





**INTERSESSIONAL WORKING GROUP ON RESEARCH  
AND CONSERVATION ACTIONS UNDERTAKEN  
IN THE EXTENDED AGREEMENT AREA:  
REPORT FROM MADEIRA**

**Preface:** In February 2008, an extension of the agreement area came into force, which changed the name to "**Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas**".

The Agreement Area is now defined as follows:

"... the marine environment of the Baltic and North Seas and contiguous area of the North East Atlantic, as delimited by the shores of the Gulfs of Bothnia and Finland; to the south-east by latitude 36°N, where this line of latitude meets the line joining the lighthouses of Cape St. Vincent (Portugal) and Casablanca (Morocco); to the south-west by latitude 36°N and longitude 15°W; to the north-west by longitude 15° and a line drawn through the following points: latitude 59°N/longitude 15°W, latitude 60°N/longitude 05°W, latitude, 61°N/longitude 4W;latitude 62N/ longitude 3W; to the north by latitude 62°N; and including the Kattegat and the Sound and Belt passages."

The Extended Agreement Area is limited by longitude 15°W. However, populations of a number of cetacean species occurring further west in the North Atlantic are likely to spend periods of their lives within the Extended Agreement Area, and so recent information on cetaceans from the Atlantic Islands such as Madeira or the Azores, is welcomed. This report by Luis Freitas summarises the work they have been undertaking in the last few years around the Portuguese archipelago of Madeira, and is tabled for information.

Peter G.H. Evans

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## **MADEIRA REPORT by Luis Freitas**

In Madeira archipelago (Portugal), research and conservation projects aimed at cetaceans have been carried out by the Madeira Whale Museum over the last decade (Project CETACEOSMADEIRA, 2000 – 2004; Project MACETUS, 2003-2005; Project GOLFINICHO 2005-2006; Project EMECETUS, 2007-2009; Project CETACEOSMADEIRA II, 2010-2013), some of these projects in partnership with research teams from the neighbouring archipelagos of Azores and Canary Islands.

### **Resumé of the technical reports**

Freitas, L. *et al* (2014b) – Technical-scientific study to support the establishment of a Site of Community Importance (SCI) for the bottlenose dolphin (*Tursiops truncatus*) in Madeira archipelago.

The major objective of the CETACEOSMADEIRA II project was to identify area(s) of importance for the bottlenose dolphin in the coastal waters of Madeira, in order to designate Sites of Community Interest (SCI(s)). Therefore, many questions were formulated, namely: how many bottlenose dolphins use the waters of Madeira? Are there resident animals? What is their distribution? How do they use these waters, i.e., which crucial activities are held and where?

Abundance estimates for the period 2007–2012 were obtained through design-based distance sampling methods, and the distribution of the density of groups and animals was modelled using Generalised Additive Models. In order to get more robust and accurate abundance estimates, data collected in a previous project (EMECETUS) were also used. The estimates were calculated based on 69 sightings of bottlenose dolphins recorded in almost 9,000 km of sampling effort.

The abundance estimate obtained for the coastal waters of the Madeira archipelago (4,409 km<sup>2</sup>; except Selvagens Islands) was 482 (365-607) animals, which corresponds to an average density of 0.1094 animals/km<sup>2</sup> with a CV of 13.5%. The abundance estimates have not been corrected for availability or perception bias and are therefore underestimates of the abundance of the species in the coastal waters of Madeira.

The bottlenose dolphins use all coastal waters of Madeira down to the 2,000 m depth contour. Nonetheless, they present a patchy distribution with some areas of greater presence, both in terms of number of groups and group size. The areas of highest density of animals and groups correspond to locations of depths between 100 m and 1,000m on the southeast, east and northeast sides of Madeira.

Bottlenose dolphin habitat use was also studied in an extended study area around the Madeira, Porto Santo and Desertas islands, based upon data obtained from systematic and random shipboard surveys, and data from observers aboard fishing and whale watching vessels over the period 2001-2012. The habitat use surface distribution maps show that bottlenose dolphins use different habitats within the coastal waters of Madeira, according to the activity they carry out. One of the calving areas is situated in the main whale watching area of operation on the south coast of Madeira, while the remaining areas coincide with higher density areas of animals on the east side of

Madeira, while activities such as feeding, resting and socialising took place in more specific areas within the general area of distribution.

During the sea surveys, photo-identification was carried out on the bottlenose dolphin sighted groups. For abundance estimates, only data from 2011-2012 were used from the southern coast of Madeira and, in order to increase the dataset, images obtained by the whale watching boats were included in the analysis. The results point to an open bottlenose dolphin population, although the data also show that a number of individuals ( $n = 183$ ; 95% CI = 155-218) display fidelity to the island, and are therefore considered residents. The "superpopulation", including transients and residents, was estimated to be 438 individuals, including the proportion of unmarked animals (32%) for the period of this study (2004-2012). Photo-identification data also revealed that calves were observed in 26.4% of the groups, on average, and although groups with calves were observed throughout the year in Madeira, there are two peaks of calving and birth with up to >50% of groups with calves, one at the beginning of the spring and another at the end of summer/autumn.

Regarding the social structure, there are a high number of transient dolphins that visit the waters of Madeira, and some of these dolphins as they pass by the study area, associate with the resident dolphins. The differentiated use of the habitat by the bottlenose dolphins has important implications for management and conservation of this species in the coastal waters of Madeira. This means that there are areas where the disruption of crucial activities, such as feeding, resting, socialising and breeding, can have major impacts on the species in Madeira, given the greater frequency with which these activities take place in those specific areas. Minimising the impact of human activities on those areas may be important for the long-term viability of the species in these coastal waters.

Considering the information obtained in this study, we conclude that the coastal waters of Madeira are a very important habitat for bottlenose dolphins, both due to its higher density compared to adjacent areas, and by the set of critical activities that take place there. It is therefore not only an important habitat for animals using this area regularly (residents), but also to transients passing by Madeira during their migration. In this context, the Madeira archipelago gains great importance for the Atlantic pelagic population, linking other important areas for this species in the Atlantic.

Mainly the photo-identification studies are addressed in the publication by Dinis (2014), and will be published further in peer-reviewed journals in due course.

Freitas *et al* (2014a) – Proposal to establish a Site of Community Importance (SCI) for the bottlenose dolphin (*Tursiops truncatus*) in Madeira archipelago coastal waters.

Based upon the results from the technical-scientific report - Freitas *et al* (2014b) - a proposal for the establishment of an SCI for the bottlenose dolphin was presented. The proposal considered recommendations and previous experience in setting SCIs for the bottlenose dolphin in Portugal and other European countries.

The proposed SCI (SCIp) for the bottlenose dolphin comprises the coastal waters of the islands of Madeira, Porto Santo, and Desertas between the coast and the 2500 m depth contour. The choice of the bathymetry to define the outer limits of the area is the result of the bottlenose dolphin's natural distribution being generally within a depth range in

the Madeira archipelago. The SCIp outer limit definition was established in order to incorporate the bottlenose dolphin higher density areas, the areas of specific use for certain activities, the general area of distribution of the bottlenose dolphin in the archipelago, and all its preferred habitat (waters between 0 and 2000 m depth), even if some areas are currently not used extensively. Therefore, the SCIp accommodates within its boundaries any local variations in species distribution, but still can be considered a small area for the bottlenose dolphin (and for cetaceans in general) since it is easily traversed in a day or two.

Based on the criteria defined in the Habitats Directive, and on the recommendations from the European Commission and others, an assessment was made of the SCIp for the bottlenose dolphin in the coastal waters of Madeira. The evaluation used the scientific information collected in Madeira in projects, relevant literature, and expert opinion. The result of this evaluation for each criterion was: A) Proportion of the population in the Member State - B; B) Conservation and restoration of the important habitat characteristics for the species - A; C) Isolation of species populations - B; and D) Overall Assessment - A.

Freitas *et al* (2014d) – Technical-scientific study to support the establishment of whale-watching operation areas and respective carrying capacity.

In the Madeira archipelago, whale watching has been carried out for nearly two decades. It has gone through a considerable growth in recent years and it is carried out in a relatively small area, concentrated on the south coast of Madeira Island. Between 2002 and 2008, the Madeira Whale Museum studied the short-term impacts of the activity on cetaceans, and detected some changes in the animals' behaviour, with unknown consequences at a population level (the long-term). In order to harmonise cetacean conservation and the whale watching activity (WW), the project CETACEOSMADEIRA II (CMII) considered objective 2, which intended to answer the following questions: should areas and limits of operation be established for the WW activity? If yes, which should be the areas, and with what carrying capacity?

To answer these questions it was necessary to understand the dynamics of the whale watching activity, the ecology and dynamics of the target species, and the interactions between animals and the activity. Therefore, this report presents results on: WW activity - main characteristics, present size, temporal and spatial patterns of the operation; relative frequency of occurrence and the main cetacean species targeted by the activity, abundance and distribution, habitat for the critical activities (feeding, resting, breeding, socialising), and vulnerabilities; how they interact with WW boats, and how these boats pressurise the animals.

This objective of the CMII project is in line with DLR 15/2013 /M, of 14 May, which includes the definition of areas of operation, and their carrying capacity as a tool for spatial management of the activity, in order to harmonise its touristic and socio-economic interests with the cetaceans' conservation objectives and animal welfare concerns of the observed animals in Madeira archipelago.

To answer the above questions, different methodologies were used. Opportunistic trips on board WW boats and observations from lookout posts on land were carried out in order to gather data to characterise the WW activity, study the interactions between boats and cetaceans, and better understand the "pressure" exerted by the WW activity on

the targeted groups. Ecological parameters were studied, using the data collected in systematic (Distance sampling) and random (photo-identification) nautical surveys, data provided by the WW operators as well as data gathered in the opportunistic surveys aboard WW boats. An experiment to assess the availability of cetaceans versus the "pressure" exerted by WW boats in the main area of activity (Funchal), was also carried out. Statistical analysis of the data included design-based distance sampling methods and spatial modelling using Generalized Additive Models. The latter were also used to study habitat use. Individuals of some cetacean species were photographed (those species with potential for photo-identification), in order to understand their short-term residence patterns and how they use the WW operation area. The study areas and periods differed according to the methodologies and features studied, covering from the south coast of Madeira to the waters around the Madeira archipelago, between 2010 and 2012, and 2001 and 2012, respectively.

By 2013, there were 15 WW boats operating around the island of Madeira year round, with twice-daily tours devoted to whale and dolphin observation. It was estimated that a total of 4,500 WW trips/year were conducted on the south coast of Madeira during the study period (2010-2012). During the study period (2010-2012), 14 species were observed in all the nautical surveys. The four most frequently observed species, regardless of the type of survey, were common dolphin, spotted dolphin, bottlenose dolphin and short-finned pilot whale. It is noteworthy that 86% of the sightings registered by WW boats correspond to just five species, the four mentioned above, and the Bryde's whale.

According to the resulting abundance estimates, the spotted dolphin is the most abundant species, followed by common dolphin, bottlenose dolphin, and short-finned pilot whale (Table 1).

Table 1. Abundance estimates of cetaceans in coastal waters of the Madeira archipelago (4,409km<sup>2</sup>) except the Selvagens Islands

<b>Species/family</b>	<b>Abundance</b>	<b>95% CI</b>	<b>CV</b>	<b>Animals/km<sup>2</sup></b>
Bottlenose dolphin	482	365 - 607	0.14	0.11
Short-finned pilot whale	151	99 - 201	0.23	0.03
Atlantic spotted dolphin	1,067	717 - 1378	0.22	0.24
Short-beaked common dolphin	741	496 - 1032	0.27	0.17

In the study area, the bottlenose dolphin showed a patchy distribution with a greater presence, both in terms of density of animals and groups, in the southeast Madeira, channel between Madeira and the Desertas islands, north and northeast of Madeira, and southwest of Porto Santo. Likewise, the short-finned pilot whale occurs in the coastal waters of the Madeira archipelago, particularly in the southeast of Madeira Island. The spotted dolphin and common dolphin showed wider distributions encompassing the entire coastal sea of Madeira, with the spotted dolphin showing a greater presence

throughout the south and north coasts of Madeira, while the common dolphin had higher densities at the edges of the island, and east of the Desertas and Porto Santo islands.

Although the spotted and common dolphins are the species with higher abundance estimates, the most frequently observed species by the WW boats was the bottlenose dolphin. This is probably due to the fact that this species is present in the coastal waters of Madeira all year-round, while the other two species have a seasonal presence. Likewise, short-finned pilot whales with a much lower abundance than common dolphins are sighted more frequently by the WW boats due to their annual presence in these waters.

The different ways that the bottlenose dolphin, short-finned pilot whale and, to a lesser extent, spotted dolphin use the habitat has important implications for the management and conservation of these species in the coastal waters of Madeira. This means that there are specific areas where the disruption of critical activities can have major impacts on these species, given the higher incidence of these activities in those areas. In contrast, the existence of specific areas for critical activities can make the process of spatial management of the WW activity easier, including the creation of exclusion zones to minimise the impact / disruption of crucial activities in these species' life cycles.

The photo-identification results showed that individuals of different cetacean species regularly use the WW operation area (Southern Madeira) either in the short term (on the same day or over several days) or long term (over several years). The repeated exposure to WW boats may not be a concern for species with an occasional presence in Madeira, but the same may not be true for species such as the bottlenose dolphin and short-finned pilot whale, with animals using the south coast regularly, as residents or island associated small groups, to whom inshore waters of Madeira are a preferred habitat. The same applies to the Bryde's whale, which has returned in recent years to Madeira in the period of greatest WW boat activity (late spring to autumn), with animals using frequently the southern coast of the island.

An experiment carried out in the main WW operation area showed that the percentage of available groups of cetaceans (i.e. that were detected and therefore could be selected for observation by WW boats) in the study area tend to be 100% targeted by the WW boats if the number of vessels was greater than the number of available cetacean groups. Therefore, the increase in the WW fleet operating in this area must be considered carefully and should be subject to future studies to better understand the long-term effects of such pressure on the main cetacean species observed, both in terms of the impact on the spatial distribution and abundance in the study area and their impact on population parameters (e.g. changes in the survival rate of offspring in the first year).

Although a significant impact from the WW activity is not expected at the genetic population level (animals using the Madeira waters belong to larger open populations with wide Atlantic ranges), impacts may occur on possible sub-populations, ecological stocks or on animal groups depending upon Madeira waters to survive. Indeed, the greatest impact may be upon the WW activity itself, with a possible decrease of animals available for observation due to habitat degradation or too much pressure affecting the local demographic parameters of these species, and forcing the animals to move elsewhere and/or change their behaviour in order to reduce exposure to boats.

Freitas *et al* (2014c) – Proposal to establish whale-watching operation areas and respective carrying capacity.

In 2013, the Regional Legislative Decree No. 15/2013/M, of 14 May, was published. This regulates observation activities on marine vertebrates in Madeira. It considers the establishment of WW areas of operation and the definition of their associated carrying capacity. Those limits were set through an Environment and Natural Resources Regional Department Ordinance, based upon the proposals presented in this report.

This study aimed to answer the following questions: should areas of operation for the WW activity and limits to its operation be defined, in order to contribute to the sustainability of the activity and to the conservation of cetaceans? If yes, which should be the operation areas and their respective carrying capacities?

The important growth of the WW activity in Madeira in recent years, and the evidence that it may continue, raises the question of the activity's sustainability and its impacts on the target species and on the local marine ecosystem. Thus the local management of the WW activity should take into consideration the precautionary principle due to the increasing number of boats operating, to the degree of vulnerability of key target species, and the empirical and scientific evidence of impacts of the activity on cetaceans.

The differing habitat use by bottlenose dolphin, short-finned pilot whale (and, to a lesser extent, spotted dolphin) has important implications for management and conservation of these species in the coastal waters of Madeira. This means that there are specific areas where disruption of critical activities can have major impacts on these species, given the higher incidence of these activities in those areas. Therefore, the spatial management tool established in the WW legislation is highly recommended for implementation because it allows one to define areas of operation and to establish their carrying capacity, in order to minimise its impacts. Associated with the concept of areas of operation is the concept of exclusion areas or refuges, important to protect a critical part of local habitats of these species, namely, high density areas and/or key areas for rest, feeding, socialising or calving.

The continuous and/or uncontrolled growth of the WW activity leads to unsustainability, and most likely to pressures not compatible with the conservation of cetaceans - which cannot be considered only as a resource but also as a sensitive, vulnerable, and essential component of the marine ecosystem.

In order to provide alternatives to managers and decision makers on defining the WW operation areas, several possibilities were studied, and three options are presented with different approaches concerning the flexible limits to areas.

As a result of this work, several technical reports, scientific publications and legislation have been produced, such as:

***Technical reports***

- (1) Freitas L, Ribeiro C, Dinis A, Alves F, Nicolau C, Carvalho A (2014a). Proposta de Criação de um Sítio de Importância Comunitária para o golfinho-roaz (*Tursiops truncatus*) no Arquipélago da Madeira (Deliverable A.7\_I). Relatório

- técnico do Projeto CETACEOSMADEIRA II (LIFE07 NAT/P/000646), Museu da Baleia da Madeira, 58p. *In Portuguese, with abstract in English.*
- (2) Freitas L, Ribeiro C, Dinis A, Nicolau C, Alves F, Carvalho A (2014b). Estudo técnico-científico de suporte à criação de um Sítio de Importância Comunitária (SIC) para o golfinho-roaz (*Tursiops truncatus*) no Arquipélago da Madeira (Deliverable A.7\_IA). Relatório técnico do Projeto CETACEOSMADEIRA II (LIFE07 NAT/P/000646), Museu da Baleia da Madeira. *In Portuguese, with abstract in English.*
  - (3) Freitas L, Alves F, Ribeiro C, Dinis A, Nicolau C, Carvalho A (2014c). Proposta de criação de áreas de operação para a actividade de whalewatching e respectiva capacidade de carga (Deliverable A.7\_II). Relatório técnico do Projeto CETACEOSMADEIRA II (LIFE07 NAT/P/000646), Museu da Baleia da Madeira. *In Portuguese, with abstract in English.*
  - (4) Freitas L, Alves F, Ribeiro C, Dinis A, Nicolau C, Carvalho A (2014d). Estudo técnico-científico de suporte à proposta de criação de áreas de operação para a actividade de whalewatching e a respectiva capacidade de carga (Deliverable A.7\_IIA). Relatório técnico do Projeto CETACEOSMADEIRA II (LIFE07 NAT/P/000646), Museu da Baleia da Madeira. *In Portuguese, with abstract in English.*
  - (5) Nicolau C, Alves F, Ferreira R, Henriques F, Carvalho A, Cunha I, Freitas L (2014). Surveillance of the conservation status of cetaceans species in Madeira offshore waters (Deliverable A.8\_I). Relatório técnico do Projeto CETACEOSMADEIRA II (LIFE07 NAT/P/000646). Museu da Baleia da Madeira.

#### ***Peer-reviewed Journals and Thesis***

2012

- (6) Freitas L, Dinis A, Nicolau C, Ribeiro C, Alves F (2012). New records of cetacean species for Madeira Archipelago with an updated checklist. *Bol. Mus. Mun. Funchal*, **62** (334): 25 – 43.

2013

- (7) Alves F, Dinis A, Ribeiro C, Nicolau C, Kaufmann M, Fortuna CM, Freitas L (2013). Daytime dive characteristics from six short-finned pilot whales *Globicephala macrorhynchus* off Madeira Island. *Arquipelago, Life and Marine Sciences* **31**: 1-8.
- (8) Alves F, Querouil S, Dinis A, Nicolau C, Ribeiro C, Freitas L, Kaufmann M, Fortuna C (2013). Population structure of short-finned pilot whales in the oceanic archipelago of Madeira based on photo-identification and genetic analyses: implications for conservation. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **5**: 758 - 776.

- (9) Alves, F (2013). Population Structure, Habitat Use and Conservation of Short-Finned Pilot Whales *Globicephala macrorhynchus* in the Archipelago of Madeira. PhD Thesis, University of Madeira.
- (10) Quérrouil S, Kiszka J, Cordeiro AR, Cascão I, Freitas L, Dinis A, Alves F, Santos RS, Bandarra NM (2013). Investigating stock structure and trophic relationships among island-associated dolphins in the oceanic waters of the North Atlantic using fatty acid and stable isotope analyses. *Mar Biol* **160**: 1325-1337.

2014

- (11) Alves F, Dinis A, Nicolau C, Ribeiro C, Kaufmann M, Fortuna C, Freitas L (2014). Survival and abundance of short-finned pilot whales in the archipelago of Madeira, NE Atlantic. *Marine Mammal Science*, **31**(1): 106–121.
- (12) Dinis, A. (2014). Ecology and Conservation of Bottlenose Dolphins in Madeira Archipelago, Portugal. PhD Thesis, University of Madeira.

### ***Legislation***

- (13) Decreto Legislativo Regional nº 15/2013/M de 14 de Maio – Madeira Regional Parliament Decree which regulates the marine vertebrates observation activities, including whale-watching;
- (14) Portaria 46/2014/M de 22 de Abril – Madeira Environment and Natural Resources Regional Department ordinance, which establishes the ports of operation and respective carrying capacity and exclusion zone.