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Checklist of marine tetrapods (reptiles, seabirds, and mammals) of Turkey

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Abstract: The occurrence of a total of 61 marine tetrapod species is presented in this paper, including 3 sea turtles, 43 sea birds, and 15 marine mammals. Distribution of each reported species along the Black Sea, Sea of Marmara, Aegean, and Levantine coasts of Turkey is mentioned, associated with key references.

Key words: Sea turtles, sea birds, marine mammals, marine biodiversity, Turkey

1. Introduction

Marine representatives of the superclass Tetrapoda (reptiles, seabirds, and mammals) occupy upper trophic levels of the oceanic food webs, which are typically characterized by lower species diversity in comparison to other aquatic invertebrate and vertebrate taxa. Approximately 430 extant species of marine tetrapods are distributed all over the world, including 7 (or 8) species of sea turtles, ca. 300 species of seabirds, and 119 species of marine mammals (Márquez, 1990; Jefferson et al. 1993; Enticott and Tipling, 1997). Diversity of these species in the Mediterranean Sea is remarkably low, where Coll et al. (2011) listed a total of 27 regularly encountered marine tetrapods, excluding vagrant/visitor species. The majority of the sea turtles, seabirds, and marine mammals are listed in IUCN Red List categories, which makes them privileged among pelagic communities, especially in respect to conservation biology studies.

Turkey is one of the most important countries in the Mediterranean area regarding the number of sea turtle nests, but relevant detailed studies date back to only a few decades ago. Lortet (1887) was the first researcher mentioning the presence of *Caretta caretta* on the Levantine coasts of Turkey, and also presented in situ observations on the abundance of this species from İskenderun Bay. Similar data were included in the works of Carus (1893) and Gruvel (1931); the latter specifically denoted northeastern Cilician shores (from Tarsus, Mersin to İskenderun) as important nesting sites for *C. caretta*. Prominent advance in sea turtle studies was seen by the early 1970s and a majority of the nesting sites along the Levantine shores of Turkey were extensively examined by the 1980s (Hathaway, 1972; Başoğlu, 1973; Geldiay et al., 1982; Geldiay, 1984). There are currently 25 sea turtle nesting sites, spread over a total of 289 km of coastline from Samandağ in the east to Ekincik Bay in the west (Türkozan and Kaska, 2010).

Turkey being located between 2 continents, the avifauna of Turkey is of special interest. The earliest information on Turkish bird diversity was provided by Belon (1555), mostly based on his observations carried out in İstanbul. Hasselquist (1757), one of the disciples of Carl von Linnaeus, listed several bird species, especially from the Smyrna (İzmir) area. In the post-Linnaean period, many naturalists conducted avifauna surveys exclusively in the Bosphorus and Marmara regions, for example Forsskål (1761–1764, in Kumerloeve, 1958), Sestini (1785), Alléon and Vian (1869, 1870), Alléon (1880), and Braun (1902), while several others concentrated on birds of the Asia Minor (i.e. Strickland, 1836; Elwes and Buckley, 1870; Danford, 1877). By the early 20th century, many foreign bird watchers were visiting Anatolia to carry out avifauna studies and compile bird collections (such as the Mathey-Dupraz Bird Collection, established in 1924). The collection has been kept in Bebek, İstanbul, although only a fraction of bird specimens are in good enough condition enough to be examined, including sea birds like *Gavia stellata*, *Gavia immer*, *Larus genei*, *Larus cachinnans*, *Larus*

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fuscus, *Rissa tridactyla*, *Sterna bengalensis*, *Sterna hirundo*, *Sterna paradisaea*, and *Chlidonias niger* (Kirwan, 1997). Following the establishment of the Republic of Turkey, the first such publication in Turkish, *Türkiye'nin Kuşları* [*Birds of Turkey*], was prepared by Saadet Ergene from İstanbul University in 1945, but her contribution had some taxonomical deficiencies. According to Bilgin (1994), the earliest most reliable avifaunal inventory was published by Kumerloeve (1961). Among other bird checklists compiled during the last few decades are those by Kiziroğlu (1993), Kasparek and Bilgin (1996), and Kirwan et al. (1999, 2008).

Regarding marine mammals distributed along the Anatolian shores, the earliest data were presented by Aristotle (384–322 BC, *Historia Animalium*, translated by Cresswell, 1878), who mentioned the occurrence of 2 distinct dolphin species along the Black Sea coast. Aristotle also shared an observation on a very large sized dolphin captured from Caria (southwestern Aegean coast of modern Turkey). In a section describing the fishes of the Black Sea, Pliny the Elder (AD 23–29, *Naturalis Historia*, translated by Bostock and Riley, 1855) wrote "the Euxine is never entered by animal that is noxious to fish, with the exception of seals and the small dolphin". Apart from these studies in antiquity, marine mammal observations are available from the Ottoman period as well (i.e. Belon, 1551, 1553), some of which presented very interesting data; for example, Sestini (1785) reported the catch of a large-sized monk seal on 17 July 1779 off Büyükdere (Sea of Marmara) that was exhibited live and later released to the sea by the command of Ottoman Sultan Selim III. During the early 20th century, only a few studies have evaluated the status of marine mammals, while detailed research attempts began only 3 decades ago (see Öztürk, 1996).

In this paper, we aimed to compile all marine tetrapod species reported from the Turkish coastline (Black Sea, Sea of Marmara, Aegean Sea, and Levantine Sea), including not only the current distribution status of species, but also the existing gaps to be filled by further detailed research.

2. Materials and methods

Species names used for sea turtles and marine mammals follows WoRMS (World Register of Marine Species, 2014, http://www.marinespecies.org). The "World Bird List" (Gill and Donsker, 2014) has been used for sea bird taxa, an online publication issued by the International Ornithologists Union Committee and regularly updated in light of ongoing scientific developments (http://www.worldbirdnames.org). Statuses of sea birds were compiled according to Boyla (2012; http://kusbank.blogspot.com.tr). One of the major problems confronted during preparation of the seabird checklist was the definition of "seabird", which is a matter of dispute among scientists. Although it is possible to define our own criterion for the seabirds of Turkey, the authors preferred to use the criterion already provided by Gaston (2001), Schreiber and Burger (2002), and Oro and Martinez-Abran (2004). Although Gaviiformes members breed in inland freshwater lakes, they winter along Turkish coastal seas and harbor areas in and near coastal settlements. Therefore, in addition to the 4 orders described as seabird groups, Gaviiformes was also taken into account as an order related to seabirds. A species diversity map of marine mammals was prepared using the natural breaks method of ArcGIS 9.3 software, where each published record (excluding gray literature) with exact coordinates was plotted throughout the Turkish coasts (divided into equivalent squares of 15 × 15 km). Except for *Monachus monachus* (Hermann, 1779), all marine mammal records were direct observations of the researchers rather than secondary informants [e.g., records given by Güçlüsoy and Cirik (2007) were not taken into consideration].

3. Results

3.1. Sea turtles

Marine representatives of the class Reptilia are confined to 3 sea turtle species, as follows: *Caretta caretta* (Linnaeus, 1758), *Chelonia mydas* (Linnaeus, 1758), and *Dermochelys coriacea* (Vandelli, 1761). The latter species does not nest in the Mediterranean and those individuals uncommonly encountered are possibly of Atlantic origin (IUCN, 2012). According to the most current data, all 3 sea turtles are distributed along the Levantine and Aegean coasts of Turkey, although *C. caretta* and *C. mydas* are almost exclusively dependent on their nesting sites along the northern Levantine shores (Türkozan and Kaska, 2010). The loggerhead sea turtle, *C. caretta*, seems to be a vagrant species in the Black Sea, but several observations were made at various localities of the Sea of Marmara in the last decade (Başoğlu, 1973; Geldiay, 1984; Akdeniz et al., 2012). The recent unusual occurrence of *C. mydas* in the central Black Sea region is also of special interest (Öztürk et al., 2011), yet the status of this species in the Sea of Marmara is still scarcely known.

3.2. Sea birds

The checklist prepared in this study includes 43 seabird species (11 of which are vagrant, Table 1) belonging to 8 families under 5 orders, namely Procellariiformes (Procellariidae, Hydrobatidae), Pelecaniformes (Pelecanidae), Suliformes (Sulidae, Phalacrocoracidae), Charadriiformes (Laridae, Stercorariidae), and Gaviiformes (Gaviidae). Distribution of species along the Turkish coasts reveals more or less similar diversity, i.e. 39 species occur at the Levantine and 38 at the Black Sea, followed by the Sea of Marmara (36 spp.) and the Aegean Sea (36 spp.). Among the marine habitats defined in Table 1, most sea birds prefer coastal habitats (38 spp.), and

Table 1. Checklist of seabirds of Turkey, compiled using relevant key references. BS: Black Sea; SM: Sea of Marmara; AS: Aegean Sea; LS: Levantine Sea; H: habitats (Os: open sea; Cs: coastal sea; C: coasts, beaches, and dunes; D: delta, lagoons, estuaries, and coastal marshes; Rs: rocky shoreline; I: islands/islets; IW: inland wetland/dam); Status (R: resident; W: winter visitor; S: summer visitor; P: passage migrant; r: resident with scarce occurrence; w: winter visitor with scarce occurrence; s: summer visitor with scarce occurrence; p: scarce passage migrant; v: vagrant)].

Group/species	BS	SM	AS	LS	H	Status
GAVIIFORMES						
Gaviidae						
Gavia arctica (Linnaeus, 1758)	1	1	2	3	Cs/IW	W
Gavia immer (Brünnich, 1764)	4	4, 5		5	Cs	v
Gavia stellata (Pontoppidan, 1763)	6	1	6	7	Cs	w
PROCELLARIIFORMES						
Procellariidae						
Calonectris diomedea (Scopoli, 1769)	7	1	7, 8	9	Os/Cs/I	w/S/P
Puffinus yelkouan (Acerbi, 1827)	10	10, 11	10	10	Os/Cs/I	R/W
Hydrobatidae						
Hydrobates pelagicus (Linnaeus, 1758)			12	4, 7	Os/I	v
PELECANIFORMES						
Pelecanidae						
Pelecanus crispus (Bruch, 1832)	1	13	14, 15	6, 13	D/IW	R/W
Pelecanus onocrotalus (Linnaeus, 1758)	1, 16	1	13	13	D/IW	w/s/P
Pelecanus rufescens (Gmelin, JF, 1789)				17	D/IW	v
SULIFORMES						
Sulidae						
Morus bassanus (Linnaeus, 1758)	18			7	Os/Cs/I	w
Phalacrocoracidae						
Microcarbo pygmeus (Pallas, 1773)	1, 10	9	9, 10	3, 19	Cs/D/IW	R/w
Phalacrocorax aristotelis (Linnaeus, 1761)	1	1	1, 8	14, 19	Cs/I/Rs	R
Phalacrocorax carbo (Linnaeus, 1758)	1	1	19	1	Cs/D/Rs/I/IW	R/W
CHARADRIIFORMES						
Laridae						
Rissa tridactyla (Linnaeus, 1758)	4	4	4	4	Cs/Rs	w
Chroicocephalus genei (Brème, 1839)	9, 19	13	9	13	D/IW	W/S/p
Chroicocephalus ridibundus (Linnaeus, 1766)	9	1	13	13	Cs/C/D/IW	r/W
Hydrocoloeus minutus (Pallas, 1776)	1, 13	13	20	1	Cs	P/W
Ichthyaetus audouinii (Payraudeau, 1826)	4	9	9	1, 13	Cs/Rs/I	R/W
Ichthyaetus ichthyaetus (Pallas, 1773)	9, 21	13, 22	23	24	Cs/Rs/IW	W
Ichthyaetus leucophthalmus (Temminck, 1825)			5, 7		Cs/Rs	v
Ichthyaetus melanocephalus (Temminck, 1820)	13	1, 13	1, 13	9, 13	Cs/IW	S/W/P
Larus argentatus (Pontoppidan, 1763)	25				Cs/Rs/I	W
Larus armenicus (Buturlin, 1934)	26	22	8	27	IW/Cs	R/W
Larus cachinnans (Pallas, 1811)	2, 4	2, 4	2	2	Cs/Rs/I/IW	W
Larus canus (Linnaeus, 1758)	9, 13	9, 13	21	13, 19	Cs/IW	W
Larus fuscus (Linnaeus, 1758)	1, 13	1, 13	9	13,1	Cs/Rs/I/IW	P/w
Larus hyperboreus (Gunnerus, 1767)	4, 28				Cs/Rs/I	v

Table 1. (Continued).

Larus marinus (Linnaeus, 1758)	5	29	13	13, 3	Cs/Rs/I	v
Larus michahellis (Naumann, JF, 1840)	2, 4	2, 4	2, 4	2, 4	Cs/Rs/IW	R/W
Gelochelidon nilotica (Gmelin, JF, 1789)	13	9	13	1	Cs/D/IW	S/P
Hydroprogne caspia (Pallas, 1770)	9, 13	9	13, 15	9, 13	Cs/D/IW	R/P/w
Thalasseus bengalensis (Lesson, 1831)			30	31	Cs	v
Thalasseus sandvicensis (Latham, 1787)	9	1	1, 15	1, 13	Cs/C/D	r/W/P
Sternula albifrons (Pallas, 1764)	19	32	1, 13	1, 13	Cs/D//IW/I	S/P
*Sterna hirundo (*Linnaeus, 1758)	1, 13	1	1, 13	1, 13	Cs/D/IW/I	S/P
Sterna paradisaea (Pontoppidan, 1763)	4	13	4		Cs	v
Chlidonias hybrida (Pallas, 1811)	13	1, 13	13	1, 13	Cs/D/IW	S/P/w
Chlidonias leucopterus (Temminck, 1815)	1, 13	9	1	1, 13	Cs/D/IW	s/P
Chlidonias niger (Linnaeus, 1758)	9, 13	1	1	1	Cs/D/IW	s/P
Stercorariidae						
Stercorarius longicaudus (Vieillot, 1819)	13	3, 7		18	Cs/Os	v
Stercorarius parasiticus (Linnaeus, 1758)	6	19	6	6, 19	Cs/IW/Os	p/w
Stercorarius pomarinus (Temminck, 1815)	13, 33	7	4	6, 7, 33	Cs/Os/Rs	p/v
Stercorarius skua (Brünnich, 1764)		4		5	Cs/I/Os/Rs	v

1) Ornithological Society of Turkey (1969); 2) Kuşbank (2014; http://www.worldbirds.org/v3/turkey.php); 3) Martins (1989); 4) Kirwan et al. (2008); 5) Kirwan (1995); 6) Beaman (1986); 7) Kirwan and Martins (1994); 8) Karauz et al. (1998); 9) Ornithological Society of Turkey (1972); 10) Ergene (1945); 11) Acerbi (1827); 12) Eken (1997a); 13) Kumerloeve (1961); 14) Ertan et al. (1989); 15) Eken (1997b); 16) Yarar and Magnin (1997); 17) Öztürk and Yoğurtçuoğlu (2011; http://www.trakus.org); 18) Kirwan et al. (2003); 19) Ornithological Society of Turkey (1978); 20) Doğal Hayatı Koruma Derneği (1992); 21) Dijksen and Blomert (1993); 22) Doğal Hayatı Koruma Derneği (1999); 23) Çağlayan et al. (2005); 24) Dijksen and Blomert (1989); 25) Yavuz and Salman (2014; http://www.trakus.org); 26) Yarar et al. (1996); 27) Doğal Hayatı Koruma Derneği (1993); 28) Bilgin (1994); 29) Boyla and Arslan (2008); 30) Atahan and Onmuş (2014; http://www.worldbirds.org/v3/turkey.php); 31) Kirwan et al. (2008); 32) Ertan (1996); 33) Ornithological Society of Turkey (1975)

islands, deltas, and rocky shores to a lesser extent. Existing species are mostly winter visitors and passage migrants.

Taxonomy of several species is still unsettled, and thus changes in nomenclature based on results of genetic studies frequently occur [seagulls belonging to the family Laridae are a good example of the matter; i.e. see Liebens et al. (2001) for the phylogeographic and genetic analyses of the *Larus cachinnans-fuscus* group]. While Kumerloeve (1961) indicated the presence of 2 subspecies of *Larus argentatus* (subsp. *cachinnans* and *michahellis*), these were proved to be 2 distinct species, namely *L. cachinnans* and *L. michahellis* (previously misidentified as *L. argentatus*) (for a full account, see Sangster et al., 2005, 2007). The first valid record of *L. argentatus* is thus very recent; 2 individuals were observed at Samsun (Black Sea) on 30 January 2014 (Figure 1).

Figure 1. *Larus argentatus* individual observed at Samsun Harbor (by Nizamettin Yavuz).

3.3. Marine mammals

The Turkish marine mammal fauna comprises 15 species (Table 2). Until 1994, only 6 species were recorded; however, significant advance was achieved during the 1995–2014 period when 9 more species are added to the inventory. The majority of the taxa belong to order Cetacea (12 spp.), followed by the Carnivora suborder Pinnipedia (3 spp.). Among families, Delphinidae (5 spp.) was the most common while Phocidae, Balaenopteridae, and Ziphidae were represented by 2 species each and Otoridae, Physeteridae,

Table 2. Checklist of Turkish marine mammals. Numbers in columns indicate the relevant key reference listed at the end of the table BS: Black Sea; SM: Sea of Marmara; AS: Aegean Sea; LS: Levantine Sea; *: vagrant or alien species.

Order/family/species	BS	SM	AS	LS
Carnivora				
Otariidae				
Arctocephalus cf. *pusillus* (Schereber, 1775)*	1			
Phocidae				
Phoca vitulina Linnaeus, 1758*				2
Monachus monachus (Hermann, 1779)	3	4	3	3
Cetacea				
Balaenopteridae				
Balaenoptera acutorostrata Lacépède, 1804				5
Balaenoptera physalus Linnaeus, 1758			6, 7	8
Physeteridae				
Physeter macrocephalus Linnaeus, 1758			8	9
Ziphiidae				
Ziphius cavirostris Cuvier, 1823			10	11
Mesoplodon cf. *europaeus* (Gervais, 1855)				12
Monodontidae				
Delphinapterus leucas (Pallas, 1776)*	13			
Delphinidae				
Tursiops truncatus (Montagu, 1821)	14	15	16	17
Stenella coeruleoalba (Meyen, 1833)		18	17	16
Delphinus delphis Linnaeus, 1758	4	4	16	19
Grampus griseus (G. Cuvier, 1812)		20	21	5
Pseudorca crassidens (Owen, 1846)			17	
Phocoenidae				
Phocoena phocoena (Linnaeus, 1758)	4	4	22	

1) Kıraç and Savaş (1996); 2) Gücü (2010); 3) Mursaloğlu (1964); 4) Devedjian (1926); 5) Öztürk et al. (2011); 6) Taşkavak et al. (1998); 7) Şerifoğlu et al. (1998), 8) Öztürk (1996); 9) Öztürk et al. (2013); 10) Marchessaux (1980); 11) Kinzelbach (1985); 12) Notarbartolo di Sciara (2009); 13) Notarbartolo di Sciara and Birkun (2010); 14) Acara (1955); 15) Kinzelbach (1991); 16) Topaloğlu et al. (1990); 17) Öztürk & Öztürk 1998; 18) Öztürk et al. (1999); 19) Akyüz (1957); 20) Dede et al (2013); 21) Okuş et al. (2006); 22) Güçlüsoy (2008).

Monodontidae, and Phocoenidae were each represented by only a single species. In terms of distribution of marine mammal taxa along seas surrounding Turkey, the Levantine Sea had the highest diversity with 11 spp., followed by Aegean Sea (10 spp.), Sea of Marmara (6 spp.), and Black Sea (6 spp.). Diversity of species along Turkish coasts is given in Figure 2.

Among the species, harbor seal *Phoca vitulina* Linnaeus, 1758 stranded on the Levantine coast (Gücü, 2010) can be regarded as a suspicious extralimital record, while fur seal *Arctocephalus* cf. *pusillus* (Schreber, 1775) and Beluga *Delphinapterus leucas* (Pallas, 1776) are alien species released (escaped) from Black Sea coasts of the former USSR and substantially encountered in the Turkish Black Sea (Kıraç and Savaş, 1996; Notarbartolo di Sciara and Birkun, 2010). It is also worth noting that the occurrence of whitebeaked dolphin *Lagenorhynchus albirostris* (Gray 1846) (Kummerloeve, 1975) was falsified and reported to be excluded from the Turkish mammal fauna (van Bree, 1977). For the sake of reliability of the mammalian records in our checklist, we neglected a few species that require appropriate occurrence validation from Turkey, i.e. *Balaenoptera musculus* (blue whale) and *Globicephala melas* (long-finned pilot whale) (see Öztürk, 1996; Demirsoy, 2003; Öztürk et al., 2014).

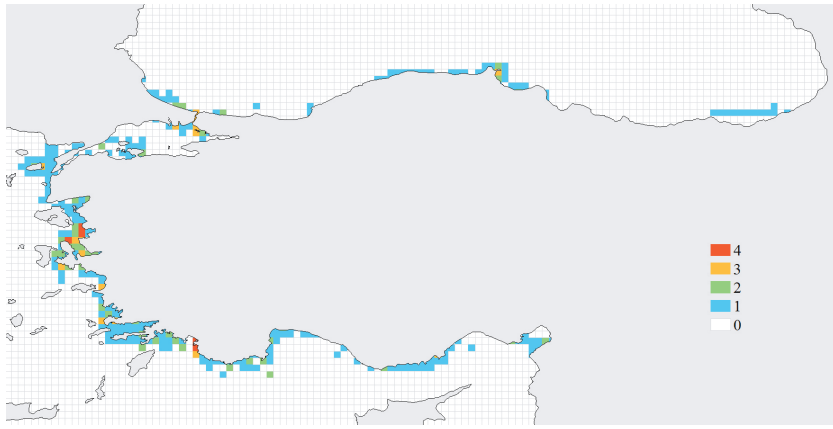

Figure 2. Map showing the distribution of marine mammal diversity along Turkish coasts.

Many of the cetacean species listed in Table 2 are categorized either as DD (data deficient) or LC (least concern) in the IUCN Red List, except for the vulnerable *Physeter macrocephalus* and endangered *Balaenoptera physalus*. In terms of conservation studies, *M. monachus* is a top priority species as the single critically endangered marine mammal in Turkey (Figure 3).

4. Discussion

From a total of 5 sea turtles known from the Mediterranean ecosystem, 3 are encountered in Turkey. The majority of studies concentrated on nesting activities and their monitoring has been regularly continuing for decades; the role of Turkey in terms of conservation of sea turtles is quite well documented (Türkozan and Kaska, 2010). There is also an increased effort in determining distribution ranges of the species, since sea turtle sightings are tending to increase for the Aegean Sea and Sea of Marmara (Akdeniz et al. 2012), but reasons for the documented unusual occurrences remain unclear.

Figure 3. *Monachus monachus*, the single critically endangered marine mammal in Turkey (by Cem Orkun Kıraç/SAD-AFAG).

Turkey is located in an important zoogeographic region for seabirds in terms of breeding, passage, and wintering. Studies on seabirds in Turkey have been promisingly accelerated in the recent years, especially after 2006. Organizations in this unique field, including NGOs and bird-watching groups organized at universities or established as independent clubs, have been spreading throughout the country. In addition, newly emerging large numbers of nature photographers and NGOs for nature photography (for example, Trakuş) provide invaluable data on the distribution of birds of Turkey with concrete proof via bird images with temporal and spatial data. This will surely contribute to filling the data gap specifically on seabirds and also on the general avifauna of the country. Nevertheless, there is still a need for increased numbers of studies on seabirds, so as to obtain satisfactory information on their distribution and population estimates. Since seabirds are important indicators of healthy marine ecosystems (Schreiber and Burger, 2002), extensive field surveys will also make valuable contributions for the conservation and monitoring of ecosystems in which marine birds thrive.

Our knowledge on the distribution and occurrence of marine mammals of Turkey has significantly increased during last 2 decades. As can been seen in Figure 2, studies have concentrated on some distinct localities and some areas were left unexplored. The authors think that rather than recording new marine mammal species, further research on the distribution of existing species (associated with their abundance estimates) and conditions of the populations are far more important to dwell upon. This will surely give guidance to decision makers to protect marine mammals from any threats, and also for the establishment and revision of the marine protected areas of the Turkish seas.

Acknowledgments

This paper is dedicated to the memory of our loving friend and colleague Kemal Gökhan Türe, who passed away on 11 May 2014. He was not only a pioneer of scientific underwater research in Turkey, but also an outstanding mentor who created great research opportunities for several graduate students in the country and helped them to gain scientific insight. As one of the founders of the Middle East Technical University Subaqua Society (ODTÜ-SAT) and the Underwater Research Society (SAD), Kemal Gökhan Türe also established the first Mediterranean monk seal, seabirds, and sea turtles research groups within the above-mentioned organizations during the early 1980s; his inspiration to us will be everlasting. Special thanks to the esteemed mammalogist Dr Peter JH van Bree, who left his personal marine mammal library to the Underwater Research Society - Mediterranean Seal Research Group. Esra Per, Kiraz Erciyes Yavuz, Nizamettin Yavuz, Utku Perktaş, Kerem Ali Boyla, Süleyman Ekşioğlu, Itri Levent Erkol, Süreyya İsfendiyaroğlu, Ortaç Onmuş, Emin Yoğurtçuoğlu, Daniel Oro, Frank Gill, Guy Kirwan, Okan Arıhan, Zühal Altundal, Ahmet İhsan Aytek, and Çiğdem İnan helped in compilation of the seabirds checklist.

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