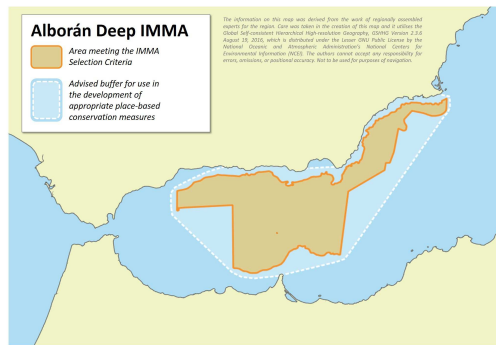


Alborán Deep Important Marine Mammal Area - IMMA

Description

The important circulation pattern of the Atlantic surface water in the Alborán Sea is often referred to as the hydrologic motor of the western Mediterranean basin (Rodríguez 1982) and makes this area one of the most productive regions of the Mediterranean (Rubin et al. 1992). The proposed area, in the eastern section of the Alborán Sea, has a relatively narrow continental shelf, somewhat wider within the large bay of Almería. The shelf edge starts its drop at around 150 meters. There is great variability in the slope of the shelf edge, from very steep escarpments to gently sloping plains. The abyssal plain is very narrow because of the presence of ridges and volcanic mountains such as those giving rise to the island of Alborán (Parrilla and Kinder 1987). The particular physiography of the Alborán basin directs the currents (Parrilla and Kinder 1987), which, favoured by atmospheric and meteorological conditions (Cheney and Doblar 1979), give rise to processes of convergence and divergence of water masses creating areas of enhanced productivity (Rubín et al. 1992). Boat-based surveys have been carried out in this area from 1992 to 2011, which have shown that in these deep waters, there is a high diversity of cetaceans; density surface models clearly show its importance for the oceanic species, which are mainly teuthophagous (beaked whales, Risso's dolphin, long-finned pilot whale, sperm whale and striped dolphin) as well as for common and bottlenose dolphins (Cañadas et al 2000; 2002; 2005; Carpinelli et al 2014; Wieruka et al 2014; Cañadas and Vazquez 2014).

The area is located in the deep waters within the eastern part of the Alborán Sea and the escarpments zone of the Gulf of Vera. Total area is 22,660 sq km. This area resulted multiple areas of interest for long-finned pilot whales, Risso's dolphin, sperm whale and



Area Size

22,660 km²

Qualifying Species and Criteria

Sperm whale - *Physeter macrocephalus*
Criterion A; C (ii)

Cuvier's beaked whale - *Ziphius cavirostris*
Criterion B (ii); C (i)

Risso's dolphin - *Grampus griseus*
Criterion B (ii); C (i, ii)

Long-finned pilot whale -
Globicephala melas
Criterion B (ii); C (i, ii)

Marine Mammal Diversity

Criterion D (ii)

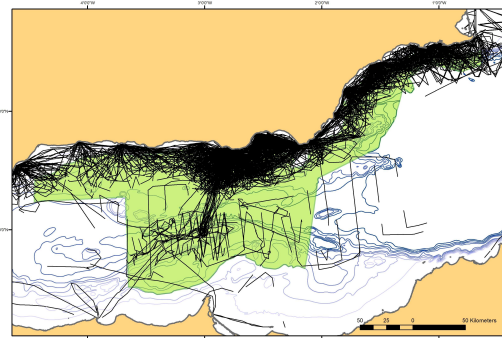
[*Balaenoptera physalus*, *Delphinus delphis*,
Tursiops truncatus]

Summary

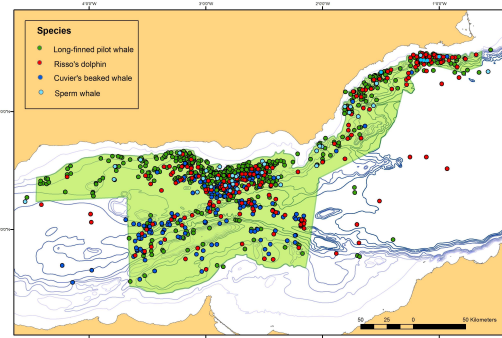
The Alborán Deep is characterised by a complex bottom topography with many escarpments, ridges, canyons, and seamounts, all creating a good habitat for squid-eating deep-diving species in the Alborán Sea. Concentrated in this area have been numerous sightings of long-finned pilot whales (*Globicephala melas*), Risso's dolphins (*Grampus griseus*), Endangered Mediterranean sperm whales (*Physeter macrocephalus*), and Cuvier's beaked whales (*Ziphius cavirostris*), all confirmed from spatial modelling of their habitats. This area has the highest density in the Mediterranean for pilot whales, and one of the three highest densities for beaked whales.

Cuvier's beaked whale, with the last three species boundaries completely inside the area of importance to long-finned pilot whales. In all cases the boundaries were drawn according to bathymetry, visual observations, density surface modelling, satellite tagging (pilot whales) and photo-id. The merged area has the 400m depth contour as the shallower limit (limit for pilot whales). The outer limit was set according to the available survey effort to avoid data poor areas. Most of the area is within Spanish jurisdiction, being only the southernmost part within Moroccan jurisdiction.

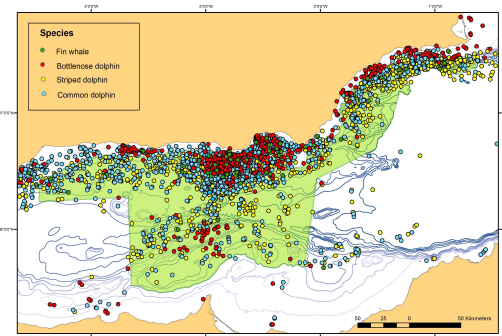
Data has been gathered in this area from 1992 to 2011 (20 years), in all seasons but majoritively during the summer months. The area is characterised by a very complex bottom topography, with many escarpments, ridges, canyons, and seamounts, all creating a very good habitat for squid-eating deep-diving species. A total of 8 species have been regularly encountered in this area including sperm whales, long-finned pilot whales, Cuvier's beaked whales, Risso's dolphins, striped, common and bottlenose dolphins, fin whales, whilst other species have been observed sporadically including false killer whale, killer whale, minke whale (Cañadas et al 2004; 2005; Cañadas 2006; Cañadas and Hammond 2006; 2008). Large aggregations of long-finned pilot whales have been observed every year in all seasons, with mean group size of 29 and up to 350 (Cañadas and Sagarminaga 2000; Cañadas et al 2004; Cañadas et al 2005; Wierucka et al 2014). Satellite tagging of pilot whales also shows an intense use of the area (Verborgh et al 2016). Cuvier's beaked whales are found every season (Cañadas et al 2004) and this area shows one of the highest densities of this species in the Mediterranean, together with the Hellenic Trench and the Ligurian Sea (Cañadas and Vazquez 2014), as shown by the Mediterranean wide density surface modelling of Cuvier's beaked whales (Cañadas et al 2016). Risso's dolphins, although encountered much less often than pilot whales, are also sighted every year (Cañadas et al 2004) and show high number of identified individuals with photo-identification, when compared with other areas such as the Ligurian Sea.



Research Vessel/Airplane Survey Effort (CIRCE, ANSE, ALNILAM, NURC, unpublished data)



All sightings of deep diver species within the Alborán Deep IMMA (CIRCE, ANSE, ALNILAM, NURC, unpublished data)



All sightings of other species occurring within the Alborán Deep IMMA (CIRCE, ANSE, ALNILAM, NURC, unpublished data)

Criterion A - Species or Population Vulnerability

Mediterranean subpopulation of sperm whales is considered to be Endangered by the IUCN Red List of Threatened Species. The Alborán Sea forms a gateway between the Mediterranean Sea and the Atlantic Ocean, and therefore forms a passage area for animals that might travel between both areas. It is especially important as a connection area between the Strait of Gibraltar and the rest of

the Mediterranean; there is photo-id evidence of recaptures of animals in the Strait of Gibraltar, the Alboran Sea and the Ligurian Sea (Carpinelli et al 2014). It is therefore, in this sense, important for the endangered Mediterranean sperm whale subpopulation. The other deep diver species in this area are not assessed as endangered or vulnerable as yet. However, the Cuvier's beaked whale Mediterranean subpopulation will be re-assessed in 2017 aiming for Vulnerable under the IUCN Red List based on the results of the basin-wide density surface modelling (Cañadas et al 2016).

Criterion B: Distribution and Abundance

Sub-criterion Bii: Aggregations

Long-finned pilot whale - highest density within the Mediterranean; Cuvier's beaked whale - one of the highest densities in the Mediterranean; Risso's dolphin - one of the highest densities in the Mediterranean (unpublished). Data has been gathered in this area from 1992 to 2011 (20 years), all seasons but mainly in summer. Large aggregations of long-finned pilot whales have been observed every year in all seasons (Figure 3), with mean group size of 29 and up to 350 (Cañadas and Sagarminaga 2000; Cañadas et al 2004; Cañadas et al 2005; Wierucka et al 2014). Satellite tagging of pilot whales also shows an intense use of the area (Verborgh et al 2016).

Cuvier's beaked whales are found every season (Figure 3) (Cañadas et al 2004) and this area shows one of the highest densities of this species in the Mediterranean, together with the Hellenic Trench and the Ligurian Sea (Cañadas and Vazquez 2014), as shown by the Mediterranean wide density surface modelling of Cuvier's beaked whales (Cañadas et al 2016). Risso's dolphins, although encountered much less often than pilot whales, are also sighted every year (Figure 4) (Cañadas et al 2004) and show high number of identified individuals with photo-identification, when compared with other areas such as the Ligurian Sea (unpublished data). The most recent abundance estimate for Risso's dolphins is of 864 (CV=15.6%) animals only in the northern third of the Alboran Sea with an

extension to include the Alboran island (Indemares report 2010). The latest abundance estimate for long-finned pilot whales is of 7,440 (CV=12.0%) animals for the same area as Risso's dolphin (Indemares Report 2010). These two estimates are not corrected for availability bias. The latest estimate of Cuvier's beaked whale in the Alboran Sea is of 429 (CV=22.0%), corrected for availability bias (Cañadas and Vazquez 2014).

Criterion C: Key Life Cycle Activities

Sub-criterion Ci: Reproductive Areas

Calves are observed very frequently for long-finned pilot whales and Risso's dolphins, indicating that this is a reproductive area for them. Calves have also been observed in Cuvier's beaked whales. Data has been gathered in this area from 1992 to 2011 (20 years), all seasons but mainly in summer. The presence and number of calves (whenever possible) was recorded for every encounter of cetaceans. 64% of the encounters of pilot whales (Cañadas and Sagarminaga 2000 for the presence of calves; Cañadas and Sagarminaga 2002; Cañadas et al 2004), and 32% of the Risso's dolphin encounters and included calves in the groups (Cañadas et al 2004). Mating behaviour was directly observed in many occasions in pilot whale's groups (Cañadas and Sagarminaga 2000; Cañadas and Sagarminaga 2002). Calves have been observed in Cuvier's beaked whales although much less frequently than for the other two species (Cañadas and Sagarminaga 2002; Cañadas et al 2004).

Criterion C: Key Life Cycle Activities

Sub-criterion Cii: Feeding Areas

Feeding behaviour is observed in the four deep diver species in this area: sperm whales, long-finned pilot whales, Cuvier's beaked whales and Risso's dolphins. Data has been gathered in this area from 1992 to 2011 (20 years), all seasons but mainly in summer. Indirect evidence during many observations

(long dives) have been observed frequently in the four deep diver species in this area (Cañadas and Sagarminaga 2002), which is rich in cephalopods due to the physiographic characteristics of the area (Cañadas 2006). Pilot whales were tagged with DTAGs in 2010 and 2011 in the Alboran Sea (Tyack 2012) showing typical forging/feeding behaviour during long dives. Cuvier's beaked whales were followed over long periods of time (several hours each) collecting data on diving behaviour through focal follow, showing typical behaviour of long dives for foraging/feeding (Cañadas and Vazquez 2014). Long dives, typical for foraging/feeding have also been observed in sperm whales and Risso's' dolphins (Cañadas and Sagarminaga 2002).

Criterion D: Special Attributes

Sub-criterion Dii: Diversity

This is an area with diversity of deep diver species (sperm whales, long-finned pilot whales, Cuvier's beaked whales and Risso's dolphins), but also holds large aggregations of other cetacean species (striped, common and bottlenose dolphins), and regular although with less density, presence of migrating fin whales. Data has been gathered in this area from 1992 to 2011 (20 years), all seasons but mainly in summer. A total of 8 species have been regularly encountered in this area (sperm whales, long-finned pilot whales, Cuvier's beaked whales, Risso's dolphins, striped, common and bottlenose dolphins, fin whales) and other species have been observed sporadically (false killer whale, killer whale, minke whale) making it the area with the highest cetacean diversity in the Mediterranean (Cañadas et al 2004; 2005; Cañadas 2006; Cañadas and Hammond 2006; 2008).

Supporting Information

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Acknowledgements

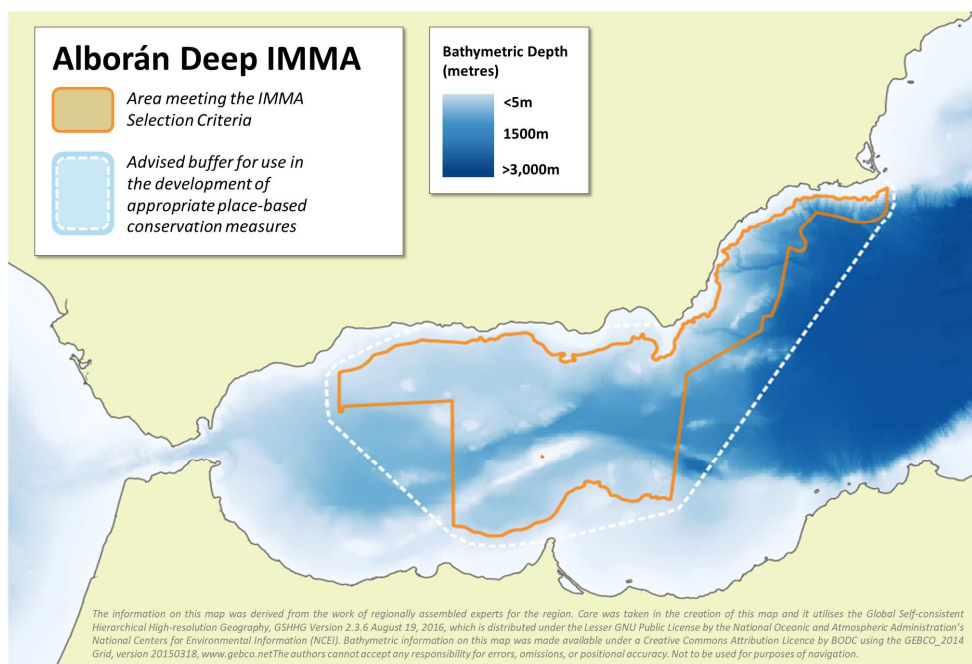
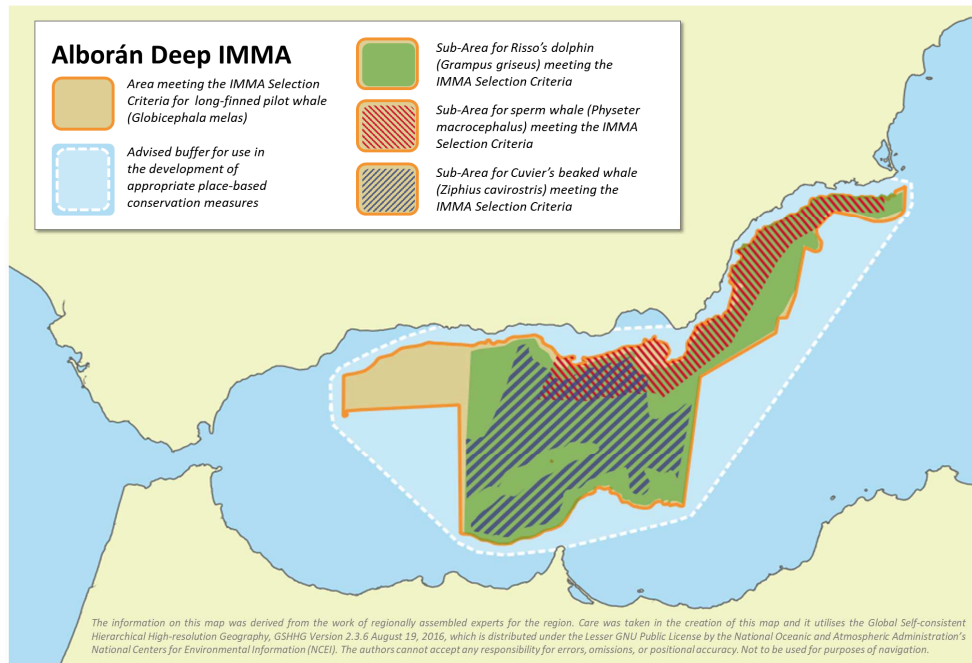
The participants of the 2016 IMMA Regional Expert Workshop held in Chania, Crete, for the Identification of IMMAs in the Mediterranean Sea. Pauline Gauffier. Ana Cañadas.

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PDF made available for download at <https://www.marinemammalhabitat.org/portfolio-item/alboran-deep/>

Annex I

Supplementary Maps



Annex II

List of Primary and Secondary Species

Primary Species – Meet the IMMA Selection Criteria

Scientific Name	Common Name of Species	Population / Subpopulation Name	IUCN Red List Status
<i>Physeter macrocephalus</i>	Sperm whale	Mediterranean subpopulation	Endangered
<i>Ziphius cavirostris</i>	Cuvier's beaked whale	Mediterranean subpopulation	Data Deficient
<i>Grampus griseus</i>	Risso's dolphin	Mediterranean subpopulation	Data Deficient
<i>Globicephala melas</i>	Long-finned pilot whale	Mediterranean subpopulation	Data Deficient

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

Scientific Name	Common Name of Species	Population / Subpopulation Name	IUCN Red List Status
<i>Delphinus delphis</i>	Common dolphin	Mediterranean subpopulation	Endangered
<i>Tursiops truncatus</i>	Common bottlenose dolphin	Mediterranean Subpopulation	Vulnerable
<i>Balaenoptera physalus</i>	Fin whale	Mediterranean Subpopulation	Vulnerable