Using land watch data to determine long-term trends in cetacean abundance

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AIMS OF THE STUDY

1) Determine whether land watches can reveal spatial trends for two cetacean species that reflect information from wider scale offshore surveys

2) Examine seasonal and long-term trends in sighting rates and compare with trends from the wider offshore surveys

3) Identify potential coastal hot spots for harbour porpoise and bottlenose dolphin with a view to recommending sites as Special Areas of Conservation

4) Identify improvements to land watch methodologies to maximise the value of the data collected
Two cetacean species, one predominantly coastal, one more widespread, both protected under EU Habitats Directive

Source: Reid, Evans & Northridge (2003)
Atlas of Cetacean Distribution in Northwest European Waters
LAND WATCH FIELD PROTOCOLS

- Choice of site on the basis of raised elevation, good field of view, and safety
- Watches commenced any time of day & state of tide on the basis of good weather, and NOT on sighting a cetacean
- Generally one or sometimes two primary observers (number recorded)
- Naked eye scans interspersed with optics to verify cues, determine species & group size
- In some situations, instantaneous scan counts at regular intervals (recorded separately)
- Environmental information recorded at start & end of watch, 15-min or 30-min intervals, or if conditions changed
• good overall coverage except SE England, W Scotland & Borders
SUMMARY OF UK LAND WATCH DATA & ANALYSIS

- >145,000 effort records
- c. 84,000 hours of effort
- 50-year time period: 1965-2014
- Number of sites: 732
- c. 20,000 harbour porpoise records
- c. 27,000 bottlenose dolphin records

- Presence, sighting and count rates calculated for each site, for both species
- Results summarised by site and by day (to eliminate within-day autocorrelation)
- GAMs & GAMMs run (the latter to quantify any effect of autocorrelation between consecutive days of observation)
- GAMs with a site x year interaction to reveal interannual changes in distribution
DISTRIBUTION OF EFFORT ACCORDING TO SEA STATE AND TIME OF DAY

Land Watch Effort by Sea State

- Most effort in sea states 1 and 2
- Little effort in sea states >4

Land Watch Effort by Time of Day

- Most effort between 09:00 to 17:00 hrs GMT
- Little effort between sunrise and 06:00 hrs or 18:00 hrs to sunset
DISTRIBUTION OF EFFORT
ACCORDING TO MONTH AND YEAR

Land Watch Effort by Month

- Most effort between May and September
- Little effort between November and February

Land Watch Effort by Year

- Most effort since 2000
- Little effort between 1965 and 1990
Land Watch Sites with different levels of Effort

a) 10-50 hours of effort

b) >50 hours of effort
POPULATION ASSESSMENT UNITS

a) Harbour Porpoise

Three areas in the UK:
• North Sea (NS)
• Celtic & Irish Seas (CIS)
• West Scotland (WS)

b) Bottlenose Dolphin

Five areas in the UK:
• Coastal East Scotland (CES)
• North Sea (NS)
• Coastal Southwest England (CSW)
• Irish Sea (IS)
• Coastal West Scotland & Hebrides (CWSH)
Map of GAM predicted likelihood of occurrence for Bottlenose Dolphin Coastal East Scotland & North Sea Assessment Units
Map of GAM predicted likelihood of occurrence for Harbour Porpoise North Sea Assessment Unit
Map of GAM predicted likelihood of occurrence for Bottlenose Dolphin Irish Sea Assessment Unit

Source: Baines & Evans (2012)
Atlas of Marine Mammals of Wales
Map of GAM predicted likelihood of occurrence for Harbour Porpoise Celtic & Irish Sea Assessment Unit

Bottlenose Dolphin killing a Porpoise

Southern Cardigan Bay, 13 June 2014
DISTRIBUTION OF UK-STRANDED PORPOISES KILLED BY BOTTLENOSE DOLPHINS

ZSL

SCOTLAND

WALES & ENGLAND
BOTTLENOSE DOLPHIN vs HARBOUR PORPOISE DISTRIBUTIONS

- North Scotland
- East Scotland
- Eastern England
- S/SW England
- Wales
- NW England
- West Scotland

Legend:
- Harbour porpoise
- Bottlenose dolphin
SEASONAL TRENDS IN OVERALL PRESENCE OF BOTTLENOSE DOLPHIN & HARBOUR PORPOISE: 1990-2014

a) Bottlenose Dolphin

- Increase between March & May
- Stable high between May & Aug
- Decrease between Aug & Oct

b) Harbour Porpoise

- Decrease between Feb & May
- Increase between May & Aug
LONG-TERM TRENDS IN OVERALL PRESENCE OF BOTTLENOSE DOLPHIN & HARBOUR PORPOISE

a) Bottlenose Dolphin

- Little change between 1995 and 2005
- General increase between 2006 and 2014

b) Harbour Porpoise

- General increase between early 1990s and 2010
- Peaks around 2001-02 and 2008-09
- Lows around 1992 & 2005
REGIONAL LONG-TERM TRENDS IN PRESENCE OF BOTTLENOSE DOLPHIN & HARBOUR PORPOISE

a) Bottlenose Dolphin

b) Harbour Porpoise

East Grampian to Northumberland
N = 56 sites

Northumberland to South Devon
N = 112 sites
July Density Distributions of Harbour Porpoise from SCANS + SCANS II Abundance Surveys

1994 2005

Source: Hammond et al., 2013
COMPARING BOTTLENOSE DOLPHIN ABUNDANCE TRENDS WITH TRENDS FROM THE LAND WATCH MODELLING IN EAST SCOTLAND

a) From Mark-Recapture estimates (Thompson et al., 2012)

b) From Land Watch data (this study)
Preferred UK option – dSACs
(IAMMWG, CSG)

Top 10% Areas of Search

1. North Minch
2. Southern Hebrides
3. North Channel and North East Irish Sea
4. North Anglesey
5. West Wales
6. Bristol Channel
7. Southwest North Sea
8. Moray Firth, Southern trench and Smilers Holes
SUMMARY

• c. 84,000 hours of land watch effort from c. 700 sites around the UK, mainly since 2000

• Overall spatial coverage good but relatively few sites in SE England, the Borders and parts of West Scotland

• Bottlenose dolphins concentrated in two regions: Eastern Scotland and West Wales, mirroring offshore survey information

• Harbour porpoises more widely distributed but concentrations in N & E Scotland, Eastern England, SW & N Wales, and West Scotland. Coastal hotspots also in similar areas to results from offshore surveys

• Coastal distributions of the two species appear to be inversely related

• Overall abundance trends indicate slight increases for both species (since early 1990s for harbour porpoise, and since 2006 for bottlenose dolphin), but with some regional variation

• Land watches have the potential to supplement more costly vessel/aerial surveys to provide early indications of population change for these two species
RECOMMENDATIONS FOR FUTURE WORK

• Improve coverage in Western Scotland, The Borders and Southeast England

• Conduct power analysis to determine optimum watch durations

• Promote more year-round watching at sites distributed evenly around the UK

• Calculate effective search areas for sites at different elevations so as to derive absolute densities

• Continue development of analytical procedures to optimise use of available data
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