



Harbour porpoise (*Phocoena phocoena* L.) have declined in the outer southern Moray Firth, NE Scotland - A spatial and temporal view.

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Poster SA2

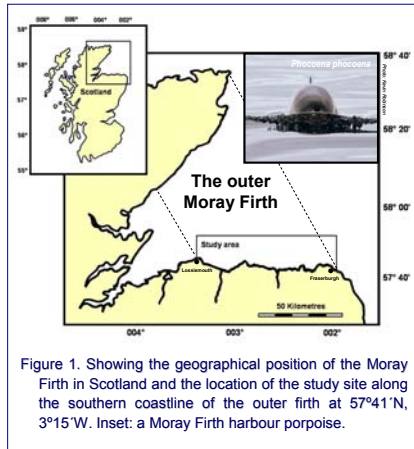


Figure 1. Showing the geographical position of the Moray Firth in Scotland and the location of the study site along the southern coastline of the outer firth at 57°41'N, 3°15'W. Inset: a Moray Firth harbour porpoise.

Introduction

Despite being the most commonly sighted cetacean around mainland Britain, surprisingly little is known about the ecology, life history and distribution of the harbour porpoise (*Phocoena phocoena* L.). Only a handful of studies have been carried out in UK coastal waters (e.g. Northridge *et al.*, 1995; Pierpoint, 2001) with very little work in the North Sea. Along the southern coastline of the outer Moray Firth in NE Scotland (fig. 1), the harbour porpoise can be found in considerable numbers during the summer and autumnal months. Recent studies by the CRRU examining the fine-scale distribution of animals in relation to underlying environmental variables have revealed some rather interesting findings.

Methods

From May to October 2002-2005, systematic boat surveys were conducted in an 880km² study area (shown in fig. 1), between the coastal ports of Fraserburgh and Lossiemouth. The distribution and abundance of *P. phocoena* was analysed from sightings data against GIS comparisons of physiographic variables (including depth, aspect, slope and sediment type, using ArcView v3.8) at contrasting spatial and temporal scales.

Results

>422 sightings of harbour porpoise, comprising 1,138 animals, were recorded during 795 hours of survey effort. Group sizes ranged from 1 to 44 with a mean of 2.90 ± 1.19 .

>Animals were commonly encountered throughout the study area at depths from 6 to 180m, but GIS plots of physiography of the coastline (fig. 2) revealed a strong preference for steep, northerly-facing slopes, sandy-gravel substrates and mean water depths of 36m.

>Distribution was found to be highly variable both within and between survey years (fig. 3); with number of sightings showing a significant increase from May to September ($H=13.33$, $DF=5$, $P=0.021$) accompanied by a corresponding increase in group size.

>Determination of relative abundance disclosed a dramatic reduction in porpoises across the study period, with numbers falling from 0.75 and 0.84 animals per km² in 2002 and 2003, to just 0.21 and 0.26 porpoises per km² in 2004 and 2005 respectively (fig. 3b).

Discussion and Conclusions

Large and small scale variations in environmental determinants result in the non-random distribution of marine communities (Johnston *et al.*, 2005). The distribution and abundance of porpoises in the outer southern Moray Firth is therefore likely related to the profitability of resources in those areas, particularly the presence of target prey. In the eastern North Sea, the sandeel, *Ammodytes marinus*, comprises a significant 58% of the stomach contents of harbour porpoises (Santos *et al.*, 2005), and in the present study the distribution of *P. phocoena* (with respect to the physiography of the study area) was strongly correlated with optimal conditions for sandeels, i.e. a predilection for steep slopes (associated with high productivity) and sandy substrates (typical sandeel habitat type). As such, the reduction in abundance of harbour porpoises observed from 2003 most probably resulted from a decrease in availability of *Ammodytes* prey items in the study area. Possible reasons for this occurrence include the negative impact of increased commercial fishing activities on sandeel populations in this region, or unfavourable climatic changes, such as rising sea temperatures, resulting in habitat change.

The successful management of highly-mobile cetacean populations relies on a thorough understanding of the issues affecting their distribution and habitat selection. This study implies that the harbour porpoise is a critical indicator of ecosystem health and change in this region. Further studies favouring ecosystem-based management approaches for the protection of this small odontocete in UK coastal waters continue to be a priority.

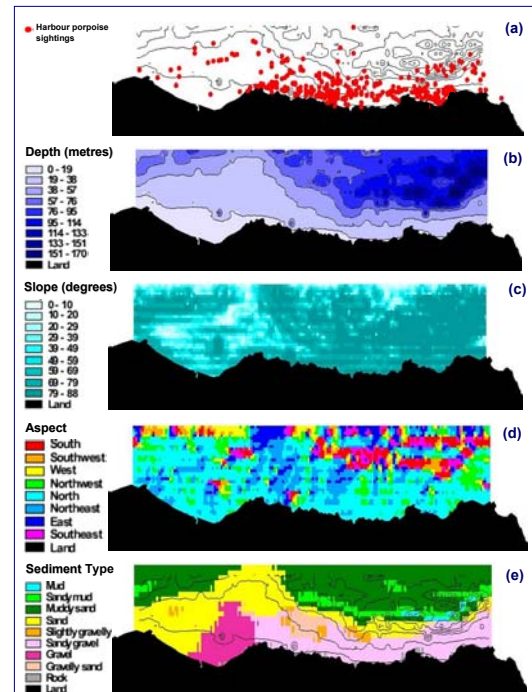


Figure 2. GIS plots of the Moray Firth study area showing (a) the position of harbour porpoises encounters from May to Oct 2002-2005 inclusive; and (b-e) the depth, slope, aspect and sediment type of the field site.

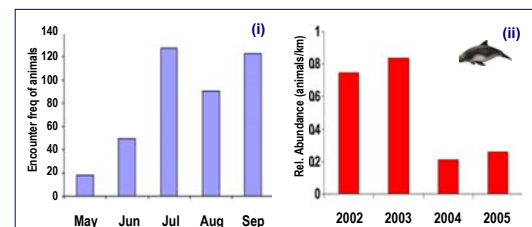


Figure 3. Histograms showing the temporal distribution of harbour porpoises by: (i) survey month; and (ii) survey year (n=422).

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