, encounter rate for sightings was 1.7567 per 100 km in this study. On the other hand, Alan (2015) reported that the encounter rate for delphinid sightings was 2.9797 for the outer İzmir Bay in 2013 and 2014.

The lower encounter rates compared to adjacent outer İzmir Bay are due to the fact that the Bay was already dedicated as the coastal industrial zone since 1960s. In fact, both coastal and marine activities revealed chemical pollution such as persistent organochlorine residues in biota and sediments (Muzyed *et al.* 2017), metal pollution in sediments (Pazı 2011) and in biota (Pazı *et al.* 2017) and PAH levels were also elevated (Küçüksezgin *et al.* 2012) in the study area. Another threat upon the cetacean may be the underwater noise pollution (Tyack 2008; Pirota *et al.* 2015) since coastal marine traffic is still in an increasing trend since the 1960s (Eroğlu and Bozyiğit 2013).

Finally, opportunistic observations of the cetaceans contributed to the presence of this taxa as well as their habitat use. For example, presence of the *T. truncatus* in the inner part of Nemrut Bay was detected in such an observation. The possibility of this area being used for nursing or feeding grounds is not yet known. Therefore, the area use characteristics of delphinids needs to be further investigated in order to fulfil data gaps on both the ecology of and anthropogenic pressures on the cetacean species in the region.

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Güney Çandarlı Körfezi (Ege Denizi)’nde 2015-2018 yunus gözlemleri

Öz

Bu çalışma, Çandarlı Körfezi’nin güney bölümünde Mayıs 2015 ve Mayıs 2018 tarihleri arasında yapılmıştır. Çalışmanın amacı, alanda var olan setase türlerinin belirlenmesi, dağılımlarının tespitidir. Setase izleme çalışmaları 3 yıl boyunca 6 ayda bir yapılmış ve alanda afalina *Tursiops truncatus* ile tırtak *Delphinus delphis*’in varlığı gözlemlerle tespit edilmiştir. Çalışmada yunus gözlemleri için 100 kilometrede toplam karşılaşma sıklığı 1,7567 olarak belirlenmiştir. Alanın endüstriyel bir bölge olması nedeniyle karşılaşma sıklıklarının az olduğu düşünülmektedir.

Anahtar kelimeler: Setase, izleme, görsel doğrusal hat örnekleme, Çandarlı Körfezi

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