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Diversity of marine tetrapods (reptiles, seabirds, and mammals) along the coasts of Türkiye

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Abstract: This paper presents the occurrence of a total of 72 marine tetrapod species, comprising 3 sea turtles, 54 seabirds, and 15 marine mammals. The distribution of each reported species along the Black Sea, Sea of Marmara, Aegean, and Levantine coasts of Türkiye is described with key references.

Keywords: Sea turtles, seabirds, marine mammals, marine tetrapods, Türkiye

1. Introduction

The marine representatives of the superclass Tetrapoda, including reptiles, seabirds, and mammals, inhabit the upper trophic levels of oceanic food webs. These food webs usually exhibit lower species diversity compared to aquatic invertebrates and other vertebrate taxa.

Of a total of five sea turtle taxa known from the Mediterranean ecosystem, three are encountered in Türkiye. The country continues to be one of the foremost countries in the Mediterranean region concerning the quantity of sea turtle nests (e.g., Oruç, 2016; Sönmez, 2016; Casale et al., 2018). The presence of these taxa from the 17th century to the 1980s, as observed in terms of abundance and nesting sites, was outlined by Güçlüsoy et al. (2014). Presently, there are 25 major sea turtle nesting locations spanning approximately 300 km of Turkish coastline, extending from Samandağ in the east to Ekincik Bay in the west (Sönmez, 2016). During the last decade, the nesting sites of loggerhead sea turtle *Caretta caretta* (Linnaeus, 1758) in particular expanded towards the northern Aegean coasts of Türkiye. This expansion included reports of one nest each from Fethiye-Kelebekler Vadisi, Marmaris-İçmeler, and Ören (Muğla Province); four nests from Kuşadası (Aydın Province); one nest from Urla (İzmir Province); and one nest each from Babakale and Gelibolu (Çanakkale Province) (Baskale et al., 2018; Özdilek et al., 2020). In addition to these and earlier records from Dalyan, Fethiye, and Rhodes Island, another nest of green turtle *Chelonia mydas* (Linnaeus, 1758) was observed in Göcek Bay (Muğla Province), constituting the northernmost record for that species (Sözbilen et al., 2018).

In the past decade, notable advancements in research and conservation efforts for sea turtle species have been achieved. Studies have mainly focused on distribution (e.g., Sözbilen et al., 2022), nesting (e.g., Olgun et al., 2016; Yılmaz et al., 2022), biology (Aymak et al., 2017; Sözbilen and Kaska, 2018), genetics (e.g., Turkozan et al., 2018), strandings (e.g., Başkale et al., 2018), and threats such as interactions with fisheries (e.g., Esenlioğulları Mete and Tosunoğlu, 2019), heavy metals (e.g., Aymak et al., 2021), climate change impact due to potentially elevated temperatures (e.g., Sönmez et al., 2021; Turkozan et al., 2021), and habitat destruction by light pollution, the use of beach chairs and umbrellas, evening boat tours, and the flooding of nesting beaches (Sönmez et al., 2021).

Due to international scientific developments in phylogenetic studies, the taxonomic list of birds has changed substantially during the last decade (Tobias et al., 2010, 2021). Many new species have been defined and the taxonomic locations or scientific names of many species have changed accordingly. Besides these changes, the number of bird watchers and ornithologists in Türkiye has also increased substantially. These changes have been further positively supported by developments in digital photography and higher-quality optical devices that

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allow for the growth of citizen science (Abolafya et al., 2013). As a result, wildlife sighting records have increased significantly in the last decades, resulting in further alterations to lists of the previously known avian fauna of Türkiye. This increased interest further triggered the formation of specialized internet databases, websites, and groups around the world, such as eBird at ebird.org.

There are 127 species of marine mammals representing the orders Carnivora, Cetacea, and Sirenia globally (Nowak, 2003). The species representing the first two orders occur with 28 species in the Mediterranean Sea and Black Sea (Notarbartolo di Sciara, 2016). In the last decade, following the last marine tetrapod checklist prepared for Türkiye by Güçlüsoy et al. (2014), significant developments in the research and protection of these taxa have been achieved. For cetaceans, in addition to studies on sightings (e.g., Alan et al., 2018; Dede et al., 2022), distribution (e.g., Akkaya Bas et al., 2016; Akkaya et al., 2020), population estimates (e.g., Paiu et al., 2024), site fidelity (e.g., Akkaya Baş et al., 2018a), seasonal movements (e.g., Uluduz et al., 2020), individual identification (e.g., Alan et al., 2017), strandings (e.g., İlkılınç and Güçlüsoy, 2019), acoustic patterns (e.g., Akkaya et al., 2023), genetics (e.g., Tonay et al., 2024), and pathology and parasitology (e.g., Birincioğlu et al., 2017), there have also been studies focused on threats affecting these taxa such as fishery interactions (e.g., Bilgin et al., 2018; Meza et al., 2020; Popov et al., 2023), marine traffic (e.g., Akkaya Bas et al., 2017), and microplastics (e.g., Yücel et al., 2022). Regarding the only representative of the family Phocidae in the Mediterranean, the Mediterranean monk seal *Monachus monachus*, studies were conducted on demography and population structure (e.g., Merve and Gücü, 2021), cave preferences (e.g., Saydam and Güçlüsoy, 2023), diet (e.g., Kıraç and Ok, 2019), strandings (e.g., Danyer et al., 2018), genetics (e.g., Salmona et al., 2022), and an artificial ledge test in a marine cave (Saydam et al., 2023). In terms of the protection of cetaceans, the most significant development was the ratification of the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area (ACCOBAMS) by the Turkish government (T.C. Cumhurbaşkanlığı, 2017). Furthermore, a total of 9 important marine mammal areas (IMMAs) and 8 candidate IMMAs as areas of interest were determined for the seas circumscribing Türkiye by the Joint IUCN-WSPA Task Force.[1]

In this study, our aim was to update the checklist of all marine tetrapod species reported from the Turkish coastlines (Black Sea, Sea of Marmara, Aegean Sea, and Levantine Sea) a decade ago by Güçlüsoy et al. (2014). This update not only provides the current protection status of these species but also highlights existing gaps to be filled by further detailed research. Finally, the update also specifies whether the listed species are alien or vagrant.

2. Materials and methods

The checklist of marine tetrapods reported by Güçlüsoy et al. (2014) has been updated for the Black Sea, the Sea of Marmara (including the Straits of İstanbul and Çanakkale), the Aegean Sea, and the Levantine Sea in this study. To update the bird-related part of that checklist, the list created by Güçlüsoy et al. (2014) was revised according to the list of world seabirds proposed by Croxall et al. (2012). For possible new seabirds observed in the waters of Türkiye, new scientific literature and the eBird database[2] were first checked. In addition, social media and web-based media sources were searched to identify the presence of any new seabirds together with the remainder of the marine tetrapod records from the coasts of Türkiye since 2014. The new records found on social media or in web-based sources were treated as new findings in the present study; hence, the date and locality are provided. The species names used for sea turtles and marine mammals follow WoRMS[3] while the nomenclature for birds follows Tobias et al. (2010, 2021) and HBW-BirdLife International.[4] Finally, the updated checklist includes information on whether a given species is protected by the Barcelona Convention (UNEP/MAP-SPA/RAC, 2018) or Bern Convention (Bern Convention, 1998, 2018) or by national legislation (T.C. Cumhurbaşkanlığı, 2020, 2022) and whether it is listed as threatened by the IUCN Red List.[5] If a regional red list existed, it was used; if not, the global list was followed for the red listing of the given species.

3. Results

A map indicating the number of tetrapod species for all seas is given in Figure 1.

3.1. Sea turtles

A decade after the last tetrapod checklist was prepared by Güçlüsoy et al. (2014), the marine representatives of the class Reptilia in Turkish seas remain confined to three sea

[1] Marine Mammal Protected Areas Task Force (2024). IMMA e-ATLAS [online]. Website https://www.marinemammalhabitat.org/imma-eatlas/ [accessed 21 May 2024].

[2] Cornell Lab of Ornithology (2024). EBird Basic Dataset. Version: EBD_relMay-2024 [online]. Website https://ebird.org/home [accessed 14 May 2024].

[3] WoRMS (2024). World Register of Marine Species [online]. Website http://www.marinespecies.org [accessed 14 May 2024].

[4] HBW-BirdLife International (2024). Handbook of the Birds of the World and BirdLife International Digital Checklist of the Birds of the World. Version 8.1 [online]. Website http://datazone.birdlife.org/userfiles/file/Species/Taxonomy/HBW-BirdLife_Checklist_v81_Jan24.zip

[5] IUCN (2024). The IUCN Red List of Threatened Species [online]. Website https://www.iucnredlist.org/ [accessed 15 May 2024].

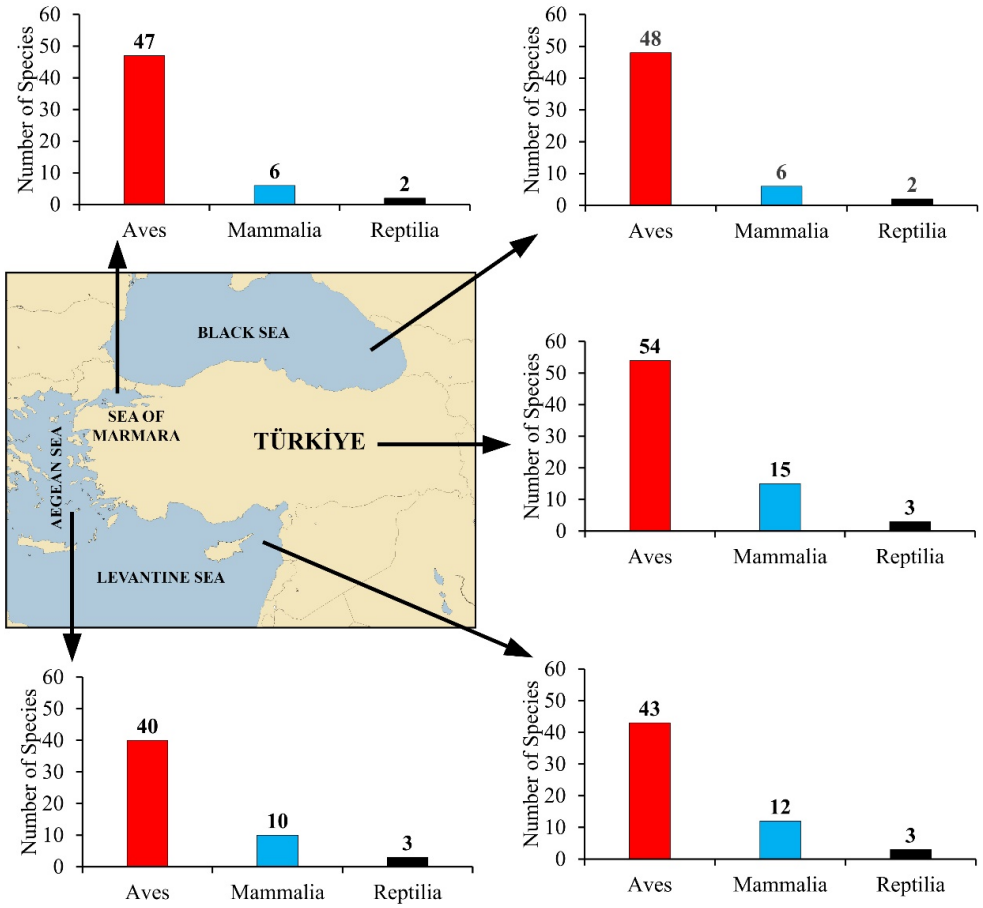

Figure 1. Map indicating the numbers of tetrapod species for all Turkish seas.

turtle species: *Caretta caretta* (Linnaeus, 1758), *Chelonia mydas* (Linnaeus, 1758), and *Dermochelys coriacea* (Vandelli, 1761). *Dermochelys coriacea* does not typically nest in the Mediterranean and the infrequently encountered individuals are likely of Atlantic origin (Casale et al., 2018). During the last decade, no major change was observed with regard to the distribution and nesting sites of sea turtles. While all three sea turtle species are found along the Levantine and Aegean coasts of Türkiye, *C. caretta* and *C. mydas* primarily rely on nesting sites along the northern Levantine shores (Sönmez, 2016). The presence of *C. mydas* was also confirmed in the Sea of Marmara (Tonay and Oruç, 2016; Özdilek et al., 2018). *C. mydas* had already been confirmed from the Black Sea in the previous checklist (Güçlüsoy et al., 2014).

While *C. caretta* and *C. mydas* are respectively categorized as being of least concern (LC) and NT (near threatened) in the Mediterranean region by the IUCN Red List, the vagrant *D. coriacea* is categorized as vulnerable (VU) globally. All three sea turtle species and their nesting sites are protected by national legislation (T.C. Cumhurbaşkanlığı, 2020). They are also listed as protected species by both the Barcelona Convention and Bern Convention.

3.2. Seabirds

The checklist presented by Güçlüsoy et al. (2014) included 43 seabirds belonging to 8 families from 5 orders: Procellariiformes (Procellariidae, Hydrobatidae), Pelecaniformes (Pelecanidae), Suliformes (Sulidae, Phalacrocoracidae), Charadriiformes (Laridae, Stercorariidae), and Gaviiformes (Gaviidae). While Güçlüsoy et al.'s (2014) study was valuable, it had limitations in identifying bird species along the Turkish coasts as it did not include groups of bird species in the list. Additionally, the species list has been changed in light of the accepted seabirds listed by Croxall et al. (2012). With the inclusion of new taxa, the total number of species became 54, belonging to 6 orders and 10 families. These are Anseriformes (Anatidae: 7 species), Gaviiformes (Gaviidae: 3 species), Procellariiformes (Procellariidae: 3 species; Hydrobatidae: 1 species), Podicipediformes (Podicipedidae: 4 species), Suliformes (Sulidae: 1 species; Phalacrocoracidae: 2 species), and Charadriiformes (Scolopacidae: 2 species; Laridae: 27 species; Stercorariidae: 4 species). The checklist of seabirds of Türkiye, their distributions, and population statuses are given in Table 1.

Table 1. Checklist of the seabirds of Türkiye, their distributions, and population status. Numbers in cells indicate the relevant reference listed at the end of the table. 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); St: status (R: resident; W: winter visitor; S: summer visitor; P: passage migrant; capital letters indicate larger occurrence and lowercase letters indicate scarce occurrence). Protected and threatened species are denoted according to the respective conventions (BC: Barcelona Convention; BN: Bern Convention) or national legislation (NL) and as endangered (EN) or vulnerable (VU) species according to the IUCN Red List.

Group/species	BS	SM	AS	LS	H	St	Note
ANSERIFORMES							
Anatidae							
Aythya marila (Linnaeus, 1761)	1	1			Cs	W	BN,NL
Bucephala clangula (Linnaeus, 1758)	1	1	1		Cs/IW	W	BN,NL
Melanitta fusca (Linnaeus, 1758)	1	1	1		Cs	W	BN, VU,NL
Melanitta nigra Linnaeus, 1758)	1	1	1	1	Cs	W	BN,NL
Mergus merganser Linnaeus, 1758	1	1			Cs	w/v	BN
Mergus serrator Linnaeus, 1758	1	1	1	1	Cs	W	BN
Somateria mollissima (Linnaeus, 1758)	1	1				W	BN, EN,NL
GAVIIFORMES							
Gaviidae							
Gavia arctica (Linnaeus, 1758)	+	+	+	+	Cs/IW	W	BN,NL
Gavia immer (Brünnich, 1764)	+	+		+	Cs	V	BN,NL
Gavia stellata (Pontoppidan, 1763)	+	+	+	+	Cs	W	BN,NL
PROCELLARIIFORMES							
Procellariidae							
Calonectris diomedea (Scopoli, 1769)	+	+	+	+	Os/Cs/I	w/S/P	BC,BN,NL
Puffinus yelkouan (Acerbi, 1827)	+	+	+	+	Os/Cs/I	R/W	BC,BN, VU,NL
Ardenna grisea (Gmelin, 1789)				1	Os	V	BN,NL
Hydrobatidae							
Hydrobates pelagicus melitensis (Linnaeus, 1758)[1]			+	+	Os/I	R, W	BC,BN,NL
PODICIPEDIFORMES							
Podicipedidae							
Podiceps auritus (Linnaeus, 1758)	1	1			Cs	V	BN,NL
Podiceps nigricollis Brehm, CL, 1831	1	1	1	1	Cs / D	W	BN, VU,NL
Podiceps cristatus (Linnaeus, 1758)	1	1	1	1	Cs / D	R	BN,NL
Podiceps grisegena (Boddaert, 1783)	1	1			Cs / D	r, w	BN, VU,NL
SULIFORMES							
Sulidae							
Morus bassanus (Linnaeus, 1758)	+	1		+	Os/Cs/I	W	BN,NL
Phalacrocoracidae							
Gulosus aristotelis (Linnaeus, 1761)	+	+	+	+	Cs/I/Rs	R	BC, BN,NL
Phalacrocorax carbo (Linnaeus, 1758)	+	+	+	+	Cs/D/Rs/I/IW	R/W	BN,NL
CHARADRIIFORMES							
Scolopacidae							
Phalaropus lobatus (Linnaeus, 1758)	1	1	1	1	Cs/IW/D	P	BN,NL
Phalaropus fulicarius (Linnaeus, 1758)	1			1	Cs/IW/D	V	BN,NL
Laridae							
Rissa tridactyla (Linnaeus, 1758)	+	+	+	+	Cs/Rs	W	BN, VU
Chroicocephalus genei (Brème, 1839)	+	+	+	+	D/IW	W/S/p	BC,BN, VU,NL

[8]Subspecies name was specifically mentioned here as the Atlantic and the Mediterranean populations of this species has recently been recommended as different species (Lalanne et al., 2001).

Table 1. (Continued.)

Chroicocephalus ridibundus (Linnaeus, 1766)	+	+	+	+	Cs / C / D / IW	r/W	BN
Hydrocoloeus minutus (Pallas, 1776)	+	+	+	+	Cs	P/W	BN,NL
Ichthyaetus audouinii Payraudeau, 1826	+	+	+	+	Cs/Rs/I	S	BC,BN, VU,NL
Ichthyaetus ichthyaetus Pallas, 1773	+	+	+	+	Cs/Rs/IW	W	BN
Ichthyaetus leucophthalmus Temminck, 1825			+		Cs/Rs	V	BN,NL
Ichthyaetus melanocephalus Temminck, 1820	+	+	+	+	Cs/IW	S/W/P	BC,BN,NL
Larus argentatus Pontoppidan, 1763	+	1			Cs/Rs/I	W	NL
Larus armenicus Buturlin, 1934	+	+	+	+	IW/Cs	R/W	BC,BN
Larus cachinnans Pallas, 1811	+	+	+	+	Cs / Rs / I / IW	W	BN
Larus canus Linnaeus, 1758	+	+	+	+	Cs/IW	W	BN
Larus fuscus Linnaeus, 1758	+	+	+	+	Cs / Rs / I / IW	P/w	
Larus hyperboreus Gunnerus, 1767	+				Cs/Rs/I	V	BN,NL
Larus marinus Linnaeus, 1758	+	+	+	+	Cs/Rs/I	V	
Xema sabini (Sabine, 1819)				[2]	Cs	V	BN
Larus michahellis JF Naumann, 1840	+	+	+	+	Cs/Rs/IW	R/W	BN
Gelochelidon nilotica (Gmelin, 1789)	+	+	+	+	Cs/D/IW	S/P	BC,BN,NL
Hydroprogne caspia (Pallas, 1770)	+	+	+	+	Cs/D/IW	R/P/w	BC,BN,NL
Thalasseus bengalensis (Lesson, 1831)			+	+	Cs	V	BC,BN,NL
Thalasseus sandvicensis (Latham, 1787)	+	+	+	+	Cs/C/D	r/W/P	BC,BN,NL
Sternula albifrons (Pallas, 1764)	+	+	+	+	Cs / D / / IW/I	S/P	BC,BN,NL
Sterna hirundo Linnaeus, 1758	+	+	+	+	Cs/D/IW/I	S/P	BN,NL
Sterna paradisaea Pontoppidan, 1763	+	+	+		Cs	V	BN,NL
Chlidonias hybrida (Pallas, 1811)	+	+	+	+	Cs/D/IW	S/P/w	BN,NL
Chlidonias leucopterus (Temminck, 1815)	+	+	+	+	Cs/D/IW	s/P	BN,NL
Chlidonias niger (Linnaeus, 1758)	+	+	+	+	Cs/D/IW	s/P	BN,NL
Stercorariidae							
Stercorarius longicaudus Vieillot, 1819	+	+		+	Cs/Os	V	BN
Stercorarius parasiticus (Linnaeus, 1758)	+	+	+	+	Cs/IW/Os	p/w	BN,EN
Stercorarius pomarinus (Temminck, 1815)	+	+	+	+	Cs/Os/Rs	p/v	BN
Stercorarius skua (Brünnich, 1764)		+		+	Cs/I/Os/Rs	V	BN

+ for the reference, see Güçlüsoy et al. (2014), 1. eBird[2].

[9]Murat Bozdoğan personal observation on 21 December 2021 at Mileyha Coast in Hatay, Türkiye.

3.3. Marine mammals

The number of marine mammal species of the Turkish coasts has reached 15, with the addition of one new species since the last update by Güçlüsoy et al. (2014) (Table 2). The newly recorded species was humpback dolphin *Sousa* cf. *plumbea* (G. Cuvier, 1829) from the Levantine Sea. Furthermore, *Mesoplodon* cf. *europaeus*, reported by Notarbartolo di Sciara (2009) and listed by Güçlüsoy et al. (2014), could be considered as *Ziphius cavirostris* (Öztürk et al., 2016a; Notarbartolo di Sciara and Tonay, 2021), but this cannot be confirmed since no DNA sample was collected during the rescue of the specimen in question. Thus, this species was removed from the updated checklist. Moreover, a stranded false killer whale was found for the first time on 25 October 2021 on the coast of Çaltıcak, Antalya, originating from the Levantine Sea.[6] The bulk of the listed taxa are classified within the order Cetacea (12 spp.), followed by the Carnivora suborder Pinnipedia (3 spp.). Among the families of the order Cetacea, Delphinidae (6 spp.) is most prevalent, while Balaenopteridae is listed with two species. Additionally, Physeteridae, Ziphiidae, Monodontidae, and Phocoenidae are represented by one species each. Within the suborder Pinnipedia, the family Phocidae includes two species, while the family

[6]DHA (2021). Antalya'da yalancı katil balina ölüsü kıyıya vurdu [online]. Website https://www.dha.com.tr/gundem/antalya-da-yalanci-katil-balina-olusu-kiyiya-vurdu-1856185 [accessed 17 May 2024].

Table 2. Checklist of Turkish marine mammals and their first reports in each sea. Numbers in cells indicate the relevant reference listed at the end of the table. Regular species are outlined in gray. BS: Black Sea; SM: Sea of Marmara; AS: Aegean Sea; LS: Levantine Sea; *: vagrant or alien species. Protected and threatened species are denoted according to the respective conventions (BC: Barcelona Convention; BN: Bern Convention) or national legislation (NL) and as endangered (EN) or vulnerable (VU) species according to the IUCN Red List.

Order/family/species	BS	SM	AS	LS	Note
Carnivora					
Otariidae					
**Arctocephalus cf. pusillus* (Schereber, 1775)	+				NL
Phocidae					
**Phoca vitulina* Linnaeus, 1758				+	BN,NL
Monachus monachus (Hermann, 1779)	+	+	+	+	BC,BN, EN,NL
Cetacea					
Balaenopteridae					
Balaenoptera acutorostrata Lacépède, 1804				+	BC,BN,NL
Balaenoptera physalus (Linnaeus, 1758)			+	+	BC,BN, VU, NL
Physeteridae					
Physeter macrocephalus Linnaeus, 1758			+	+	BC,BN, EN,NL
Ziphiidae					
Ziphius cavirostris Cuvier, 1823			+	+	BC,BN,NL
Monodontidae					
**Delphinapterus leucas* (Pallas, 1776)	+				BN,NL
Delphinidae					
**Sousa cf. plumbea* (G.Cuvier, 1829)				1	BC,BN, EN,NL
Tursiops truncatus (Montagu, 1821)	+	+	+	+	BC,BN, VU,NL
Stenella coeruleoalba (Meyen, 1833)		+	+	+	BC,BN, VU,NL
Delphinus delphis Linnaeus, 1758	+	+	+	+	BC,BN, EN,NL
Grampus griseus (G. Cuvier, 1812)		+	+	+	BC,BN,NL
Pseudorca crassidens (Owen, 1846)			+	2[10]	BC,BN,NL
Phocoenidae					
Phocoena phocoena (Linnaeus, 1758)	+	+	+		BC,BN, EN,NL

+ for the reference, see Güçlüsoy et al. (2014), 1. Doganyılmaz Ozbilgin et al. (2018), 2. Present study[10]

Otariidae includes one species. In the last decade, one new marine mammal species (*S.* cf. *plumbea*) and one new record of a preexisting species from the Levantine Sea (*Pseudorca crassidens*) contributed to the distribution of marine mammal taxa along the seas bordering Türkiye. The Levantine Sea exhibited the highest diversity with 12 marine mammal species, followed by the Aegean Sea (10 spp.), the Sea of Marmara (6 spp.), and the Black Sea (6 spp.) (see Table 2). In terms of rare records, *P. crassidens* and *Balaenoptera physalus* have expanded their presence from the central to the northern Aegean Sea. While the former species was encountered in a group of 8 animals, the latter was found stranded in Saros Bay (Dede et al., 2020; Tonay et al., 2020).

Since 2014, all regular cetacean species assessed for the Mediterranean, as listed in Table 2, have been categorized within one of two IUCN Red List categories for threatened species: endangered (EN) or vulnerable (VU). In terms of conservation studies, the endangered *Physeter macrocephalus*, *Delphinus delphis*, and *Phocoena phocoena* require the utmost attention. Moreover, *M. monachus* remains the only pinniped species categorized as endangered in Türkiye (Figure 2) (Karamanlidis, 2024).

4. Discussion

Of the total five sea turtle taxa known from the broader Mediterranean ecosystem, no additional species records were reported for the Turkish coasts. Thus, the species list for Reptilia remains at three in Türkiye.

Nevertheless, over the last decade, significant progress was made in studying sea turtles in Turkish waters, especially concerning conservation initiatives and the exploration of changes in their habitat use and population trends. During this period, conservation programs were strengthened, focusing on safeguarding grounds for *C. caretta* and *C. mydas* along Türkiye's

Figure 2. A single specimen of *Monachus monachus* resting on an artificial ledge built in a coastal cave in Türkiye (Mediterranean Conservation Society (AKD) Archive).

southern and southwestern shores. These initiatives have involved protecting habitats, monitoring nesting beaches, and educating the public to minimize human-induced risks to turtles (Oruç, 2016; Sönmez, 2016). In terms of population research and genetic studies, there has been an emphasis on investigations to understand how different sea turtle populations in the Mediterranean are connected. Such research aids in identifying migration routes and genetic variations within populations, which is essential for conservation measures (Turkozan et al., 2018; Loisier et al., 2021). Regarding changes in habitat distribution and uncommon sightings, studies have also delved into tracking shifts in sea turtle distribution likely influenced by changes in ocean temperatures and habitat conditions. For example, unusual sightings of *C. mydas* in the Black Sea region and their presence in the Sea of Marmara have been closely examined to understand the human factors affecting these patterns (Güçlüsoy et al., 2014; Tonay and Oruç, 2016; Baskale et al., 2018; Özdilek et al., 2018). The impact of climate change on sea turtle habitats is a growing concern with a focus on how rising sea levels and temperature shifts affect their sites and life cycles (Abolafya, et al., 2013; Sönmez et al., 2021; Turkozan et al., 2021). Turkish researchers have actively participated in collaborations aimed at conserving Mediterranean Sea turtles. They have shared data with conservation groups and collaborated in multinational studies to better protect the turtles' migratory routes (e.g., Casale et al., 2018). Advancements in technology such as satellite tracking have also greatly enhanced the monitoring of sea turtles' movements and behaviors. This technology allows for real-time data collection, improving our understanding of sea turtle ecology (e.g., Stokes et al., 2015; Cerritelli et al., 2022). The establishment and improvement of rehabilitation centers for sea turtles has played an important role in treating sick turtles, leading to higher survival rates after release (e.g., Şahin et al., 2017). These centers also serve as hubs to raise awareness among communities and tourists. Overall, research conducted on sea turtles in Turkish waters over the last decade has not only deepened our understanding of their ecological status but has also highlighted Türkiye's significant role in sea turtle conservation efforts within the Mediterranean region.

The checklist prepared by Güçlüsoy et al. (2014) included 43 seabirds from 5 orders and 8 families, while the current study lists a total of 54 species from 6 orders and 10 families. The main differences between the present study and the study by Güçlüsoy et al. (2014) arise from the bird taxa evaluated. Specifically, due to the seabird species list accepted by Croxall et al. (2012), seven species in the order Anseriformes and family Anatidae and four species in the order Podicipediformes and family Podicipedidae were added as seabird species seen in Türkiye in the present study. Furthermore, according to the list of Croxall et al. (2012), three species from the order Pelecaniformes

and family Pelecanidae, which were listed as seabirds in Güçlüsoy et al.'s (2014) study, were removed from the list.

The definition of seabirds is not as straightforward as it seems. Seabird species are defined as bird species for which a large proportion of the population relies on the marine environment for at least part of the year (Croxall et al., 2012). However, Jones (2001) concluded that habitat selection involves a process, not a pattern; that many different extrinsic factors influence habitat selection; and that a complete review of habitat selection must involve an assessment of whether or not documented habitat preferences are adaptive. Accordingly, some bird species may change their habitat preferences due to these factors. For example, great crested grebe *Podiceps cristatus* was listed by Croxall et al. (2012) as a seabird, but this bird breeds and is observed in inland lakes and deep wetlands and dams in Türkiye. In the winter period, this species shows partial distribution in river outlets and bays and at sea. Therefore, according to the definition advocated by Croxall et al. (2012), the great crested grebe may not be accepted as a seabird in Türkiye. Similarly, black tern *Chlidonias nigra*, white-winged tern *Chlidonias leucopterus*, and whiskered tern *Chlidonias hybridus* are accepted as seabirds, but they clearly choose inland freshwater marshes or lakes in Türkiye and it is difficult to observe them at sea. These are only a few of the relevant examples.

Many coastal bird species in Türkiye, on the other hand, may be classified as seabirds according to the definition used by Croxall et al. (2012). With the addition of those coastal birds to the list of seabirds, the new list would be dramatically different. Although the distribution and status of coastal birds are relatively well known in Türkiye, their breeding information is lacking, excluding a few species such as flamingos (Balkiz et al., 2015), pelicans (Onmuş et al., 2011; Catsodorakis et al., 2015; Bounas et al., 2022), and cormorants (Onmuş et al., 2023) or a few specific sites such as the Kızılırmak Delta or Gediz Delta (Onmuş and Sıkı, 2010; Onmuş et al., 2019). Türkiye has many islands and islets, and there is limited knowledge about the bird species that breed there. Existing studies are either outdated or focus on single species in smaller regions (Eken, 1997; Onmuş and Gönülal, 2019; Onmuş et al., 2022, 2023). While the breeding seabirds of the western Mediterranean are relatively well known (De Juana and Paterson, 1986), the status and distribution of the species in Türkiye are still scarcely known with a few exceptions (Onmuş and Gönülal, 2019; Özkan and Yapan, 2024). A complete survey of breeding birds on islands is therefore needed. Additionally, we also need to identify the most significant areas at sea for seabirds. In light of Nankinov's (1996) study, we know that the outlets of river deltas in the Black Sea are very important for many coastal species and seabirds. We also have evidence that the İstanbul and Çanakkale Straits are important for seabirds, particularly for yelkouans (Sahin et al., 2011). However, we do not have reliable information on whether sea transportation and pollution are affecting those seabirds significantly. Very recently, a new congregation area was discovered for the yelkouan shearwater (*Puffinus yelkouan*) between Mytilene Island (Greece) and the islets of Ayvalık (Türkiye). Thousands of yelkouans are staging in that area.[7] Seabirds and coastal birds reflect the health of these ecosystems; therefore, their populations need to be identified and monitored.

Seabirds and birds that depend on coastal biotopes are under threat. The impacts of human intervention and anthropogenic activities, habitat degradation, water level changes and increased salinity in wetlands, urban and industrial development in coastal zones, pollution, overfishing, overexploitation, and hunting are the general factors that cause changes in bird populations (Gül et al., 2013; Onmuş and Sıkı, 2013; Ataol and Onmuş, 2021). The top threats to seabirds in terms of the number of species affected and average impact are 1) invasive alien species, 2) bycatching in fisheries, 3) climate change/severe weather, and 4) overfishing, hunting/trapping, and disturbance (Dias et al., 2019).

Our understanding of the occurrence of marine mammals in Türkiye has peaked over the last decade. During this period, there has been a significant increase in research on the distribution and abundance of species, either as part of broader Mediterranean and Black Sea regional efforts (e.g., Cucknell et al., 2016; Lazăr, 2021; Gnone et al., 2023; Panigada et al., 2024) or through national studies (e.g., Akkaya Bas et al., 2016; Alan et al., 2018; Akkaya et al., 2020).

We do not anticipate the expansion of the current checklist for marine mammals beyond possible observations of a few potential alien or vagrant species in the future. However, we have needed to exclude some of the previously reported marine mammal species. For example, while Öztürk et al. (2016a) reported potential sightings of rough-toothed dolphin *Steno bredanensis* and false killer whale *P. crassidens* in the Levantine Sea, the presence of the former in Turkish waters has yet to be confirmed. However, the presence of the latter species was confirmed in the present study. Indeed, while possible occurrences of this species as generally single individuals have been reported in the eastern Mediterranean (Akkaya Baş et al., 2018b; Notarbartolo di Sciara and Tonay, 2021), they have never been confirmed in Turkish waters within the Levantine Sea. Similarly, the reported sighting of long-finned pilot whale *Globicephala melas* by a fisherman requires confirmation. The stranding record of the same species by İlkılınç and Güçlüsoy (2018) has been verified in the present study as *Grampus griseus*. Furthermore, True's

[7] Personnel observation of Danae Portolou, 2024.

beaked whale *Mesoplodon mirus*, initially reported in 2016 by Öztürk et al. (2016b), was refuted by the same authors after further genetic analyses (Öztürk et al., 2016c). The same record was erroneously used by Turan et al. (2023).

All marine mammal species are protected in Türkiye by Turkish legislation and international conventions. Therefore, all threats to these taxa must be mitigated and, if possible, halted. Filling the information gap regarding the status (i.e., distribution, abundance, and population trends) of these species and the threats they face is crucial. This will provide guidance to decision-makers in protecting marine mammals from any threats and in establishing and revising marine protected areas in the Turkish seas.

Regarding the information requirements, Marine Monitoring Guides, published in 2017 as part of the Project for Standardization in Marine Monitoring, were produced in collaboration between the Turkish Ministry of Environment, Urbanization, and Climate Change and TÜBİTAK (ÇŞB and TÜBİTAK, 2017). One of the guides in this compilation aims to enhance and standardize the monitoring of marine mammals along Türkiye's coastlines and it should be followed more closely (Güçlüsoy et al., 2017). It provides methodologies for assessing the population sizes, distributions, and demographic characteristics of marine mammals, focusing on species regularly occurring in the region. The guide emphasizes the use of noninvasive monitoring techniques, such as passive acoustic monitoring, to minimize the impacts on these animals. Monitoring efforts are aligned with both national legislation and international agreements to which Türkiye is a party. This includes adherence to the Marine Strategy Framework Directive and the Habitats Directive of the European Union, aiming to achieve or maintain the good environmental status of marine waters. Thus, this guide provides a structured approach to data collection and analysis that supports both national management strategies and compliance with international environmental standards. The monitoring of marine mammals by the marine monitoring program of Türkiye in line with this guide has yet to be achieved.

In conclusion, this review has significantly enhanced the list of marine tetrapods found along the Turkish coasts, presenting a detailed overview of the variety and distribution of sea turtles, seabirds, and marine mammals in this area. This review not only sheds light on the challenges and new threats these taxa face but also emphasizes the important conservation measures currently in progress. The extensive information gathered throughout the last decade highlights how marine tetrapod diversity in Türkiye is constantly evolving and demonstrates the need for research and focused conservation efforts. Such actions are crucial to minimize the impacts of human activities and environmental shifts, ensuring the long-term survival of these vital marine tetrapod populations.

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