

DISTRIBUTION AND HABITAT PREFERENCE OF BOTTLENOSE DOLPHINS IN CARDIGAN BAY, WALES

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INTRODUCTION

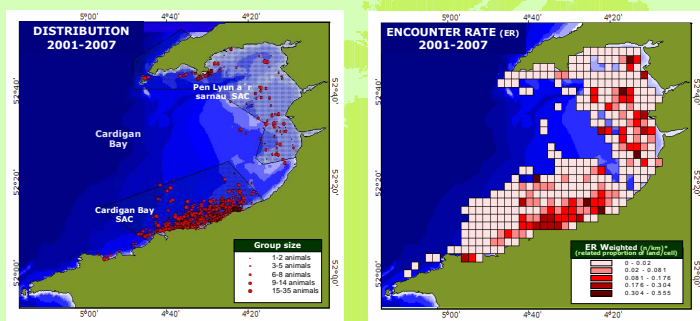
Cardigan Bay has two Special Areas of Conservation (SAC) to protect its population of common bottlenose dolphins (*Tursiops truncatus*): the Cardigan Bay SAC and Pen Llyn a'r Sarnau SAC. Understanding the ecology of this species is essential to ascertain whether the current conservation management plan is appropriate to protect it, or whether further actions are needed to achieve "Favourable Conservation Status" in this area.

MATERIALS AND METHODS

- Data recording:** Line-transect and *ad-libitum* boat surveys were undertaken along the coast of Ceredigion, Pembrokeshire and Gwynedd. A total of 44,691 km were travelled in good sighting conditions and 2,044 bottlenose dolphin sightings were recorded between 2001 and 2007.
- Data processing:** All the data were integrated using the software ArcGIS 9.1. The study area was divided into cells of 2'x2' and the information analysed using vector and raster formats. Effort and sightings in favourable sea and weather conditions were used to calculate the encounter rate per cell (ERW). The Kernel probabilistic technique was applied to calculate dolphins' known range. Spatial interpolations were run to predict surfaces, and the relationship between dolphin presence and environmental variables was evaluated (following Ingram and Rogan, 2002 and Petroselli, 2006).
- Data statistics:** Statistical analyses were carried out using the software SPSS 14.0. Residuals were checked for all parametric tests, and the response variables were transformed where appropriate. Uni and multivariate analyses determined the quality of the data and the presence of any significant differences or relationships between the variables considered. Geostatistical methods were used to evaluate the precision of the predicted surfaces.

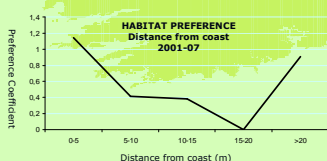
RESULTS

i) distribution and encounter rates:



*Group size and ERW distributed uniformly along 2001-07. However, it was registered a significant decrease in the ERW from 2003 (mean=1,6 group/10km. W=4703, p<0.001, Mann-Whitney U test) and 2005 (mean=0,8 groups/10km, W=13480, p=0.001, Mann-Whitney U test) to 2007 (mean=0.4 groups/10Km).

iii) distance from coast:

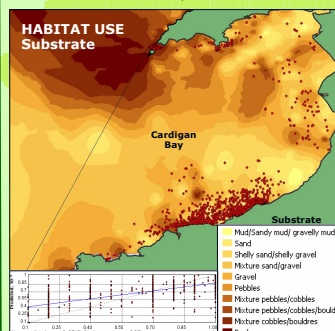


Graph 2: Distance from coast analysis according Ingram and Rogan (2002) methodology.

Distance from coast had a significant effect on encounter rates ($F=24,871$, $df=1$, $p<0.001$).

Dolphins showed a preference for **inshore waters** (0-5 km from coast) along the considered period.

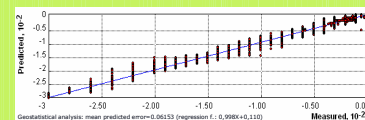
ii) environmental variables:



During the period considered, 2001-07, distribution of dolphins was significantly different from a uniform distribution in respect to environmental variables:

- Substrate:** according to the predicted surface of the study area (see figure), the dolphins showed a preference for a substrate comprising **gravel, mixed or not with sand** (see the significant error graph obtained for the prediction) ($F=8,001$; $df=5$; $p<0.001$).
- Slope:** the mean slope was obtained from the depth predicted surface. Over 95% of Cardigan Bay had a slope of **less than 1%**. 99% of sightings were recorded over this slope range ($F=20,057$, $df=2$, $p<0.001$).
- Depth:** the water depth in the study area ranges from 0 to 75 metres (see the error graph in the prediction). The distribution of dolphins was

highly significant different from a uniform distribution with respect to depth. Waters deep between **5 and 10 meters** appeared as preferred with no differences between years. ($F=14,049$, $df=6$, $p<0.001$)



CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

Environmental variables have a direct influence on bottlenose dolphins distribution within Cardigan Bay. Animals are non-randomly distributed, preferring particular areas in relation to depth, slope, substrate type and distance from the coast.

Recommendations:

- It is recommended to extend the statistical analysis carried out with a generalized additive model in order to support the obtained results.
- Results in relation to the substrate variable should be taken carefully until more in-depth substrate surveys are carried out in Cardigan Bay.

These results have given us a better understanding of the ecology of bottlenose dolphins in Cardigan Bay, providing information that is essential to continue the conservation management plan in the area.

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ACKNOWLEDGEMENTS

- The Mammals Trust UK for supporting me economically.
- Gio, Pia and Peter for supporting me technically. I have learnt a lot from them.
- Gio, Fidi and Lauren for supporting me morally during the project.