

Relationship between the bottlenose dolphin (*Tursiops truncatus*) population and ecological factors in Cardigan Bay, Wales



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Introduction

Cardigan Bay, West Wales, is one of two areas of UK territorial waters where there are semi-resident groups of bottlenose dolphins, the other being eastern Scotland, particularly the Moray Firth. Both populations are afforded protection by the establishment of Special Areas of Conservation (SAC) under the EU Habitats Directive. This study examined the relationship between groups of bottlenose dolphins and their local environment.

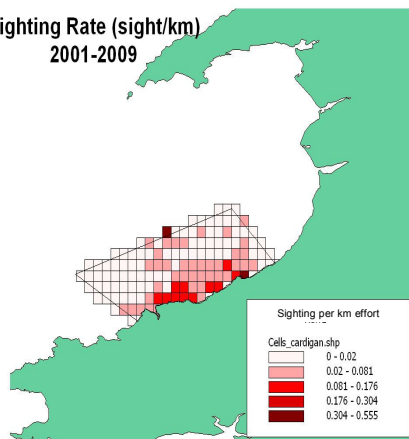
Methods

Data were collected from 2001-09 from line-transect and ad-libitum (photo-ID) vessel surveys which took place within Cardigan Bay SAC. One-two hour long commercial boat trips leaving from New Quay Bay were also taken into consideration. A total of 26,648 km were travelled in good sighting conditions, and 2,448 bottlenose dolphin sightings recorded within Cardigan Bay SAC. Data were incorporated using ArcView 3.2 and ArcGIS 9.3 and dividing the research area into 2'x2' grid cells (Pesante *et al.*, 2008). Statistical analysis was conducted using SPSS 14.

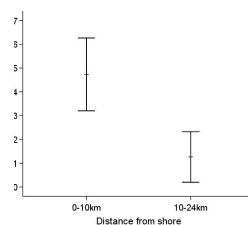
Results

Encounter Rate and Distribution

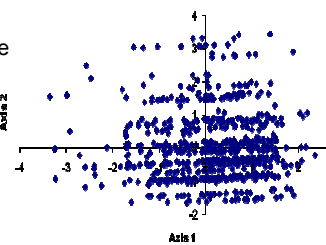
Sighting Rate (sight/km)
2001-2009



Bottlenose dolphin encounter rates, corrected for effort, were significantly greater near-shore (Mann-Whitney U-Test, $U=1090.5$, $P < 0.001$).



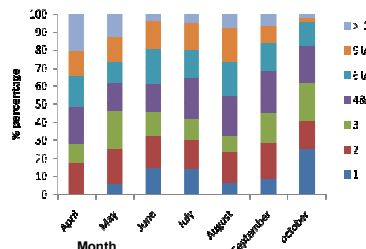
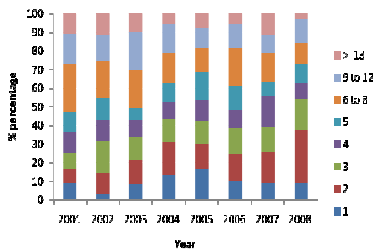
Environmental Variables



Axis 1 correlates distance to coast, depth and distance to estuary. Axis 2 correlates chlorophyll "a" and sea surface temperature (SST).

Factor analysis was carried out showing clustered points along Axis 1, and revealed that the most significant environmental parameters affecting dolphin locations in Cardigan Bay were distance to coast, depth, and distance to estuary.

Group Size



Bottlenose dolphin group size in Cardigan Bay ranged between one and 46 animals with a mean of 5.59 and a median of 4. Largest group sizes were seen in April, May, August and September, coinciding with seasonal concentrations of herring, mackerel and bass in the Bay (Baines *et al.*, 2000).

Encounters are presented as a percentage of the total sightings during that year/month. Groups of two individuals are the most common. Percentage of groups sighted per year with five or less animals shows an increase between 2001 and 2008 (2009 data was incomplete at the time of analysis).

Multiple linear regression show that distance to coast is the environmental parameter that most affects the distribution of group sizes within Cardigan Bay ($P < 0.001$). As distance to coast is correlated with distance to estuary as well as depth, these variables also significantly affect dolphin distribution.

Conclusions and Recommendations

To derive and implement effective conservation strategies, it is imperative to understand how this population relates to its environment. A number of interrelated environmental factors were seen to affect the distributions of groups, suggesting that a multivariate ecosystem approach is required to ensure the health of the local bottlenose dolphin population. Further data have confirmed that bottlenose dolphins are associated with sheltered conditions, taking advantage of the shallow coastal habitats for calving, nursing and feeding. Protection needs to include consideration of the bottlenose dolphins' prey, and to the Cardigan Bay ecosystem in its entirety.

References

- ✓ Pesante, G., Evans, P.G.H., Baines, M.E., and McMath, M. (2008). *Abundance and Life History Parameters of Bottlenose Dolphin in Cardigan Bay: Monitoring 2005-2007*. CCW Marine Monitoring Report No: 61. 81pp.
- ✓ Baines, M.E., Evans, P.G.H. and Shepherd, B. (2000) *Bottlenose dolphins in Cardigan Bay, West Wales*. First Report to EU INTERREG & Countryside Council for Wales. Sea Watch Foundation, Oxford.

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