Mediterranean Monk Seal
(Monachus monachus)

5-Year Review:
Summary and Evaluation

Photo Credit: MOm / A. A. Karamanlidis

National Marine Fisheries Service
Office of Protected Resources
Silver Spring, MD

September 2017

5-YEAR REVIEW
Mediterranean monk seal
(*Monachus monachus*)

1.0 GENERAL INFORMATION

1.1 Reviewers
Lead Regional or Headquarters Office:
Sasha Doss and Brendan Newell, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, (301) 427-8403

1.2 Methodology used to complete the review:
A 5-year review is a periodic analysis of a species' status conducted to ensure that the listing classification of a species as threatened or endangered on the List of Endangered and Threatened Wildlife and Plants (List) (50 CFR 17.11 – 17.12) is accurate. The 5-year review is required by section 4(c)(2) of the Endangered Species Act of 1973, as amended (ESA) and was prepared pursuant to the joint National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife 5-year Review Guidance and template (USFWS and NMFS 2006). The NMFS Office of Protected Resources led the 5-year review with input from NMFS regional offices and science centers. We relied on peer-reviewed publications, government and technical reports, conference papers, dissertations, and theses. We gathered information through March 2017. This review relies heavily on two documents: a review paper by Karamanlidis et al. (2015) and on the 2015 IUCN assessment (Karamanlidis and Dendrinos 2015). The information on the Mediterranean monk seal (*Monachus monachus)* biology and habitat, threats, and conservation efforts were summarized and analyzed in light of the ESA section 4(a)(1) factors (see Section 2.3.2.1) to determine whether a reclassification or delisting may be warranted (see Section 3.0). NMFS initiated a 5-year review of the Mediterranean monk seal and solicited information from the public on September 1, 2016 (81 FR 60347). NMFS received no public comments on this species.

1.3 Background

1.3.1 FR Notice citation announcing initiation of this review
81 FR 60347, September 1, 2016

1.3.2 Listing history
Original Listing
Federal Register notice: 35 FR 8491
Date listed: June 2, 1970
Entity listed: Species
Classification: Endangered

1.3.3 Associated rulemakings
None

1.3.4 Review History
This is the first, formal 5-Year Review for the Mediterranean monk seal.

1.3.5 Species' Recovery Priority Number at start of 5-year review
Not applicable

1.3.6 Recovery Plan or Outline
Not applicable – we determined that a recovery plan would not promote the conservation of the species because it exists solely in foreign waters.

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy[1]

2.1.1 Is the species under review a vertebrate?

_X_ ***Yes***, *go to section 2.1.2*
____ ***No***, *go to section 2.2*

2.1.2 Is the species under review listed as a DPS?

____ ***Yes***, *go to section 2.1.3*
_X_ ***No***, *go to section 2.1.4*

2.1.3 Was the DPS listed prior to 1996?

____ ***Yes***
____ ***No***

[1] To be considered for listing under the ESA, a group of organisms must constitute a "species," which is defined in section 3 of the ESA to include "any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature." NMFS and USFWS jointly published a policy regarding the recognition of DPSs of vertebrate species under the Endangered Species Act (DPS Policy, 61 FR 4722; February 7, 1996).

"DPS" is not a scientifically defined term; it is a term of art that is used in the context of ESA law and policy. Furthermore, when passing the provisions of the ESA that give us authority to list DPSs, Congress indicated that this provision should be used sparingly. We have discretion with regard to listing DPSs and, in order to be consistent with the directive of the Congressional report that followed the introduction of the DPS language in the ESA to identify DPSs sparingly, we will generally not, on our own accord, evaluate listings below the taxonomic species or subspecies level if the best available information indicates that the species or subspecies is in danger of extinction throughout all or a significant portion of its range. We should only identify DPSs if there is an overriding conservation benefit to the species.

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ ***Yes****, provide citation and go to section 2.1.4*
____ ***No****, go to section 2.1.3.2*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ ***Yes****, discuss how it meets the DPS policy, and go to section 2.1.4*
____ ***No****, discuss how it is not consistent with the DPS policy and consider the 5-year review completed. Go to section 2.4., Synthesis.*

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

__X__ ***Yes,*** **See section 4.0 Recommendations for Future Actions.**
_____ ***No****, go to section 2.2., Recovery Criteria*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

____ ***Yes***
__X__ ***No***

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

____ ***Yes***
____ ***No***

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

____ ***Yes***
____ ***No***

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information
Not applicable

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Mediterranean monk seals *Monachus monachus* are phocids or true (earless) seals and are one of the few pinniped species, along with members of the closely related genus *Neomonachus*, to reside in tropical and subtropical waters (Gilmartin and Forcada 2002). The Mediterranean monk seal is considered the rarest and most endangered pinniped and exists primarily as three geographically and genetically isolated subpopulations in the eastern Mediterranean Sea, off the coasts of the Cabo Blanco peninsula (on the borders of Mauritania and Western Sahara), and throughout the archipelago of Madeira (Karamanlidis et al. 2015).

The average adult monk seal ranges from 7 to 9 feet (2.3 to 2.8 meters) nose to tail (Gilmartin and Forcada 2002), and typically weighs between 530 and 660 pounds (240 and 300 kilograms). Females are generally smaller than males (Johnson et al. 2006). Maximum weights of 881 and 665 pounds (400 and 302 kg) have been reported for adult male and pregnant female monk seals respectively (Karamanlidis et al. 2015). Monk seal pups are typically 2.9 to 3.4 feet in length (0.9 to 1.0 meters) and weigh between 33 and 44 pounds (15 and 20 kilograms) (Johnson et al. 2006). The average length of a pup at birth in the Cabo Blanco and eastern Mediterranean subpopulations is 3.3 feet (1 meter) (Marchessaux 1989, Samaranch and González 2000, Dendrinos 2011).

Several morphological differences characterize the different developmental stages of the monk seal (González et al. 1996, Samaranch and González 2000). Newborn pups have a black or dark brown, woolly coat called "lanugo" (Figure 1a). The coat is interrupted by a white, sometimes spotted, patch on the ventral side (i.e., the belly) of the seal. The shape, size, spot-pattern, and position of the patch varies between seals and can be used to identify individual seals and their gender prior to the first molting (Badosa et al. 1998). When the pup is approximately four to eight weeks old, the first molt occurs, and short, glossy, grey hair replaces the long, black lanugo (Figure 1b). A seal's first molt may last between one and three weeks (Mursaloglo 1986, Androukaki et al. 2002, Dendrinos 2011), and is not associated with weaning as it is in other seal species (Badosa et al. 2006). Molting in Mediterranean monk seals has a consistent pattern, beginning at the head and progressing anteriorly and distally on the body (Androukaki et al. 2002). Female pups tend to molt earlier and more quickly than male pups, although the resulting gray dorsal and white ventral pelage is similar. Molting of juvenile and adult seals occurs throughout the year with pre- and post-molt phases (Androukaki et al. 1999, Güçlüsoy and Savaş 2003, Pastor and Aguilar 2003). Mediterranean monk seals also shed large layers of epidermis during the molting process, and molting can occur partially in the water (Badosa 1998). At the adult and juvenile stages, the seal's coat becomes short and bristly (i.e., hair length of about 0.5 cm; Ling 1970). Adult males have a black pelage and usually retain the white ventral patch (Figure 1c). In contrast, adult females typically exhibit a brown or gray pelage with a lighter belly (Figure 1d; Karamanlidis et al. 2015). The development of the adult male pelage takes

approximately four years with two molts per year (Badosa et al. 2006). Once the seals reach sexual maturity, it is also common to find scarring on the throats and hind flippers of males and on the backs of females from mating and other social interactions (Grau et al. 1994, Forcada and Aguilar 2000, Samaranch and González 2000).

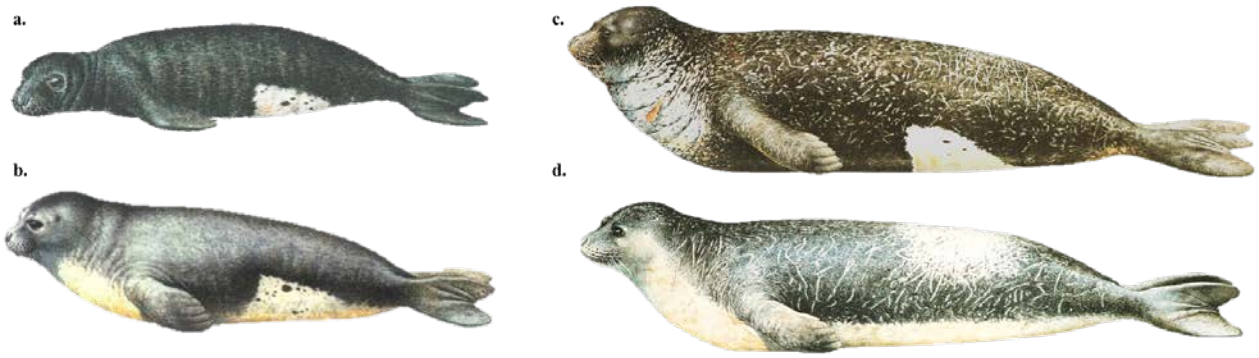

Figure 1. The various morphologies exhibited by different developmental stages of the Mediterranean monk seal: **(a)** newborn pup with lanugo and the white ventral patch, **(b)** older pup going through the first molt, **(c)** adult male with the white ventral patch and scarring on throat, flippers, and back, and **(d)** adult female with a lighter belly and scarring on the back. Sources: Eduardo Saiz; Kıraç and Güçlüsoy (2008).

Male Mediterranean monk seals mature later in life than females. Female Mediterranean monk seals typically reach sexual maturity between 5 and 6 years of age, while the earliest age males have been observed mating is 7 (Karamanlidis et al. 2015). Over the last 30 years, however, female monk seals have been observed mating earlier at 2.5 and 2.1 years of age (Gazo et al. 2000, unpublished data, Fundación para la Conservación de la Bioversidad y su Hábitat [CBD-Habitat])—the lowest age band for any phocid species. Gestation lasts 9-11 months (Karamanlidis et al. 2015), and females give birth to one pup (King 1956). Female monk seals can give birth in consecutive years (Pastor and Aguilar 2003), and often give birth within the same few days each year (Pastor and Aguilar 2003). Mating of Mediterranean monk seals takes place in the water (Pastor et al. 1998).

Although pups may be born year-round, most pupping takes place in autumn (Karamanlidis et al. 2015). In the Cabo Blanco subpopulation, births have been concentrated from April-November with a peak in September (Cedenilla et al. 2007). Throughout the rest of the species' range, where monitoring data are available, pupping usually occurs between October and November with 2-3 pups born annually in Madeira (Pires et al. 2008) and about 40 pups born annually in Greece (unpublished data, Hellenic society for the Study and Protection of the Monk Seal [MOm]). During lactation, females may leave their pups unattended to forage (Gazo and Aguilar 2005). On average, these foraging trips last about nine hours, although trips as long as 17 hours have been recorded (Gazo and Aguilar 2005). Fostering of unrelated pups and milk-stealing are common (Karamanlidis et al. 2015), and long-term fostering has been observed in the Cabo Blanco subpopulation (Aguilar et al. 2007). Pups are weaned and begin to independently forage at about 4-5 months (Karamanlidis et al. 2015).

Historically, monk seals hauled out on open beaches for resting and pupping, but due to centuries of human persecution and disturbance, they have been extirpated from much of their original habitat (Karamanlidis and Dendrinos 2015, Karamanlidis et al. 2015). Now in response to anthropogenic pressures, females tend to give birth in remote, marine caves. Pupping females prefer caves where they and their pups cannot be seen, that have some light, that have multiple entrances/escape routes, are not easily accessible to humans, that have a low risk of pup washout, and that have interior beaches with soft substrate (Dendrinos et al. 2007). The size of caves and the density of seals within caves used for pupping varies throughout the species' range. In Cabo Blanco, the entire monk seal population uses less than five large, neighboring marine caves (Karamanlidis et al. 2015). The Madeira and eastern Mediterranean subpopulations use dozens or hundreds of small caves (Karamanlidis et al. 2004, Karamanlidis et al. 2015).

In contrast to other pinniped species, information on the diving behavior of the Mediterranean monk seal is scarce. Generally, Mediterranean monk seals are thought to dive and feed in shallow, nearshore waters (Gazo and Aguilar 2005). However, there is some evidence to suggest that some seals will travel more than 20 km offshore to forage (Gazo and Aguilar 2005). Dive durations are short compared to other phocids; the average dive is only about five to seven minutes, with a maximum-recorded dive time of 18 minutes (Kıraç et al. 2002). There are some regional variations in diving behavior. Seals at Cabo Blanco typically make more shallow dives than their eastern Mediterranean counterparts. However, this is likely because the seals at Cabo Blanco are constrained by local topographic features. Pups often enter the water within their first week of life and increase their diving capacity with age. By the end of lactation, pups are capable of spending approximately three minutes at depths greater than 10 meters (Karamanlidis et al. 2015). Seals in the Mediterranean have been observed to occasionally travel long distances (~288 km in three months) (Karamanlidis and Dendrinos 2015).

Mediterranean monk seals are considered opportunistic predators (Karamanlidis et al. 2015). They exploit a variety of forage including, bony fishes, cephlapods (mainly the common octopus *Octopus vulgaris*), and crustaceans. Over 530 prey species were found in the stomachs of deceased seals in Greece (Pierce et al. 2011). Cephlapods dominate the diet of seals in the Aegean Sea (Salman et al. 2001), and are the most important prey item for seals residing along the Greek coast in terms of number and biomass consumed (Pierce et al. 2011). Data from multiple sources and methods suggest that Mediterranean monk seals primarily feed along the continental shelf (Marchessaux 1989, Salman et al. 2001, Pierce et al. 2011, Karamanlidis et al. 2014).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

The current distribution of the Mediterranean monk seal encompasses the eastern Mediterranean and the Northeast Atlantic (i.e., the peninsula of Cabo Blanco on the coasts of Western Sahara and Mauritania and the archipelago of Madeira) (Figure 2). Each location supports an isolated subpopulation of seals. Historically, the species was present throughout the Mediterranean and Black seas and throughout North Atlantic waters from Cabo Blanco to Spain (Figure 2; Johnson et al. 2006).

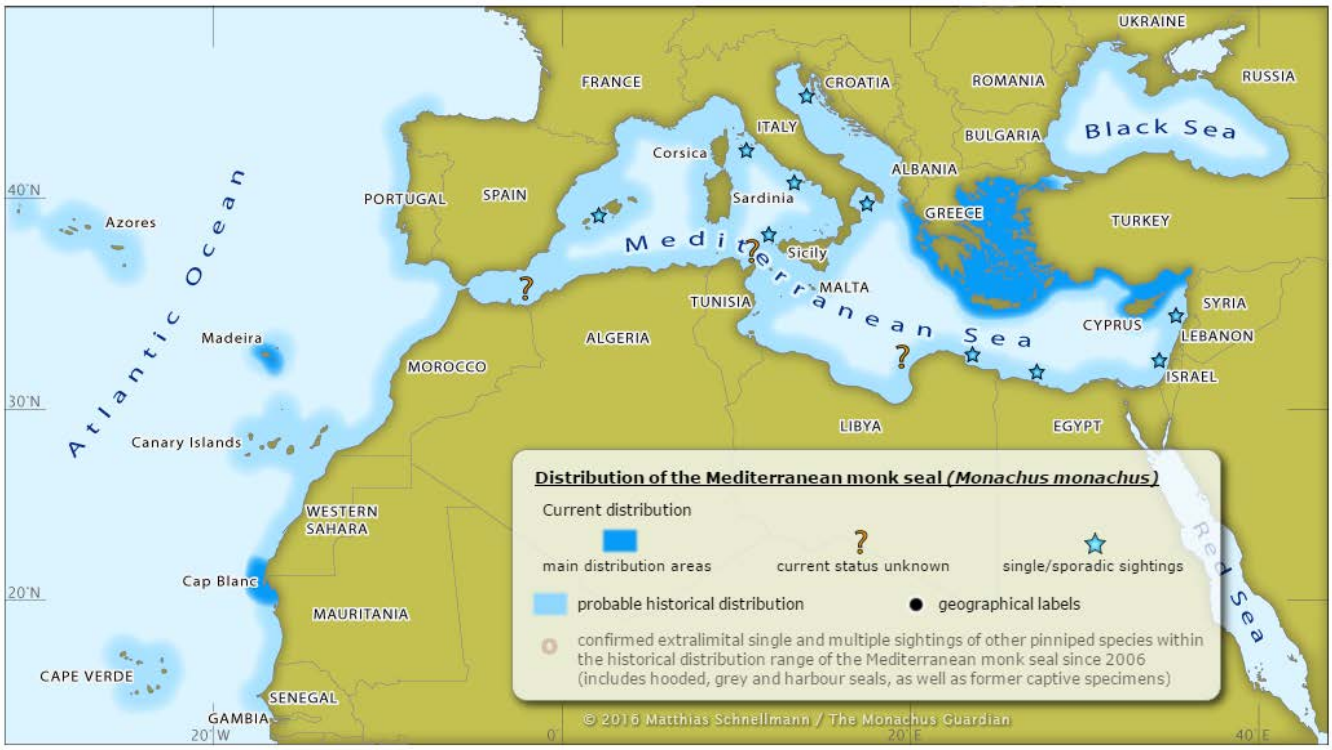

Figure 2. Current and historical distributions of the Mediterranean monk seal *Monachus monachus*. In the figure, Cabo Blanco is referred to as "Cap Blanc." Source: Matthias Schnellmann/The Monachus Guardian 2016

The Mediterranean monk seal is thought to have been abundant throughout this historical range as there was extensive exploitation of the species for oil and pelts (Marchessaux 1989). Fifteenth century Portuguese hunters reported as many as 5,000 animals in the Western Sahara region (Monod 1932). The current population of Mediterranean monk seals is limited to 600 or 700 individuals with 350 to 450 mature individuals (Karamanlidis and Dendrinos 2015, Karamanlidis et al. 2015), and in the Cabo Blanco subpopulation the abundance of Mediterranean monk seals is estimated to represent about 3% of its historic abundance (Pastor et al. 2004).

Conservation efforts initiated over the past few decades seem to have at least partially stymied the population's decline, as the current overall abundance of seals is substantially higher than the

350 to 450 monk seals estimated in 2010 (Aguilar and Lowry 2010).[2] It is unclear when this increasing trend began and if it will continue (Karamanlidis and Dendrinos 2015).

The eastern Mediterranean subpopulation is currently the largest with fewer than 350 adult seals (Güçlüsoy et al. 2004). Prior to 1997, Cabo Blanco represented the largest subpopulation of the species with about 300 individuals, but a mass mortality event starting in the spring of 1997 reduced the population by more than 67% (Forcada et al. 1999, Gazo et al. 1999, Forcada and Aguilar 2000). The archipelago of Madeira has the fewest seals at approximately 40 individuals (Pires et al. 2008, Pires 2011). Each of the subpopulations have shown recent small increases and signs of recovery. The Cabo Blanco subpopulation was estimated at 159 adult seals in 2013 and at 220 adult seals in 2016 (Martinez-Jauregui et al. 2012, Karamanlidis et al. 2015). Additionally, seals in the Madeira archipelago have begun recolonizing the main island of Madeira with some possible indications of pupping (Pires 2011, Karamanlidis and Dendrinos 2015).

These small, localized recoveries are likely the result of four factors (Notarbartolo di Sciara and Kotomatas 2016). First, the importance of artisanal fishing in many economies has declined. As the costs of the profession increase, more people, particularly younger generations, opt for other employment. Over time, this likely has reduced the number of negative interactions between fisheries and monk seals. Second, a shift in public opinion regarding environmental stewardship and animal welfare has created substantial opposition to the killing of monk seals. In Greece, the public now places substantial nonuse value on the monk seal (e.g., finding inherent value in its existence; Langford et al. 2001). Third, the work of non-governmental organizations (NGOs) has greatly improved monk seal conservation via seal rehabilitation, research on the species biology, managing marine protected areas (MPAs), and generally building public support for the species. Finally, monk seal habitat is often inaccessible to humans, and this refuge may have enabled the population to avoid extinction.

Furthermore, there may be another subpopulation of seals in eastern Morocco/Algeria, but there has not been systematic monitoring to discern the status of this population (Mo et al. 2011, Karamanlidis et al. 2015). Vagrant individuals have also been recently sighted throughout the Mediterranean in areas where the species was thought to be extinct (e.g., in Albania, Croatia, Israel, Lebanon, Spain, etc.) (Karamanlidis et al. 2015).

The subpopulation in Cabo Blanco and the seals around Gyaros Island (Greece) are the only groups of monk seals to preserve the social structure of a colony (Martinez-Jauregui et al. 2012, Karamanlidis et al. 2013). The function of the colony structure in monk seals, and thus the conservation implications of retaining colony structure, are not well understood (Acevedo-Gutiérrez 2009). Although monk seals are thought to be primarily solitary animals, they do on occasion aggregate into small colonies—such as those mentioned above—and interact with other individuals (Karamanlidis et al. 2013). Generally, the gathering of individuals into colonies has

[2] Although there have been improvements in the methodologies used to study monk seals (e.g., the remote use of infrared photo cameras in caves), it is unlikely that the estimated increase in population size was substantially influenced by differences in methodology as the methods used to calculate abundance (although different by location) have been largely similar across time (e.g., Pires and Neves 2001, Pires et al. 2008 and Karamanlidis et al. 2009).

been hypothesized to provide several benefits, including improved reproduction and breeding success, higher pup survival, and reduced predation (Acevedo-Gutiérrez 2009). For instance, the formation of colonies can benefit breeding success via access to and competition for mates, and pup survival when milk-stealing and/or fostering are common, both of which have been observed in the Mediterranean monk seal. The formation of colonies in all pinniped species seems to be highly dependent on the distribution of females and suitable habitat (Acevedo-Gutiérrez 2009).

Defining demographic parameters of the various monk seal subpopulations has been fraught with difficulty given the inaccessibility of their habitat. However, the development of novel methods involving the attachment of video cameras to cave entrances has improved our ability to monitor seals, identify individuals, and estimate pup survival (e.g., Gazo et al. 2000). Current estimations of abundance and annual pup production can be found in Table 1.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Genetic analyses of both nuclear and mitochondrial deoxyribonucleic acids (DNAs) show that each subpopulation retains very little genetic diversity (Pastor et al. 2004, 2007; Karamanlidis et al. 2014). Microsatellite variation in Mediterranean monk seals is among the lowest reported for any mammal, and similarly low levels of variation have only been documented in a handful of severely bottlenecked species, such as the northern hairy-nosed wombat *Lasiorhinus krefftii* (Taylor et al. 1994). Among pinnipeds, only the Hawaiian monk seal (Gemmell et al. 1997, Kretzmann et al. 2001) and northern elephant seal *Mirounga angustirostris* (Garza 1998) have similarly low genetic variability, and both of those species have experienced well-documented reductions in population size. Despite the Mediterranean monk seals' small population size, the amount of variability in the number of polymorphic loci and its allelic diversity are higher than that exhibited by the Hawaiian monk seal and northern elephant seal (Pastor et al. 2004).

Trends in the data show a loss of genetic diversity over the last few centuries (Karamanlidis and Dendrinos 2015). Genetic and skull morphology data suggest substantial genetic differences between the Atlantic and Mediterranean subpopulations of Mediterranean monk seal (Karamanlidis and Dendrinos 2015). While genetically isolated, all haplotypes are closely related, suggesting an evolutionarily recent dispersal event from one ancestral population, followed by a human driven reduction of monk seals into many subpopulations—most of which have been extirpated (Karamanlidis and Dendrinos 2015, Karamanlidis et al. 2016). The distinct mtDNA subpopulations support observations that this species has a high rate of philopatry (Karamanlidis et al. 2016).

The species' lack of genetic diversity is likely due to reduced effective population size, severe population bottlenecks, and fragmentation (Pastor et al. 2004, 2007; Karamanlidis et al. 2015). Inbreeding depression and reduced fitness often occur at such low levels of genetic diversity and may be occurring in the various subpopulations (Jimenez et al. 1994, Keller et al. 1994, Madsen et al. 1996). Ultimately, there is uncertainty related to how this low genetic diversity contributes

Table 1. Regional estimates of abundance and annual pup production (pups·year^{-1}) for the Mediterranean monk seal.

Area	Country	Subpopulation	No. of Individuals	Annual Pup Production (pups·year^{-1})	Source(s)
Gyaros island	Greece	Eastern Mediterranean	65-70	9.75	Dendrinos et al. 2008, MOm 2015
Northern Sporades	Greece	Eastern Mediterranean	52	8.4	Dendrinos et al. 1999, Notarbartolo di Sciara et al. 2009, Notarbartolo di Sciara and Kotomatas 2016
Kimolos and Polyaigos islands	Greece	Eastern Mediterranean	49	7.9	Notarbartolo di Sciara et al. 2009, Notarbartolo di Sciara and Kotomatas 2016
North Karpathos and Saria islands	Greece	Eastern Mediterranean	23	3.7	Notarbartolo di Sciara et al. 2009, Notarbartolo di Sciara and Kotomatas 2016
Ionian islands	Greece	Eastern Mediterranean	20	--	Panou 2009
Northern Aegean	Turkey	Eastern Mediterranean	35	--	Güçlüsoy et al. 2004
Southern Aegean	Turkey	Eastern Mediterranean	28	--	Güçlüsoy et al. 2004
Mediterranean Coast (Levantine Sea)	Turkey	Eastern Mediterranean	>40	--	Gücü et al. 2009b
--	Cyprus	Eastern Mediterranean	<10	1	Demetropoulos 2011, Marcou 2015, Gücü et al. 2009a
Cilician Basin	Turkey	Eastern Mediterranean	22	2	Gücü et al. 2004
Foça	Turkey	Eastern Mediterranean	9	1	Güçlüsoy and Savaş 2003
--	Mauritania (before 1997)	Cabo Blanco	317	51	Gazo et al. 1999
--	Mauritania (after 1997)	Cabo Blanco	109	25	González et al. 2002
--	Portugal	Madeira	20	3	Neves and Pires 1998, Pires et al. 2007
Black Sea	Turkey	--	2-3	--	Güçlüsoy et al. 2004
Sea of Marmara	Turkey	--	1	--	Güçlüsoy et al. 2004

to the extinction risk of the species. Although it leaves the species vulnerable to catastrophic events, such as disease outbreaks and toxic algal blooms (Karamanlidis and Dendrinos 2015, Karamanlidis et al. 2016), many pinniped species have been able to recover from severe bottlenecks and small population sizes (Stewart et al. 1994, Atkinson 1997, Gerber and Hilborn 2001).

2.3.1.4 Taxonomic classification or changes in nomenclature:

There are no changes in the taxonomic classification or nomenclature for the Mediterranean monk seal.

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Pinnipedia
Family: Phocidae
Genus: Monachus
Species: Monachus

The Mediterranean monk seal *Monachus monachus* is the only representative of the genus *Monachus*. Their closest taxonomic relatives are seals of the genus *Neomonachus*: the Hawaiian monk seal *Neomonachus schauinslandi* and the extinct Caribbean monk seal *Neomonachus tropicalis*. The genus *Monachus* previously included all three species until research showed that molecular, morphological, and temporal divergence between the Mediterranean and New World monk seals (i.e., Hawaiian and Caribbean) was equivalent to or greater than between sister genera of other phocids (Scheel et al. 2014). As a result, Caribbean and Hawaiian Monk Seals were reclassified together in the new genus *Neomonachus*.

There is some debate regarding the origin of the three species as a whole, as well as the processes giving rise to the disjunct distribution of the Mediterranean monk seal (e.g., Fyler et al. 2005, Fulton and Strobeck 2010, Schultz 2011). However, the most recent research suggests the *Neomonachus* and *Monachus* genera diverged approximately 6.3 million years ago (Scheel et al. 2014). This split between the new world monk seals and the Mediterranean monk seals is likely far older than the basal divergence within any other genus of modern seals (Scheel et al. 2014).

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Mediterranean monk seals were once continuously distributed throughout the Black Sea, the Mediterranean Sea, and the Northeastern Atlantic from Spain to the Cabo Blanco peninsula, including the Azores, Madeira, and the Canary Islands (Figure 2). But human exploitation drastically reduced and fragmented the seal population (Johnson and Lavigne 1999b, Johnson 2004, Stringer et al. 2008, Brito 2012, González 2015), and now the seals exist as three (possibly four) fragmented subpopulations (i.e., eastern Mediterranean, Cabo Blanco, and Madeira and possibly Morocco/Algeria; Figure 2; Mo et al. 2011, Karamanlidis et al. 2015).

In the Mediterranean, the species is found mainly along the mainland coasts of Greece, Cyprus, and western and southern Turkey and around islands in the Ionian and Aegean Seas. The species previously occupied the Black Sea, but individuals have not been observed there since 1997 (Kıraç and Savaş 1996, Kıraç 2011). Some individuals still occupy the Sea of Marmara (Inanmaz et al. 2014).

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

Historically, monk seals hauled out on open beaches to rest and pup (Johnson and Lavigne 1999b, Johnson 2004), but centuries of persecution have relegated the species to remote marine caves. Usually found along cliff-lined coasts, these caves are isolated and often inaccessible to humans. Cave selection by monk seals is influenced by a variety of parameters including, the cave's internal morphology, the tide (in the Atlantic populations), number of entrances, etc. In Cabo Blanco, less than five neighboring caves are used (González et al. 1997) compared to the hundreds used by seals in Madeira (Karamanlidis et al. 2004) and the eastern Mediterranean (Gücü et al. 2004, MOm 2007, 2008, 2009).

There are a few protected areas where human pressure is minimal and where beach haul outs and births still frequently occur, such as the Desertas Island Nature Reserve in the Madeira archipelago (Pires and Neves 2001) and the island of Gyaros in Greece (Dendrinos et al. 2008).

Industrial development and increased tourism activity, particularly in the Mediterranean, have further displaced the seals. Construction of power plants, roads, and houses along the coast have made many of the remaining beaches unsuitable (Kıraç and Güçlüsoy 2008, Karamanlidis and Dendrinos 2015). Increased tourism activities, especially diving, has also driven seals from hauling out on open beaches and has even caused them to vacate otherwise preferred marine caves (see **Section 2.3.2.1 for more information on destruction, modification, or curtailment of habitat or range**).

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

Threats to the Mediterranean monk seal vary regionally, but the primary threats to the species are displacement and habitat deterioration, deliberate killing by humans, and fisheries bycatch and entanglement (Karamanlidis et al. 2015).

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Although the Mediterranean monk seal was historically distributed throughout the Mediterranean and the Northeast Atlantic, the species is now considered functionally extinct throughout much of this historical range, including Albania, Egypt, France (including Corsica), Israel, Italy (including Sardinia and Sicily), Lebanon, Libya, Spain (including the Balearic and Canary Islands), Syrian Arab Republic, Tunisia, Bosnia and Herzegovina, Bulgaria, Montenegro, Romania, and Slovenia (Karamanlidis and Dendrinos 2015). Greece, Turkey, and Cyprus represent the species' last strongholds in the Mediterranean (Johnson and Lavigne 1999a).

The curtailment of the Mediterranean monk seal's range is largely due to habitat deterioration and human encroachment. Anthropogenic pressures forced the species to shift from hauling out on open beaches to inaccessible marine caves (Karamanlidis et al. 2015), which had devastating effects on pup survival. Increasing human presence in the forms of tourism and development

(largely to support the tourism industry) has reduced the availability of suitable habitat, particularly in the Mediterranean (Johnson and Lavigne 1999a).

In Turkey, the construction of hotels, roads, houses, and thermal and nuclear power plants has been linked to substantial decreases in pup survival (Johnson and Lavigne 1999a, Karamanlidis and Dendrinos 2015). Some hotels have even been constructed directly atop marine caves used by the seals for breeding. These projects are assumed to have major impacts on the occupation of nearby caves, although changes in cave usage have not been formally documented.

While construction represents a substantial threat to the seals, tourism (and the construction it prompts) is arguably the largest threat monk seals now face. Disturbance by high-intensity tourism may be responsible for somewhat recent extirpations of small surviving populations in the Mediterranean. In Turkey, diving tourists frequent monk seal habitat and pupping activity has ceased at many of these sites. In addition to abandonment of caves, disturbance caused by tourists has led to the separation of pups from the mother (Ronald and Yeroulanos 1984), severance of the maternal bond (van Haaften and Reiner 1984, Israëls 1992), and even to the abortion of pups (Ronald and Duguy 1979). Increased boat activity (for pleasure boating, recreational fishing, diving, etc.) has led to a number of boat strikes and has allowed tourists to reach even the most isolated areas. Tourism continues to threaten this species in Morocco, Greece, and Turkey (Johnson and Lavigne 1999a).

The Mediterranean is one of the most popular vacation destinations in the world. The area attracts over 110 million people each year, mostly in the months of July and August (Johnson and Lavigne 1999a). This peak influx of tourists partially coincides with the breeding season of seals, which can exacerbate the impact of tourism on the eastern Mediterranean subpopulation (Johnson and Lavigne 1999a).

In addition to curtailment of habitat by tourism and construction, Jepson and Law (2016) found that contamination from polychlorinated biphenyls (PCBs) in apex predators, such as marine mammals, poses a particular threat in the Mediterranean and the Iberian Atlantic. Seals of the Western Sahara subpopulation were found to exhibit very low levels of PCBs (lower than levels found in most pinnipeds) that were unlikely to cause any deleterious effects (Borrell et al. 1997, Borrell et al. 2007). However, the eastern Mediterranean subpopulation exhibited much higher levels of PCBs that have been associated with impairment of immune function and a reduction in reproductive fitness in other seal species (Helle et al. 1976, Reijnders 1980, Baker 1989, Brouwer et al. 1989, Swart et al. 1994, 1995). The relative proportion of different congeners in relation to the total PCB load (congener/tPCB) also suggests that the pollutants in seals of the eastern Mediterranean subpopulation are of primarily agricultural origin (Borrell et al. 2007).

Lastly, the invasion of Lessepsian fishes, such as the silver-cheeked toadfish *Lagocephalus sceleratus* (a toxic pufferfish), could have a negative impact on Mediterranean monk seals. In addition to their spines that become a hazard to predators when the fish expand, these pufferfish also carry the strong paralytic toxin, tetrodotoxin. Hence, consuming a pufferfish can prove fatal (Beköz 2013). Thus far, pufferfish have been implicated in only one monk seal death in Cyprus (Karamanlidis and Dendrinos 2015).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Historically, Mediterranean monk seals were exploited for their fur, oil, meat, and for medicinal uses. Initial exploitation occurred in small numbers not likely to influence the species' persistence (Johnson et al. 2006). The seals were easy to capture because of their gregarious nature. Exploitation of the seal grew and peaked during the Roman era (~27 BC-476 AD) likely depleting the species. Following the fall of the empire, the monk seal may have staged a temporary recovery, but not to earlier population levels. Commercial exploitation peaked again in the Middle Ages in the Madeira and Canary Islands, and the Bay of Dhakla (Western Sahara). It was at this time that the seals began to seek refuge in remote caves (Johnson et al. 2006).

The seals continued to be heavily persecuted by fishermen for most of the 20th century. However, during this time, interactions with fishermen transitioned from exploitation to deliberate killings, mostly in retaliation for lost catch or ruined gear. Currently there is no commercial exploitation of the species (Karamanlidis and Dendrinos 2015).

Mediterranean monk seals made relatively frequent appearances in traveling shows, fairs, zoos, and aquaria, and capture of the seals for the entertainment industry has been linked to their disappearance from certain areas, including Croatia and the Black Sea (Kıraç and Savaş 1996, Kıraç 2001, Johnson 2004). The appearance of Mediterranean "sea calves" in circuses has been documented as far back as ancient Rome (Johnson and Lavigne 1999a). The capture of monk seals for various zoos and aquaria continued across Europe during the 20th century (Mursaloglu 1964).

Historical evidence suggests that the seals did poorly in captivity (Johnson 2004); due to a poor understanding of the seals' diet and unsanitary conditions, the seals often survived only a few weeks or months (Johnson and Lavigne 1994). Because of this, the captive breeding of monk seals has been met with substantial opposition from the scientific and conservation communities (Johnson and Lavigne 1994). Currently, there have been no known successful attempts at captive breeding, and with the exception of orphaned monk seal pups detained for rehabilitation, there are currently no Mediterranean monk seals in captivity (Johnson and Lavigne 1994).

2.3.2.3 Disease or predation:

Disease
Viral outbreaks (particularly of morbilliviruses) and paralysis following paralytic shellfish poisoning are the primary disease-related threats. An outbreak of morbillivirus was previously indicated in the mass die-off of two indigenous seal species in northwestern Europe in 1988 (Osterhaus et al. 1997), causing the death of about 20,000 seals. Morbillivirus may also be the cause of another mass die-off of Mediterranean monk seals in 1997 that devastated the Cabo Blanco subpopulation. The cause of the 1997 die-off has never been explicitly determined, but a viral strain closely related to the morbillivirus implicated in a mass die-off of striped dolphin *Stenella coeruleoalba* in 1991 was discovered in many of the seals, including asymptomatic pups who were rescued after their mothers died. Unlike previous morbillivirus-associated events, many of the deceased seals were in good condition and did not exhibit any overt signs of the virus (Hardwood 1998, Hernandez et al. 1998). However, the seals did exhibit symptoms

consistent with exposure to paralytic shellfish poison saxitoxins. Three toxic dinoflagellate species were identified in high concentration in waters near the seal colony, and fish collected from known feeding grounds were positive for the saxitoxins (Hernandez et al. 1998). Thus, paralysis following the consumption of fish contaminated with the saxitoxins may have been the cause of or contributed to the mass die-off (Hernandez et al. 1998).

Unfortunately, a limited understanding of the effects of saxitoxins on marine mammals has prevented biologists from attributing the mass die-off to the saxitoxins and paralytic shellfish poisoning. Ultimately, both the saxitoxins and morbillivirus may have been contributors (Harwood 1998). Regardless of the cause, mass mortalities can have far-reaching impacts on population biology, and the 1997 mass die-off reduced the breeding population in Cabo Blanco to fewer than 77 individuals, which further reduced the population's genetic variability and may have compromised the species' persistence (Forcada et al. 1999, Fire et al. 2012).

Viral outbreaks represent a dangerous (albeit not the most imminent) threat to the seal population for several reasons. First, the proximity of seals during the breeding season, especially in the Cabo Blanco subpopulation that uses only a handful of caves, creates the perfect atmosphere for extensive transmission of the virus between seals. Second, each of the subpopulations demonstrates a severe lack of genetic diversity. Thus, mounting a defense to a virus is substantially harder (Karamanlidis and Dendrinos 2015). Finally, there are so few individuals to begin with, that the death of only a few seals could represent a substantial loss to any subpopulation (Karamanlidis and Dendrinos 2015).

Predation
Although predation by sharks has been a cause for concern in the Hawaiian monk seal population (particularly for pups; Bertilsson-Friedman 2006, C. Littnan personal communication) and has been documented in the Mediterranean (Pujol 2015), predation is not considered a significant source of mortality for the Mediterranean monk seal.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

The Mediterranean monk seal has been classified as "Endangered" by the International Union for the Conservation of Nature (IUCN; Karamanlidis and Dendrinos 2015) and is legally protected throughout its range via regional, national, and international legislation, including the Convention on the Conservation of Migratory Species of Wild Animals, Convention on the Conservation of European Wildlife and Natural Habitats, Barcelona Convention, Convention on Biological Diversity, and Convention on International Trade in Endangered Species of Wild Fauna and Flora. Countries with jurisdiction over the species' strongholds have designated numerous protected areas, including the Desertas Islands Nature Reserve (Madeira), the National Marine Park of Alonnisos-Northern Sporades Islands (NMPANS; Greece), the marine protected area in Northern Karpathos–Saria (Greece), the 3-mile no-take zone at the Island of Gyaros (Greece), the no-fishing area of the Cabo Blanco peninsula, and a participative reserve surrounding pupping caves in Cabo Blanco. In the 2014 National Action Plan for the Conservation of the Mediterranean Monk Seal in the Aegean and Mediterranean Sea, Turkey began piloting five "Monk Seal Protection Areas (MSPAs)," including Gökçeada-Bocaada-Baba, Foça-Yeni Foça and Karaburun-Mordoğan, Çeşme-Alaçatı, Küdür Yarımadası-Bodrum

Yarımadası, and Gazipaşa-Taşucu. In addition to some site-specific protections, the MSPA designation prohibits the entering of monk seal caves by any means, all types of construction, and exceeding defined speed limits while in an MSPA. The designation also regulates fishing and the operation of fish farms within MSPAs.

Additionally, the European Union's Habitats Directive (92/43/EEC) lists the Mediterranean monk seal in the directive's Annexes II and IV. Via Annex II the monk seal is designated as a species of Community interest whose conservation requires the creation of Special Areas of Conservation (SAC). The Directive mandates Member States to designate SACs to protect species listed in Annex II, and those sites are then linked together to create a coherent European ecological network called Natura 2000. As of 2015, the Mediterranean monk seal is mentioned in 102 Natura 2000 sites within the European Union (82 sites in Greece, 10 in Italy, 5 in Spain, 3 in Portugal, and 2 in Cyprus). Annex IV requires Member States to take measures to establish a system of strict protection for the species, and they must establish a system to monitor the incidental capture and killing of such species (Notarbartolo di Sciara et al. 2009).

Numerous international entities, including the Regional Activity Centre for Specially Protected Areas (RAC/SPA) and the General Fisheries Commission for the Mediterranean, have constructed and passed proposals to ameliorate current threats to the Mediterranean monk seal. For instance, the United Nations Environmental Program (UNEP) has a Mediterranean Action Plan (most recently updated in 2013) in force for the conservation and management of monk seals throughout the Mediterranean, Greece has the "National Strategy and Action Plan for the Conservation of the Mediterranean Monk Seal in Greece: 2009-2015," and in Turkey the National Monk Seal Committee drafted a "National Action Plan for the Conservation of Mediterranean Monk Seal *Monachus monachus* in Turkey" that has been approved by the Turkish Ministry of Forest and Water Works (Kıraç et al. 2013). There is also an Action Plan for the recovery of monk seals in the eastern Atlantic under the Migratory Species of Wild Animals Convention (Bonn Convention). Furthermore, many workshops and conferences have brought together scientists and managers to discuss monk seal conservation issues and problems.

However, despite the numerous agreements, conventions, and treaties in force to protect the species, the existing mechanisms do not afford the species and its habitat sufficient protection for the species' recovery. Illegal fishing (including the use of explosives) and overfishing routinely occur throughout the species' range, including in protected areas containing important habitat for the species. Humans continue to deliberately kill monk seals without prosecution, and encroachment on monk seal habitat continues relatively unabated by current legislation. Ultimately, many of the protections afforded to the seals and their habitat are poorly implemented, and many important sites lack any formal protection (Notarbartolo di Sciara and Kotomatas 2016).

The failure of many conservation efforts seems to be related to three factors (Notarbartolo di Sciara and Kotomatas 2016). First, there is limited political will or ability to enforce relevant legislation. Lack of financial resources, labor, and public interest have plagued the ability of institutions to properly implement conservation efforts. Second, ineffective international coordination has resulted in a piecemeal conservation strategy. Third, the focus of conservation

actions has emphasized monk seal ecology and biology rather than ameliorating human interactions.

Most successful conservation measures have been implemented by NGOs rather than by governmental institutions. For instance, systematic monitoring of incidental captures and killings of monk seals—mandatory for all European Member States under the provisions of the Habitat Directive—has been carried out by NGOs, such as MOm and SAD-AFAG (Sualtı Araştırmaları Derneği - Akdeniz Foku Araştırma Gurubu or Underwater Research Society - Mediterranean Seal Research Group), a Turkish NGO. MOm and SAD-AFAG have also developed a joint Species Specific Contingency Plan for mass mortality events in the Eastern Mediterranean, including a plan in response to oil spills. The Plan is pending adoption by the authorities of both countries.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Fisheries Interactions
The frequency of fishery-related deaths (i.e., deliberate killings and entanglements) are considered one of the main threats prohibiting the recovery of the Mediterranean monk seal. Deliberate killings are usually committed by fishermen in response to damage to fishing gear or lost catch. Although the deliberate killing of a monk seal is illegal, fishermen have been observed shooting seals and using explosives in occupied caves (Johnson 1988). Deliberate killing is primarily a threat to this species in the areas of Greece, Turkey, and Cabo Blanco. Deliberate killing of monk seals was responsible for a third of recorded mortalities in Greece from 1991 to 1995 (Androukaki et al. 1999), and is often considered the single most important source of mortality in the eastern Mediterranean (Karamanlidis and Dendrinos 2015). Deliberate killings may also be responsible for the extirpation of monk seals on open beaches across the Cabo Blanco peninsula (González and Fernandez de Larrinoa 2012).

Accidental entanglement in fishing gear and drowning as a result of entanglement (especially in static nets) is a major source of mortality, particularly for sub-adult monk seals in the eastern Mediterranean. Tempted by an easy meal, younger seals tend to be less cautious and experienced than adults when approaching nets and often are not strong enough to disentangle themselves. Monk seals can become entangled in a wide variety of fishing gear, including set-nets, trawl nets, and long lines. Of the three major subpopulations, negative seal-fishery interactions seem to be the lowest in the Madeira region, likely due to the prohibition of gill nets in the area and strict enforcement of other protective fishing regulations around the main pupping sites at the Desertas islands (Hale et al. 2011). However, negative interactions with fishermen are still regularly recorded (Karamanlidis and Dendrinos 2015), and the fact that the species is repopulating the main island of Madeira means that fisheries interactions are likely to increase (Pires et al. 2008).

Reduction and overexploitation of forage due to fishing, in combination with negative fishery interactions, has caused some problems for the species. Generally, reductions in forage have driven seals away from natal areas, which has affected growth, reproduction, and juvenile survival and mortality rates throughout the Mediterranean (Isräels 1992). Reductions in forage have also caused some extreme issues, including the near extirpation of a colony in southern

Turkey (Karamanlidis and Dendrinos 2015). Reductions in forage also exacerbate "stealing" catch from fishing operations (Johnson and Karamanlidis 2000, Karamanlidis et al. 2008).

Shipping Interactions
Mediterranean monk seals are also at an unknown (but suspected high) level of risk from oil tanker and other ship accidents, spills, and groundings. Increases in tanker traffic increase the possibility of accidents, disturbance, and collisions near important habitat. Four accidents or spills have occurred near seal habitat in the past, including a supertanker that spilled oil off Morocco in 1989 (Isräels 1992), an oil spill in the Madeira Islands in 1990 (UNEP 2005), and the grounding of a bulk carrier near Cabo Blanco in 2003 (UNEP 2005). None of these spills or accidents had any known impacts on Mediterranean monk seals. However, a ship accident that occurred at Çavuş Island near Bodrum in southwest Turkey in 1996 directly affected monk seals and their habitat (Kıraç 1998). A yearlong clean-up operation was required to restore the habitat to its original quality. In response to this accident, Turkey has taken regulatory measures to reduce the threat from oil spills (Kıraç and Güçlüsoy 2007).

Other
Additional threats to the Mediterranean monk seal and its recovery include negative effects resulting from political instability, the challenge of implementing effective conservation in a multi-national environment (**see section 2.3.2.4 Inadequacy of existing regulatory mechanisms**), stochastic events (e.g., toxic algal blooms - **see section 2.3.2.3 Disease or predation**, viral outbreaks - **see section 2.3.2.3 Disease or predation**, rock slides, and cave collapses[González et al. 1997]), and climate change (Otero et al. 2013).

Sovereignty over Western Sahara (and consequently part of the Cabo Blanco peninsula) has been contested by Morocco, Mauritania, and the Polisario Front (the national liberation movement opposing outside control of the region). Claims of sovereignty by Morocco and Mauritania began in the early 1960's and grew following Spain's withdrawal from the region in 1975. Mauritania eventually left the conflict in 1979, abandoned their claim to the region, and recognized the Sahrawi Arab Democratic Republic in 1984. Morocco immediately took the territory previously occupied by Mauritania, and conflict over the sovereignty of Western Sahara remains unresolved today between Morocco and the Polisario Front. This political instability has important conservation implications for the Mediterranean monk seal, as the Western Sahara currently does not participate in many of the international conservation agreements that provide protection to the seals (e.g., CITES). Furthermore, the lack of a consistent, recognized authority can create inconsistent conservation standards and policies for this important subpopulation.

Although there is limited evidence on the exact implications, climate change will also affect the Mediterranean monk seal. As sea levels rise, the number of and available space within breeding and resting marine caves will become increasingly scarce (Otero et al. 2013). Furthermore, there have been reports of a shift in the pupping season from end-of-summer months to autumn and winter months, which coincides with a period of more frequent sea storms (UNEP/MAP-RAC/SPA 2006).

2.4 Synthesis

As of 2015, fewer than 700 Mediterranean monk seals are estimated to remain throughout the Mediterranean and Northeast Atlantic (Karamanlidis et al. 2015). The species' primary threats—displacement and habitat deterioration, deliberate killing by humans, and fisheries bycatch and entanglement—have led to severely reduced abundance and fragmentation of the species. In some places, the species' current abundance is predicted to represent only about 3% of historical abundance (UNEP/MAP–RAC/SPA 2006), and the species is confined to three small, isolated subpopulations in the eastern Mediterranean, the archipelago of Madeira, and the Cabo Blanco peninsula. However, the species is showing signs of localized recovery in each of the three subpopulations, and the current estimate of abundance is greater than the 350-450 individuals estimated in 2010 (Aguilar and Lowry 2010). For example, until recently the subpopulation located in the archipelago of Madeira was restricted mostly to the Desertas Islands, but seals have now begun recolonizing the main island of Madeira (Pires 2011). Additionally, vagrant animals have been sighted throughout the Mediterranean providing support that, given the opportunity, there is potential for recolonization of these areas.

These small, localized recoveries are likely the result of several factors (**see Section 2.3.1.2**; Notarbartolo di Sciara and Kotomatas 2016), including the involvement of NGOs in conservation, shifting paradigms on environmental welfare, a reduction in fisheries employment, and the inaccessibility of the seals due to their habitat. Unfortunately, there is much uncertainty surrounding the continuance of these localized recoveries and their translation to a recovery for the species as a whole, particularly given the population's susceptibility to mass die-offs and the imminence of new threats such as climate change. Additionally, conservation efforts have suffered from lack of cooperation among nations to effectively enact a range-wide strategy, lack of capital, and limited political willingness to enforce relevant legislature. For these reasons, we conclude the Mediterranean monk seal is currently in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (*Indicate reasons for delisting per 50 CFR 424.11):*
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
_X_ No change is needed

3.2 New Recovery Priority Number: N/A

3.3 Listing and Reclassification Priority Number: N/A

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

As the species' range falls solely outside the jurisdiction of the United States, NMFS should, in coordination with the State Department, continue to encourage Mediterranean countries to conserve the Mediterranean monk seal. Conservation of the Mediterranean monk seal primarily falls to those countries with jurisdiction over the species' strongholds, namely Greece, Turkey, Mauritania, Western Sahara, and Portugal (Madeira). However, if a full recovery of the species is to be realized, there will need to be cooperation of countries throughout the Mediterranean on concerted conservation actions. NMFS should examine the conservation priorities and actions for the Mediterranean and Northeast Atlantic subpopulations (e.g., see Table 1; Karamanlidis et al. (2015) to determine if there are ways to support high priority conservation actions.

In addition to the ESA, several domestic instruments may promote the conservation of the Mediterranean monk seal. The first is via the United States' recent rule (81 FR 54390, August 15, 2016) implementing the import provisions of the Marine Mammal Protection Act. The rule states that trade partners must show that killing or injuring marine mammals incidental to fishing activities, or bycatch, in their export fisheries do not exceed the United States' standards. The rule will go into full effect following a 5-year exemption period in 2022. By the end of the exemption period and every four years thereafter, a harvesting nation must have applied for and received a comparability finding for its fisheries to export fish and fish products to the United States. To receive a comparability finding, the harvesting nation must demonstrate (1) it has prohibited the intentional mortality or serious injury of marine mammals in the course of commercial fishing operations, unless the intentional mortality or serious injury of a marine mammal is imminently necessary in self-defense or to save the life of a person in immediate danger and (2) its regulatory program with respect to incidental mortality and serious injury of marine mammals in the course of commercial fishing operations is comparable to the United States' regulatory program. While the majority of the United States' fish and fish products may not be imported from this area of the world, the United States imported over $100 million worth of fish and fish products in 2016 from Cyprus, Greece, Mauritania, Portugal, and Turkey (National Marine Fisheries Service Fisheries Statistics and Economics Division 2017; http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/applications/annual-product-by-countryassociation; Table 2), so there may be some economic foundation on which to encourage conservation.

Regulations (50 CFR Part 300) enacted under the High Seas Driftnet Fishing Moratorium Protection Act allow the United States "to identify and certify nations whose vessels are engaged in illegal, unreported, or unregulated fishing or whose fishing activities result in bycatch of protected living marine resources (PLMRs). PLMRs include non-target fish, sea turtles, or marine mammals that are protected under United States law or international agreement, including the Marine Mammal Protection Act, the Endangered Species Act, the Shark Finning Prohibition Act, and the Convention on International Trade in Endangered Species of Wild Flora and Fauna. Identified nations that do not receive a positive certification may be subject to trade restrictive measures for certain fishery products. The Moratorium Protection Act also authorizes cooperation and assistance to nations that are taking action to combat illegal, unreported, or unregulated fishing or reduce bycatch of protected living marine resources.

(http://www.nmfs.noaa.gov/ia/iuu/msra_page/highseas_final_rule.pdf)" Thus, we may be able to incentivize nations to protect the monk seal in order to avoid trade restrictions.

Lastly, as more information on the Mediterranean monk seal and its various subpopulations becomes available, future 5-year reviews may consider whether the Mediterranean monk seal subpopulations represent two Distinct Population Segments (DPSs): the eastern Mediterranean DPS consisting of the eastern Mediterranean subpopulation and the Northeast Atlantic DPS consisting of the Madeira and Cabo Blanco subpopulations. Genetic studies comparing the eastern Mediterranean subpopulation and the Northeast Atlantic subpopulations show that the two groups exhibit genetic (Stanley and Harwood 1997, Pastor et al. 2007, Karamanlidis et al. 2015) and morphological differences (van Bree 1979). The two groups are also separated by approximately 4,000 km (Aguilar and Lowry 2013)—much farther than any recorded distance traveled by a Mediterranean monk seal. Furthermore, there are differences in management and conservation of the species across international boundaries. For instance, in Madeira, use of certain fishing gears found to entangle seals has been completely banned. Additionally, management of subpopulations in Madeira and Cabo Blanco requires cooperation among fewer entities. Each of these factors describes marked separation between the groups. However, Congress indicated that DPS listings should be used sparingly. NMFS should weigh whether the Mediterranean monk seal would gain an overriding conservation benefit by being listed as DPSs. Application of the DPS policy to this species may confer the most conservation benefit if differences in management throughout the species' range begin to recover the subpopulations at different rates.

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NATIONAL MARINE FISHERIES SERVICE
5-YEAR REVIEW
species

Current Classification:

Recommendation resulting from the 5-Year Review

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X No change is needed

Review Conducted By:

Assistant Administrator, NOAA Fisheries

_____Concur _____ Do Not Concur

Signature_____ Date 09/25/2017