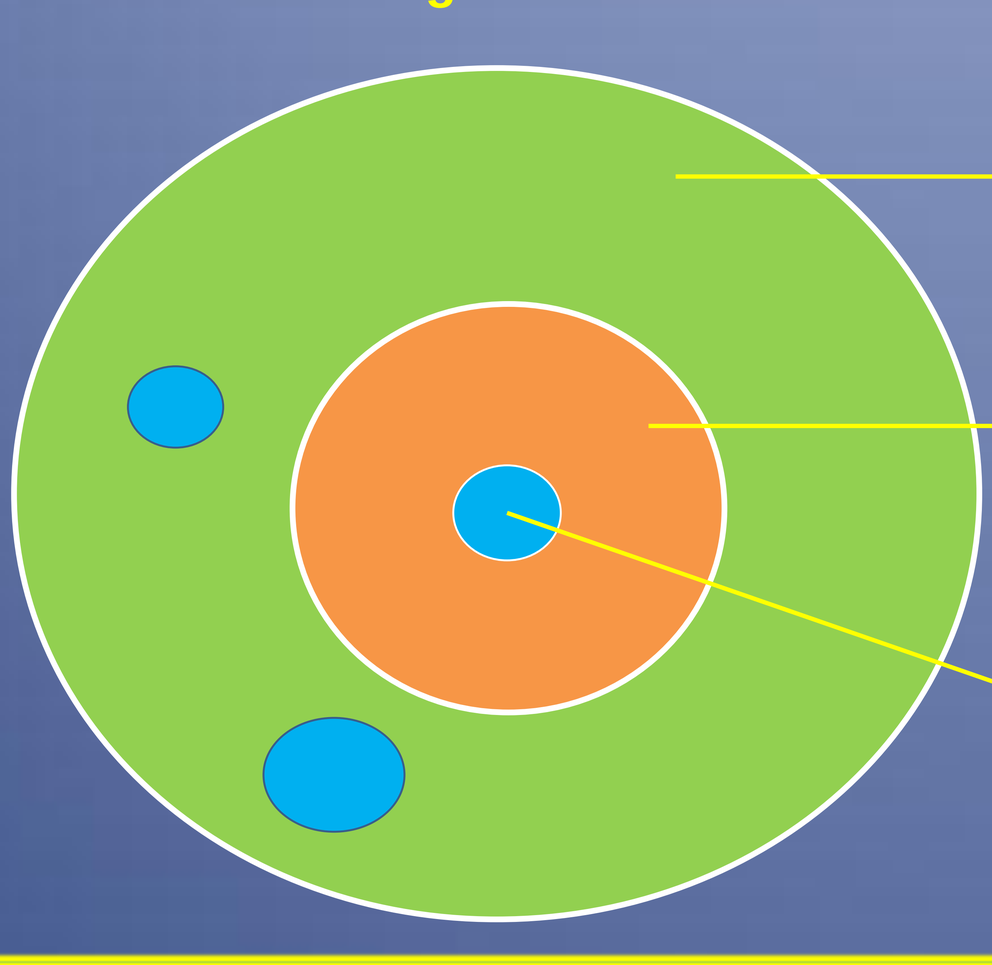
Marine mammal monitoring: making it count

Macleod, K.[1], Wilson, J.[2], Du Fresne, S.[1], Rexstad, E.[3], Faustino, C.[1] and Boyd, I.[4]

1 SMRU Limited, Scottish Oceans Institute, New Technology Centre, North Haugh, St Andrews, Fife, Scotland KY16 9SR. km2@smru.co.uk
2 SOI Limited, Scottish Oceans Institute, New Technology Centre, North Haugh, St Andrews, Fife, Scotland KY16 9SR.
3 RUWPA, The Observatory, Buchanan Gardens, University of St Andrews, St Andrews, Fife, Scotland KY16 9LZ.
4 Sea Mammal Research Unit, Scottish Oceans Institute, East Sands, University St Andrews, St Andrews, Fife , Scotland KY16 8LB.

Introduction Many marine mammal populations are wide-ranging and monitoring them in relatively small areas may not be the best approach to allow Developers to satisfy consenting requirements under the *Habitats Directive* and *Environmental Impact Assessment Regulations*. The design of monitoring programs at the appropriate scale is critical in generating robust estimates of species distribution and abundance to obtain consent. Also, importantly this allows impacts to be detected to assure any licensing conditions are upheld.

Scales of monitoring



Regional: area encompasses site, impact area and wider region to provide contextual information. Less risk of misinterpretation of any observed changes at the site. Could also capture neighboring sites; allow cumulative impacts to be assessed. Robust impact assessment

Impact footprint: site and likely area of impact; could be 10's km for cetaceans in the context of noise disturbance from pile driving. Gradient designs well suited. Larger dataset, more useful and precise metrics for robust impact assessment

Site: site only surveys will assess species presence and local distribution. Potential for small sample sizes which may be insufficient for density estimation or estimates will have very high uncertainty

Recommended approach Increasing the spatial scale of marine mammal surveys to encompass an area beyond the development site. This offers a number of benefits to the Developer:

1) Improved precision of important metrics as a result of larger datasets;

2) Decreased risk of misinterpreting observed changes in local density/abundance through provision of contextual information at a regional scale;

3) More meaningful data for interpreting spatially explicit impacts;

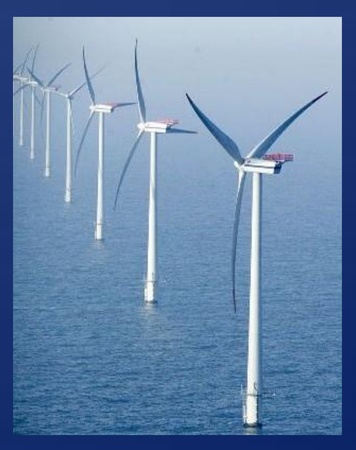
4) Allow more cohesive monitoring of cumulative impacts; and

5) Resource sharing and cost savings.

Collaborative approaches have merit for baseline and impact monitoring. Implementing designs at the largest scale which cover multiple site surveys, would need to be Developer-led coordinated programs. Whilst timescales would need to be considered for individual Developers, such an approach could simplify survey logistics and reduce competition for suitable survey platforms and experienced observers. The financial gain could also be significant (Table 1). There are also differences in the cost of ship versus aerial surveys (ships being twice that of aerial in this example) and savings of up to 25% could be made by collaboratively surveying zones.

Table 1: *Costs of independent and collaborative surveying based on a hypothetical survey design in two Round 3 sites to achieve adequate sample size for abundance estimation (80 harbour porpoise sightings based on the SCANS-II data within these zones). Costs are expressed as an index based on costs per unit of survey effort.*

Method	Norfolk	Dogger Bank	Saving (% reduction compared to independent surveys)
Relative cost index			
Aerial	1	1	25.2
Ship-based	2	3.1	6.7



Acknowledgement*: Based on a report funded by The Crown Estate to SMRU Ltd, "Approaches to marine mammal monitoring at marine renewable energy developments". Final report to The Crown Estate. 110pp. Available at: http://www.thecrownestate.co.uk/marine_mammal_monitoring.pdf*