Hellenic Trench Important Marine Mammal Area – IMMA

Description

The Hellenic Trench is a long bathymetric feature in the eastern Mediterranean consisting of a more or less continuous steep continental slope sloping seaward, often bounding offshore trenches, troughs and basins which reach 5 km in depth. Sperm whales, Cuvier’s beaked whales, and striped dolphins inhabit the area. Monk seals, Risso’s dolphins, and common bottlenose dolphins are also present. The IUCN Red List classifies the Mediterranean sperm whale population as Endangered and declining. The area is the core habitat of the eastern Mediterranean sperm whale population unit, which accounts for some 200-250 animals threatened by unsustainable ship-strikes. The area contains sub-areas which include the largest among five Mediterranean high-density areas of occurrence for Cuvier’s beaked whales that have suffered repeated dramatic mass strandings in the area.

The Mediterranean population of sperm whales is small and densities are considerably lower than at equivalent latitudes elsewhere. Point estimates for the western Mediterranean vary between around 400 animals from photo-identification studies, which may be incomplete because of the limited sampling area, to around 1,000 animals from combined line transect surveys with incomplete coverage. Information from the western basin combined with an estimate of 200-250 for the eastern basin, suggest total sperm whale numbers in the Mediterranean are likely less than 2,000 (Frantzis et al., 2014a; Rendell et al., 2014; Lewis et al., 2017). This is also an isolated and genetically different population from conspecifics in the Atlantic Ocean (Engelhaupt et al., 2009). Considering its special characteristics and conservation status has been listed as an Endangered subpopulation in the IUCN Red List since 2012 (Notarbartolo di Sciara et al., 2012), with ship strikes and entanglement in

Area Size
56,568 km²

Qualifying Species and Criteria
Sperm whale - *Physeter macrocephalus*  
Criterion A; B (i, ii); C (i, ii); D (i)  
Cuvier’s beaked whale - *Ziphius cavirostris*  
Criterion B (ii); C (i, ii); D (i)  

Marine Mammal Diversity
Criterion D (ii)

Summary

The Hellenic Trench is a long bathymetric feature in the eastern Mediterranean consisting of a continuous steep continental seaward slope, often bounding offshore linear trenches, troughs and basins, which reach 5 kilometres in depth. The area is the core habitat for Eastern Basin distribution of the Endangered Mediterranean sperm whale (*Physeter macrocephalus*) subpopulation. This eastern Mediterranean distribution accounts for some 200-250 animals threatened by potentially unsustainable ship-strikes. Additionally, the Hellenic Trench include sub-areas which include the largest among five high-density areas of Mediterranean occurrence for Cuvier’s beaked whales (*Ziphius cavirostris*) that have suffered repeated mass strandings in the area.
driftnets identified as their main threats followed by ingestion of plastic debris, anthropogenic noise, chemical pollution and disturbance by inadequately managed whale watching operations (Rendell and Frantzis, 2016). Nevertheless, no systematic monitoring or substantial conservation measures have been applied for these species throughout the Mediterranean Sea. In the eastern Mediterranean basin, the numbers of sperm whales are substantially lower than the western basin with only limited mixing between basins (Frantzis et al., 2011). The conservation status of the eastern subpopulation seems even more precarious due to the high rate of ship strikes (Frantzis et al., 2014b; Frantzis et al., 2015). Considering the high rate of photographic recapture, any estimate for the entire subpopulation of sperm whales living in the Greek Seas is unlikely to exceed 250 animals (Frantzis et al., 2014a). Since large scale surveys conducted over the entire eastern Mediterranean Basin indicate that the majority of the sperm whales concentrate along the Hellenic Trench (Boisseau et al., 2010; Lewis et al., 2007; Lewis et al., 2017) the total number of sperm whales for the eastern Basin is very likely to be in the very low hundreds. Recently, Lewis et al. (2017) provided an abundance estimate of only 164 animals for the eastern Mediterranean basin.

The Hellenic Trench appears to be the most important habitat for sperm whales in the eastern Mediterranean basin (Frantzis et al., 2014a; Lewis et al., 2017). These whales were observed to have a very pronounced association with certain bathymetric features along the Hellenic Trench: a strong and clear density peak around the 1,000 m depth contour (Frantzis et al., 2014a). In this area, solitary males, loose male aggregations and mainly long-term resident social units of sperm whales were observed feeding and breeding. High calving rate has been observed along the Hellenic Trench, as Frantzis et al. (2014a) reported that 15 of the 16 social units they observed between 1998 and 2009 had a calf with them at least once in that period, and that 79% of encounters with social groups included calves. However, calf presence does not necessarily lead to recruitment into the adult population, since the same study reported that calf and juvenile mortality was likely to be high (>40% and >27% respectively).

The relatively high densities of sperm whales along the 1,000 m contour beside the Hellenic Trench coincide almost exactly with major foci of maritime traffic (Frantzis et al., 2014b).
Propeller marks and cut flukes have been observed on photo-identified sperm whales and the known numbers of sperm whale ship strikes in Greece alone illustrate the scale of the problem. Twenty three of the 28 sperm whales stranded in Greece since 1992 were examined, and 15 (65%) of these had either definite (12) or possible (3) collision marks on their bodies, indicating a ship strike as the likely cause of death (Frantzis et al., 2015). These figures inevitably represent a subset of the true mortality, since many victims of ship strike may never reach the shore. Such a rate of collisions is considered to be unsustainable for the Endangered Mediterranean population as a whole and has more serious implications for the subpopulation of the eastern Mediterranean basin (Rendel and Frantzis, 2016). So far, no areas of equivalent importance of the Hellenic Trench to the eastern subpopulation have been found in the western Mediterranean Sea but Pirotta et al. (2011) do highlight the importance of waters off SW-W Balearic Islands.

The Hellenic Trench is the largest among five “High-density areas of occurrence” in the Mediterranean for a second-deep diver: the Cuvier’s beaked whale (Podestà et al., 2016). It is also known from several dramatic mass stranding events of Cuvier’s beaked whales, which coincided with the use of military sonar (Frantzis, 1998; Frantzis, 2004; Frantzis, 2015). The Mediterranean subpopulation of Cuvier’s beaked whales is classified as “Data Deficient” in the Red List of IUCN (Cañadas, 2012), but experts are discussing to review this status in light of new evidence. Because of their elusive nature, the activities of Cuvier’s beaked whales are less understood than those of sperm whales in the area. High observation rates have been recorded in the past (Frantzis et al., 2003). The western portion of the Hellenic Trench has been classified as a sensitive area by ACCOBAMS, to be avoided by Navies when using military sonar, because of its importance for Cuvier’s beaked whales (ACCOBAMS 2013). Despite this international effort, naval exercises and subsequent mass strandings of whales have continued in the area, with the most recent stranding event in April 2014 in south Crete (Frantzis, 2015).

This was the fourth time that Cuvier’s beaked whales stranded during naval exercises conducted in the area of the Hellenic Trench in Greece since 1998, raising the recorded mortalities to more than 45 whales (ACCOBAMS 2013). This number may be the “tip of the iceberg” (see Peltier et al., 2012), since the effect at the population level is unknown. However, the use of military sonar can have a very important impact (including many mortalities) on local population units and especially on those that are isolated from larger populations, as is the case of the Mediterranean beaked whales (Dalebout et al., 2005). Unpublished data indicate a dramatic decline in natural stranding events of Cuvier’s beaked whales in the area after 1998. This decline may reflect a decline in the local population unit, suggesting that the impact of sonar is likely to be unsustainable. In 2002, the ACCOBAMS Parties adopted the Hellenic Trench as a potential pilot Marine Protected Area (MPA), following the proposal of the ACCOBAMS Scientific Committee, who re-
asserted the urgency to create this MPA in November 2006 and, in early 2007, refined the proposed boundaries (Agardy et al., 2007).

**Criterion A - Species or Population Vulnerability**

The Mediterranean sperm whale population is classified as an "Endangered" subpopulation in the IUCN Red List (Notarbartolo di Sciara et al., 2012), and faces a number of threats and is inferred as declining (Notarbartolo di Sciara et al., 2012). Furthermore, genetic studies (Drouot et al., 2004a; Engelhaupt, 2009) indicate that the Mediterranean subpopulation is likely to be isolated from that of the Atlantic and therefore particularly vulnerable to the impact of human activities. The principal threats are from ship strikes (Frantzis et al., 2014b; Frantzis et al., 2015) and entanglement in driftnets followed by ingestion of plastic debris, anthropogenic noise, chemical pollution and disturbance by poorly managed whale watching operations (Rendell and Frantzis, 2016).

Surveys indicate that the majority of sperm whales within the eastern Mediterranean basin concentrate along the Hellenic Trench (Boisseau et al., 2010; Lewis et al., 2007; Lewis et al., 2017). Estimates of 164 to 250 animals using the area from 12 years of photo-identification within the area (Frantzis et al., 2014a) are similar to the total abundance estimate for the entire eastern Mediterranean (Lewis et al., 2017), this together with evidence from photo-identification suggest that animals from across the entire eastern Mediterranean use the area. Furthermore, within the Hellenic Trench whales were observed to have a very pronounced density peak around the 1,000 m isobath, which was typically within 3–10 km of the coastline (Frantzis et al., 2014a). Such concentrations are vulnerable to anthropogenic threats ship-strikes and noise in particular.

**Criterion B: Distribution and Abundance**

**Sub-criterion Bi: Small and Resident Populations**

The area is a core habitat for a resident population of sperm whales in the eastern Mediterranean, with most of these animals being resident in or visiting the area. Frantzis et al. (2014a) obtained a minimum of 164 live animals from 12 years of photo-identification within the area, producing an estimate of 200 to 250 animals (Frantzis et al., 2014a) using the area - this is similar to the total abundance estimate for the entire eastern Mediterranean of 164 animals (excluding animals too young to echolocate) (Lewis et al., 2017) suggesting that animals from across the entire eastern Mediterranean use the area. This together with photo-ID evidence suggests the area is a core habitat either occupied or visited by most of the eastern Mediterranean subpopulation of sperm whales. It is occupied consistently by long-term resident social units of sperm whales together with solitary males and loose male aggregations (Frantzis et al., 2014a).
Although the eastern Mediterranean basin subpopulation is smaller than that in the western basin, the entire Mediterranean population is small (Rendell et al., 2014; Frantzis et al., 2014a; Lewis et al., 2017), such that numbers of sperm whales using the area are a substantial portion of the whole Mediterranean population. While there are many photographic recaptures of individuals within the individual western and eastern Mediterranean basins (e.g. Carpinelli et al., 2014; Rendell et al., 2014) there are only three cases of animals moving from the western basin to the eastern basin (Frantzis et al., 2011) suggesting that though not isolated the western and eastern subpopulations are predominantly separate.

**Criterion B: Distribution and Abundance**

**Sub-criterion Bii: Aggregations**

Within the Hellenic Trench whales were observed to have a very pronounced density peak over the 1,000 m isobath on the slopes on the landward side of the trench (Frantzis et al., 2014a). This combination of slope, aspect and depth appears to represent a significant zone for aggregating sperm whales in the eastern Mediterranean making the Hellenic Trench the core habitat for the subpopulation of the entire eastern basin (Frantzis et al., 2014a; Lewis et al., 2007; Lewis et al., 2017). Such consistent and predictable aggregations can enable effective management actions to reduce the risk of ship strikes through minor routing changes which are recognised by the IMO as the most effective way to address the ship strike issue (IMO, 2016).

**Criterion C: Key Life Cycle Activities**

**Sub-criterion Ci: Reproductive Areas**

The area appears to be the core habitat for sperm whale calving and nursing. Calves (≤2 years old) were present in 79% of social unit encounters, accounting for 17% of social unit members within the area (Frantzis et al., 2014a). Observations of 15 newborns indicate a mid-summer calving season which would imply a mating season from late winter to late spring (Frantzis et al., 2014a). Though no observations of mating within the area have been reported, this mating season lies outside the normal fieldwork season, which may explain the lack of such observations so far.

Calves have been observed in sightings of Cuvier’s beaked whales and also have repeatedly stranded along the Hellenic Trench including newborns bearing foetal folds, the most recent being on the Island of Rhodes in September 2016 (Frantzis, unpublished data). During the last mass stranding of Cuvier’s in south Crete in April 2014, a fully formed foetus was found in a necropsied stranded female animal (Frantzis, 2015). These data show that the area constitutes a reproductive area for the species.

**Sub-criterion Cii: Feeding Areas**

The area is an important feeding area for the eastern Mediterranean sperm whale subpopulation. Solitary males, loose male aggregations and members of long-term resident social units of sperm whales were observed feeding in the area (Frantzis et al., 2014a), with foraging and feeding activities being confirmed acoustically.

The area and in particular the Cuvier’s beaked whale sub-area is an important feeding area. Since Cuvier’s has the same feeding habits as sperm whales and both species inhabit the area because of the presence of their prey. Long lasting deep feeding dives have been repeatedly observed along the Hellenic Trench (Frantzis, unpublished data) and stomach contents of stranded animals had as primary prey species the three meso- and bathypelagic species that are also found in sperm whale stomachs of stranded sperm whales in the very same area (*Histioteuthis bonnellii*, *H. reversa*, *Octopoteuthis sicula*, see Lefkaditou and Poulopoulos, 1998; Rendell and Frantzis, 2016).

**Criterion D: Special Attributes**
Sub-criterion Di: Distinctiveness

The Mediterranean population of sperm whales are genetically and culturally different from conspecifics in the Atlantic Ocean. The Mediterranean population of sperm whales is both genetically isolated and different from conspecifics in the Atlantic Ocean (Engelhaupt et al., 2009). In addition, at the local level of the eastern Mediterranean, social units are likely to be resident and may not migrate out of this basin (Frantzis et al., 2014). Some codas (distinctive communication sounds) produced by males and social units in the Hellenic Trench have not been recorded in the western Mediterranean so far (Frantzis and Alexiadou, 2008; Rendell and Frantzis, 2016). This is an indication that cultural evolutionary processes may have affected coda dialects differently in the eastern Mediterranean basin compared to the western Mediterranean, since coda repertoires are almost certainly acquired by cultural transmission (Rendell et al., 2012), a process that occurs at the core of social units.

The Mediterranean population of Cuvier’s beaked whales are genetically different from conspecifics in the Atlantic Ocean (Dalebout et al., 2009).

Criterion D: Special Attributes

Sub-criterion Dii: Diversity

The area includes important habitat for seven marine mammal species: sperm whale, Cuvier’s beaked whale, striped dolphin, Risso’s dolphin, Common bottlenose dolphin (Frantzis, 2009; Boisseau et al., 2010) and monk seal (Legakis and Maragkou, 2009). It is possible that rough toothed dolphins also use the area as they have been sighted in neighbouring areas with similar habitats (Kerem et al., 2016). Therefore, the area is rich in marine mammal diversity.

Supporting Information

ACCOBAMS 2013. Report of the Fifth Meeting of the parties to ACCOBAMS, Tangier 5-8

November 2013. Recommendation 8.6: Recommendation on the conservation of Cuvier’s beaked whales in the Mediterranean. “Areas of Special Concern for Beaked Whales” (ASC-BW) and mitigation protocols for anthropogenic activities using intense underwater sound sources. Appendix 1: Mediterranean beaked whale mortality events associated with naval manoeuvres and/or use of military sonar.


Cañadas, A. et al. 2016. ACCOBAMS Collaborative effort to map high-use areas by beaked whales in the Mediterranean. ACCOBAMS Report (available from ACCOBAMS)


among Cuvier’s beaked whales (Ziphius cavirostris): implications for threatened populations Molecular Ecology, 14: 3353-3371.


Lewis, T., Gillespie, D., Lacey, C., Matthews, J., Danbolt, M., Leaper, R., McLanaghan, R., Moscrop, A., 2007. Sperm whale abundance estimates from acoustic surveys of the Ionian...


Acknowledgements

The participants of the 2016 IMMA Regional Expert Workshop held in Chania, Crete, for the Identification of IMMA in the Mediterranean Sea. Alexandros Frantzis. Tim Lewis.


PDF made available for download at www.marinemammalhabitat.org/portfolio-item/hellenic-trench/
### Primary Species – Meet the IMMA Selection Criteria

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name of Species</th>
<th>Population / Subpopulation Name</th>
<th>IUCN Red List Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Physeter macrocephalus</em></td>
<td>Sperm whale</td>
<td>Mediterranean subpopulation</td>
<td>Endangered</td>
</tr>
<tr>
<td><em>Ziphius cavirostris</em></td>
<td>Cuvier's beaked whale</td>
<td>Mediterranean subpopulation</td>
<td>Data Deficient</td>
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</tbody>
</table>

### Secondary Species – Do not individually meet the IMMA Selection Criteria but are present within the area

<table>
<thead>
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</thead>
<tbody>
<tr>
<td><em>Stenella coeruleoalba</em></td>
<td>Striped dolphin</td>
<td>Mediterranean Subpopulation</td>
<td>Vulnerable</td>
</tr>
<tr>
<td><em>Grampus griseus</em></td>
<td>Risso’s dolphin</td>
<td>Mediterranean Subpopulation</td>
<td>Data Deficient</td>
</tr>
<tr>
<td><em>Delphinus delphis</em></td>
<td>Common dolphin</td>
<td>Mediterranean subpopulation</td>
<td>Endangered</td>
</tr>
<tr>
<td><em>Tursiops truncatus</em></td>
<td>Common bottlenose dolphin</td>
<td>Mediterranean Subpopulation</td>
<td>Vulnerable</td>
</tr>
<tr>
<td><em>Monachus monachus</em></td>
<td>Mediterranean monk Seal</td>
<td>Mediterranean Subpopulation</td>
<td>Endangered</td>
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