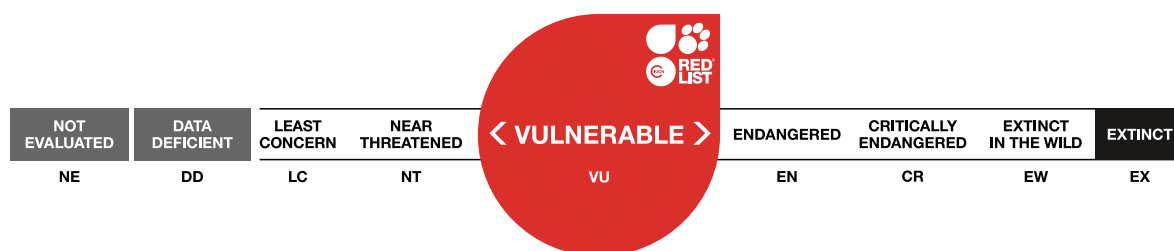


Monachus monachus, Mediterranean Monk Seal

Assessment by: Karamanlidis, A.A., Dendrinis, P., Fernandez de Larrinoa, P., Kiraç, C.O., Nicolaou, H. & Pires, R.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Phocidae

Scientific Name: *Monachus monachus* (Hermann, 1779)

Synonym(s):

- *Phoca monachus* Hermann, 1779

Regional Assessments:

- Europe
- Mediterranean

Infra-specific Taxa Assessed:

- [Monachus monachus Eastern Mediterranean subpopulation](#)

Common Name(s):

- English: Mediterranean Monk Seal
- French: Phoque-moine Méditerranéen
- Spanish; Castilian: Foca Monje
- Greek, Modern (1453-): Μεσογειακή φώκια
- Portuguese: Lobo-marinho
- Turkish: Akdeniz Foku

Taxonomic Source(s):

Scheel D.M., Slater G.J., Kolokotronis S-O., Potter C.W., Rotstein D.S., Tsangaras K., Greenwood, A.D. and Helgen, K.M. 2014. Biogeography and taxonomy of extinct and endangered monk seals illuminated by ancient DNA and skull morphology. *ZooKeys* 409: 1-33.

Society for Marine Mammalogy (SMM). 2023. List of Marine Mammal Species and Subspecies. June 2023. Yarmouth Port, MA: Committee on Taxonomy, Society for Marine Mammalogy. Available at: <https://marinemammalscience.org/species-information/list-marine-mammal-species-subspecies/>. (Accessed: 23 October 2023).

Taxonomic Notes:

The Mediterranean Monk Seal (*Monachus monachus*) is the sole representative of the genus *Monachus* (Scheel *et al.* 2014). The global distribution of the species includes one subpopulation in the eastern Mediterranean Sea and two subpopulations in the North Atlantic [i.e., one in the Cabo Blanco Peninsula (Ras Nouadhibou), western Africa and one in the Archipelago of Madeira]. Examination of mitochondrial and nuclear DNA has indicated genetic differences among and between Monk Seal subpopulations in the Atlantic and the eastern Mediterranean Sea (Pastor *et al.* 2007, Karamanlidis *et al.* 2016b, Gaubert *et al.* 2019, Rey-Iglesia *et al.* 2020, Salmona *et al.* 2022), but to date no separation of this species into subspecies has been suggested taxonomically.

Assessment Information

Red List Category & Criteria: Vulnerable D1 [ver 3.1](#)

Year Published: 2023

Date Assessed: June 27, 2023

Justification:

The Mediterranean Monk Seal (*Monachus monachus*) is one of the most endangered pinniped species and an Evolutionarily Distinct and Globally Endangered (EDGE) mammal (Isaac *et al.* 2007).

Historically, commercial seal hunting and human persecution (Johnson and Lavigne 1998, Johnson 2004, González 2015) wiped out colonies living on open beaches and reduced Mediterranean Monk Seal populations to small numbers. This in turn led to a change in terrestrial habitat use and produced severe bottleneck(s) that significantly reduced genetic diversity. For most of the 20th century, numbers continued to decline, mostly as a consequence of human invasion into critical seal habitat, persecution and adverse fishing interactions. This resulted ultimately in the fragmentation of the species into several subpopulations and its disappearance from most of its historical range. At the species level, the Mediterranean Monk Seal was listed on the IUCN Red List as “Critically Endangered” at the Global scale in 2008 (Aguilar and Lowry 2008); a re-assessment in 2015 listed the species as “Endangered” (EN) (Karamanlidis and Dendrinis 2015). In 2019, the subpopulation in the eastern Mediterranean Sea was also listed as Endangered (Karamanlidis *et al.* 2019).

Mediterranean Monk Seals continue to be exposed to a number of substantial threats, including habitat loss and deterioration [e.g., in the Cabo Blanco Peninsula (Ras Nouadhibou) and the Archipelago of Madeira pup mortality has been attributed mainly to pupping in unsuitable habitat (Pires *et al.* 2020, Fernández de Larrinoa *et al.* 2021)], displacement, as well as persecution and negative interactions with fisheries (Karamanlidis *et al.* 2016a, Karamanlidis *et al.* 2020) and tourism (Pires *et al.* 2020). Currently, however, the primary constraint for population growth of the small Monk Seal subpopulation in the Archipelago of Madeira are the low reproductive rates that are likely a result of the low marine productivity around Madeira (Pires *et al.* 2023). Unpredictable threats, such as disease, toxic algal blooms (red tides) (Martínez-Jauregui *et al.* 2012), cave collapses (González *et al.* 1997), pollution (e.g., oil spills, microplastic) and habitat change due to climate change also pose (potential) threats to the Mediterranean Monk Seal.

There is recent evidence of a significant increase in the range of the Monk Seal in Greece, which is one of the main reproductive areas of the European Mediterranean Monk Seal subpopulation (Adamantopoulou *et al.* 2022). In Türkiye a range expansion and an increase in sightings have also been documented (SAD-AFAG unpublished data September 2023), while in the Archipelago of Madeira, the population has been growing from 2012 to 2021 slowly, but steadily, with a rate of 3% (Pires *et al.* 2023). In the Cabo Blanco Peninsula, the local Monk Seal subpopulation has grown to its pre-mass die-off levels (Fernández de Larrinoa *et al.* 2021). The number of mature individuals is now thought to be globally more than 250, but less than 1,000 individuals. Because the global population of the Monk Seal still remains small, it qualifies as Vulnerable (VU) under Red List Criterion D1.

Conservation priorities for the Mediterranean Monk Seal include: a) strengthening the legal framework for the protection of the terrestrial and marine habitat of the species, b) effective protection of the

species (i.e., reduction of deliberate killing) and its terrestrial and marine habitat, c) population and habitat monitoring (including, for example, determining food availability and primary death causes), d) rescue and rehabilitation of injured, orphaned and sick individuals, e) public awareness, f) monitoring and mitigating negative seal – fishery interactions (Karamanlidis *et al.* 2016a), and g) expansion of the species' current geographic range in the Atlantic Ocean (González *et al.* 2006).

Previously Published Red List Assessments

2015 – Endangered (EN)

2013 – Critically Endangered (CR)

2008 – Critically Endangered (CR)

1996 – Critically Endangered (CR)

1994 – Endangered (E)

1990 – Endangered (E)

1988 – Endangered (E)

1986 – Endangered (E)

1965 – Unknown (N/A)

Geographic Range

Range Description:

Monachus monachus (Mediterranean Monk Seals) were once widely and continuously distributed throughout the entire Mediterranean and Black Sea and the Archipelagos of the Canary, Madeira and Azores Islands (Karamanlidis *et al.* 2016a), as well as the north-western coast of Africa and the coast of the Iberian Peninsula in the north-eastern Atlantic Ocean (González 2015). Today the global distribution of the species is fragmented into three main subpopulations, one in the eastern Mediterranean Sea and two in the northeastern Atlantic Ocean. In the eastern Mediterranean Sea, the most important reproductive areas of the species are at islands in the Ionian and Aegean Seas, and along the coasts of mainland Greece, Türkiye and Cyprus (Adamantopoulou *et al.* 1999, Güçlüsoy *et al.* 2004, Gücü *et al.* 2004, Gücü *et al.* 2009a, Gücü *et al.* 2009b, Nicolaou *et al.* 2019, Beton *et al.* 2021, Adamantopoulou *et al.* 2022). In the Turkish Black Sea, Mediterranean Monk Seals are believed to be extinct since 1997 (Kıraç and Savas 1996; Kıraç 2001, 2011); some individuals still survive in the Sea of Marmara (Inanmaz *et al.* 2014, Kıraç and Ververi 2018). Following a number of sightings (Bundone *et al.* 2022) and the birth of a pup in 2019 (Eastern Adriatic Monk seal Project 2019) the species is considered to be resident now also in Albania.

Sightings/occurrences of vagrant animals, most likely originating from Greece and Türkiye, are reported/assumed from throughout the Mediterranean (Karamanlidis *et al.* 2016a, Bundone *et al.* 2019): e.g., Italy (Fioravanti *et al.* 2020, Valsecchi *et al.* 2022), Montenegro and Croatia (Eastern Adriatic Monk seal Project 2019), Lebanon, Israel (Scheinin *et al.* 2011), Libya (Alfaghi *et al.* 2013), Egypt and Spain (Valsecchi *et al.* 2022). Mediterranean Monk Seals are considered extinct in Algeria, Bosnia and Herzegovina, Bulgaria, Cabo Verde, France, Gambia, Georgia, Malta, Monaco, Morocco, Portugal

(continental part and Archipelago of Azores), Romania, Russia, Senegal, Slovenia, Spain (including the Canary Islands in the Atlantic Ocean), Tunisia and Ukraine.

In the north-eastern Atlantic Ocean Monk seals have gone extinct throughout their historical range and survive nowadays only in the Cabo Blanco Peninsula (Ras Nouadhibou) and the Archipelago of Madeira (Pires and Neves 2001, Karamanlidis *et al.* 2003, Karamanlidis *et al.* 2004, Pires *et al.* 2008, González 2015, Pires *et al.* 2020, Fernández de Larrinoa *et al.* 2021, Pires *et al.* 2023).

Country Occurrence:

Native, Extant (resident): Albania; Cyprus; Greece (East Aegean Is., Greece (mainland), Kriti); Mauritania; Portugal (Madeira); Türkiye (Türkiye-in-Asia, Türkiye-in-Europe); Western Sahara

Native, Possibly Extinct: Egypt (Sinai); Israel; Italy (Italy (mainland), Sardegna, Sicilia); Lebanon; Libya; Montenegro; Palestine, State of; Spain (Balears); Syrian Arab Republic

Native, Extinct: Algeria; Bosnia and Herzegovina; Bulgaria; Cabo Verde; France (Corsica, France (mainland)); Gambia; Georgia; Malta; Monaco; Morocco; Portugal (Azores, Portugal (mainland)); Romania; Russian Federation (South European Russia); Senegal; Slovenia; Spain (Canary Is., Spain (mainland)); Tunisia; Ukraine

Native, Presence Uncertain: Croatia

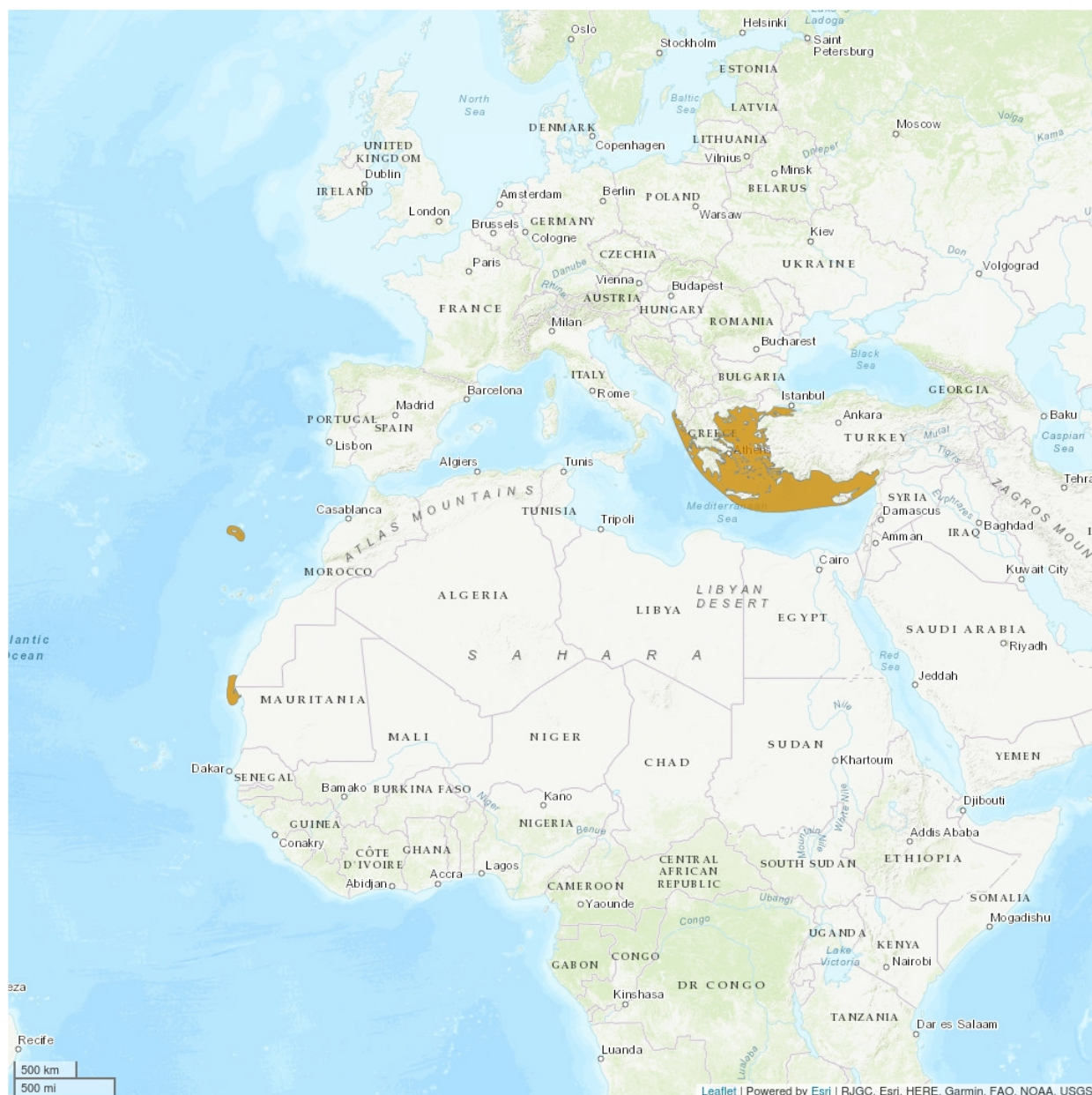
FAO Marine Fishing Areas:

Native: Atlantic - northeast

Native: Atlantic - eastern central

Native: Mediterranean and Black Sea

Distribution Map

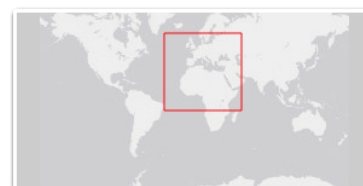


Legend

■ EXTANT (RESIDENT)

Compiled by:

European Red List; IUCN & EU 2023



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

The once abundant Mediterranean Monk Seal has disappeared from most of its historical range; the most significant declines in the Mediterranean Sea occurred during ancient and historic times (Johnson and Lavigne 1999, Johnson 2004) and along the Atlantic coasts of northwest Africa during the 14th–16th centuries when commercial exploitation of the Monk Seal colonies on open beaches took place (González 2015). Deliberate killing up until the first half of the 20th century reduced Monk Seal populations further (Karamanlidis *et al.* 2016a). All these significant population declines occurred more than three generations ago. Nine Important Marine Mammal Areas (IMMAs) have been identified for this species, including the Cabo Blanco IMMA, the Madeira and Desertas IMMA, and seven IMMAs in the eastern Mediterranean.

Conservation measures introduced over the last 35 years have helped to stem the decline, and there is now evidence of an increase in the size of the surviving subpopulations in the Atlantic Sea, i.e., Cabo Blanco Peninsula (Ras Nouadhibou) and the Archipelago of Madeira (Pires *et al.* 2020, Fernández de Larrinoa *et al.* 2021, Pires *et al.* 2023), as well as a recent, significant increase in the range of the Mediterranean Monk Seal in Greece, in the eastern Mediterranean Sea (Adamantopoulou *et al.* 2022). However, the global population of the Mediterranean Monk Seal remains small and still faces many threats (see the 'Threats' section). The Mediterranean Monk Seal is regarded as one of the most endangered pinniped species in the world, with an estimated total global population size of fewer than 1,000 mature individuals (Karamanlidis and Dendrinis 2015, Karamanlidis *et al.* 2019, CBD Habitat, Department of Fisheries and Marine Research Cyprus, MOm, IFCN, SAD-AFAG unpublished data September 2023).

Three subpopulations are globally recognised, two in the Atlantic Ocean and one in the Mediterranean Sea. The Atlantic Ocean subpopulations have been the subject of intensive monitoring efforts for more than 10 years that have produced accurate population size estimates: The 2021 census of the subpopulation in the Archipelago of Madeira identified 27 individuals (Pires *et al.* 2023). The colony in the Cabo Blanco Peninsula (Ras Nouadhibou), which is concentrated in a small area, has been estimated to number approximately 350 seals (CBD-Habitat unpublished data September 2023). The other large Monk Seal subpopulation is widely distributed, mainly throughout the eastern Mediterranean Sea (Karamanlidis and Dendrinis 2015, Karamanlidis *et al.* 2019). Based on population parameters from the Monk Seal subpopulations in the Cabo Blanco Peninsula (Ras Nouadhibou) (P. Fernandez de Larrinoa pers. comm. September 2023), Madeira (Pires *et al.* 2023), and the reproductive nuclei in Astakida (MOm 2008a) and Gyros (Karamanlidis and Dendrinis 2012) in Greece, a minimum annual pup production in the eastern Mediterranean of 97 [i.e., Greece: 75; Türkiye: 17 (M. Ok and C.O. Kiraç pers. comm. September 2023), Cyprus: 3; Remainder: 2] and a “pup multiplier” created from the relationship between the number of pups born annually and the number of reproducing animals in a given subpopulation (A. Karamanlidis pers. comm. September 2023), the global number of mature animals is likely 444–600.

Current Population Trend: Increasing

Habitat and Ecology (see Appendix for additional information)

Mediterranean Monk Seals are medium-sized phocids that reach 2.3–2.8 m in length (Littnan *et al.* 2018). Based on seals examined after a mass mortality event in the Cabo Blanco Peninsula (Ras

Nouadhibou), average adult lengths were estimated at 2.42 m in females and 2.51 m in males. Pups up to three months of age averaged 1.08 m in length with a range of 0.74-1.38 m (Samaranch and González 2000). In Europe, new-born pups average 1.02 m and 15.5 kg in weight (Dendrinis 2011). Adults weigh from 240-300 kg (Littnan *et al.* 2018), with maximum records for a male weighing 400 kg and a pregnant female 302 kg (Sergeant *et al.* 1978).

Mediterranean Monk Seal pups in the Cabo Blanco Peninsula (Ras Nouadhibou) moult on average 64 days after birth in the case of females and 82 days on average in the case of males; the moult occurs partly in the water and is completed after approximately 15 days (Badosa *et al.* 2006). In contrast, in the eastern Mediterranean Sea, the first moult occurs 19-57 days postpartum (Dendrinis 2011). Adult male Monk Seals develop the characteristic, black, adult pelage at the age of 4-6 years (Koentzopoulos *et al.* 2022; R. Pires pers. comm. September 2023).

Mediterranean Monk Seals once hauled out on open beaches (Johnson and Lavigne 1999, Johnson 2004), but today they primarily use throughout their range marine caves for hauling out, resting, and pupping (González 2015, Karamanlidis *et al.* 2016a). However, in recent years Monk Seals in the Archipelago of Madeira (since 1997) (Pires *et al.* 2020) and in Greece (Dendrinis *et al.* 2008, Dendrinis *et al.* 2022) have been observed hauling out increasingly on open beaches and resting in the water (Pires 2011, Karamanlidis *et al.* 2017).

Most marine caves used by Mediterranean Monk Seals for resting and pupping possess a set of common geophysical characteristics, that include an entrance corridor and a dry surface/area where the seals haul out (Karamanlidis *et al.* 2004, Dendrinis *et al.* 2007b). Seal preferences regarding cave selection and use in an area are influenced by numerous parameters (Dendrinis *et al.* 1994). As a result, Monk Seals in the eastern Mediterranean and the Archipelago of Madeira use a high number of marine caves for resting and pupping (Gücü *et al.* 2004; MOM 2007, 2008b, 2009). In Greece, more than 500 caves have been found to be occupied by the species and more than 100 are used for pupping (MOM 2007, 2008b, 2009). Similarly, in a study that covered the coastline inhabited by Monk Seals in the Cilician Basin region of southern Türkiye 39 marine caves were discovered, including three that were used for pupping and 16 that were actively used at the time of the survey (Gücü *et al.* 2004). At the island of Madeira and the sub-archipelago of the Desertas Islands 12 and 13 marine caves are considered to be suitable for the Mediterranean Monk Seal; from these, two and nine respectively are currently used by the species (Pires *et al.* 2020). In contrast, in the Cabo Blanco Peninsula (Ras Nouadhibou) only three caves are primarily used for hauling out and pupping (Fernández de Larrinoa *et al.* 2021). Cave selection may be influenced by changes in the internal morphology of a cave, as has been seen to occur in the Cabo Blanco Peninsula (Ras Nouadhibou) (González *et al.* 1997) or the state of the tide (only in the Atlantic populations, as tides in the Mediterranean are negligible) (Pires *et al.* 2007). Monk Seal activity in and around the marine caves in the eastern Mediterranean Sea and the Archipelago of Madeira is highest in autumn and winter and coincides with the pupping season of the species (Dendrinis *et al.* 1994, Gücü *et al.* 2004, Pires *et al.* 2007, Dendrinis 2011).

Monk Seal pupping in the eastern Mediterranean Sea and the Archipelago of Madeira is quite synchronous, occurring mainly in the months of October and November. This has been the case for more than 220 pups born in Greece from 1990 to 2014 (Dendrinis *et al.* 1994, Dendrinis 2011, MOM unpublished data September 2023), for 11 pups born at the Cilician Basin (Gücü *et al.* 2004) and six pups born at the coasts of İzmir and Muğla in Türkiye (SAD-AFAG unpublished data September 2023) and the

majority of pups born in Madeira from 1990 onwards (Pires 2011, IFCN unpublished data September 2023). In contrast, in the Cabo Blanco Peninsula (Ras Nouadhibou) births can take place throughout the year (P. Fernández de Larrinoa pers. comm. September 2023). Pups begin to catch fish toward the end of their lactation period (Pastor and Aguilar 2003) and are weaned when they are about four months old, with up to five months reported (Pastor and Aguilar 2003, Aguilar *et al.* 2007, Dendrinis 2011, Kiraç and Ok 2019). Fostering and allosuckling are not uncommon and have been recorded in the Cabo Blanco Peninsula (Ras Nouadhibou) (Aguilar *et al.* 2007), the Archipelago of Madeira (Pires 2004), and in Greece (Karamanlidis *et al.* 2013). At the Cabo Blanco subpopulation, in 26.6% of the suckling episodes observed in mother–pup pairs of known identity, pups suckled from females other than their mothers. Some females nursed more than one pup at least occasionally, and in some cases, a pup was fostered long-term by an unrelated female (Aguilar *et al.* 2007). Pups enter the water and begin diving during the first week of their life (Karamanlidis *et al.* 2010, Karamanlidis *et al.* 2021a).

Generation length for the Mediterranean Monk Seal is estimated to be 11.2 years (Pacifi *et al.* 2013). Female Monk Seals in the Cabo Blanco Peninsula (Ras Nouadhibou) become sexually mature at three years of age (Fernández de Larrinoa *et al.* 2021) and can give birth in successive years. In contrast, in the Archipelago of Madeira, the age of first reproduction of females has been estimated at 6–7 years of age (Pires *et al.* 2020, Pires *et al.* 2023). Male Monk Seals have been recorded to become sexually mature at the age of four in Cabo Blanco, at the age of 4.5 in Greece (Koemtzopoulos *et al.* 2022) and at the age of 4–6 years in the Archipelago of Madeira (R. Pires pers. comm. September 2023).

Annual pup survival in the Cabo Blanco Peninsula (Ras Nouadhibou) is 0.59 (0.55–0.62) at two months of age and 0.46 (0.43–0.49) from birth to the age of one year (Fernández de Larrinoa *et al.* 2021). In the Archipelago of Madeira, the survival rate during the first year of life is 0.47 (0.31–0.64) (Pires *et al.* 2023). In the eastern Mediterranean Sea, and more specifically in Greece, annual pup survival until weaning has not been estimated, but is suspected to be generally higher (i.e., 0.7) than that recorded in the Atlantic subpopulations, which is most likely due to the fact that lactating females and their pups have a higher number of suitable caves to choose from when seeking refuge from severe weather conditions.

Telemetry studies have been performed in the Cabo Blanco Peninsula (Ras Nouadhibou) and in the Archipelago of Madeira in order to assess the diving behaviour of the Monk Seal. In the Cabo Blanco Peninsula, the maximum depth and duration of diving for one lactating female were 78 m and 15 minutes respectively (Gazo and Aguilar 2005), and 100 m for an adult male (P. Fernandez de Larrinoa pers. comm. September 2023). Although maximum dive depths for an adult male and an adult female of 393 m and 429 m have been recorded in the Archipelago of Madeira respectively, the majority (i.e., 80%) of the dives were between 0 m and 49 m and 99.6% of the dives occurred up to a depth of 200 m (Pires *et al.* 2020). In the eastern Mediterranean Sea, maximum dive depths for a rehabilitated male and a female Monk Seal in Greece were 123 m (Dendrinis *et al.* 2007a) and 191 m (MOM unpublished data September 2023), respectively. In Türkiye, adult Monk Seals have been observed to dive for an average of approximately 6.5 minutes and then rest at the surface for approximately one minute (Kiraç *et al.* 2002). Monk seals in the eastern Mediterranean Sea have been recorded to travel ~288 km in three months with a maximum straight distance travelled of ~78 km (Adamantopoulou *et al.* 2011).

Stomach content analysis of dead Monk Seals has revealed that they have a heterogeneous diet consisting of bony fishes, cephalopods, and crustaceans. In Greece for example, Monk Seals are known to eat more than 70 different prey species [50% cephalopods, 48% fishes, 1.5% non-cephalopod

molluscs, 0.4% crustaceans (Pierce *et al.* 2011)]. The Common Octopus (*Octopus vulgaris* ~34%) and bony fish from the family Sparidae (~28%) were most frequently identified in Monk Seal stomachs (Pierce *et al.* 2011). Collectively, results from throughout the range of the species from direct observations (Neves 1998, Neves and Pires 1999), stomach content (Machado 1979, Salman *et al.* 2001, Karamanlidis *et al.* 2011, Pierce *et al.* 2011, Tonay *et al.* 2016, Pires *et al.* 2020) and stable isotope analyses (Karamanlidis *et al.* 2014) suggest that Monk Seals in the eastern Mediterranean Sea and in the Archipelago of Madeira forage primarily on the continental shelf along the coast.

Systems: Terrestrial, Marine

Use and Trade

In the past, Mediterranean Monk Seals were hunted by humans for their fur, oil, meat, and for medicinal use. Evidence suggests that Monk Seal colonies in the Mediterranean Sea and the Atlantic Ocean were severely depleted during the Roman era (Johnson and Lavigne 1999, Johnson 2004), the Middle Ages (González 2015), up until the 20th century (González and Fernandez de Larrinoa 2012, Karamanlidis *et al.* 2016a). Today there is no commercial exploitation of the species.

Threats (see Appendix for additional information)

Mediterranean Monk Seals have a long history of interaction with humans that includes exploitation for subsistence needs, commercial harvest, and persecution as a competitor for fisheries resources or because they caused actual and perceived damage to fishing gear (Johnson and Lavigne 1999, Stringer *et al.* 2008, González 2015). Once abundant, Monk Seals were written about and illustrated in the literature of classical antiquity (Johnson 2004).

The major reasons for the population decline of Monk Seals in the 20th century include: increased human pressure displacing seals from their original habitat; destruction/alteration of suitable habitat; negative interactions with the fisheries industry (including aquaculture), i.e., deliberate aggression by fishermen to eliminate a competitor, even in countries and areas where the species is legally protected; fisheries bycatch and a mass mortality (Forcada *et al.* 1999, Kırış *et al.* 2013, Karamanlidis *et al.* 2016a, Karamanlidis *et al.* 2020, Kırış *et al.* 2020, Pires *et al.* 2020).

Habitat deterioration, destruction, and fragmentation have played a significant role in the plight of the Mediterranean Monk Seal. Once an open beach dweller, the species has been persecuted by humans for centuries and forced into increasingly marginal habitat. This habitat shift has been thoroughly documented (Johnson and Lavigne 1999). This marginalization is still the case today, both, in the eastern Mediterranean Sea (MOM 2007, Kırış *et al.* 2013, Dendrinos *et al.* 2020) and in the Atlantic Ocean, where the high pup mortality recorded currently has been associated with pupping in suboptimal habitat (Pires *et al.* 2020). An alarming decline in pupping success has been recorded in the most important pupping location of the species in southern Türkiye, due to increased human activity (i.e., industrial development, including the construction of a thermal and nuclear power plant and a marine terminal). Critical Monk Seal habitat has been affected by increased tourism activities throughout Türkiye, even in protected areas such as the Olympos Beydagları National Park, and the Kas, Kekova Specially Protected Area. Although some resting activity by Mediterranean Monk Seals continues in these caves, no pupping has been recorded recently (Gücü *et al.* 2009b). Tourists and SCUBA divers, boat excursions, and even unauthorized and incompetent research activities in Monk Seal shelters in

Türkiye appear to have increased in the last decade and are considered a disturbance to the species (Kıraç and Savaş 2019, SAD-AFAG unpublished data September 2023). Similarly, in the Archipelago of Madeira tourism activities at sea are considered to be a disturbance to Mediterranean Monk Seals if not conducted properly (Pires *et al.* 2020). With human populations and coastal activities increasing throughout the range of the species there are corresponding increases in threats to the species' habitat.

Interactions with fisheries remain a great conservation concern throughout the entire range of the Monk Seal (Güçlüsoy and Savaş 2003; Güçlüsoy 2008a,b; Karamanlidis *et al.* 2008, Karamanlidis *et al.* 2020). The deliberate killing of Monk Seals, mainly by fishermen, has been responsible for at least 110 dead seals recorded throughout Greece from 1990 on (MOM unpublished data September 2023) and is considered one of the most important sources of mortality for the species in the eastern Mediterranean (Androukaki *et al.* 1999). Deliberate killing, hunting, and the capture of live animals for exhibition purposes were the main cause for the population reduction of the species in Türkiye until 1980 (Kıraç *et al.* 2013). At least 14 Monk Seals have died from entanglement in fishing gear in the Turkish Aegean and Mediterranean Sea (Kıraç *et al.* 2020, SAD-AFAG unpublished data September 2023). In the Archipelago of Madeira the aquaculture industry increasingly represents a threat to the local Monk Seal population (Pires *et al.* 2020).

Mediterranean Monk Seals have been entangled in a wide variety of fishing gear including set-nets, trawl nets, and long-lines (Johnson and Karamanlidis 2000) and entanglement remains a major source of mortality in the eastern Mediterranean Sea, especially for sub-adult animals (Karamanlidis *et al.* 2008, Kıraç *et al.* 2013, Karamanlidis *et al.* 2020, Kıraç *et al.* 2020). In the Archipelago of Madeira, despite original indications that negative interactions with fisheries were lower than in other areas of the species' distribution (Hale *et al.* 2011), recent data indicate that accidental catches in fishing traps and deliberate killings associated with this industry are on the rise (Pires *et al.* 2020).

Potentially, limited availability of food sources, genetic inbreeding, pollution, cave collapses and epizootic outbreaks could constitute threats to the survival of the Monk Seal. In the Archipelago of Madeira for example, limited food resources have been associated with the poor nutritional status of individual Monk Seals and the late sexual maturity of females compared to other areas of the species' distribution (Pires *et al.* 2020). Similarly, in the Cabo Blanco Peninsula, a mass mortality event such as the one that occurred in 1997 (Forcada *et al.* 1999) and/or the collapse of one or more of the remaining marine caves used by the species (González *et al.* 1997) would have detrimental effects on this subpopulation (Fernández de Larrinoa *et al.* 2021).

Genetic analyses of mitochondrial and nuclear DNA (Pastor *et al.* 2007, Karamanlidis *et al.* 2016b, Gaubert *et al.* 2019, Rey-Iglesia *et al.* 2020, Karamanlidis *et al.* 2021b) have shown that as a consequence of severe population bottlenecks and population/habitat fragmentation, Monk Seals have suffered a dramatic decrease in genetic diversity over the last few centuries. The genetic diversity of Mediterranean Monk Seals is among the lowest found in pinnipeds; it is comparable to Hawaiian Monk Seals (*Neomonachus schauinslandi*) and Northern Elephant Seals (*Mirounga angustirostris*) (Karamanlidis *et al.* 2016b). The potential consequences of the loss of genetic variability and genetic inbreeding are still hard to evaluate for the Mediterranean Monk Seal. Additionally, low fitness and increased susceptibility to disease may be an effect of genetic erosion.

Contaminant burdens have always been suspected to be a threat to the Mediterranean Monk Seal

(Boulva 1979, Reijnders *et al.* 1993). Research on organochlorine pollutants, which were analysed in the blubber of individuals collected during the 1990s from the Cabo Blanco and the subpopulation in the eastern Mediterranean, indicate that residue levels were very low in the former subpopulation and moderate to high in the latter (Yediler *et al.* 1993, Borrell *et al.* 1997, Borrell *et al.* 2007). More recent research efforts indicate that trace elements do not constitute a major conservation threat for Monk Seals in Greece (Formigaro *et al.* 2016).

Mediterranean Monk Seals are at an unknown, but suspected, medium level of risk from oil spills. This results from increased tanker traffic, and a greater chance for accidents, disturbance, and collisions near important habitats. In Türkiye, at least three such accidents that have affected Monk Seals and their habitat have occurred (Kıraç 1998, Kıraç *et al.* 2022). In response to one of these accidents, a clean-up operation and regulatory measures were taken in Türkiye to reduce the threat from oil spills (Kıraç and Güçlüsoy 2007). Accumulation of solid waste negatively affecting suitable monk seal habitat has been recorded in Greece, Türkiye and Cyprus and has been dealt with, with clean-up operations (Dendrinis *et al.* 2015).

The arrival of Lessepsian fishes in the eastern Mediterranean Sea, such as the toxic Silver-cheeked Toadfish (*Lagocephalus sceleratus*), could have a negative impact on Monk Seals in the region. This fish has been implicated in the death of at least one Monk Seal in northern Cyprus (A.C. Gücü pers. comm. November 2022).

Conservation Actions (see Appendix for additional information)

The Mediterranean Monk Seal is legally protected throughout its range through numerous national laws and regional (Notarbartolo di Sciara 2013) and international treaties [e.g., the Convention on International Trade in Endangered Species of Wild Fauna and Flora (a.k.a. the CITES Convention), the Convention on the Conservation of Migratory Species of Wild Animals (CMS or the Bonn Convention), the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention), the Convention on Biological Diversity (CBD) and the United Nations Convention on the Law of the Sea (UNCLOS)], as well as European Union (EU) regulations (e.g., Council Directive 92/43/EEC-Natura 2000 on the Conservation of Natural Habitats of Wild Fauna and Flora, and Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008, the “Marine Strategy Framework Directive”).

Legislative measures and research, management, and conservation actions to effectively protect important Monk Seal populations in Greece are carried out throughout the country (Dendrinis *et al.* 2020), and have been supported by several EU-funded LIFE projects (e.g., “Monk seal & fisheries: Mitigating the conflict in Greek seas”, LIFE05 NAT/GR/000083; “Integrated monk seal conservation in Northern Cyclades”, LIFE12 NAT/GR/000688). In Türkiye, conservation measures are carried out primarily in four provinces: İzmir, Muğla, Antalya and Mersin. In addition, five coastal locations were adopted as monk seal priority conservation zones in the country in 2004: Gökçeada, Foça-Karaburun, Alaçatı-Sığacık, the Bodrum Peninsula, and the Cilician coasts (Kıraç *et al.* 2013). In Cyprus, the Mediterranean Monk Seal has been legally protected since 1971 by the Fisheries Law and Regulations. Research (i.e., including intense monitoring efforts), effective management of marine protected areas designated for the species and public awareness, are some of the conservation measures implemented to effectively protect and conserve the Monk Seal in Cyprus (Department of Fisheries and Marine Research 2022). In Madeira, legislative measures and research, management, and conservation actions to effectively protect Monk Seals and their habitat are carried out throughout the Archipelago since

1988 (Pires *et al.* 2020). Recent conservation efforts in the region have been supported by the LIFE “Mediterranean monk seal conservation in Madeira and development of a conservation status surveillance system” Project LIFE13NAT/ES/000974. Monk Seal habitat in the Cabo Blanco Peninsula (Ras Nouadhibou) is currently protected by several coastal and marine protected areas, as well as by ‘no take’ reserves. The local Monk Seal subpopulation has been permanently monitored and protected by an International Conservation Program since 2000.

Additionally, the species is explicitly mentioned in numerous Natura 2000 sites within the countries of the EU (i.e., Greece, Cyprus and Madeira in Portugal). According to the Council’s Directive 92/43EEC ‘on the conservation of natural habitats of wild fauna and flora’ the Mediterranean Monk Seal is considered a species of community importance. Based on the above Directive, Natura 2000 sites are legally considered by EU Member States as Protected Areas. All marine caves used by Monk Seals in the Archipelago of Madeira are situated within the local Natura 2000 network (Pires *et al.* 2020).

Throughout the range of the species, widespread action has been taken to sensitize the general public towards Monk Seal conservation, to protect pupping caves, to restrict fishing gear and relocate the most dangerous fishing practices, to develop monitoring programs and intervention protocols, and to increase on-site capability to rehabilitate sick and injured individuals, particularly pups. Numerous agreements, conventions, and treaties (on a regional, national, and international level) are in force to protect Monk Seals and many workshops and conferences have brought together scientists and managers to discuss Monk Seal conservation issues and problems. Furthermore, numerous international bodies and fora, including the Regional Activity Centre for Specially Protected Areas (SPA/RAC) and the General Fisheries Commission for the Mediterranean, have put forward initiatives and proposals in order to ameliorate existing threats and mitigate pressures from relevant sectors (i.e., fisheries, bycatch, etc.). An International Action Plan for the recovery of the Monk Seal in the eastern Atlantic Ocean has been developed by the national authorities of Mauritania, Morocco, Portugal and Spain and has been successfully implemented over the last 20 years, thus improving the conservation status of the species in the region (González *et al.* 2006).

In Greece, the “Action plan for the Mediterranean Monk Seal” (Dendrinos *et al.* 2020) describes in detail actions that should be carried out in the country until 2027 in order to safeguard the future of the species. In Türkiye, nationwide conservation and public awareness and educational efforts have been ongoing for more than three decades. Conservation activities have included the protection of critical Monk Seal habitat (i.e., including the prohibition of the illegal entering into Monk Seal caves), scientific monitoring of the species, rescue and rehabilitation of orphan, sick and wounded seals, clean-up activities in and around important Monk Seal caves and widespread awareness and educational activities in schools and fishing communities (Kıraç *et al.* 2013). Despite stable population trends, numerous threats to the Monk seal persist in Türkiye and the status of the species should be considered critical. Therefore, effective conservation measures for the species and its habitat remain of critical importance in Türkiye and should be pursued with vigour (C.O. Kıraç and M. Ok pers. comm. September 2023). In Cyprus, habitat restoration activities, promoting public awareness, developing and establishing a National Action Plan and a national monitoring protocol, scientific monitoring of the species and habitat protection are some of the priorities for, and conservation actions taken, to safeguard the future of the species in the country (Department of Fisheries and Marine Research 2022). Following the conservation priorities identified in the Action Plan for the recovery of the Monk Seal in the eastern Atlantic Ocean (González *et al.* 2006), conservation actions for Monk Seals in the Archipelago of Madeira

have included, among others, the standardized, systematic monitoring of the species and its habitat, mitigating negative fishery-Monk Seal interactions, public awareness and habitat protection (Instituto das Florestas e Conservação da Natureza unpublished data September 2023). In 2020 a Strategy for the Conservation of the Mediterranean Monk Seal was approved by the Government Council of Madeira (Pires *et al.* 2020). Following the same priorities, conservation actions in the Cabo Blanco Peninsula (Ras Nouadhibou) have included the permanent protection and monitoring of the reproductive areas of the local Monk Seal population, the standardized, systematic monitoring of the population, the identification of critical terrestrial and marine (e.g. foraging areas) habitats, the development of a social aid program focused on artisan fishermen to improve their living and working conditions, as well as the implementation of a wide awareness and information program for local communities, fishermen and the general public.

Priority conservation actions for the Mediterranean Monk Seal include: a) strengthening the legal framework for the protection of the terrestrial and marine habitat of the species, b) effective protection of the species (i.e., reduction of deliberate killing) and its terrestrial and marine habitat, c) population and habitat monitoring (including, for example, determining food availability and primary death causes), d) rescue and rehabilitation of injured, orphaned and sick individuals, e) public awareness, f) monitoring and mitigating negative seal – fishery interactions (Karamanlidis *et al.* 2016a), and g) expansion of the species' current geographic range in the Atlantic Ocean (González *et al.* 2006).

Credits

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External Resources

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Appendix

Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
9. Marine Neritic -> 9.1. Marine Neritic - Pelagic	Resident	Suitable	Yes
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	Resident	Suitable	Yes
10. Marine Oceanic -> 10.2. Marine Oceanic - Mesopelagic (200-1000m)	Resident	Suitable	Yes
12. Marine Intertidal -> 12.1. Marine Intertidal - Rocky Shoreline	Resident	Suitable	Yes
12. Marine Intertidal -> 12.2. Marine Intertidal - Sandy Shoreline and/or Beaches, Sand Bars, Spits, Etc	Resident	Suitable	Yes
13. Marine Coastal/Supratidal -> 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands	Resident	Suitable	Yes
13. Marine Coastal/Supratidal -> 13.2. Marine Coastal/supratidal - Coastal Caves/Karst	Resident	Suitable	Yes

Use and Trade

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

End Use	Local	National	International
1. Food - human	Yes	No	No
3. Medicine - human & veterinary	Yes	No	No
7. Fuels	Yes	No	No
8. Fibre	Yes	No	No

Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Majority (50-90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation	
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Ongoing	Majority (50-90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation	

1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Majority (50-90%)	Rapid declines
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation	
4. Transportation & service corridors -> 4.3. Shipping lanes	Ongoing	Majority (50-90%)	Slow, significant declines
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Past, unlikely to return	Unknown	Unknown
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance	
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.5. Persecution/control	Ongoing	Majority (50-90%)	Rapid declines
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Majority (50-90%)	Rapid declines
	Stresses:	2. Species Stresses -> 2.2. Species disturbance	
6. Human intrusions & disturbance -> 6.2. War, civil unrest & military exercises	Ongoing	Minority (<50%)	Negligible declines
	Stresses:	2. Species Stresses -> 2.2. Species disturbance	
7. Natural system modifications -> 7.3. Other ecosystem modifications	Future	Minority (<50%)	Unknown
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success	
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (<i>Lagocephalus sceleratus</i>)	Ongoing	Majority (50-90%)	Negligible declines
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
8. Invasive and other problematic species, genes & diseases -> 8.6. Diseases of unknown cause	Ongoing	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.3. Type Unknown/Unrecorded	Ongoing	Majority (50-90%)	Negligible declines
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation	
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.1. Oil spills	Ongoing	Whole (>90%)	Negligible declines
	Stresses:	2. Species Stresses -> 2.1. Species mortality	
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.3. Type Unknown/Unrecorded	Ongoing	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation	

9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.4. Type Unknown/Unrecorded	Ongoing	Unknown	Unknown
Stresses: 1. Ecosystem stresses -> 1.2. Ecosystem degradation			
11. Climate change & severe weather -> 11.1. Habitat shifting & alteration	Ongoing	Whole (>90%)	Unknown
Stresses: 1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation			

Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: Yes
Systematic monitoring scheme: Yes
In-place land/water protection
Conservation sites identified: Yes, over part of range
Area based regional management plan: Yes
Occurs in at least one protected area: Yes
Invasive species control or prevention: No
In-place species management
Harvest management plan: No
Successfully reintroduced or introduced benignly: No
Subject to ex-situ conservation: Yes
In-place education
Subject to recent education and awareness programmes: Yes
Included in international legislation: Yes
Subject to any international management / trade controls: Yes

Conservation Actions Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Action Needed	Notes
1. Land/water protection -> 1.1. Site/area protection	Yes, important pupping sites should be effectively protected.

Conservation Action Needed	Notes
1. Land/water protection -> 1.2. Resource & habitat protection	The marine and coastal environment should be protected horizontally in order to ensure the survival of the species.
2. Land/water management -> 2.1. Site/area management	See 1.1
3. Species management -> 3.2. Species recovery	Conservation priorities identified in the local action plans should be implemented.
3. Species management -> 3.3. Species re-introduction -> 3.3.1. Reintroduction	-
4. Education & awareness -> 4.1. Formal education	Formal education of public authorities and bodies is necessary in order to effectively implement priority conservation actions.
4. Education & awareness -> 4.2. Training	See 4.1
4. Education & awareness -> 4.3. Awareness & communications	Public awareness and education actions are necessary, especially in: a) areas where the mediterranean monk seal has been re-establishing itself (e.g., albania, cyprus) and b) areas where it is being planned to be potentially reintroduced.
5. Law & policy -> 5.2. Policies and regulations	-
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level	-

Research Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Research Needed	Notes
1. Research -> 1.1. Taxonomy	-
1. Research -> 1.2. Population size, distribution & trends	Yes, important subpopulations should be closely monitored.
1. Research -> 1.3. Life history & ecology	-
1. Research -> 1.5. Threats	-
1. Research -> 1.6. Actions	-

Research Needed	Notes
2. Conservation Planning -> 2.1. Species Action/Recovery Plan	-
2. Conservation Planning -> 2.2. Area-based Management Plan	-
3. Monitoring -> 3.1. Population trends	Yes, population trends of important subpopulations should be closely monitored.
3. Monitoring -> 3.4. Habitat trends	-

Additional Data Fields

Distribution
Continuing decline in area of occupancy (AOO): No
Extreme fluctuations in area of occupancy (AOO): No
Continuing decline in extent of occurrence (EOO): No
Extreme fluctuations in extent of occurrence (EOO): No
Number of Locations: 2-5
Continuing decline in number of locations: No
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 0
Upper elevation limit (m): 5
Lower depth limit (m): 429
Upper depth limit (m): 0
Population
Number of mature individuals: 444-600
Continuing decline of mature individuals: No
Extreme fluctuations: No
Population severely fragmented: No
No. of subpopulations: 3
Continuing decline in subpopulations: No
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
No. of individuals in largest subpopulation: 247-402

Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 11.2
Movement patterns: Not a Migrant

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