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The Status and Distribution of Cetaceans in the Black Sea and Mediterranean Sea

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A bottlenose dolphin leaping on the bow wave of a large ocean freighter in the Strait of Gibraltar, 27 March 2005.

Sperm whale (*Physeter macrocephalus*)
Mediterranean subpopulation

Taxonomy

Family

Physeteridae

Relevant Common Names

EN	sperm whale
FR	cachalot
ES	cachalote
SQ	kashalot
AR	عنبر (anbar)
HR	ulješura
EL	φυσητήρας (fysitíras)
HE	ראשתן (roshtan)
IT	capodoglio
ML	gabdoll
PT	cachalote
TR	İspermeçet balinası, kaşalot

Assessment Information

Endangered (EN C2a(ii))

Year Assessed

2006

Assessor(s)

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IUCN/ACCOBAMS Workshop on the Red List Assessment of Cetaceans in the ACCOBAMS Area (Monaco, 5-7 March 2006)

Justification

The listing proposed is EN C2a(ii). As explained below, this listing is based on inference leading to the following assumptions:

1. The Mediterranean sub-population, which is genetically distinct, contains fewer than 2,500 mature individuals;
2. There is a continuing decline in numbers of mature individuals;
3. All mature individuals are in one undivided subpopulation.

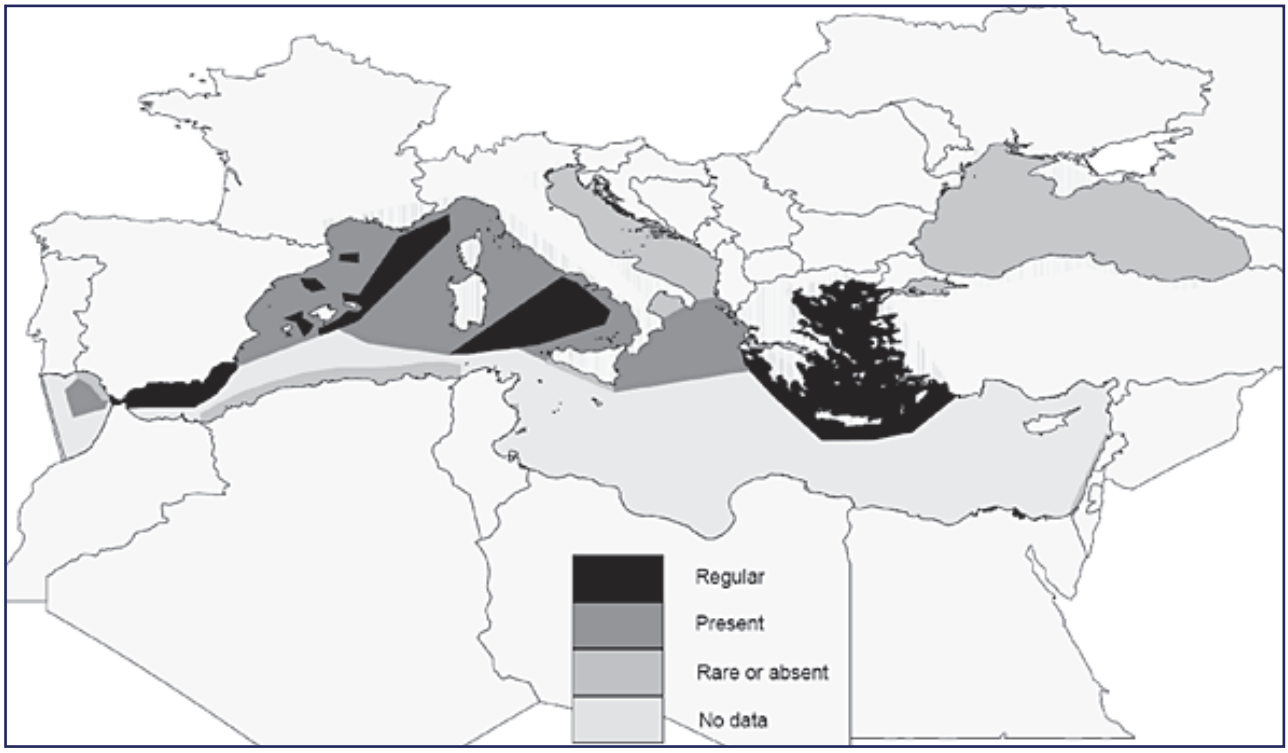
1. Although no past or present abundance estimate is available for the entire range of the sub-population, some data are available for limited areas within the region. If data from the Hellenic Trench can be extrapolated to the entire region, only 45% of the total present-day Mediterranean sub-population is mature. In other parts of the world this value can be as high as 85%. Those two extremes would require the total number of sperm whales to be either 2,950 (if 85% are mature) or 5,555 (if 45%) if there were to be 2,500 or more mature individuals. Given present knowledge, it is unlikely that there are enough sperm

whales in the region to infer a number of mature individuals anywhere near 2,500.

2. The Mediterranean subpopulation is subject to a number of threats that can result in direct mortality. These include bycatches in fishing gear (especially drift gillnets) and ship strikes. In addition, the subpopulation may be affected by disturbance, particularly related to intense maritime traffic. It is suspected that a combination of these factors has led to decline (of unknown magnitude) over the last half-century.

3. Genetic data from a sample of sperm whales across the Mediterranean have not provided evidence for within-region population structure (Drouot *et al.* 2004; Engelhaupt 2004). Sperm whales are thought to roam widely across the Mediterranean, and it is parsimonious to assume that they form a single subpopulation within the basin.

Distribution



Country Names

Territorial waters of	Native - presence confirmed	Native – possibly present	Visitor	Possibly Visitor	Vagrant	Possibly vagrant	Other
Albania	X						
Algeria	X						
Bosnia and Herzegovina				X			
Croatia			X				
Cyprus	X						
Egypt	X						
France	X						
Gibraltar (UK)	X						
Greece	X						
Israel	X						
Italy	X						
Lebanon		X					
Libya		X					
Malta	X						
Monaco	X						
Morocco	X						
Palestinian Territory		X					
Serbia and Montenegro				X			
Slovenia				X			
Spain	X						
Syria		X					
Tunisia	X						
Turkey	X						

Summary Documentation

Biome

Marine

Major Habitat(s)

Open sea

Taxonomy

Although *Physeter catodon* is still occasionally used in the literature, *P. macrocephalus* is recommended (Rice 1998). Both names are listed on the same page of the original description by Linnaeus (1758), and priority is unclear. However, *P. macrocephalus* is preferable because it is used much more frequently, and this will support nomenclatural stability.

Geographic Range

In the Mediterranean Sea, sperm whales are widely distributed from the Gibraltar Strait area in the west to the Levant Basin in the east. Known in the past to have been predictably present in parts of the Gibraltar Strait area, around the Balearic Islands, in the Algerian-Ligurian Basin, in the Tyrrhenian Sea, in the deep waters to the north, east and southeast of Sicily, in the Ionian Sea and in parts of the Aegean Sea; still fairly predictable in the Gibraltar Strait and along the Hellenic Trench from the NE Ionian Sea to the NW Levant Basin. Rare in the Sicilian Channel. Vagrant in the Adriatic Sea. Absent from the Black and Marmara Seas.

Population

No estimate of population size exists for the region. Gannier *et al.* (2002) reported the highest encounter rates in the northwestern portions of the Mediterranean, especially near the Gulf of Lions, and in eastern coastal areas of the Ionian Sea, especially off the Greek Islands. Estimated abundance for the Ionian Sea in 2003, based on surveys combining visual and acoustic techniques, was 66 individuals (with 95% lognormal confidence limits 28 – 156) (IFAW 2006). No sperm whales were observed on-transect during a survey of the Strait of Sicily (IFAW 2006). These results are consistent with the number of photo-identified sperm whales along the Hellenic Trench (see below). Preliminary results from a survey of a large portion of the western basin (from Gibraltar to Sicily and bounded on the north by a line from the Balearics east to Sardinia) in Summer 2003 indicate a sperm whale detection rate roughly eight times that in the Ionian Sea (T. Lewis, IFAW, pers. comm.). This suggests that sperm whale numbers are significantly higher in the western basin than in the Ionian Sea, but still are likely to be only in the low to mid hundreds. Gannier *et al.* (2002) provided sperm whale visual and acoustic encounter rates for a large portion of the Mediterranean sea, however no absolute abundance estimates can be derived from their data. About 150 individuals have been photo-identified in the Mediterranean Sea during the last decade (NAMSC 2004). Almost 100 of these (22 solitary males and 11 social units) were photo-identified along the Hellenic Trench during eight years of intense research effort. In this particular area the re-sighting rate expressed as the number of sightings of mature males or social units already photo-identified in previous years ("re-captures") divided by the total number of sperm whale sightings was roughly 0.5 for both solitary males and social units during the last two field seasons (Frantzis unpubl.). These estimates relate to the population that uses the Hellenic Trench study area, including animals that are regularly observed there and animals that are occasional visitors. The variable amount of time that individual whales spend in the area introduces heterogeneity of capture probabilities, which will result in an underestimate of the total number of animals using the area. Animals that never visit the Hellenic Trench obviously will not be included in these estimates. In the Ligurian Sea, known to contain one of the most productive pelagic areas in the Mediterranean, only 40 sperm whales have been photo-identified during 15 years of intensive research (Tethys Research Institute, unpublished), suggesting that density there is low. In the Strait of Gibraltar 21 individuals were identified during the last 8 years (de Stephanis *et al*. 2005). Based on all of the above information, the total number of sperm whales in the Mediterranean region is more likely in the hundreds than the thousands.

No evidence exists of population fragmentation across the region.

Population Trend

↓ (probably)

Detailed Documentation

Range and Population

Genetic data suggest that sperm whales in the Mediterranean constitute a separate population. Drouot *et al.* (2004), comparing eastern North Atlantic specimens with 13 individuals sampled in the Tyrrhenian Sea, Ionian Sea, northwestern Mediterranean basin and Balearic Sea, found significant differences in mitochondrial DNA (mtDNA) haplotype frequencies, suggesting that the sperm whales in the Atlantic and Mediterranean belong to separate matrilineal complexes. Engelhaupt (2004) compared a sample of 23 male sperm whales from the Mediterranean with a much larger sample from the North Atlantic using the mtDNA control region and 16 microsatellite DNA loci. The Mediterranean sample had only one mtDNA haplotype, compared to haplotypic diversity of 0.65 in the North Atlantic, and the Mediterranean sample also exhibited lower microsatellite diversity. The Mediterranean animals were significantly differentiated from the North Atlantic animals at both the mtDNA control region and the microsatellite DNA loci, although the effect was much stronger for mtDNA, suggesting greater female than male philopatry (also A.R. Hoelzel pers. comm.). This is consistent with the frequent observations of the same groups of sperm whales in the Gibraltar Strait (Fernandez-Casado *et al*. 2001, de Stephanis *et al.* 2005), which could be primarily mature males. Other types of observations are consistent with the hypothesis of a high degree of isolation. All age classes of sperm whales are found within the Mediterranean, and the occurrence of neonates (Gannier *et al*. 2002, Frantzis *et al*. 2003, Moulins & Würtz 2005) confirms that calving takes place there. In the eastern Mediterranean, both social units and large males are present year-round. In other regions of the basin social units with calves seem to be rather infrequent (with the exception

of the Balearic Islands and the Strait of Messina historically). Moreover, Mediterranean sperm whales seem to have a particular repertoire of codas, the stereotyped patterns of clicks that sperm whales use for communication. Repertoire differences among populations have been interpreted as indicative of cultural differences (Whitehead 2003). Although more than 25 coda types have been recorded in the Mediterranean (Drouot & Gannier 1999, Frantzis & Alexiadou submitted), the coda repertoire is dominated by a pattern (the "3+1" coda) that is not common in adjacent waters of the Atlantic (Borsani *et al*. 1997, J. Gordon pers. comm.). More than 50% of codas produced by Mediterranean solitary males are "3+1" codas (Frantzis & Alexiadou submitted). .

There is evidence that sperm whales were formerly common in portions of the Mediterranean, such as in the Strait of Messina and the waters adjacent to the Eolian Islands (e.g., Bolognari 1949, 1950, 1951, 1957), at least until the 1950s. Bolognari (1949, 1950, 1951, 1957) reported the frequent occurrence of large "aggregations" or "clusters" (*sensu* Whitehead 2003), consisting of as many as 30 individuals, in the area of the Strait of Messina during winter in the late 1940s and early 1950s. Such large groups have not been recorded in more recent times in that area or anywhere else in the Mediterranean. When data on sperm whale encounter rates started to become available in the mid-1990s (Notarbartolo di Sciara *et al*. 1993; Marini *et al*. 1996), they were very low compared to the impression given by the historical records (Bolognari 1949, 1950, 1951, 1957). For example, in the waters adjacent to the northern and eastern coasts of Sicily, an intensive (and ongoing) programme of dedicated surveys in the Strait of Messina and surrounding waters, based on a combination of visual and acoustic techniques (S. Panigada and G. Notarbartolo di Sciara, unpublished), produced eight sperm whale sightings (total of only 9 individuals), all of them in winter, during 108 days of survey spanning 9 months..

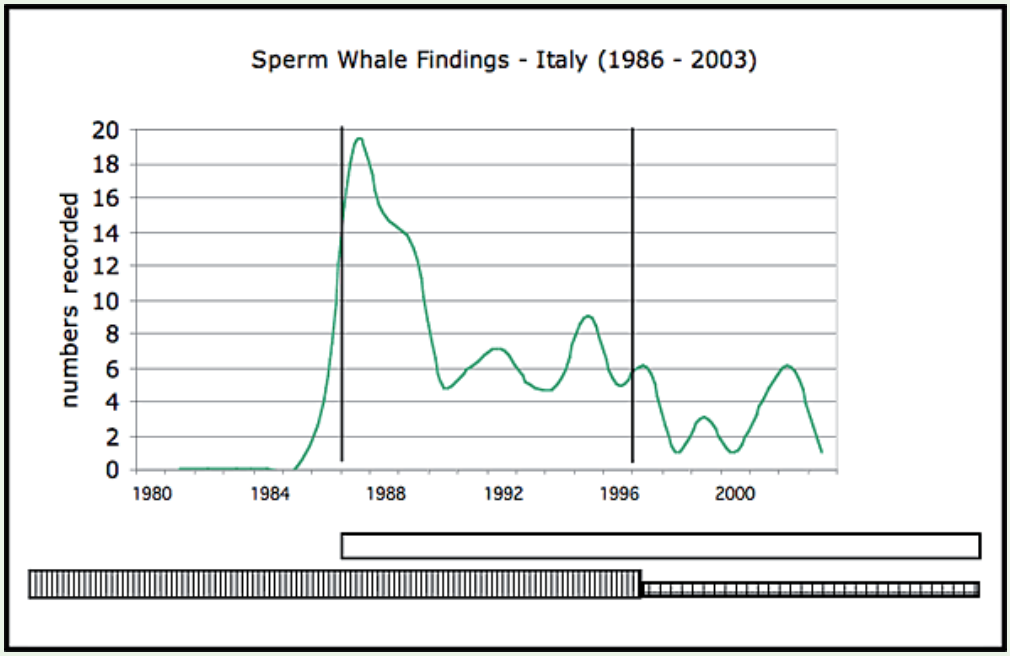


Fig. 1 – The term 'findings' is used here to cover stranded and floating carcasses as well as animals found entangled in fishing gear. The bars under the graph represent the time during which the Italian stranding network has been in operation (white bar), and the duration of driftnet activities by the Italian fleets (bar with vertical pattern and bar with small squares). The first full year of operation of the national stranding network (ongoing) was 1987. Bar with vertical pattern: driftnet operations in Italy were in full swing until 1996 (although around 1992 a few of the Italian vessels moved their operations to the Balearic Sea, most of the fleet continued to fish in the waters adjacent to Italy). Bar with small squares: after 1996 the fishery was phasing down, but illegal activities persist to the present day on a limited scale. The portion of the curve falling between the two vertical lines shows the decrease in sperm whale findings while the Italian driftnet fleet was fully operational (data in the graph are derived from the stranding reports by Centro Studi Cetacei). For a complete list of the reports see Notarbartolo di Sciara *et al.* (2004).

Sperm whales have declined considerably in the stranding records of France and Italy in the last decade, in stark contrast with the large numbers of individuals in the records in the 1987-1998 period (see also "Threats"), and in spite of the fact that efficiency of discovery and reporting of strandings has greatly

improved over time in the two countries (Notarbartolo di Sciara *et al.* 2004). This is best exemplified by the situation in Italy, the nation that in those years had the largest driftnet fleet (in excess of 700 vessels) operating throughout a significant portion of the central Mediterranean (Scovazzi 1998). In Italy the organised nation-wide recording of stranded, floating dead and entangled cetaceans began in mid-1986 (for a complete list of the annual stranding reports, see Notarbartolo di Sciara *et al.* 2004). The first full year in which such data were collected (1987) coincides with the highest value of sperm whale findings, 19 (Fig. 1), at least 13 of which involved capture in driftnets. Findings sharply decreased in the following years, stabilising at a mean of 4.6 animals/year between 1990 and 2003 (range: 1-9). This decrease did not coincide with a decrease in fishing effort, which started declining appreciably only after 1996 (Scovazzi 1998). Although a number of alternative explanations can be offered to account for the observed trend (such as movement of sperm whales out of the area, fluctuations in fishing effort, changes in area of fishing operations, etc.), the abrupt decline in the number of records, which corresponds with increased stranding detection and reporting, can also be interpreted as a possible sign of decreased availability of animals to become entangled in that area.

Mass strandings of sperm whales are extremely rare in the Mediterranean, and limited to ancient times: a stranding of 13 reported near Mazzara del Vallo, Sicily, by Antonino Mongitore in 1743, another stranding of 7 individuals reported from Marsala, Sicily, by Giuseppe Riggio in 1893 (Notarbartolo di Sciara & Bearzi 2004), and a stranding of 6 near Cittanova d'Istria, northern Adriatic Sea, in 1853 (Heckel, 1853).

Habitat and Ecology

Preferred sperm whale habitat in the Mediterranean consists mostly of continental slope waters where mesopelagic cephalopods, the species' preferred prey, are most abundant. Deeper offshore waters are also inhabited, but perhaps to a lesser degree.

Adult males of oceanic populations are known to segregate from social units of females and immatures as they reach sexual maturity. Males live separately from the social units in higher latitudes, some reaching as far as the ice edge. Some of the larger adult males migrate latitudinally to join social units, which remain in warmer waters year-round. These males rove between social groups, associating with a given social group for only a few hours at a time, presumably just long enough to breed (Whitehead 2003). A generally similar social system may occur in parts of the western and central Mediterranean, with males segregating during summer in the northern part (roughly north of 41° N), while social units remain in the south (Drouot *et al.* 2004), although the latter may be found occasionally in the north as well (Moulins & Würtz 2005). In some parts of the eastern basin, social units of females with immatures and solitary mature males are both found in the same area year-round (Frantzis *et al*. 1999, 2003), although in the northern part of the Hellenic Trench only social units are present and large males are rarely seen in a reproductive context among them. These social units typically consist of 10-12 individuals including at least 1-2 calves (Gannier *et al*. 2002). Social units seem to be stable, but members of one unit have been observed to associate with other units (Frantzis, unpubl.), as has been described for oceanic populations (Whitehead 2003).

It is unclear whether sperm whales have regular movement patterns within the Mediterranean, although a highly speculative scheme, yet to be confirmed, was proposed by Bolognari (1949). At least in the eastern Mediterranean, both solitary males and social units may remain in a limited area for more than a month, or may visit that area repeatedly during the same summer season, indicating that they stay in neighbouring waters (Frantzis unpubl.). Many solitary males and some social units have been re-sighted in the same area for up to four consecutive years during ongoing long-term studies (Frantzis *et al*. 2003; Frantzis unpubl.). Information on the reproductive behaviour and ecology of sperm whales in the Mediterranean remains sparse. There was no apparent distinction between feeding and breeding grounds along the Hellenic Trench, where sperm whales had been studied for nine years as of 2006 (Frantzis unpubl.). Both solitary males and social units of sperm whales are thought to feed throughout their range, and short, apparently reproductive associations of mature males with social units have been observed in the Ionian Sea (Frantzis unpubl.).

Threats

The most likely cause of recent decline of sperm whales in the Mediterranean is entanglement in high-seas swordfish driftnets, which has caused considerable mortality since the mid-1980s (Notarbartolo di Sciara 1990; International Whaling Commission 1994). Such mortality is ongoing (Tudela *et al.* 2003;

ACCOBAMS 2003; Pace *et al.* 2005). The recorded number of sperm whales found dead or entangled during the last three decades (from 1971 to 2004) in Spain, France and Italy (combined) was 229, and there is no reason to believe that documentation is anywhere near complete. The large majority of the strandings in Italy and Mediterranean Spain were caused by entanglement in driftnets, as evident from the reported presence of net fragments or characteristic marks on the whales' bodies (Podestà & Magnaghi 1989, Lazaro & Martin 1999). Cagnolaro & Notarbartolo di Sciara (1992) reported that for 83% of 347 cetaceans stranded in Italy from 1986 to 1990 (inclusive), which included 56 sperm whales, the likely cause of death was related to entanglement. Despite international and national regulations banning driftnets from the Mediterranean, illegal or quasi-legal driftnetting continues in sperm whale habitat, not only in the western Mediterranean (e.g., in France, Italy, and Morocco) but recently also in the eastern basin (e.g., Greece and Turkey), thereby continuing to threaten the species' survival in the region.

Although the continuation of driftnet fishing by non-EU Mediterranean fleets and illegal EU operations represent the most important ongoing threat to sperm whales in the Mediterranean Sea, the disturbance from intense marine traffic (development of 'highways of the sea') and collisions with vessels, especially hydrofoils and other passenger craft including high-speed ferries (e.g., see de Stephanis *et al.* 2003, 2005), may be serious as well. More than 6% (7) of 111 sperm whales stranded in Italy (1986-1999) and Greece (1982-2001) had died after being struck by a vessel, and 6% of 51 photo-identified individuals (39 in Greece and 22 in Italy) bore wounds or scars that were clearly caused by a collision (Pesante *et al.* 2002). Underwater noise from mineral prospecting (seismic airguns), military operations, and illegal dynamite fishing are other sources of concern (Notarbartolo di Sciara & Gordon 1997). Dynamite fishing is still a common activity in large portions of the eastern and southern Mediterranean, where feeding and socializing sperm whales are present year-round (Frantzis *et al*. 2003).

Conservation measures

An international sanctuary for the conservation of Mediterranean cetaceans was recently established, encompassing key cetacean habitat in portions of the Provençal, Corsican, Ligurian, Tyrrhenian and northern Sardinian Seas. However, large portions of what is likely critical habitat for sperm whales in the Mediterranean region fall outside any type of protective regime. Sperm whales are listed by the Bonn Convention - CMS (Appendix I), the Bern Convention (Appendix II), CITES (Appendix I), the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area (a priority species for conservation action) and the Protocol on Specially Protected Areas and the Biological Diversity in the Mediterranean of the Barcelona Convention (Annex II). The International Convention for the Regulation of Whaling confers full protection from commercial whaling on sperm whales under the moratorium on commercial whaling that took effect from 1986.

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