



# Mapping Cetacean Biodiversity in the Bay of Biscay

Walker, D.<sup>1,2</sup>, McHenry, M.<sup>1,2</sup>, Hickey, R.<sup>1,2</sup>, Clemente, S.<sup>1,2</sup>, Beaumont, E.S.<sup>1,2</sup> & Macleod, K.<sup>2</sup>

<sup>1</sup>Marine Mammal Science MSc, University of Wales, Bangor, UK  
<sup>2</sup>Organisation Cetacea (ORCA), 9 Prospect Row, St Neots, Cambridge, UK



## Introduction

One aim of current conservation research is to prioritise regions with high species diversity for protection (Purvis and Hector, 2000). Diversity indices have rarely been applied to cetaceans due to a lack of survey effort in offshore areas where the majority of species occur. These habitats are, however, known to be threatened by the effects of anthropogenic impacts such as overfishing, fisheries bycatch, and pollution. The Organisation Cetacea (ORCA) open-access database consists of an extensive dataset involving 4500 cetacean sightings over a large geographical area including shelf, slope and oceanic habitats. This study utilised the ORCA database in order to map and compare cetacean biodiversity by habitat within the Bay of Biscay and English Channel.

## Methods

Between 1998-2003, ORCA volunteers conducted 48219 km of line-transect survey effort in the Bay of Biscay and English Channel during which 18 species of cetacean were recorded. Surveys were undertaken onboard two 'vessels of opportunity'. Both were ferries operating between the south coast of England and the north coast of Spain: P&O's 'Pride of Bilbao' and Brittany Ferries 'Val de Loire'. A standard line-transect methodology was adopted (see Walker 2004 for further details). The high viewing platform and stability of both vessels enabled good viewing conditions to be retained at higher sea states than on most vessels, so only data above sea state 5 was removed from the database prior to analysis.

The study area was divided into quarter ICES squares and categorised into three habitats: shelf (0-200 m), slope (200-3250 m) and oceanic (> 3250 m). The number of species occurring in each box was ascertained and a Biodiversity Index (BI) was developed that attributed the highest scores to the species occurring in the least number of boxes (see Table 1). Due to the large quantity of survey effort attributed to boxes (59% had coverage in excess of 500km) it was assumed that plotting species diversity by survey effort would reveal a cut-off point after which diversity would stop increasing. This level of effort could then be used as a lower cut-off point, with boxes below the cut-off point being excluded from analysis. However, as Figure 1 shows, the increase in species diversity with effort showed no signs of levelling off despite the extensive survey coverage, so an alternative method of accounting for effort was sought. Variable effort in each box was therefore accounted for by calculating the BI per km travelled, termed the Biodiversity Score (BS). Boxes with < 200 km of survey effort were discarded as they were considered to produce outliers in the dataset.

Table 1

Species	No. Squares	BI
Common Dolphin	32	1
Striped dolphin	27	1
Bottlenose dolphin	25	1
Finn whale	23	2
Blue whale	20	2
Harbour porpoise	27	2
Sperm whale	20	2
Mink whale	10	2
Convict backed Whale	15	4
Risso's dolphin	12	4
Squid fish	9	4
Killerwhale	8	4
Eastern bottlenosewhale	6	8
Bluewhale	2	16
Falck killer whale	2	16
Humpback whale	2	16
Megapodion	2	16
Whitebacked dolphin	1	32

## Acknowledgements

Thanks to Organisation Cetacea for providing the database and technical assistance for this poster to their volunteers (in particular, The Company of Whales), and core sponsor, the Esmée Fairburn Foundation. Images courtesy of Graeme Cresswell and Dylan Walker.

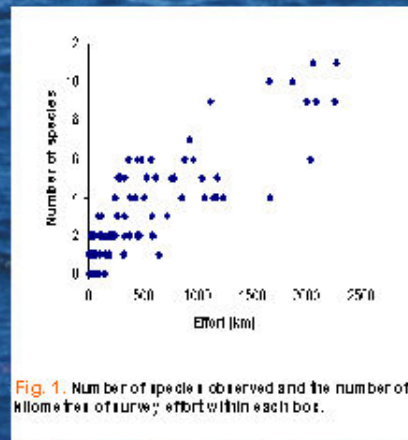


Fig. 1. Number of species observed and the number of kilometers of survey effort within each box.

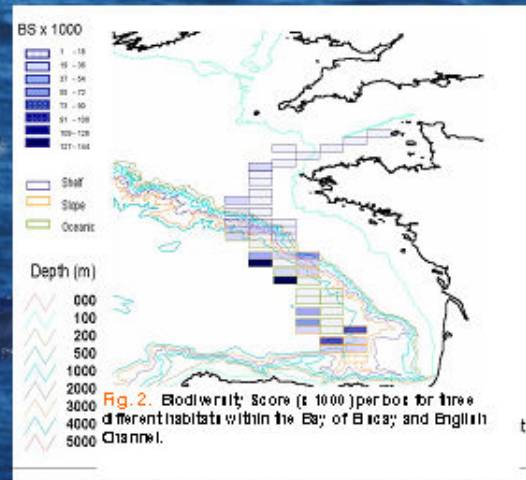


Fig. 2. Biodiversity Score (x 1000) per box for three different habitats within the Bay of Biscay and English Channel.

## Results

The lowest BI was found in the shelf habitat (5.20). The values for oceanic and slope habitats were 10.53 and 13.31, respectively. Slope habitat was found to have a significantly greater BS than shelf habitat ( $p = 0.0008$ ). No significant difference was found between the biodiversity of the oceanic habitat and either of the other habitats.

## Discussion

Although further refinements are required in order to increase the accuracy of the results of this approach, particularly with regard to relating the BI score to a comparable amount of survey effort in each box, the results indicate that oceanic, and particularly slope areas, support a far higher biodiversity than shelf waters (Figure 2). Whilst there has been limited previous research focusing on the diversity of cetaceans (e.g. MacLeod *et al.* 2004), this preliminary study has provided a unique opportunity to measure cetacean diversity over a large spatial scale. All 20 existing and 30 proposed Marine Protected Areas in the Northeast Atlantic are in shelf waters. However, our results indicate this habitat is likely to have relatively low cetacean biodiversity. We therefore recommend that greater emphasis be placed on slope and oceanic regions for marine conservation.

## References

- MacLeod, C. D., Hauser, N. and Peckham, H. (2004). Diversity, relative density and structure of the cetacean community in summer months east of Great Abaco, Bahamas. *J. Mar. Biol. Ass. U.K.* **84**: 469-474
- Purvis, A. and Hector, A. (2000). Getting the measure of biodiversity. *Nature* **405**: 212-219
- Walker, D. (Ed.) (2004). ORCA No. 3. *The Annual Report of Organisation Cetacea*. Organisation Cetacea, UK. **80pp**