**Institution:** University of St Andrews

**Unit of Assessment: 5 – Biological Sciences**

**Title of case study: Marine Mammal Conservation: from policy to bycatch reduction**

## 1. Summary of the impact

The research resulted in primary legislation and provided government with the evidence used when implementing the measures set out within legislation. Specifically, this concerned:

- Enabling effective conservation of marine mammals in UK, EU and international waters
- Defining UK and EU policy objectives for marine mammal conservation
- Delivering UK obligations arising from EU legal instruments
- Reducing marine mammal bycatch by over 90% in key fisheries

This work, together with connected public outreach, was awarded the Queen's Anniversary Prize in 2011 for excellence in research supporting better governance of the ocean.

## 2. Underpinning research

The following research was undertaken at the University of St Andrews in the period 1996-2013 by Sea Mammal Research Unit (SMRU) researchers including Professors **Boyd** and **Hammond**; Dr's **Hall**, **Lonergan**, **McConnell**, **Northridge** and others (details in section 3).

This research has focussed on the accurate measurement of marine mammal populations and distributions in UK and EU waters. Marine mammals spend most of their lives under water and are typically highly mobile; they are thus inherently difficult to study. This has necessitated the development of new technologies, data collection and statistical analysis methodologies to ensure that estimates of population abundance and mortality rates are robust. This maximises the ability of end users such as Governments, NGOs and the fishing industry to enact policy and implement changes to achieve conservation aims.

Key research-led advances that were developed by St Andrews scientists have included the development of methods for "sparse data sampling" from boats or aircraft, to give robust estimates of marine mammal population density and distribution **[1]**. The development of new telemetry technology from the late 1990s has allowed individual animals to be tagged and their behaviour and movements logged and recovered via satellite **[2]** and more recently via mobile phone technology.

Some specific examples from St Andrews' research on marine mammals include:

*Harbour seal decline*

Using techniques for the collection and analysis of "sparse data sampling", SMRU scientists have accurately quantified the decline in populations of harbour seals in UK waters in the period 2000-07 **[3]**. This research demonstrated that populations were dropping significantly in diverse locations from Shetland to the Wash, but were stable or increasing in the Hebrides, with consequences for marine policy.

*Rogue seals in the Moray Firth*

In the Moray Firth seals have been shot due to the perception that they impact on salmon stocks and thus the local economy. Research in the period 2005-08 using photo sampling of seals combined with analysis of their diets suggested that only a small number of rogue seals specialising in river feeding were responsible **[4]**. Targeting individual seals in rivers is thus a more effective management option, whilst protecting seal populations.

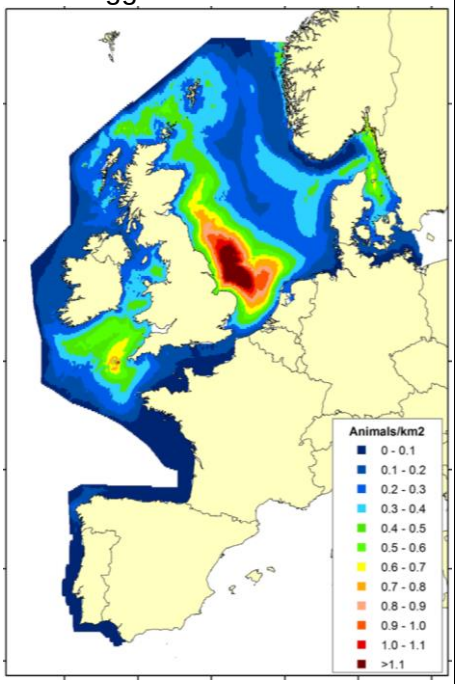


*Figure 1. Predicted density of harbour porpoise in 2005.*

*Quantifying and assessing the importance of marine mammal bycatch*
In 2006, a global analysis by SMRU scientists and collaborators highlighted the bycatch of marine mammals in fisheries as the main threat to their conservation status **[5]**. For policymakers to address this threat and take effective action, robust estimates of marine mammal abundance over relevant (large) spatial scales, coupled with estimates of bycatch mortality, are essential. In the period 2004-2009 SMRU led two major European projects (SCANS-II and CODA) that established the benchmark for collection and analysis of data to estimate the abundance of cetacean species (Figure 1) and to define associated safe limits to bycatch **[6]**.

## 3. References to the research

St Andrews contributors in bold. Employment dates in St Andrews: Borchers 1993-present; Boyd 2001-present; Burt 1996-present; Duck 1996-present; Fedak 1996-present; Gillespie 2005-present; Gordon 2000-present; Graham 2005-2010; Hammond 1996-present; Harwood 1996-present; Harris 1999-present; Hooker 2001-present; Lonergan 2001-present; Lovell 1997-present; Mackey 2005-2010; Macleod 2002-present; McConnell 1996-present; Northridge 1997-present; Paxton 2001-present; Swift 2005-present; Thompson 1996-present.

SMRU in St Andrews has published 546 papers in this area in the period 1996-2013, with over 10,000 citations, of which the following are a representative cross-section with application to this impact. These are all published in international, peer-reviewed journals.

**[1] Hammond, PS**, Berggren, P, Benke, H, **Borchers, DL**, Collet, A, Heide-Jørgensen, MP, Heimlich, S, Hiby, AR, Leopold, MF & Øien, N (2002) Abundance of harbour porpoises and other cetaceans in the North Sea and adjacent waters. Journal of Applied Ecology 39: 361-376. DOI: 10.1046/j.1365-2664.2002.00713.x (130 citations).

**[2] McConnell, B.J., Fedak, M.A., Lovell, P., Hammond, P.S.** (1999) Movements and foraging areas of grey seals in the North Sea. J. Appl. Ecol. 36: 573-590 DOI: 10.1046/j.1365-2664.1999.00429.x. (91 citations).

**[3] Lonergan, M., Duck, C.D., Thompson, D., Mackey, B.L.,** Cunningham, L.**, Boyd, I.L.** (2007) Using sparse survey data to investigate the declining abundance of British harbour seals. J. Zoology 271: 261-269 DOI: 10.1111/j.1469-7998.2007.00311.x (25 citations).

**[4] Graham, I.M., Harris, R.N.,** Matejusova, I. & Middlemas, S.J. (2011) Do rogue' seals exist? Implications for seal conservation in the UK. Animal Conservation 14: 587-598, DOI 10.1111/j.1469-1795.2011.00469.x. (7 citations).

**[5]** Read, A.J., Drinker, P. & **Northridge, S.P.** (2006) Bycatch of marine mammals in US and global fisheries. Conservation Biology. 20(1):163-169. DOI: 10.1111/j.1523-1739.2006.00338.x (106 citations).

**[6] Hammond, P.S.**, **Macleod, K.**, Berggren, P.**, Borchers, D.L.**, **Burt, M.L.**, Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., **Gillespie, D.**, **Gordon, J.**, Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., **Lovell, P.**, Øien, N., **Paxton, C.G.M.**, Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., **Swift, R.**, Tasker, M.L., Teilmann, J., Van Canneyt, O. & Vázquez, J.A. (2013) Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164: 107-122. DOI: 10.1016/j.biocon.2013.04.010.

## 4. Details of the impact

This impact case study relates to important changes in marine policy at the local, national and international levels in the period 2008-13. Policy has been informed and underpinned by the research carried out by SMRU in St Andrews since 1996, which has allowed sea mammal behaviour, abundance and distribution to be understood to a robust degree. The main impact areas are:

- Enabling effective conservation of marine mammals in UK, EU and international waters
- Defining EU policy objectives for marine mammal conservation
- Delivering UK obligations arising from EU legal instruments
- Reducing marine mammal bycatch by over 90% in key fisheries

**Conservation of Seals in UK Waters**

SMRU has a critical role undertaking the research that underpins Government policy in relation to seals. The Scottish Government highlighted in 2012 the

> "*vital work undertaken by SMRU in support of the development of Scottish Government policy on seal management*" **[S1]**.

In the Moray Firth, conflicts arising between fishermen and seals led to widespread shooting of seals. SMRU research showed that specific 'rogue' seals were responsible, suggesting that a targeted response was crucial to the co-management of this seal-fishery conflict. The Scottish Government **[S1]** has recognised that research by SMRU was "*instrumental in the success*" of the **Moray Firth Seal Management Plan** (MFSMP) which was a landmark agreement forged between all interested parties. The result was a "*dramatic reduction* (~60%) *in seal shooting in the area*" **[S1]**. The success of the MFSMP led to the development, successful drafting and progression to legislation of the **Marine (Scotland) Act 2010 [S6],** which relied heavily on the seal research carried out by SMRU. It introduces a new system within Scotland for licensing of the removal and disturbance of seals and for placing protective measures on seals when that is deemed necessary. This licensing scheme has "*greatly improved the ability of Ministers to protect seals*" according to the principal marine advisor to Scottish Natural Heritage **[S2]**. The Scottish Government has acknowledged

> "*The research undertaken by SMRU has informed all these important policy developments*" **[S1]**.

**Defining EU policy objectives for marine mammal conservation**

SMRU's research has been instrumental in the development of policy on marine mammal conservation at an EU level, such as the **Marine Strategy Framework Directive (MSFD)** (2010) **[S7]**, as marine mammal population trajectories and bycatch levels are key targets and indicators for defining 'good environmental status' for the seas around our coastline. The Head of Marine Advice for the UK Joint Nature Conservation Committee stated in 2013:

> "*St Andrews research has been particularly effective and therefore influential on policy and policy implementation. I chaired EU level groups that examined the scientific evidence around these issues that has led to policy changes and in doing so was able to assess and draw upon St Andrews (and other) research. I thus feel in a good position to assess the relative importance of the St Andrews work*." And continued:
> "*The St Andrews work in particular helped to underpin EU Regulation 812/2004 and subsequent amendments. This regulation has undoubtedly helped to reduce small cetacean bycatch within EU waters. It has also allowed the setting of suitable targets to describe Good Environmental Status under the EU's Marine Strategy Framework Directive*." **[S3]**

**Delivering obligations arising from UK and EU legal instruments**

The EU Habitats Directive (1992) and MSFD (2010) place legal obligations on Member States to assess and report on the conservation status of their marine mammal populations. These directives form the basis of national marine environmental planning in the UK. The underpinning research required to meet these obligations is delivered by SMRU. In particular, the large-scale abundance surveys (SCANS, SCANS-II and CODA) developed robust methodology that has become the "gold standard" and has been widely emulated in surveys of the waters of other European countries. The large majority of the information on cetacean distribution and abundance used by the UK to report under Article 17 of the Habitats Directive **[S8]** was generated by these SMRU-led surveys. Other EU countries bordering the Atlantic Ocean have also made extensive use of this information.

A DEFRA spokesperson commented:

> "*Through its coordination of the Europe-wide SCANS and CODA surveys, SMRU has played a notable role in the subsequent determination of the conservation status of cetacean species to be determined for European Atlantic waters, which is a requirement for all relevant EU Member States under Article 17 of the Habitats Directive."* **[S4]**

In 2013, Scottish Natural Heritage said:

> "*The joint objectives of maintaining 'favourable conservation status' and 'good environmental status' in the context of European directives is integral to the conservation objectives set out in the Scottish Marine Plan. The research done by SMRU sustains our ability to uphold those objectives for some of the most highly valued conservation assets.*" **[S2]**

**Reducing bycatch**

Under the EU Habitats Directive, MSFD, Council regulation 812/2004, the UK is required to reduce marine mammal bycatch to levels that are sustainable. To address these obligations, SMRU has implemented an observer scheme on UK fishing boats to quantify bycatch. Furthermore, SMRU has identified and helped to implement specific acoustic deterrent devices (Pingers) that have been effective in reducing cetacean bycatch by over 90% from over 400 animals in 2004/5 to just a handful in 2010-12 in the Pair-trawl bass fishery in the English Channel **[S4]**. SMRU research has also shown that Pingers deployed in the Cornish Offshore Gillnet fishery in the period 2009-12 can reduce porpoise bycatch by over 90%, and since July 2013 the UK Marine Management Organisation is enforcing this use of Pingers in this fishery. A DEFRA spokesperson stated in 2013:

> *"The new approaches developed by SMRU on bycatch limits for small cetaceans have been adopted as the de facto European standard for other Member States to achieve conservation goals."* **[S4]**

The Head of Marine Advice for the UK Joint Nature Conservation Committee states that:

> *"The St Andrews work led by Simon Northridge on bycatch of cetaceans in fisheries is world class. The UK is widely praised as having a state of the art bycatch observer scheme, that has worked well with the fishermen stakeholder community, and has also been influential in developing techniques for minimising that bycatch. When carrying out this sort of practical research, it is absolutely critical to be sensitive to the concerns and problems facing the fishermen, and the St Andrews team has been exemplary in this regard. This work has been published in papers and in reports, but the contributions through the ICES and EU Expert groups should not be overlooked as they are crucial to policy and policy development in the EU."* **[S3]**

Finally, the Head of Science at the International Whaling Commission stated in 2013:

> "*I would just like to state that the work of SMRU on matters related to cetacean conservation and management has been of immeasurable value to our work and to cetacean conservation. The theoretical and practical developments that have arisen from SMRU scientists represent a remarkable degree of innovation from a single group. The impact on the conservation and management has been profound"* **[S5].**

**5. Sources to corroborate the impact**

**[S1]** Letter from the Marine Environment officer of Scottish Government Oct 2012. Corroborates impact of SMRU research on Moray Firth Seal Management Plan, reduction of seal mortality and Marine Scotland act.

**[S2]** Letter from the principal marine advisor to Scottish Natural Heritage, 15-8-13.Corroborates impact of SMRU research on Scottish Government Policy relating to marine mammals.

**[S3]** Letter from the Head of Marine Advice, Joint Nature Conservation Committee. Corroborates impact of SMRU research on reduction in bycatch in fisheries, and on formulation of EU policy.

**[S4]** Letter from the Evidence and Analysis Deputy Director, Marine Directorate, DEFRA Corroborates impact of SMRU research on bycatch and policy.

**[S5]** Letter from the Head of Science, International Whaling Commission. Corroborates profound impact of SMRU research on cetacean conservation.

**[S6]** Marine (Scotland) Act 2010.
http://www.legislation.gov.uk/asp/2010/5/pdfs/asp_20100005_en.pdf

**[S7]** Report from the Commission to the Council and the European Parliament. Contribution of the Marine Strategy Framework Directive (2008/56/EC) to the implementation of existing obligations, commitments and initiatives of the Member States or the EU at EU or international level in the sphere of environmental protection in marine waters. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0662:FIN:EN:PDF

**[S8]** UK report under Article 17 – http://jncc.defra.gov.uk/page-6387