

**Marine Mammal Strandings Co-ordination and  
Investigation (Scotland)**

**Annual Report**

**1 January to 31 December 2009**

**for Marine Scotland, Scottish Government**



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[www.strandings.org](http://www.strandings.org)

## **Executive Summary**

In 2009, 204 marine animals were reported to the Scottish Strandings Investigation Programme, of these 38 cetaceans, 1 basking shark, 1 turtle and 9 seals were necropsied. Total number of strandings was lower than both 2008 and the annual average for the project. The number of cetaceans reported has remained largely constant over time, however seals are still underrepresented. Attempts have been made to increase public awareness of the need to report stranded mammals through the design and distribution of poster/leaflets and a radio feature. Work has begun on the creation of a website and online database.

## **Project overview**

The principal requirement of this project is to provide a co-ordinated approach to surveillance of marine mammal (e.g. cetaceans & seal) strandings and to investigate major causes of death of stranded marine mammals in Scotland.

This work builds on the work undertaken in Scotland by the UK Cetacean Strandings Investigation Programme.

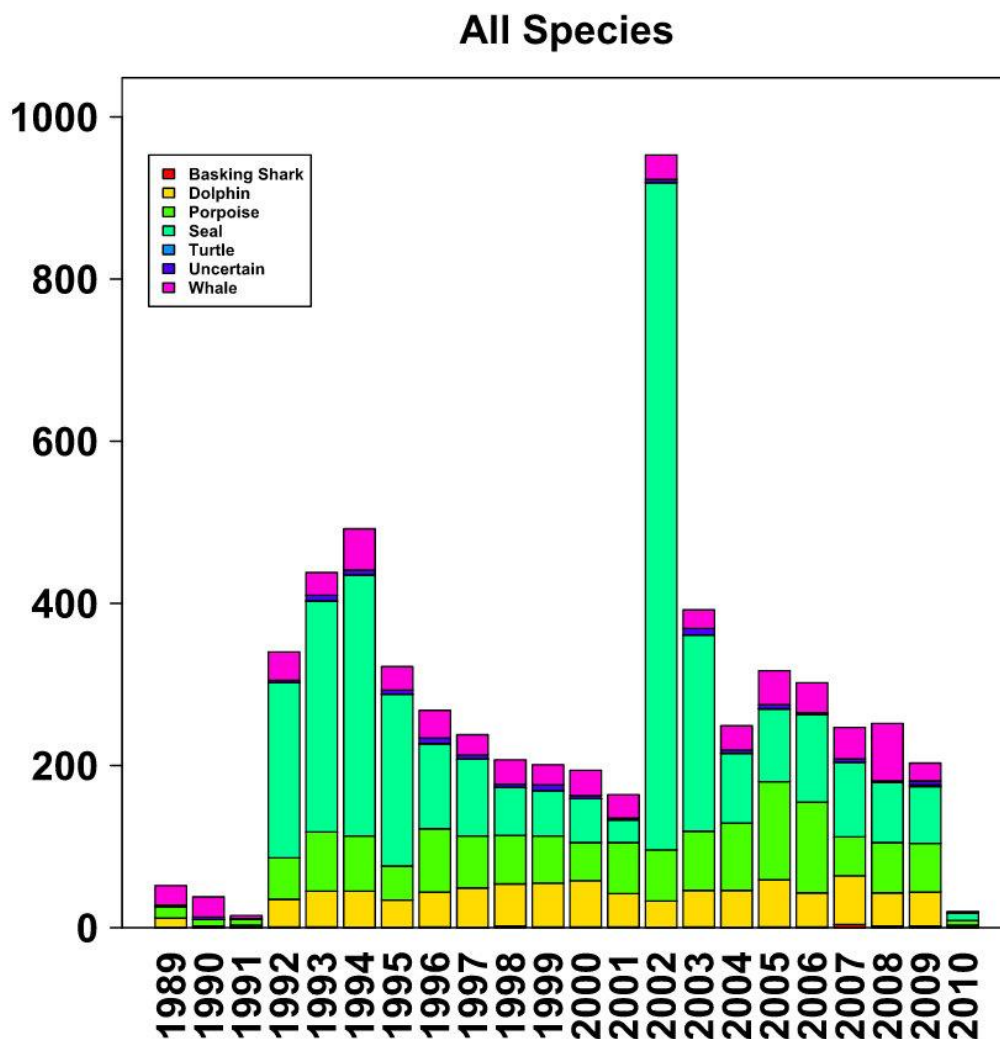
## **Details of work**

- a) To continue to collate, analyse and report data for all cetacean, seal, basking shark and marine turtle strandings across the Scottish coast. This will include determination of cause of death and surveillance of the incidence of disease.
- b) To undertake approximately 70 post mortems on cetaceans and seals stranded around the Scottish coast (approx 20-30 cetaceans and 40-50 seals). A wide geographical spread of post mortems should be achieved unless specified otherwise.
- c) In light of the further decline in common seal numbers in Orkney, considerable effort should be made to post mortem a proportion of seals from Orkney, Shetland (and along the North coast) to determine cause of death and any contributing factors.
- d) To investigate specific cases of strandings/causes of death as requested by the SG
- e) Continue to contribute to existing SG funded projects including the minke whale entanglement and the bottlenose dolphin projects
- f) To provide scientific advice to the Scottish Government as necessary about major causes of death in stranded marine mammals, trends etc.
- g) To develop a database which brings together data on both strandings and post mortems for seals. All cetacean data should be fed into the database for the "UK Cetacean Strandings Investigation Programme".

- h) Where necessary, to contribute to the production of strandings training material and workshop events

## Strandings summary

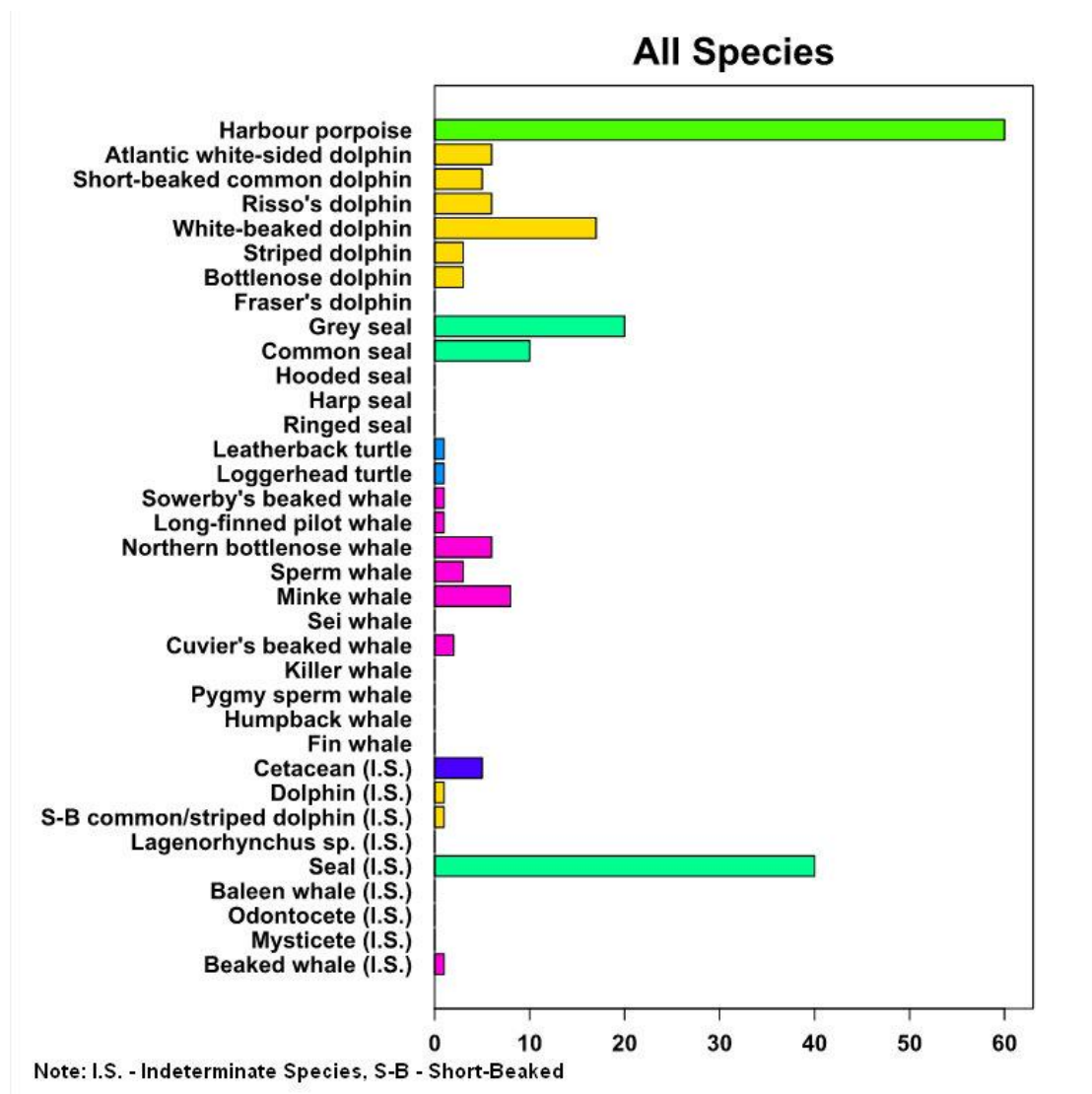
In 2009, 129 cetaceans were reported to the Scottish Strandings Investigation Programme, 26% lower than the number reported in 2008 (n=176) and 17% lower than the annual average since the project started in 1992 of 153 animals.



**Figure 1: Scottish strandings 1989-2009, all species**

Figure 1 shows the total number of Scottish strandings reported since 1989. The number of stranded cetaceans appears more constant than the number of seals. The large peak in 2002 represents the PDV (Phocine distemper virus) outbreak, although it of interest that only 29% (24/83) of seals necropsied that year were found to be infected with PDV (data not shown here) The remainder mortalities were other traumatic, infectious or physiological causes and the large number of submissions is therefore largely attributable to increased public awareness and sampling effort during that year. This highlights the need for coastal communities to be aware that

strandings, and in particular seal strandings, should be reported to this project for investigation.



**Figure 2:** Plot of total number of marine strandings, Scottish waters, 2009

Table 1 and Figure 2 show the total number of marine strandings during 2009. 204 animals reported as stranded; 129 cetaceans, 71 seals, 2 basking sharks and 2 turtles. As in previous years, the most commonly Scottish stranded cetacean species was the harbour porpoise (*Phocoena phocoena*, n=60). Figure 3 shows the proportion of strandings suitable for necropsy. Harbour porpoise were again overrepresented in this, with 24/60 (40%) of strandings undergoing necropsy, compared to 38/129 (30%) of all cetaceans. This is attributable to the longer time window available for meaningful necropsy of small cetaceans, compared to larger species which decompose very rapidly.

**Table 1:** Total number of marine strandings, Scottish waters, 2009

Species	Sent for necropsy?		Grand Total
	No	Yes	
<b>Basking Shark</b>	<b>1</b>	<b>1</b>	<b>2</b>
Basking shark	1	1	2
<b>Cetacean</b>	<b>91</b>	<b>38</b>	<b>129</b>
Atlantic white-sided dolphin	4	2	6
Bottlenose dolphin	3		3
Cetacean (indeterminate species)	5		5
Cuvier's beaked whale	2		2
Dolphin (indeterminate species)	1		1
Harbour porpoise	36	24	60
Long-finned pilot whale	1		1
Minke whale	6	2	8
Northern bottlenose whale	4	3	7
Risso's dolphin	6		6
Short-beaked common dolphin	4	1	5
Short-beaked common dolphin/striped dolphin (indeterminate species)	1		1
Sowerby's beaked whale	1		1
Sperm whale	3		3
Striped dolphin	2	1	3
White-beaked dolphin	12	5	17
<b>Marine Turtle</b>	<b>1</b>	<b>1</b>	<b>2</b>
Leatherback turtle	1		1
Loggerhead turtle		1	1
<b>Seal</b>	<b>62</b>	<b>9</b>	<b>71</b>
Common seal	8	2	10
Grey seal	13	7	20
Seal (indeterminate species)	41		41
<b>Grand Total</b>	<b>155</b>	<b>49</b>	<b>204</b>

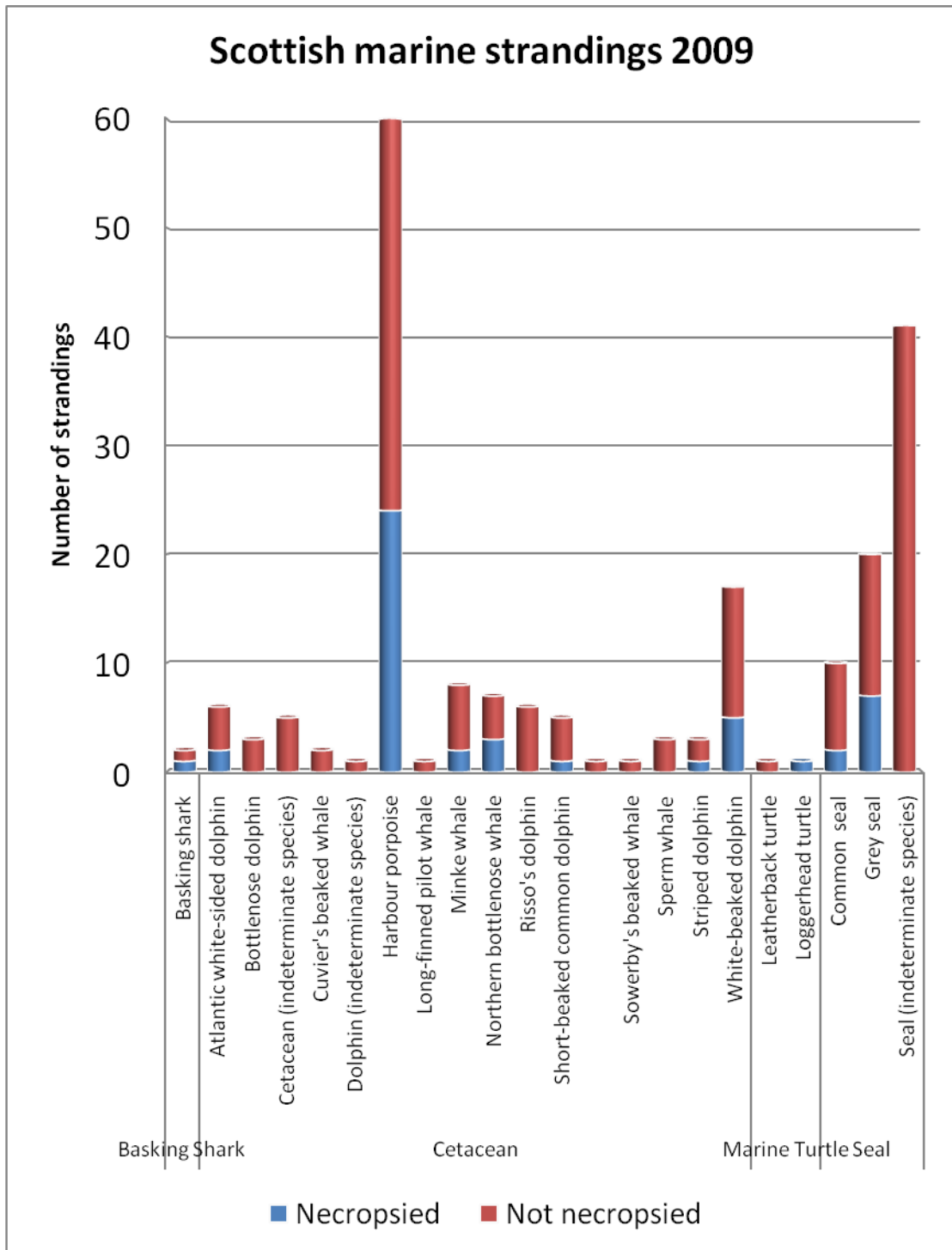


Figure 3: All marine strandings 2009, by % necropsied

### Post mortem summary

In 2009, 38 cetacean strandings (comprising 7 species), two harbour seals and seven grey seals were examined at post mortem using standardised protocols. Results can be seen in Figure 4. All cases of fatal attack from bottlenose dolphins occurred in

north-east Scotland where porpoises have sympatric distributions with resident bottlenose dolphin populations.

Skeletal material from all marine carcasses necropsied in Scotland is donated to National Museums of Scotland for addition to their research collection.

Data and tissue samples generated from the systematic examination of Scottish-stranded cetacean carcasses since 1992 supports a broad range of multidisciplinary scientific research activity. For example, gonadal tissues, teeth (for age determination) and stomach contents fed into additional Defra-funded research into the ecological impacts of cetacean by-catch in UK and European waters.

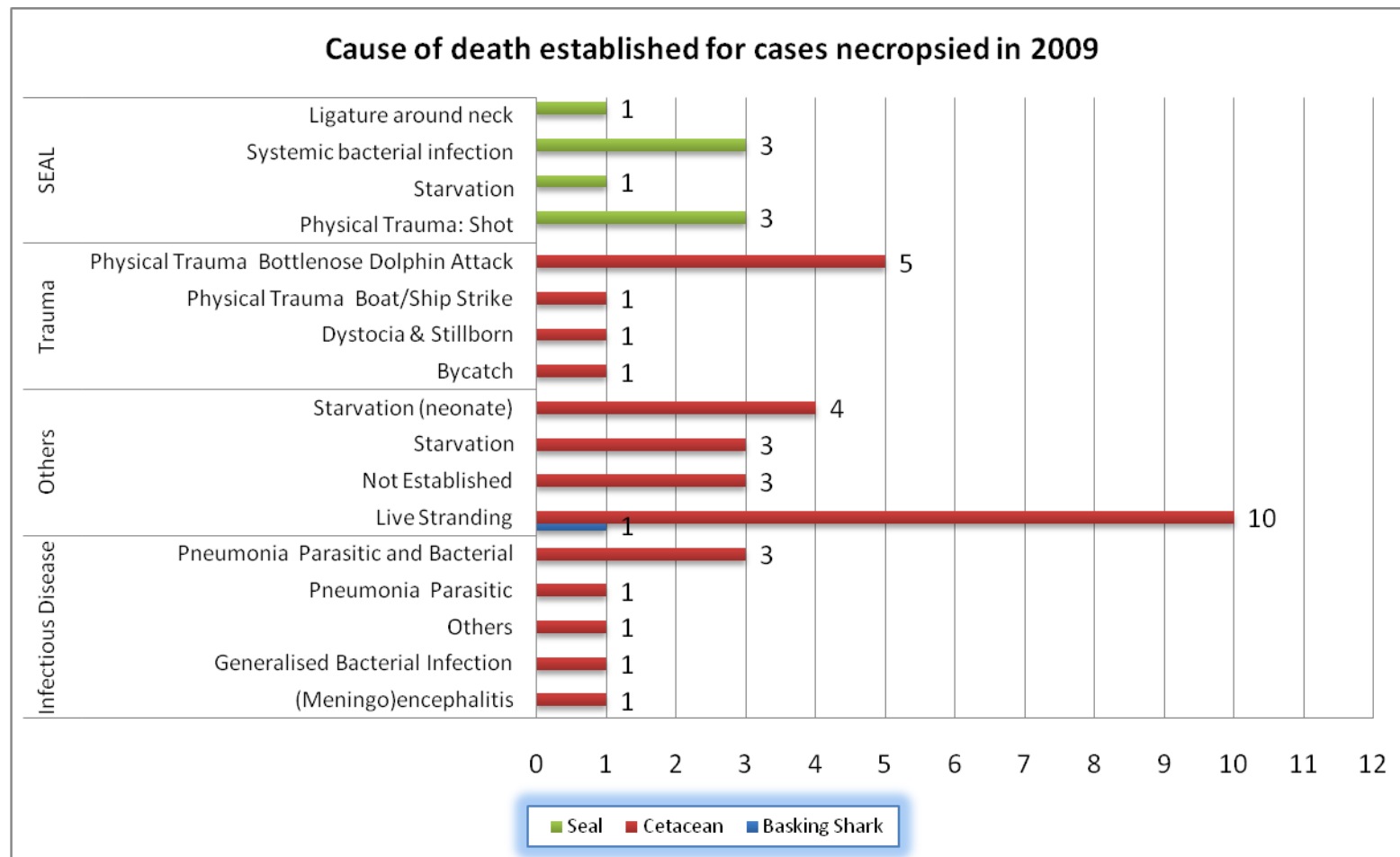


Figure 4: Necropsy findings 2009, all species



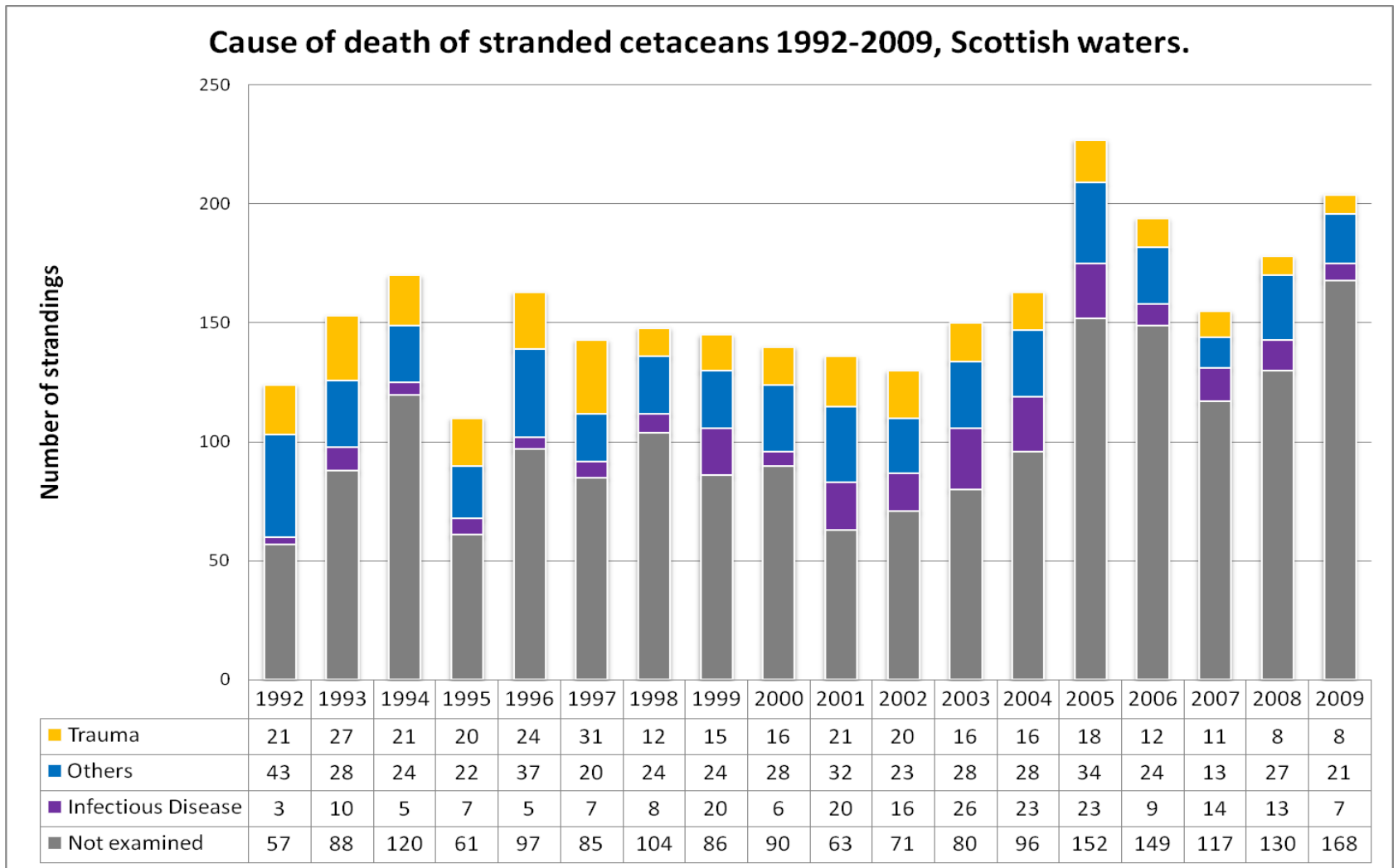
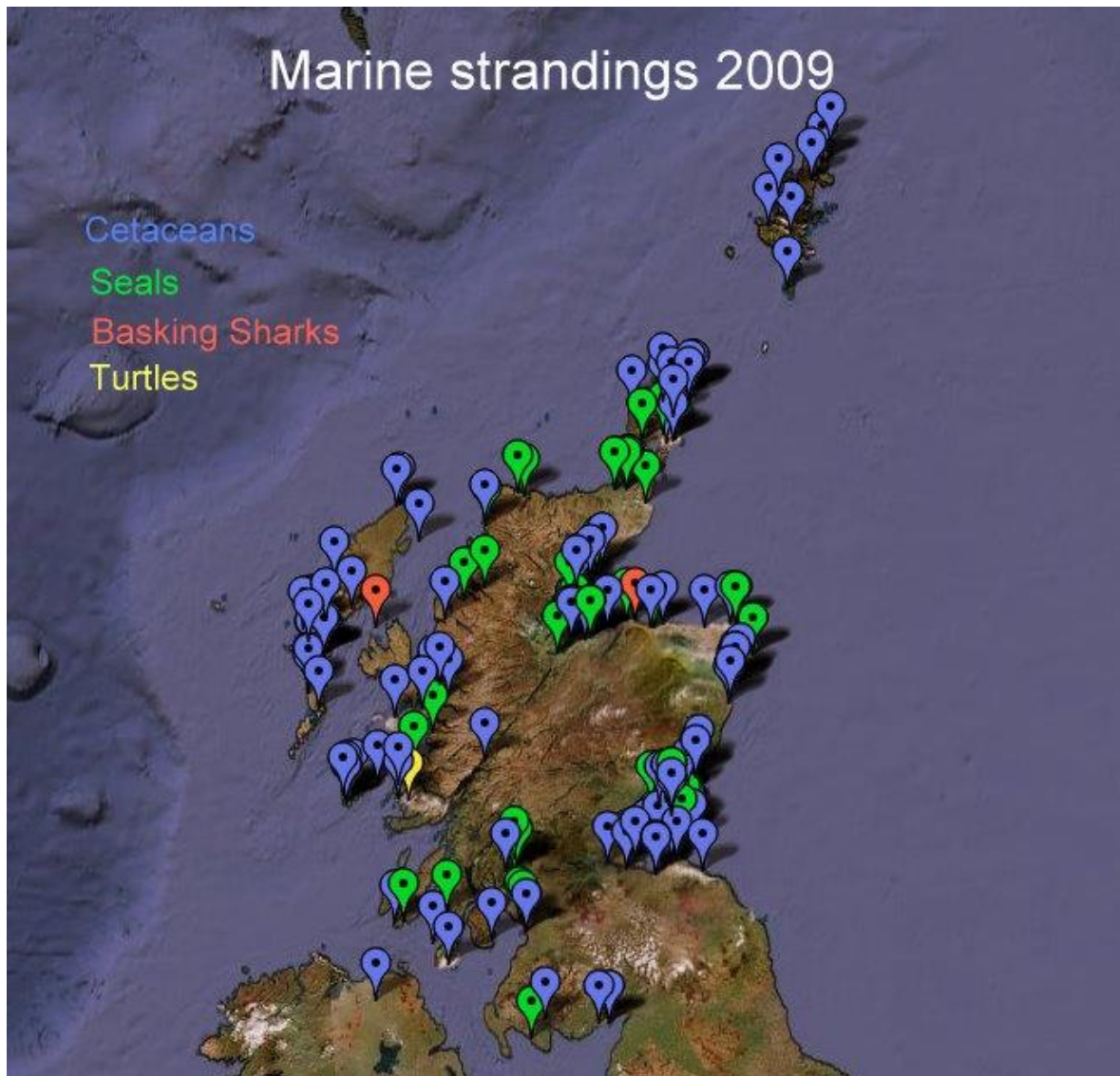


Figure 5: Cause of death of stranded cetaceans 1992-2009



**Figure 6: Map of strandings by species 2009 (mapped using Google software)**

Figure 6 shows the spatial distribution of strandings, arranged by species class. It can be seen there was an equal spread around the Scottish coastline with clusters around Western Uist, the Forth, Tay and Moray firths. The cluster on the Uists is probably representative of a true stranding focus, given the location in the Atlantic Ocean. The foci around the on the east coast firths is likely to also represent the populations resident around these sites, but may be biased due to increased probability of reporting in areas of higher population density.

### **Live cetacean strandings**

Table 1 shows the total number of stranded animals reported in 2009. Some notable live stranding cases are described below

- Five white-beaked dolphins Grimsay, south Uist, Western Isles, 22/07/2009 – Significant effort was made by marine life rescuers to refloat these animals.

Initially successful, however unconfirmed reports that several dead dolphins had been seen on beaches in the area during the following week

- Three Northern Bottlenose whales, Cromarty harbour on 02/08/2009. Reports on one adult (7-8meters) and two juvenile whales. Large whale reported as injured in harbour, haemorrhaging and in or close to Cromarty harbour, however seen to swim back out to the open sea. Two juveniles found to live strand on a stretch of rocky coastline 2 miles upstream on the south side of Nigg bay. An attempt was made to euthanize however insufficient euthanasia solution was available for administration. One animal refloated on the rising tide and swam back to deep water. A dead NBW of similar proportions to this animal was seen floating three days later but could not be recovered. The second animal remained close to shore and was found dead the following morning. This specimen was taken to SAC Inverness where a diagnosis of starvation and subsequent live stranding was made. It is likely these juvenile animals had strayed from their deep oceanic feeding grounds for some time and were in a weakened state. Confused by the topography of the coastline, they live stranded and this generated pathology sufficient to cause the death of both animals.
- One minke whale Southend, Campbeltown, Argyll, Strathclyde 04/08/2009 – refloated. Found dead a week later.
- One Northern bottlenose whale Wigton bay, Dumfries & Galloway 24/08/2009 – A juvenile male stranded and was necropsied on site. In similar circumstances to the cases described earlier in the month at Cromarty, this animal appeared to have socially separated, had insufficient feeding and live stranded.
- One Northern bottlenose whale Loch Eil Fort William, Highland 09/10/2009 – had been seen in the area for over a week. Various techniques were employed to encourage the animal to swim out of the narrow bottleneck of the Loch Eil and into deeper water. Although initially successful, and seen swimming in Loch Linnhe, the animal was seen dead the following day.
- A Northern bottlenose whale was seen far up the Clyde in the centre of Glasgow 21 & 22 09/2009. It was never reported as dead but it is extremely unlikely that it would have been able to navigate its way back to open sea.
- One young basking shark was found at Lossiemouth, Grampian 25/10/2009 – Attempts were made to refloat the shark but it kept coming back to the beach. Necropsy of a similar sized shark last year had revealed brain pathology, however this specimen had been euthanized with a shotgun which effectively destroyed any meaningful neurological examination.
- One sperm whale Balmedie, Aberdeen, Grampian 30/10/2009. The animal live-stranded and died near a popular visitor centre in the Grampian area but was not examined due to logistical issues. Unfortunately it was found on a Friday afternoon and Grampian Council had no contingency plan that could be put into place quickly for its disposal. A decision not to carry out an examination was taken on the basis that if the carcass was opened for

examination the abdominal and thoracic contents would have been spread over this beach by the time a plan for disposal was activated four days later. It is a great source of frustration as we rarely have the opportunity to carry out necropsies on these large whales due to similar logistical issues and the very narrow time window in which a meaningful necropsy is possible due to the rate of decomposition in large whales.

- Two Atlantic white-sided dolphins live stranded and died on Unst, Shetland. 07/11/2009. They were taken to our Inverness laboratory for necropsy and were seen to be thin and showing signs of live stranding. No infectious pathology was identified
- A white-beaked dolphin live-stranded at St Andrews, Fife in 09/11/2009. It died before rescuers arrived and was collected for necropsy. Necropsy showed a profound lung pathology and subsequent weakness presumably led to the live stranding.

## Outputs

### Conferences and meetings:

Bob Reid and Andrew Brownlow were invited speakers at a seminar in Galway, Republic of Ireland in June 2009 that was organised by the Irish Whale and Dolphin Group with a view to having more necropsies carried out on stranded cetaceans.

Andrew Brownlow attended the European Cetacean Society meeting in Istanbul and the biennial meeting of the Society for Marine Mammology in Quebec. At the latter he presented a poster outlining approaches for analysis of stranding data. A copy of the presentation has been included in Appendix 1.

### Marine strandings poster:

A new strandings poster was designed and distribution begun to relevant stakeholders, e.g. marine welfare charities, coastal communities, countryside wardens. A copy of the poster has been included in appendix 2.

### Website and database:

Work was begun designing a web-based database to hold Scottish seal necropsy data and any data not held in the UK CSIP database. Additionally, a website outlining the Scottish Marine Stranding scheme was outlined and work begun on designing a interface for mapping and displaying the Scottish strandings data. This site is due to go live in mid 2010.

<http://www.sac.ac.uk/consulting/services/s-z/veterinary/scottishmarinestranding/>  
[www.strandings.org](http://www.strandings.org)

### Radio and Media

The strandings scheme featured on Radio Scotland's magazine programme 'Out of Doors' in August

### Publications:

**Importance of biological parameters in assessing the status of *Delphinus delphis***- MEPS 388:273-291(2009) - doi:10.3354/meps08129

Sinéad Murphy<sup>1,2,\*</sup>, Arliss Winship<sup>1</sup>, Willy Dabin<sup>3</sup>, Paul D. Jepson<sup>4</sup>, Rob Deaville<sup>4</sup>, Robert J. Reid<sup>5</sup>, Chris Spurrier<sup>6</sup>, Emer Rogan<sup>2</sup>, Alfredo López<sup>7</sup>, Angel F. González<sup>8</sup>, Fiona L. Read<sup>8</sup>, Marjan Addink<sup>9</sup>, Monica Silva<sup>10</sup>, Vincent Ridoux<sup>2</sup>, Jennifer A. Learmonth<sup>11</sup>, Graham J. Pierce<sup>11,12</sup>, Simon P. Northridge<sup>1</sup>

**Dentinal anomalies in teeth of harbour porpoises (*Phocoena phocoena*) from Scottish waters: Are they linked to sexual maturation and environmental events?** Journal of the Marine Biological Association of the United Kingdom 89(5):893-902. 2009

Luque, P. L.; G. J. Pierce; J. A. Learmonth; M. B. Santos; E. Ieno; A. Lopez; R. J. Reid; E. Rogan; A. F. Gonzalez; J. Boon; R. J. Law And C. H. Lockyer.

## Appendices showing selected fields of strandings, by species class.

### Appendix 1a: Scottish marine animal strandings 2009: Cetaceans

Class	Unique ID ref	Species name (common)	Date Found	Region	Sex	Length	Findings
Cetacean	M001/09	Harbour porpoise	05/01/2009	Grampian	M	118	Pneumonia Parasitic And Bacterial
Cetacean	M002/09	Harbour porpoise	07/01/2009	Grampian	M	135	Live Stranding
Cetacean	M003/09	Minke whale	13/01/2009	Highland	U		Not examined: Decomposed
Cetacean	M004/09	Harbour porpoise	24/01/2009	Fife	U	NA	Frozen Pending Post-Mortem Examination
Cetacean	M005/09	Harbour porpoise	26/01/2009	Fife	U	121	Not examined: Decomposed
Cetacean	M007/09	Harbour porpoise	02/02/2009	Fife	U	NA	Frozen Pending Post-Mortem Examination
Cetacean	M008/09	Risso's dolphin	02/02/2009	Shetland	U	310	Not examined: delay in reporting
Cetacean	M010/09b	Short-beaked common dolphin	11/02/2009	Tayside	U	NA	Not examined: refloated
Cetacean	M011/09	Atlantic white-sided dolphin	16/02/2009	Western Isles	U	226	Not examined: refloated
Cetacean	M012/09	Bottlenose dolphin	16/02/2009	Western Isles	U	279	Not examined: delay in reporting
Cetacean	M013/09	White-beaked dolphin	24/02/2009	Lothian	F	188	Live Stranding
Cetacean	M014/09	Harbour porpoise	22/02/2009	Highland	U	NA	Not examined: Decomposed
Cetacean	M015/09	Harbour porpoise	19/02/2009	Western Isles	U	129	Not examined: Predated
Cetacean	M016/09	Harbour porpoise	21/02/2009	Orkney	U	165	Not examined: Decomposed
Cetacean	M017/09	Short-beaked common dolphin	27/02/2009	Tayside	F	127	Starvation/Hypothermia (Neonate)

Class	Unique ID ref	Species name (common)	Date Found	Region	Sex	Length	Findings
Cetacean	M018/09	Harbour porpoise	27/02/2009	Highland	U	140	Not examined: delay in reporting
Cetacean	M020/09	Harbour porpoise	22/02/2009	Shetland	U	120	Not examined: delay in reporting
Cetacean	M021/09	Harbour porpoise	04/03/2009	Grampian	F	155	Pneumonia Parasitic And Bacterial
Cetacean	M023/09a	Harbour porpoise	09/03/2009	Lothian	U	150	Not examined: refloated
Cetacean	M023/09b	Harbour porpoise	09/03/2009	Lothian	U	110	Not examined: refloated
Cetacean	M024/09	Atlantic white-sided dolphin	10/03/2009	Shetland	U	300	Not examined: Decomposed
Cetacean	M025/09	Harbour porpoise	10/03/2009	Lothian	M	115	Pneumonia Parasitic
Cetacean	M026/09	Harbour porpoise	16/03/2009	Grampian	F	125	Physical Trauma Bottlenose Dolphin Attack
Cetacean	M027/09	Harbour porpoise	14/03/2009	Orkney	M	103	Starvation/Hypothermia
Cetacean	M028/09	Harbour porpoise	17/03/2009	Lothian	M	115	Meningoencephalitis Fungal
Cetacean	M029/09	Harbour porpoise	17/03/2009	Fife	U	130	Not examined: Carcase moved by council
Cetacean	M030/09	Harbour porpoise	11/03/2009	Tayside	U	120	Not examined: Decomposed
Cetacean	M031/09	Cuvier's beaked whale	09/03/2009	Western Isles	U	520	Not examined: Decomposed
Cetacean	M032/09	Striped dolphin	16/03/2009	Strathclyde	M	157	Not examined: Decomposed
Cetacean	M033/09	Sperm whale	17/03/2009	Orkney	U	1000	Not examined: Decomposed
Cetacean	M034/09	Harbour porpoise	19/03/2009	Western Isles	U	150	Not examined: Decomposed
Cetacean	M035/09	Harbour porpoise	21/03/2009	Lothian	M	107	Pneumonia Parasitic And Bacterial
Cetacean	M036/09	Harbour porpoise	22/03/2009	Grampian	U	110	Not examined: Decomposed
Cetacean	M037/09	Harbour porpoise	30/03/2009	Grampian	F	104	Starvation/Hypothermia
Cetacean	M039/09	Harbour porpoise	03/04/2009	Strathclyde	U	100	Not examined: carcase moved by tide

Class	Unique ID ref	Species name (common)	Date Found	Region	Sex	Length	Findings
Cetacean	M040/09	Harbour porpoise	29/03/2009	Central	U	121	Not examined: delay in reporting
Cetacean	M041/09	Harbour porpoise	08/04/2009	Fife	U	91	Not examined: carcass moved by tide
Cetacean	M042/09	Risso's dolphin	18/03/2009	Strathclyde	U	304	Not examined: delay in reporting
Cetacean	M044/09	Harbour porpoise	27/04/2009	Tayside	M	111	Physical Trauma Bottlenose Dolphin Attack
Cetacean	M046/09	Harbour porpoise	03/05/2009	Highland	U	100	Not examined: Decomposed
Cetacean	M047/09	White-beaked dolphin	21/04/2009	Orkney	U	200	Not examined: delay in reporting
Cetacean	M050/09	Risso's dolphin	19/05/2009	Strathclyde	U	274	Not examined: Decomposed
Cetacean	M051/09	Minke whale	20/05/2009	Highland	M	720	Physical Trauma Boat Strike
Cetacean	M053/09	Harbour porpoise	31/05/2009	Highland	U	100	Not examined: seen at sea
Cetacean	M054/09	Harbour porpoise	30/04/2009	Fife	F	101	Starvation/Hypothermia
Cetacean	M055/09	Harbour porpoise	04/06/2009	Grampian	M	120	Physical Trauma Bottlenose Dolphin Attack
Cetacean	M056/09	Harbour porpoise	04/06/2009	Grampian	M	120	Physical Trauma Bottlenose Dolphin Attack
Cetacean	M057/09	Harbour porpoise	06/06/2009	Tayside	U	150	Not examined: Decomposed
Cetacean	M058/09	Cetacean (indeterminate species)	08/06/2009	Highland	U	NA	Not examined: Poor data
Cetacean	M059/09	Harbour porpoise	09/06/2009	Highland	U	121	Not examined: Decomposed
Cetacean	M060/09	Harbour porpoise	09/06/2009	Highland	F	154	Coliform Septicaemia Sequential To Physical Trauma Dystocia
Cetacean	M062/09	Harbour porpoise	10/06/2009	Fife	M	82	Starvation/Hypothermia (Neonate)
Cetacean	M063/09	Minke whale	10/06/2009	Strathclyde	F	850	Not examined: Decomposed
Cetacean	M064/09	Harbour porpoise	15/06/2009	Grampian	U	100	Not examined: Decomposed



Class	Unique ID ref	Species name (common)	Date Found	Region	Sex	Length	Findings
Cetacean	M065/09	Harbour porpoise	17/06/2009	Tayside	U	100	Not examined: Decomposed
Cetacean	M066/09	Northern bottlenose whale	18/03/2009	Highland	U	700	Not examined: Decomposed
Cetacean	M070/09	Harbour porpoise	08/06/2009	Strathclyde	U	100	Not examined: Decomposed
Cetacean	M071/09	White-beaked dolphin	13/06/2009	Strathclyde	U	190	Not examined: Decomposed
Cetacean	M073/09	Harbour porpoise	18/06/2009	Fife	M	130	Not examined: Decomposed
Cetacean	M074/09	Minke whale	25/06/2009	Western Isles	F	400	Not Established
Cetacean	M083/09	White-beaked dolphin	14/07/2009	Western Isles	U	170	Not examined: Decomposed
Cetacean	M086/09	Harbour porpoise	15/07/2009	Shetland	M	83	Maternal Separation/Starvation
Cetacean	M089/09A	White-beaked dolphin	22/07/2009	Western Isles	U	NA	Not examined: refloated
Cetacean	M089/09E	White-beaked dolphin	22/07/2009	Western Isles	U	NA	Not examined: refloated
Cetacean	M090/09	Risso's dolphin	26/06/2009	Shetland	F	182	Not examined: Decomposed
Cetacean	M094/09	White-beaked dolphin	27/07/2009	Highland	F	230	Not Established
Cetacean	M095/09	Harbour porpoise	14/07/2009	Highland	U	100	Not Established
Cetacean	M097/09	Risso's dolphin	29/07/2009	Strathclyde	U	243	Not examined: Decomposed
Cetacean	M099/09	Harbour porpoise	30/07/2009	Dumfries and Galloway	M	NA	Maternal Separation/Starvation
Cetacean	M100/09	Harbour porpoise	31/07/2009	Highland	F	160	Physical Trauma Bycatch
Cetacean	M103/09A	Northern bottlenose whale	02/08/2009	Highland	M	615	Live Stranding
Cetacean	M103/09B	Northern bottlenose whale	02/08/2009	Highland	U	600	Not examined: Decomposed
Cetacean	M105/09	Cetacean (indeterminate species)	01/08/2009	Western Isles	U	900	Not examined: Decomposed

Class	Unique ID ref	Species name (common)	Date Found	Region	Sex	Length	Findings
Cetacean	M107/09	Harbour porpoise	05/08/2009	Tayside	U	121	Not examined: carcase not found
Cetacean	M108/09	Harbour porpoise	04/08/2009	Dumfries and Galloway	U	152	Not examined: Decomposed
Cetacean	M109/09	Sperm whale	23/06/2009	Western Isles	U	NA	Not examined: Decomposed
Cetacean	M112/09	Bottlenose dolphin	08/08/2009	Grampian	U	203	Not examined: Decomposed
Cetacean	M116/09	Harbour porpoise	13/08/2009	Fife	U	150	Not examined: access problems
Cetacean	M118/09	Minke whale	13/08/2009	At sea	M	480	Not examined: Decomposed
Cetacean	M119/09	Atlantic white-sided dolphin	27/07/2009	Shetland	U	NA	Not examined: delay in reporting
Cetacean	M120/09	Minke whale	17/08/2009	Orkney	U	609	Not examined: Decomposed
Cetacean	M121/09	Risso's dolphin	10/08/2009	Western Isles	U	310	Not examined: Decomposed
Cetacean	M122/09	Sowerby's beaked whale	23/08/2009	Western Isles	U	420	Not examined: Decomposed
Cetacean	M124/09	Harbour porpoise	23/07/2009	Strathclyde	U	NA	Not examined: Poor data
Cetacean	M125/09	Harbour porpoise	13/08/2009	Western Isles	U	120	Not examined: Decomposed
Cetacean	M126/09	Harbour porpoise	13/08/2009	Western Isles	U	130	Not examined: Decomposed
Cetacean	M127/09	Northern bottlenose whale	24/08/2009	Dumfries and Galloway	M	599	Live Stranding
Cetacean	M130/09	Minke whale	09/09/2009	Western Isles	U	550	Not examined: removed by tide
Cetacean	M135/09	Harbour porpoise	14/09/2009	Dumfries and Galloway	U	150	Not examined: Decomposed
Cetacean	M137/09	Harbour porpoise	18/09/2009	Grampian	M	134	Not Established
Cetacean	M140/09	Northern bottlenose whale	22/09/2009	Strathclyde	M	609	Not examined: Decomposed

Class	Unique ID ref	Species name (common)	Date Found	Region	Sex	Length	Findings
Cetacean	M145/09	Northern bottlenose whale	08/10/2009	Highland	M	584	Live Stranding
Cetacean	M148/09	Bottlenose dolphin	07/10/2009	Lothian	U	150	Not examined: Decomposed
Cetacean	M149/09	Atlantic white-sided dolphin	09/10/2009	Orkney	M	245	Not examined: delay in reporting
Cetacean	M150/09	Harbour porpoise	12/10/2009	Highland	U	NA	Not examined: Poor data
Cetacean	M151/09	Harbour porpoise	19/10/2009	Grampian	M	124	Physical Trauma Bottlenose Dolphin Attack
Cetacean	M156/09	White-beaked dolphin	16/10/2009	Orkney	M	285	Not examined: Decomposed
Cetacean	M160/09	Sperm whale	30/10/2009	Grampian	M	1300	Not examined: disposal issues
Cetacean	M162/09a	Atlantic white-sided dolphin	03/11/2009	Shetland	M	229	Live Stranding
Cetacean	M162/09b	Atlantic white-sided dolphin	03/11/2009	Shetland	M	231	Live Stranding
Cetacean	M167/09	White-beaked dolphin	07/11/2009	Fife	F	249	Live Stranding
Cetacean	M172/09A	White-beaked dolphin	15/11/2009	Orkney	U	NA	Not examined: removed by tide
Cetacean	M173/09	White-beaked dolphin	26/11/2009	Highland	M	209	Live Stranding
Cetacean	M176/09	Harbour porpoise	27/11/2009	Fife	U	NA	Frozen Pending Post-Mortem Examination
Cetacean	M178/09	Harbour porpoise	01/12/2009	Western Isles	U	120	Not examined: delay in reporting
Cetacean	M179/09	Long-finned pilot whale	02/12/2009	Western Isles	U	500	Not examined: Decomposed
Cetacean	M180/09	Dolphin (indeterminate species)	02/12/2009	Strathclyde	U	200	Not examined: Decomposed
Cetacean	M181/09	Striped dolphin	07/12/2009	Strathclyde	U	208	Not examined: Decomposed
Cetacean	M183/09	Short-beaked common dolphin	08/12/2009	Orkney	U	220	Not examined: access problems
Cetacean	M187/09	Harbour porpoise	16/12/2009	Strathclyde	F	165	Possible Coliform Endometritis (Pending

Class	Unique ID ref	Species name (common)	Date Found	Region	Sex	Length	Findings
							Histopathology)
Cetacean	M188/09	White-beaked dolphin	20/12/2009	Western Isles	U	213	Not examined: delay in reporting
Cetacean	M189/09	Striped dolphin	20/12/2009	Highland	M	188	Generalised Bacterial Infection (Photobacterium Damselae) (Pending Histopathology)
Cetacean	M190/09	Cuvier's beaked whale	17/12/2009	Strathclyde	U	610	Not examined: Decomposed
Cetacean	M191/09	Northern bottlenose whale	08/12/2009	Strathclyde	F	NA	Not examined: skeleton only
Cetacean	M192/09	White-beaked dolphin	31/12/2009	Highland	F	254	Live Stranding
Cetacean	M193/09	Harbour porpoise	31/12/2009	Highland	U	110	Not examined: Decomposed
Cetacean	M194/09	Short-beaked common dolphin	25/11/2009	Orkney	U	182	Not examined: delay in reporting
Cetacean	M195/09	Short-beaked common dolphin/striped dolphin (indeterminate species)	30/12/2009	Orkney	U	220	Not examined: Decomposed
Cetacean		Harbour porpoise	03/07/2009	Highland	U	121	Not examined: Decomposed
Cetacean		Harbour porpoise	19/07/2009	Grampian	U	80	Not examined: carcass unrecoverable
Cetacean		Minke whale	01/08/2009	Strathclyde	U	500	Not examined: carcass unrecoverable
Cetacean		Short-beaked common dolphin	11/02/2009	Tayside	U	NA	Not examined: carcass unrecoverable
Cetacean		White-beaked dolphin	22/07/2009	Western Isles	U	NA	Not examined: carcass unrecoverable
Cetacean		White-beaked dolphin	22/07/2009	Western Isles	U	NA	Not examined: carcass unrecoverable
Cetacean		White-beaked dolphin	22/07/2009	Western Isles	U	NA	Not examined: carcass unrecoverable
Cetacean		White-beaked dolphin	15/11/2009	Orkney	U	NA	Not examined: carcass unrecoverable

### Appendix 1b: Scottish marine animal strandings 2009: Turtles

Class	Unique ID ref	Species (common)	Date Found	Region	Sex	Length	Findings
Marine Turtle	M123/09	Leatherback turtle	21/08/2009	Strathclyde	U	200	Not examined: Decomposed
Marine Turtle	M152/09	Loggerhead turtle	21/10/2009	Strathclyde			Not examined: Carcass lost

### Appendix 1c: Scottish marine animal strandings 2009: Basking sharks

Class	Unique ID ref	Species (common)	Date Found	Region	Sex	Length	Findings
Basking Shark	M114/09	Basking shark	02/07/2009	At sea	U	900	Not examined: at sea
Basking Shark	M154/09	Basking shark	25/10/2009	Grampian	M	373	Live Stranding

## Appendix 1d: Scottish marine animal strandings 2009: Seals

Class	Unique ID ref	Species (common)	Date Found	Region	Sex	Length	Findings
Seal	M006/09	Grey seal	01/02/2009	Tayside	U	210	Physical trauma, gunshot
Seal	M009/09	Grey seal	06/02/2009	Highland	U	75	Not examined: headless
Seal	M011/09	Common seal	14/02/2009	Dumfries and Galloway	U		Not examined: Decomposed
Seal	M019/09	Seal (indeterminate species)	01/03/2009	Grampian	U		Not examined: Decomposed
Seal	M038/09	Seal (indeterminate species)	30/03/2009	Fife	U	152	Not examined: Poor data
Seal	M043/09	Common seal	16/04/2009	Highland	F	87	Starvation/hypothermia
Seal	M045/09	Seal (indeterminate species)	30/04/2009	Fife	U		Not examined: Poor data
Seal	M061/09	Seal (indeterminate species)	09/06/2009	Fife	U		Not examined: Poor data
Seal	M067/09	Common seal	19/06/2009	Highland	U	150	Not examined: Decomposed
Seal	M068/09	Seal (indeterminate species)	22/06/2009	Strathclyde	U		Not examined: Poor data
Seal	M069/09	Common seal	22/06/2009	Highland	U	90	Not examined: Decomposed
Seal	M072/09	Seal (indeterminate species)	24/06/2009	Fife			Not examined: Decomposed

Class	Unique ID ref	Species (common)	Date Found	Region	Sex	Length	Findings
Seal	M075/09	Seal (indeterminate species)	02/07/2009	Highland	U		Not examined: Poor data
Seal	M078/09b	Seal (indeterminate species)	07/07/2009	Tayside			Not examined: Poor data
Seal	M079/09	Grey seal	09/07/2009	Highland	U	120	Not examined: Decomposed
Seal	M081/09	Common seal	09/07/2009	Highland	U	180	Not examined: Decomposed
Seal	M082/09	Grey seal	13/07/2009	Tayside	F	171	Physical trauma: gunshot
Seal	M085/09	Seal (indeterminate species)	16/07/2009	Strathclyde	U	100	Not examined: Decomposed
Seal	M092/09	Seal (indeterminate species)	11/07/2009	Highland	U	152	Not examined: Decomposed
Seal	M096/09	Seal (indeterminate species)	29/07/2009	Fife	U		Not examined: Decomposed
Seal	M098/09	Seal (indeterminate species)	30/07/2009	Fife	U	120	Not examined: Poor data
Seal	M102/09	Seal (indeterminate species)	01/08/2009	Tayside	U		Not examined: Poor data
Seal	M110/09	Seal (indeterminate species)	07/08/2009	Tayside	U	121	Not examined: Decomposed
Seal	M111/09	Grey seal	09/08/2009	Strathclyde	F	185	Systemic bacterial infection
Seal	M113/09	Seal (indeterminate species)	11/08/2009	Tayside	U		Not examined: Decomposed
Seal	M117/09	Common seal	13/08/2009	Fife	M	89	Not examined: Decomposed
Seal	M128/09	Seal (indeterminate)	27/08/2009	Strathclyde	U		Not examined: Poor data

Class	Unique ID ref	Species (common)	Date Found	Region	Sex	Length	Findings
		species)					
Seal	M131/09	Grey seal	09/09/2009	Dumfries and Galloway	U	145	Ligature around neck
Seal	M132/09	Common seal	10/09/2009	Highland	U		Not examined: Decomposed
Seal	M133/09	Grey seal	10/09/2009	Highland	U		Not examined: Decomposed
Seal	M134/09	Seal (indeterminate species)	10/09/2009	Central	U	182	Not examined: Decomposed
Seal	M136/09	Seal (indeterminate species)	14/09/2009	Fife	U		Not examined: Decomposed
Seal	M138/09	Seal (indeterminate species)	21/09/2009	Highland	U	200	Not examined: Poor data
Seal	M141/09	Grey seal	23/09/2009	Tayside	U		Not examined: Decomposed
Seal	M142/09	Seal (indeterminate species)	23/09/2009	Strathclyde	U		Not examined: Poor data
Seal	M143/09A	Seal (indeterminate species)	27/09/2009	Orkney	U		Not examined: Poor data
Seal	M143/09B	Seal (indeterminate species)	27/09/2009	Orkney	U		Not examined: Poor data
Seal	M144/09	Seal (indeterminate species)	28/09/2009	Strathclyde	U		Not examined: Decomposed
Seal	M146/09	Grey seal	06/10/2009	Fife	F	194	Systemic bacterial infection. Euthanized by BDMLR
Seal	M147/09	Seal (indeterminate species)	06/10/2009	Highland	U	130	Not examined: Poor data



Class	Unique ID ref	Species (common)	Date Found	Region	Sex	Length	Findings
Seal	M153/09	Grey seal	23/10/2009	Grampian	F	186	Systemic bacterial infection
Seal	M155/09	Seal (indeterminate species)	25/10/2009	Fife	U		Not examined: Poor data
Seal	M157/09	Seal (indeterminate species)	26/10/2009	Tayside	U		Not examined: Decomposed
Seal	M158/08	Seal (indeterminate species)	28/10/2009	Tayside	U	167	Not examined: Poor data
Seal	M159/09	Seal (indeterminate species)	27/10/2009	Fife	U	152	Not examined: Poor data
Seal	M161/09	Grey seal	30/11/2009	Grampian	U	200	Not examined: delay in reporting
Seal	M163/09	Grey seal	02/11/2009	Strathclyde	F	157	Not examined: Decomposed
Seal	M164/09	Seal (indeterminate species)	04/11/2009	Grampian	U		Not examined: Poor data
Seal	M165/09	Common seal	05/11/2009	Highland	M	110	Physical trauma: gunshot
Seal	M168/09	Seal (indeterminate species)	06/11/2009	Grampian	U		Not examined: Poor data
Seal	M169/09	Grey seal	11/11/2009	Highland	U	210	Not examined: Decomposed
Seal	M170/09	Grey seal	14/11/2009	Fife	U	98	Sampled by SMRU
Seal	M171/09	Grey seal	09/11/2009	Highland	M	97	Systemic bacterial infection
Seal	M174/09	Grey seal	30/11/2009	Lothian	U	120	Not examined: Decomposed
Seal	M175/09	Grey seal	01/12/2009	Highland	F	106	Systemic bacterial infection
Seal	M177/09	Seal (indeterminate species)	02/12/2009	Strathclyde	U		Not examined: Poor data

Class	Unique ID ref	Species (common)	Date Found	Region	Sex	Length	Findings
Seal	M182/09	Grey seal	08/12/2009	Orkney	U	150	Not examined: access problems
Seal	M184/09	Seal (indeterminate species)	10/12/2009	Strathclyde	U		Not examined: Poor data
Seal	M185/09	Grey seal	05/12/2009	Fife	U	180	Not examined: poor data
Seal	M186/09	Seal (indeterminate species)	08/12/2009	Fife	U		Not examined: Poor data
Seal	M78/09a	Seal (indeterminate species)	07/07/2009	Tayside	U		Not examined: Decomposed
Seal		Common seal	03/07/2009	Highland	U	100	
Seal		Common seal	23/07/2009	Highland	U	152	Not examined: Decomposed
Seal		Grey seal	27/07/2009	Highland			Not examined: Decomposed
Seal		Seal (indeterminate species)	02/07/2009	Highland			Not examined: Poor data
Seal		Seal (indeterminate species)	02/07/2009	Highland			Not examined: Poor data
Seal		Seal (indeterminate species)	02/07/2009	Highland			Not examined: Poor data
Seal		Seal (indeterminate species)	08/07/2009	Highland	U	152	Not examined: Poor data
Seal		Seal (indeterminate species)	18/07/2009	Grampian			Not examined: Poor data
Seal		Seal (indeterminate species)	30/07/2009	Fife	U	120	Not examined: Poor data



# Appendix 2: Poster presented at the SMM conference, Quebec City, October 2009.

## Analysis of UK cetacean strandings data 1989-2008: Bayesian inference methods for disease prevalence estimations



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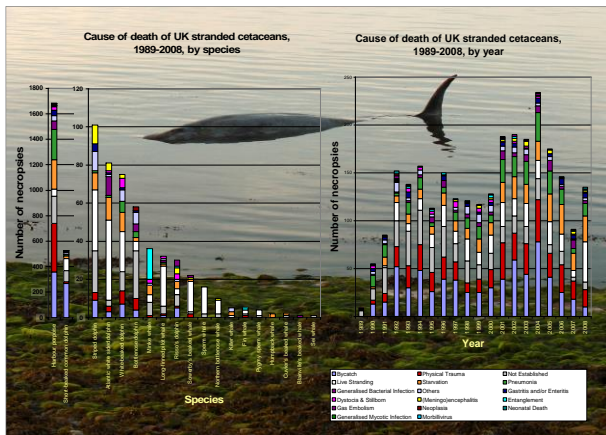
<sup>c</sup>Natural History Museum, Cromwell Road, London, SW7 5BD, UK. <sup>d</sup> Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, UK.

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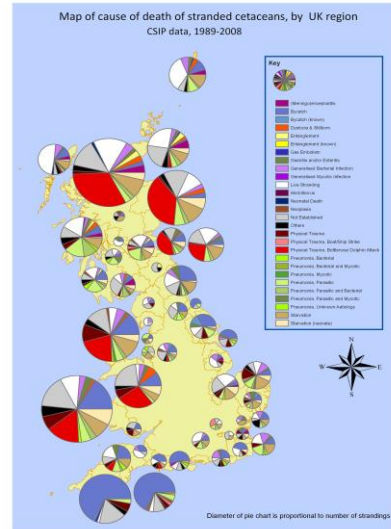
### Introduction

The UK Cetacean Strandings Investigation Programme (CSIP) has been running since 1990. It coordinates the investigation of all cetaceans, marine turtles and basking sharks found stranded around the UK coastline. The scheme aims to assess the demographics of stranded marine mammals, establish potential causes of death, identify and determine prevalence of disease and contaminants in marine mammals and improve knowledge of life history parameters. This has generated a potentially rich dataset for analysis. In common with many free-ranging wildlife studies however, epidemiological analysis has to contend with factors such as potential reporting bias, small sample size and temporal variability.

Between 1998 and 2008 the CSIP received reports of 9293 cetacean strandings. Of these, 2692 animals were necropsied to establish a cause of death. Excluding by-caught and live-stranded animals, the most common causes of mortality established were starvation, infectious diseases (mainly pneumonias due to combinations of parasitic, bacterial and/or mycotic infections) and physical trauma.



The above graphs show the cause of death established from post mortem examination. The table to the right shows the number of strandings reported and necropsied, arranged by species. Analysis using a frequentist approach becomes difficult when sample sizes are small, test prevalences are low or diagnostic tests have imperfect sensitivity and specificity. We are exploring a Bayesian statistical approach, whereby disease prevalence estimations elicited from previous research, expert opinion, or different species in the same ecosystem, can be used to inform our prior expectations of disease prevalence in those cases where there is scant data.



Species	Total necropsied	Total not necropsied	Grand Total	Species % of all strandings
Harbour porpoise	1683	2877	4560	49.1%
Short-beaked common dolphin	528	1046	1574	16.9%
Long-finned pilot whale	32	285	317	3.4%
Minke whale	36	217	253	2.7%
White-beaked dolphin	75	135	210	2.3%
Atlantic white sided dolphin	81	127	208	2.2%
Striped dolphin	101	80	181	1.9%
Risso's dolphin	30	125	155	1.7%
Bottlenose dolphin	58	76	134	1.4%
Sperm whale	16	112	128	1.4%
Sowerby's beaked whale	22	22	44	0.5%
Cuvier's beaked whale	2	34	36	0.4%
Northern bottlenose whale	10	19	29	0.3%
Fin whale	5	22	27	0.3%
Killer whale	5	17	22	0.2%
Humpback whale	2	10	12	0.1%
Pygmy sperm whale	4	4	8	0.1%
Sei whale	1	2	3	0.0%
Blainville's beaked whale	1	0	1	0.0%
Other/Species not identified	0	1391	1392	15.0%
<b>Grand Total</b>	<b>2692</b>	<b>6601</b>	<b>9293</b>	<b>100.0%</b>
Percentage	29%	71%		

### Example

Forty-two necropsies were performed on bottlenose dolphins (BND, *Tursiops truncatus*). Of these 5 were diagnosed with pneumonia as the main cause of death. An exact binomial test,  $x=5$ ,  $n=42$ , gives an estimated prevalence of pneumonia of 11.9%, 95%CI = 4.0-25.6. Precision can be improved by incorporating information attained from other sources. If, for example, it was considered that pneumonia in a sympatric species, e.g. harbour porpoises (*Phocoena phocoena*  $x=238$ ,  $n=1683$ ) could reasonably be used to inform the statistical estimation of expected prevalence in BND, then estimated prevalence =  $\text{Beta}(238+5, 1445+37) = 14.1\%$ , 95% CI 12.5-15.8. A narrower prevalence interval is achieved and the mean prevalence is slightly altered. It should be emphasised that interpretation requires accepting both the legitimacy of information incorporated from other populations and the shape of this prior information used in the model.

### Conclusion

Bayesian methods are particularly relevant when prevalence is low, sample sizes are small or test accuracy is uncertain. This is often the case when considering stranding data. Priors can be estimated from previous studies conducted on the population in question, different populations or different species, however the choice and weighting of prior is subjective and needs to be done with care.

### References & Acknowledgements

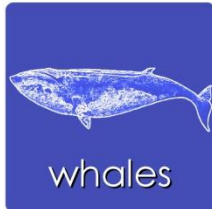
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SAC is a charity registered in Scotland, No. SC090112

**Appendix 3: Poster presented at the SMM conference, Quebec City, October 2009.**

Scottish Marine Animal Stranding Hotline 



If you find a  
**dead, stranded marine animal,**  
 please call  
**01 463 243030**  
 or email  
**stranding@sac.co.uk**

Rescue for **LIVE** strandings can be called 24 hours a day through  
**Scottish SPCA Animal Helpline (03000 999 999)**  
 or **British Divers Marine Life Rescue (01825 765546).**

- 1** What is it? (What type/species of animal? If you are not sure, take pictures on your phone or camera)
- 2** Where is it? (As precise a location as you can give, how far to the nearest road access and is it above the high tide mark?)
- 3** What size is it? (Approximate length, can it be moved or secured against removal by the tide?)
- 4** How fresh is it? (Is it in a good state or a smelly heap of bones? Are parts missing?)

**WARNING:** Marine animals are wild animals. They may carry diseases which are transferable to humans. Do not put yourself at risk of injury. Do not attempt to move heavy animals without adequate assistance. Always wash hands thoroughly after any contact.



The Scottish Marine Animal Stranding Scheme collates, investigates and reports information on stranded marine animals for Scotland. It is managed by the SAC Veterinary Investigation Centre, Inverness in collaboration with the above organisations: