Scottish Marine Animal Stranding Scheme

Annual Report 2012

1 January to 31 December 2012

for Marine Scotland, Scottish Government

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Section 1: Executive summary

This report details the number of marine mammal strandings reported to the Scottish Marine Animal Stranding Scheme (SMASS) in 2012. This data is presented alongside trend data derived from the last 20 years of the stranding scheme. Further details of specific strandings and an online searchable database can be found online at www.strandings.org

In 2012 the Scottish Marine Animal Strandings Scheme received 431 stranding reports, consisting of 469 individual animals. These consisted of 267 pinnipeds, 197 cetaceans, 4 basking shark and one marine turtle. Of these, 132 cases (28%), comprising 88 cetaceans and 44 pinnipeds were necropsied. Excluding the 2002 PDV epidemic, this represented the largest number of necropsied cases per year since the project began in 1992. Due to an increase in total strandings reported however there was a proportionally smaller number necropsied.

The most commonly reported identified species was the grey seal (*Halichoerus grypus*) representing 26.2% of the total stranding reports (123 individuals). Harbour (common) seals (*Phoca vitulina*) account for 8.3% of the reported strandings (39 individuals). Unidentified seals account for 21.9% (103 individuals) of the 2012 stranding reports.

The most common cause of death identified by necropsy seals were corkscrew 'spiral' lesions. These data are subject to reporting biases but highlight the continued prevalence of this form of trauma in Scotland's seal populations.

Live stranding was the most common cause of death for cetaceans examined at necropsy (47%, n=41). Direct anthropogenic trauma (bycatch, entanglement or ship strike) accounted for 7% of deaths. Infectious disease accounted for 14% with meningioencepalitis and verminous pneumonia being the most common syndromes observed.

Harbour porpoises (*Phocoena phocoena*) were the most commonly reported species of cetacean, representing 14% of the total stranding reports. The most common cause of death for harbour porpoises was bottlenose dolphin attack.

Minke whales (*Balaenoptera acutorostrata*) were the most commonly reported mysticete species and white-beaked dolphins (*Lagenorhynchus albirostris*) were the most commonly reported pelagic delphinid.

There was a cluster of strandings around the Forth and Tay estuary in August and September 2012. These comprised two Sowerby's beaked whale in the upper Forth Estuary a, minke and sei whale, near Arbroath and a mass stranding of pilot whale in Pittenweem, Fife. This number of strandings attracted significant media attention however subsequent investigation indicated it was very unlikely that the different species shared a common aetiology.

The mass stranding event (MSE) in September of a pod of long-finned pilot whales (*Globicephala melas*) comprised approximately 35 animals reported as stranded or attempting to strand on the rocky coastline between Pittenweem and Anstruther, Fife. A large rescue and refloat attempt was launched and ten animals were refloated on the following tide. Twenty-one animals were either found dead by the rescue teams or died during the refloat. The carcasses were recovered to an adjacent field and necropsied with assistance from veterinary pathologists and biologists from the wider UK Cetacean Stranding Investigation Programme (CSIP), the Sea Mammal Research Unit (SMRU) and Moredun Research Institute (MRI). This single event represents 9% of

all 2012 reports. In total there were 42 individuals in 12 separate long-finned pilot whale stranding events.

1.1 Project overview

The Scottish Marine Animal Stranding Scheme has been in operation since 1992. It is funded by the Scottish government to monitor and collate marine animal stranding data, with the aim of assessing the health of, and threats to, Scotland's marine animal species. The principal requirement of this project is to provide a co-ordinated approach to surveillance of marine species (e.g. cetaceans & seal) strandings and to investigate major causes of death of stranded marine mammals. Examination of animals at necropsy additionally provides data and samples for a range of research studies and the scheme is used as an educational resource for a range of institutions from primary schools to doctorate research level.

This work builds on the work undertaken in Scotland by the UK Cetacean Strandings Investigation Programme (CSIP). Detailed information about the CSIP, including access to stranding records, can be found at ukstrandings.org

The Scottish Marine Animal Stranding Scheme is based at the SAC Disease Surveillance Centre, Drummondhill, Inverness, IV2 4JZ (01463 243030)

1.2 Details of work

- 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.
- To undertake approximately 70 necropsies on cetaceans and seals stranded around the Scottish coast (approx 20-30 cetaceans and 40-50 seals). A wide geographical spread of necropsies should be achieved unless specified otherwise.
- To provide an overall Scottish sample of both species of seal, including areas of common seal decline, to determine cause of death and any potential contributing factors.
- To investigate specific cases of strandings/causes of death as requested by Scottish Government.
- Continue to contribute to existing SG funded projects including the minke whale entanglement and the bottlenose dolphin projects
- To provide scientific advice to the Scottish Government as necessary about major causes of death in stranded marine mammals, including any trends or unusual trends.
- To develop a database which brings together data on both strandings and necropsies for seals. All cetacean data should be fed into the database for the "UK Cetacean Strandings Investigation Programme".
- Contribute to the production of strandings training material and workshop events and raise awareness through publicity.
- Standardise the current protocols for necropsies where appropriate

- Review options for specimen storage facility, with a focus on reducing storage demand and consider publicising tissue bank facility.
- Review any papers compiled using SAC free samples as a means of quality control.

1.3 Policy Objectives

The JNCC Surveillance and Monitoring website page for cetaceans (http://jncc.defra.gov.uk/page-1554) states that;

"*A variety of conservation issues affect cetaceans in UK waters today, many of which are related to human activity. They include fishing, pollution and the effects of noise from shipping, oil and gas exploration , military activity and tourism. The degree of impact of any human activity varies considerably between different species and depending on their ecology, distribution and abundance.*

A range of legislative instruments oblige the UK to support research that has a bearing on the conservation status of cetacean populations. All species are listed on Annex IV of the Habitats Directive (92/43/EEC). It requires regular assessments of the conservation status of all species that cover abundance, distribution and the pressures and threats experienced. In addition, bottlenose dolphin and harbour porpoise are listed on the Directive's Annex II which requires the designation of Special Areas of Conservation where areas can be identified. The Convention on the Conservation of Migratory Species (Bonn Convention) and the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), oblige signatories – which include the UK - to apply a range of research and management measures aimed at the conservation of all cetaceans. An objective under ASCOBANS commits signatories to reducing the incidental catch of harbour porpoises in commercial fisheries to 1.7 per cent of the species' abundance, a target specified in the EU Regulation 812/2004."

In addition, elements of strandings research in the UK may also provide data to help inform the implementation of the Marine Strategy Framework Directive in the UK.

1.4 Summary project data

Contact details	Scottish Marine Animal Stranding Scheme (SMASS) Andrew Brownlow, SRUC, Drummondhill, Inverness, IV2 4JZ, Scotland andrew.brownlow@sruc.ac.uk Nick Davison, SRUC, Drummondhill, Inverness, IV2 4JZ, Scotland nick.davison@sruc.ac.uk
Collection of samples (type, preservation method)	A variety of tissues are routinely sampled for any bacteriological, virological and/or histopathological investigations when deemed appropriate and a range of samples routinely collected for archive. Any non-routine samples are also collected as necessary. A number of preservation methods are employed; • stored frozen at -20°C or -80°C;

	• stored in 70% ethanol (parasites); • or in 10% buffered formalin (fixed samples)
Database and digital media	The CSIP holds data on nearly 11000 cetaceans which were reported stranded around the UK between 1990 and 2012. Data collected on strandings and during necropsies are routinely recorded in a web-accessed relational database (http://data.ukstrandings.org). The Scottish Marine Animal Stranding Scheme has developed a specific database for Scottish cases. A subset of this dataset is publically available at www.strandings.org A specific Facebook and twitter presence for the SMASS scheme is in operation which serves as both a reporting and discussion forum for public engagement with the scheme.
Additional Information	Further information on the SMASS is available at www.strandings.org and on the CSIP at www.ukstrandings.org.

1.5 Stranding methodology

The collation, collection and investigation of strandings is undertaken by SMASS staff based at the Scottish Rural College (SRUC) Disease Surveillance centre in Inverness. Significant logistical assistance in this is however kindly provided by a number of collaborators, most notably the Sea Mammal Research Unit (SMRU) in St Andrews. Strandings are reported through a variety of routes, usually telephone, although there has been an increase in web and email reports following the launch of the website and online reporting tool in 2010.

Necropsies conducted under the Scottish Marine Animal Stranding Scheme run according to protocols agreed UK wide for sample collection and necropsy:

http://randd.defra.gov.uk/Document.aspx?Document=FinalCSIPReport2005-2010_finalversion061211released[1].pdf

Strandings are recorded by SMASS when an animal swims ashore or is left by a receding tide deposited on land (beach, mudflats, sandbank etc) dead or alive. Live animals that are prevented from stranding by human interaction from the shore, but would clearly have otherwise stranded without such intervention, may also be included. In addition, the SMASS also continues to record information on dead cetaceans that are found at sea in and around UK territorial waters.

The quality of the data reported has also improved over the past few years, with a larger proportion of reports being submitted with photographs or biometric information. This type of reporting infrastructure is essential to maximise the information from strandings reports, as it permits an effective triage system for carcass sampling and recovery. Carcasses deemed too autolysed or inaccessible to justify a full diagnostic necropsy can be sampled on site, measured and photographed. This enables accurate species identification and in some cases excluding certain causes of death.

The relevant public health considerations of handling stranded cetacean carcasses are stressed to those individuals and organisations that are involved with the day-to-day reporting and recovery of stranded carcasses. The triage flowchart used is given in Appendix 1 (Figure 37)

Section 2: Strandings overview

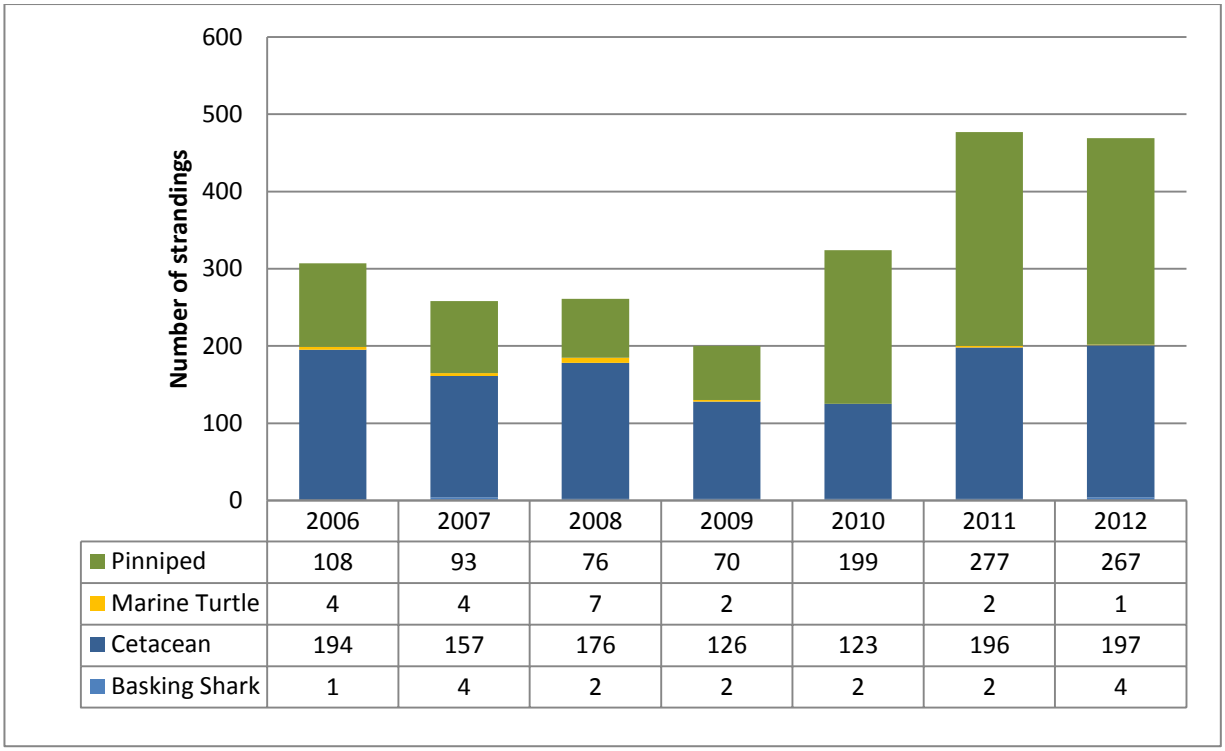
2.1 2012 strandings

During 2012, 469 marine animals were reported to the Scottish Marine Animal Stranding Scheme (SMASS). This consisted of 267 pinnipeds, 197 cetaceans, 4 basking sharks and 1 marine turtle (table 1). Of these cases, 132 individuals (28%), comprising 88 cetaceans and 44 pinnipeds were necropsied to establish cause of death. No marine turtles or basking sharks were necropsied during 2012.

Group	Necropsied	Not necropsied	Total strandings
Basking shark	**0**	**4**	**4**
Cetacean	**88**	**109**	**197**
Marine turtle	**0**	**1**	**1**
Pinniped	**44**	**223**	**267**
TOTAL	**132**	**337**	**469**

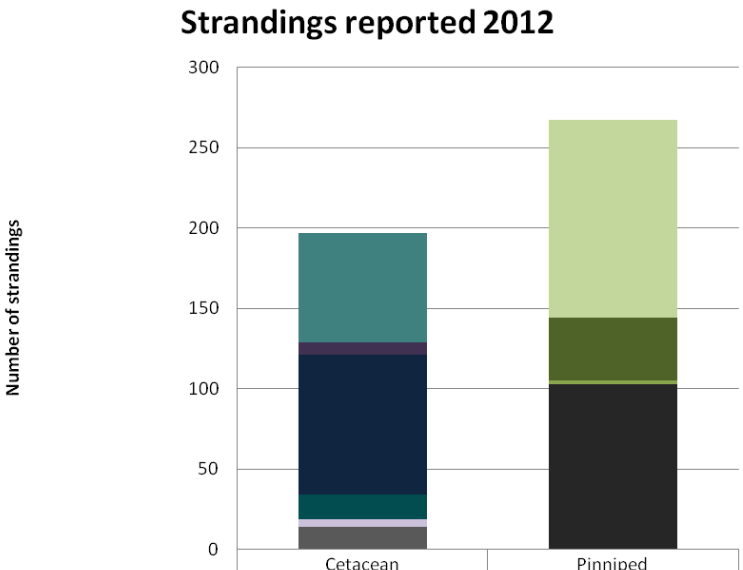
Table 1: Summary of 2012 stranding reports

Figure 1 shows the number of Scottish strandings between January and December by species class since 2006. This past year saw the second highest number of strandings reported over this seven year period, 1.7% less than 2011 and period maximum. The proportion of seals and cetaceans reported remained largely unchanged from 2011 with pinnipeds comprising approximately 57% of all reports. Figure 3 shows the number of strandings by month with September in specific seeing a significant rise compared to other years. This is due to the mass stranding of 34 long-finned pilot whales in Fife (See section 4.4.4). It is also likely the recent improved poster distribution and media coverage of the strandings project has improved the reporting rate.



	2006	2007	2008	2009	2010	2011	2012
Pinniped	108	93	76	70	199	277	267
Marine Turtle	4	4	7	2		2	1
Cetacean	194	157	176	126	123	196	197
Basking Shark	1	4	2	2	2	2	4

Figure 1: Strandings reported 2006-2013

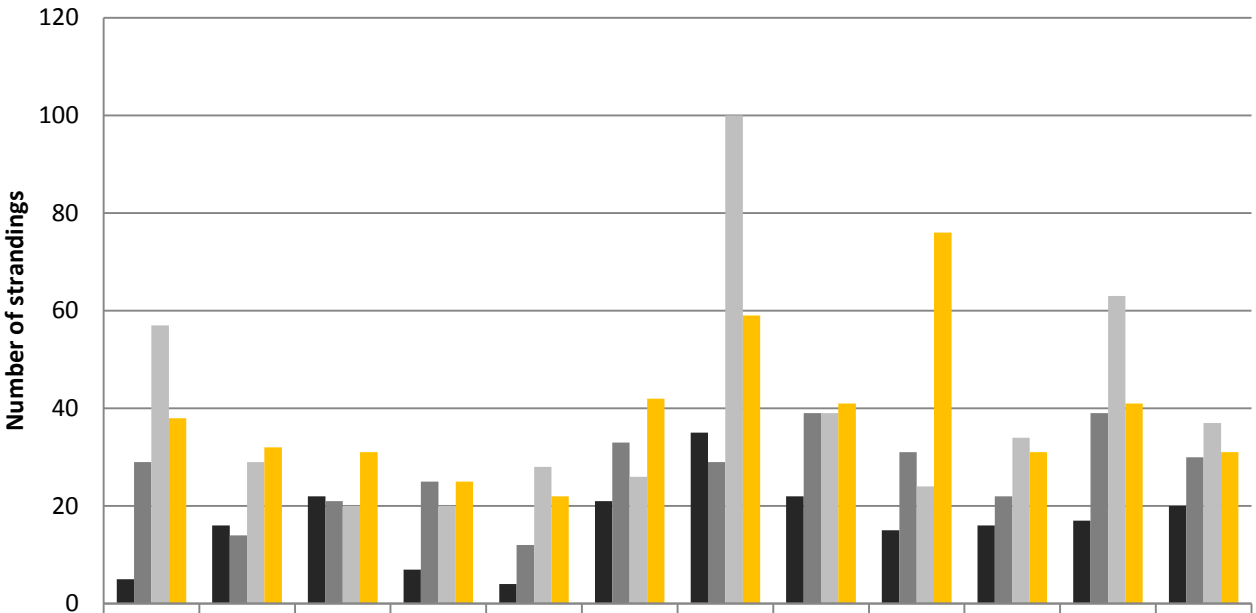


	Cetacean	Pinniped
Harbour porpoise	68	
Sperm/Beaked whale	8	
Pelagic delphinid	87	
Mysticete	15	
Bottlenose dolphin	5	
Grey seal		123
Harbour seal		39
Pinniped (Other)		2
Pinniped (indeterminate species)		103
Cetacean (indeterminate species)	14	

Figure 2: Species reported, by class

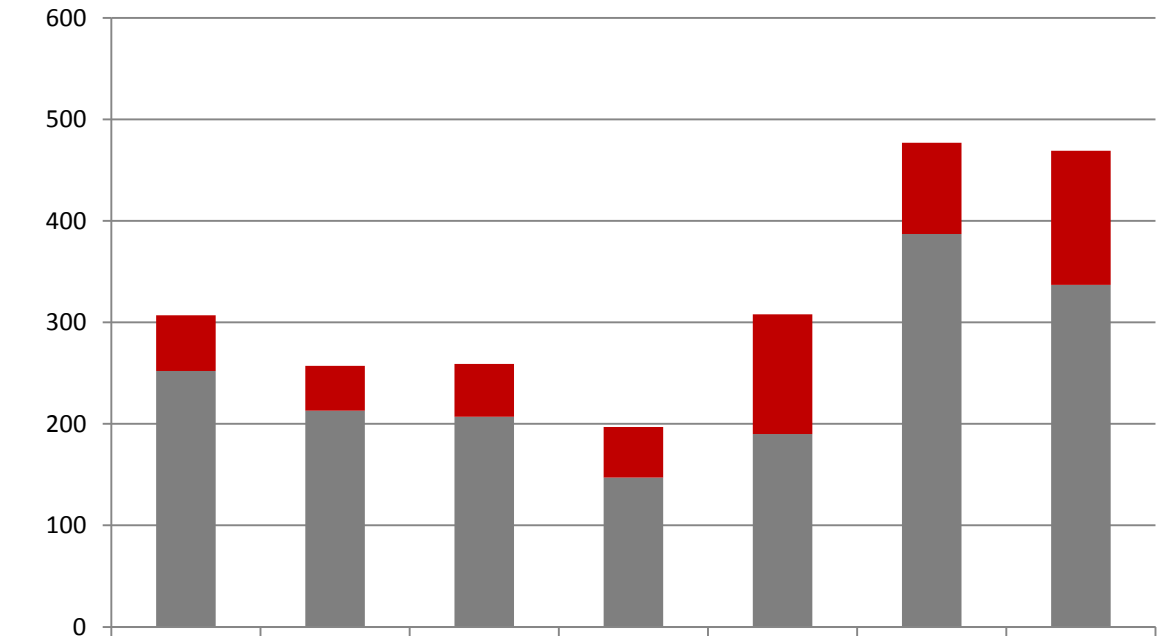
Strandings Jan-Dec 2012	Not Necropsied	Necropsied	Grand Total
Basking Shark	**4**		**4**
Cetacean	**109**	**88**	**197**
Bottlenose dolphin	**3**	**2**	**5**
Harbour porpoise	**29**	**39**	**68**
Harbour porpoise	29	39	68
Mysticete	**13**	**2**	**15**
Humpback whale	1		1
Minke whale	8	1	9
Mysticete (indeterminate species)	4		4
Sei whale		1	1
Pelagic delphinid	**46**	**41**	**87**
Atlantic white-sided dolphin	3	2	5
Dolphin (indeterminate species)	3		3
Killer whale		1	1
Lagenorhynchus sp. (indeterminate species)	2	1	3
Long-finned pilot whale	21	25	46
Risso's dolphin	5	2	7
Short-beaked common dolphin	6	1	7
Short-beaked common dolphin/striped dolphin (indeterminate species)	1		1
Striped dolphin	1	1	2
White-beaked dolphin	4	8	12
Sperm/Beaked whale	**4**	**4**	**8**
Cuvier's beaked whale	1		1
Northern bottlenose whale	1	1	2
Sowerby's beaked whale		2	2
Sperm whale	2	1	3
Cetacean (indeterminate species)	**14**		**14**
Cetacean (indeterminate species)	11		11
Odontocete (indeterminate species)	3		3
Marine Turtle	**1**		**1**
Loggerhead turtle	1		1
Pinniped	**223**	**44**	**267**
Grey seal	94	29	123
Harbour Seal (Common Seal)	25	14	39
Bearded seal		1	1
Hooded seal	1		1
Pinniped (indeterminate species)	**103**		**103**
Grand Total	**337**	**132**	**469**

Table 2: Total number of marine strandings, Scottish waters Jan-June 2013



	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2009	5	16	22	7	4	21	35	22	15	16	17	20
2010	29	14	21	25	12	33	29	39	31	22	39	30
2011	57	29	20	20	28	26	100	39	24	34	63	37
2012	38	32	31	25	22	42	59	41	76	31	41	31

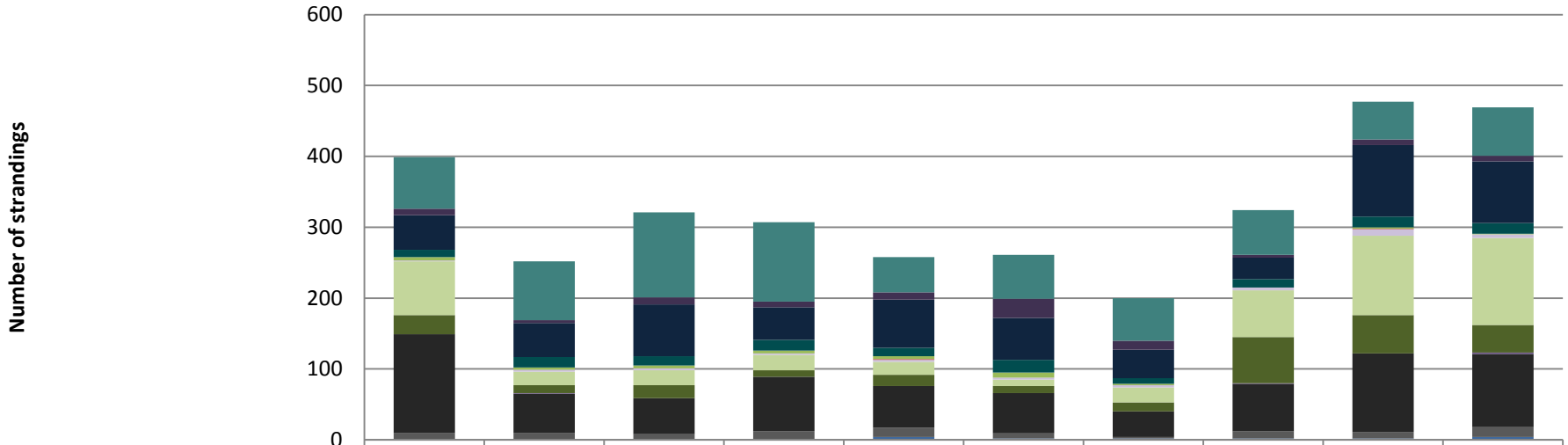
Figure 3: All strandings, by month



	2006	2007	2008	2009	2010	2011	2012
TRUE	55	44	52	50	118	90	132
FALSE	252	213	207	147	190	387	337

Figure 4: Cases necropsied 2006-2012

Figure 4 shows the number of cases necropsied between January and December 2013. The 132 cases are over twice the running mean of 69 over the past 6 years. This is attributable to increased effort made in sample collection, in specific for seals, and a major mass stranding event. The specific reason why cases were not collected is given in appendix 1 however poor carcass condition was the most common reason cases were not suitable for necropsy.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Harbour porpoise	73	83	120	112	50	62	60	63	53	68
Sperm/Beaked whale	9	4	10	8	10	27	13	4	8	8
Pelagic delphinid	49	48	73	46	68	59	40	30	101	87
Mysticete	10	15	13	15	12	18	8	12	15	15
Marine Turtle	5	3	4	4	4	7	2		2	1
Kogia sp.					1				1	
Bottlenose dolphin	1	3	3	2	3	3	3	4	9	5
Grey seal	76	19	21	22	18	9	21	66	112	123
Harbour seal	27	11	18	9	16	10	13	65	54	39
Pinniped (Other)		1						1		2
Pinniped (indeterminate species)	139	55	51	77	59	57	36	67	111	103
Cetacean (indeterminate species)	9	10	7	11	13	7	2	10	9	14
Basking Shark	1		1	1	4	2	2	2	2	4

Figure 5: Strandings 2003-2012

2.2 Spatial distribution of strandings

Figure 6 and Table 3 show the spatial distribution of strandings during 2012. Cases were reported in all coastal regions with western Scotland seeing a lower number of cases than the east but a higher proportion of pelagic species.

There is a reporting bias towards the eastern side of the country, with half of all strandings reported from Grampian, Tayside, Fife or Lothian regions. This is likely due to a number of reasons; higher human population density, more accessible coastline and good public awareness of the strandings scheme as examples. The converse may explain the low reporting levels in the north and west, although this situation is improving. Table 4 illustrates total stranding numbers by region 1992-2012 and shows reporting levels have historically been low in areas such as Orkney, Shetland and west Scotland. Based on population estimates from sightings data (Reid, Evans, & Northridge, 2003; SCOS 2012), it is likely stranding numbers have been underreported in these regions. Efforts to promote stranding reporting now form a significant part of the work of the current contract in an attempt to address this bias (see section 1.1)

Region	Basking shark	Cetacean	Marine turtle	Pinniped	Total	% in 2012
Borders	0	0	0	1	**1**	0.2%
Central	0	6	0	0	**6**	1.3%
Dumfries & Galloway	0	1	0	5	**6**	1.3%
Fife	0	45	0	36	**81**	17.3%
Grampian	0	32	0	67	**99**	21.1%
Highland	1	30	0	45	**76**	16.2%
Lothian	0	12	0	13	**25**	5.3%
Orkney	0	8	0	37	**45**	9.6%
Shetland	0	5	0	11	**16**	3.4%
Strathclyde	2	22	0	22	**46**	9.8%
Tayside	0	13	0	13	**26**	5.5%
Western Isles	1	23	1	17	**42**	9.0%
Total	4	197	1	267	**469**	

Table 3: Regional distribution of 2012 stranding reports

Region	Basking shark	Cetacean	Marine turtle	Pinniped	Total	% since 1992
Borders	0	8	0	80	88	1.2%
Central	0	13	0	1	14	0.2%
Dumfries & Galloway	0	85	13	60	158	2.2%
Fife	0	216	2	359	577	8.1%
Grampian	1	448	0	594	1043	14.7%
Highland	10	672	13	942	1637	23.0%
Lothian	1	112	0	117	230	3.2%
Orkney	0	283	6	723	1012	14.2%
Shetland	0	210	3	174	387	5.4%
Strathclyde	9	469	19	301	798	11.2%
Tayside	0	123	0	219	342	4.8%
Western Isles	6	639	12	174	831	11.7%
TOTAL	27	3278	68	3744	**7117**	

Table 4: Regional trend data 1992-2012

2.3 Map of all 2012 strandings

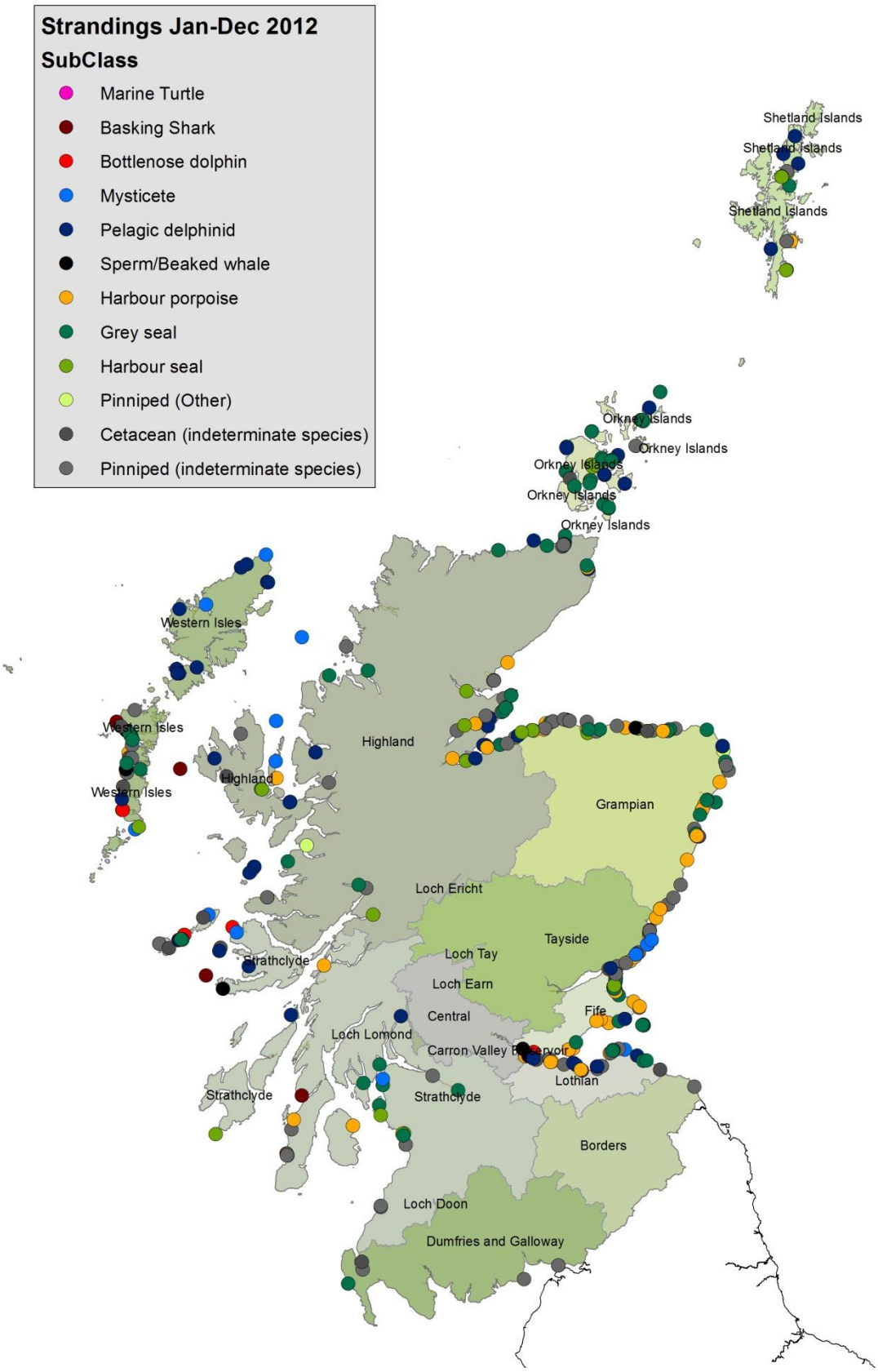


Figure 6: Scottish stranding reports 2012

2.4 Necropsied cases

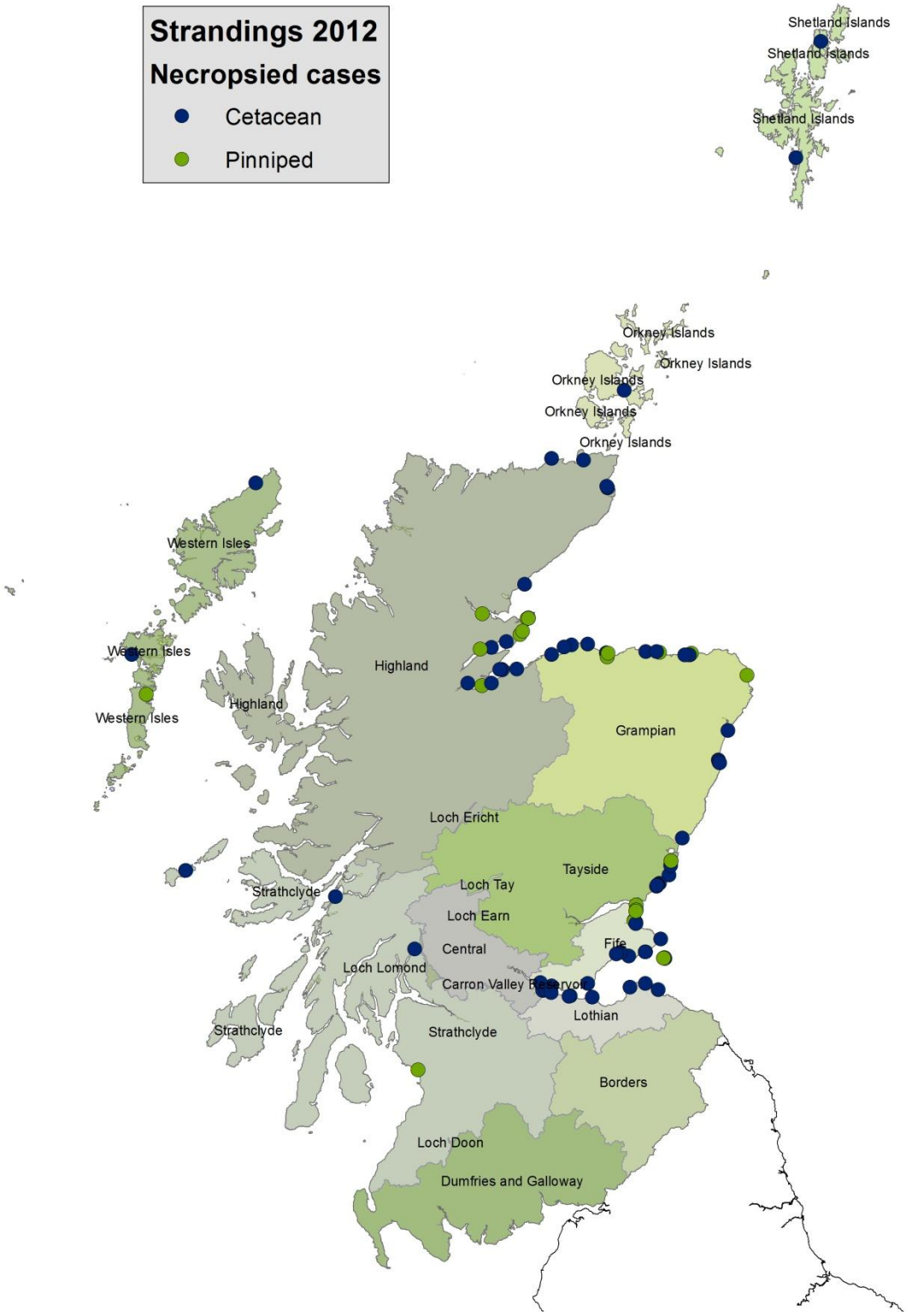


Figure 7: Cases necropsied 2012

2.5 Not necropsied cases

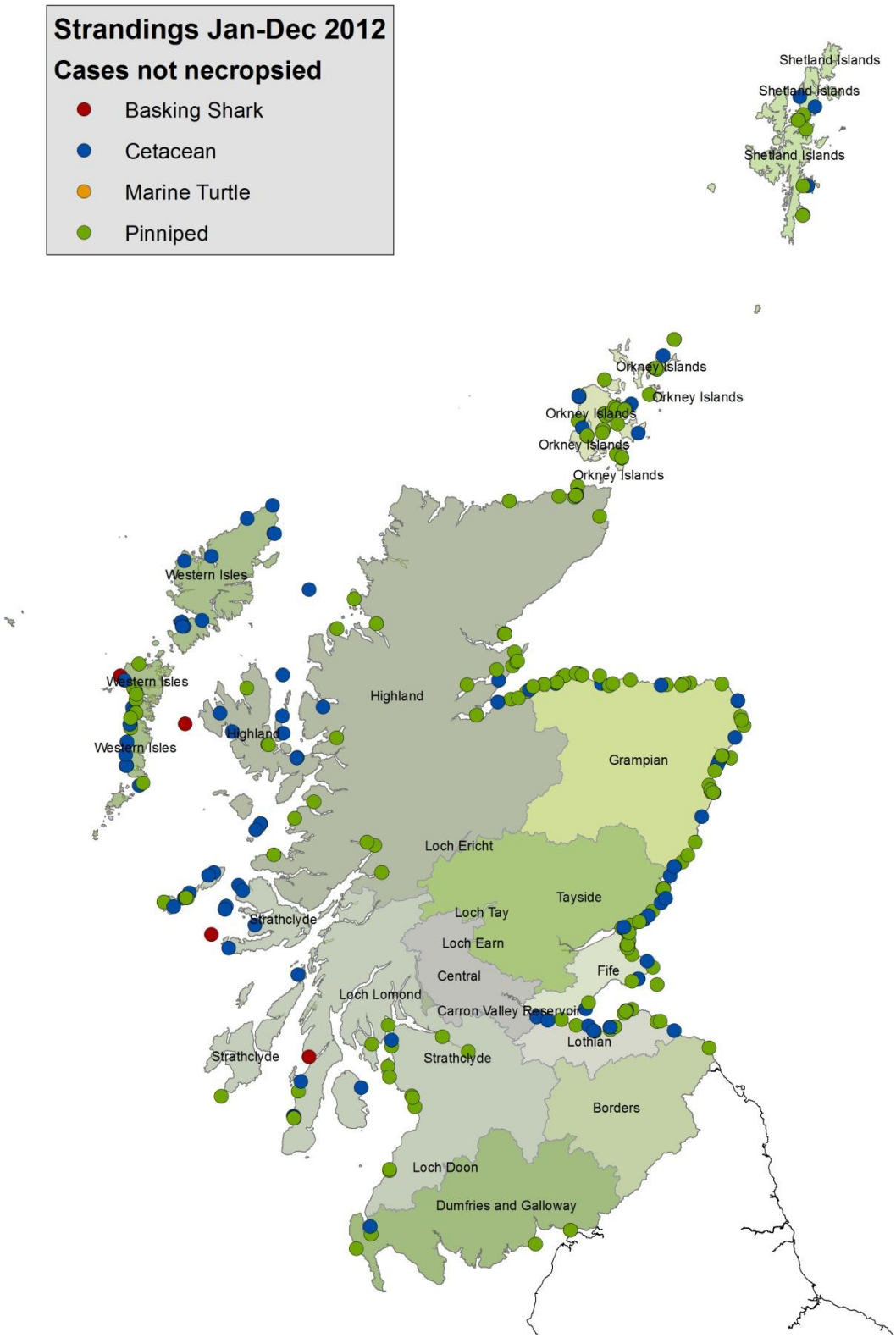


Figure 8: Cases not necropsied 2012

2.6 Table of non-sampled cases, by reason

Cases not examined	Count	%
Not Examined: Advanced Autolysis	162	**54.0%**
Not Examined: Insufficient data received to locate case	64	**21.3%**
Not Examined: Not priority: other concurrent strandings	17	**5.7%**
Not Examined: Refloated	12	**4.0%**
Not Examined: Delay In Reporting	9	**3.0%**
Not Examined: Carcase not found, assumed removed	8	**2.7%**
Not Examined: Carcase unrecoverable due to location	8	**2.7%**
Not Examined: Neonate	8	**2.7%**
Not Examined: Removed By Council	5	**1.7%**
Not Examined: Weather/Travel Difficulties	3	**1.0%**
Not Examined: Samples taken on request	2	**0.7%**
Not Examined: At Sea	1	**0.3%**
Not Examined: Taken to rehab	1	**0.3%**
TOTAL	300	

Table 5: Non sampled cases 2012

Of the 469 individuals reported to SMASS in 2012, 132 cases were necropsied, 37 were sampled and 300 were not investigated any further The specific reasons for not examining the stranding are tabulated above, however the two most common reasons were the degree of carcass autolysis (54%) or insufficient information left by the reporter to adequately triage and locate the case (21.3%). The 37 cases sampled were predominantly trauma cases where the cause of death could be reliably established from photographs or reliable witness reports.

As can be seen from comparing Figure 7 with Figure 8 & Figure 9, there are regions where carcasses are seldom recoverable for necropsy. Orkney and the Western Isles are particular problematic for a combination of logistical and reporting reasons. Efforts are however planned in 2013 to train suitable volunteers in safe and effective sampling protocols in order to increase the data recovered from cases which do not merit a full necropsy but can still offer potentially valuable morphometrics, life history or genetic data.

Section 3: Pinnipeds

3.1 Overview

There were 267 pinnipeds reported stranded to SMASS between January and December 2012. These consisted of; 123 grey seals, 39 common seals and 103 unidentified pinnipeds which were too autolysed or data deficient for accurate speciation to be made (Table 6 and Figure 9). In addition a single bearded and single hooded seal were found during this period. Forty-four of these cases were taken for necropsy. This is about average for the annual number of seals necropsied since 2009.

Species	Not necropsied	Necropsied	TOTAL
Bearded seal		1	1
Grey Seal	94	29	123
Harbour (Common) seal	25	14	39
Hooded seal	1		1
Indeterminate species	103		103
TOTAL	**223**	**44**	**267**

Table 6: Pinniped cases 2012

The most commonly reported species was the grey seal (*Halichoerus grypus*) representing 46% of pinniped strandings and 26.2% of all stranding reports (123 individuals). Harbour (common) seals (*Phoca vitulina*) account for 14.6% of pinniped strandings and 8.3% of total strandings (39 individuals). Unidentified seals account for 38.5% of pinniped strandings and 21.9% of all 2012 stranding reports (103 individuals). The bearded seal (*Erignathus barbatus*) is the first record for this species since the project began.

The proportion of reported seal strandings necropsied in 2012 was 16.4% whereas in comparison the proportion of cetaceans necropsied was 44%. The difference is mainly due to these cases being in an advanced state of autolysis when reported (51%) or the reported not supplying sufficient data for the animal to be successfully located (25%).

With both seal species it is considered there remains a significant degree of underreporting. This biases stranding counts alone as an accurate metric of population mortality, nonetheless, since 2009, reporting rates have improved and provide some indication of minimum mortality rates. Increased efforts are however underway to further increase the reporting and recovery rate for seals through public outreach events. By mid 2013 there were some indications of an improvement in areas where these events had been trialled.

3.2 Map of 2012 pinniped strandings

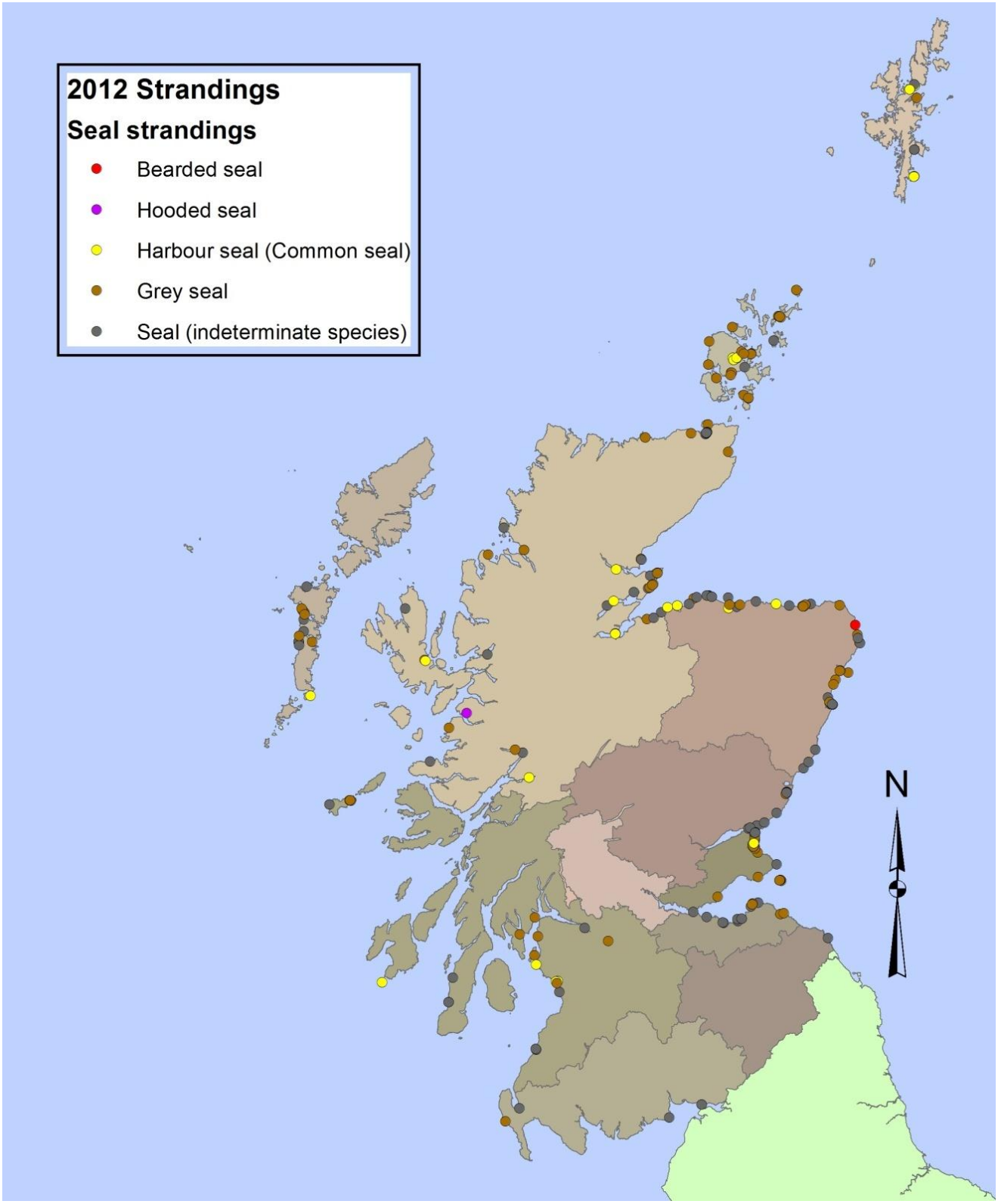


Figure 9: Pinniped strandings 2012

3.3 Grey seal

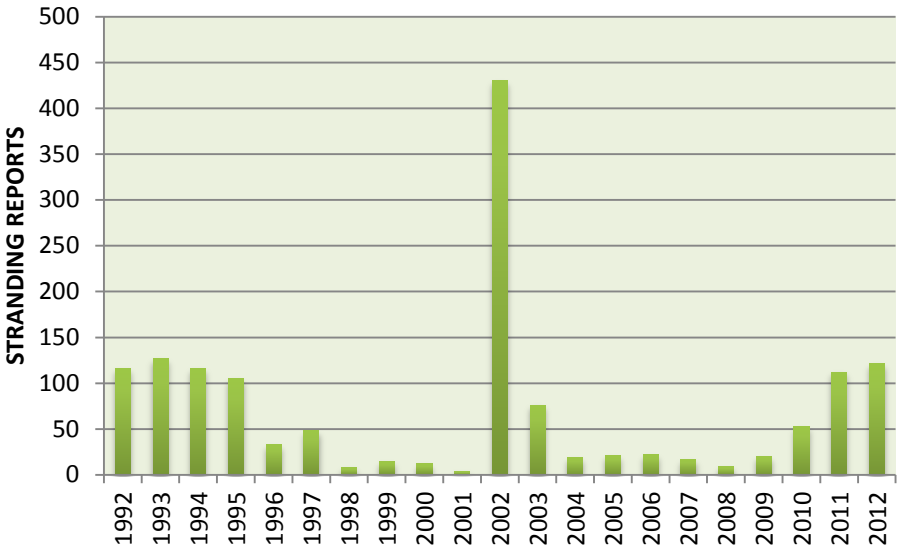


Figure 10: Annual grey seal strandings reports 1992 – 2012

Since 1992 there have been several peaks in grey seal strandings (Figure 10). Between 1992 and 1995, before the seal management plan was introduced, there were large numbers of animals killed and this was reflected in the strandings database. Increased survey effort during the 2002/3 phocine distemper outbreak (PDV) resulted in an increase in stranding reports, demonstrating the effect of active surveillance on stranding reports. Equally, following publicity campaigns from 2009 onwards, it is suspected that the increase in reporting is due to an increase in awareness and effort rather than increased mortality.

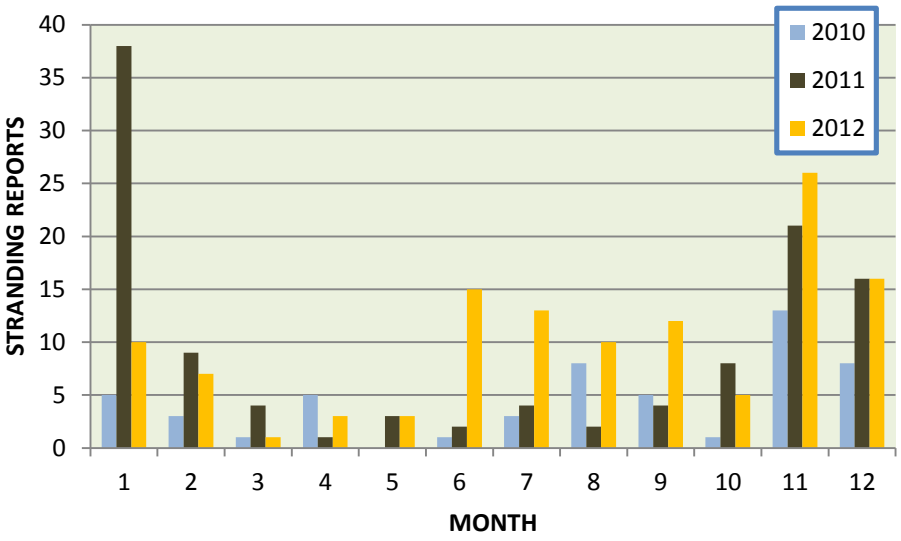


Figure 11: Monthly grey seal stranding reports 2010 - 2012

The 2012 monthly trend in grey seal strandings is similar to previous years, showing a marked increase between November and January, coinciding with the pupping season

(Figure 11). The peak seen in January 2011 was due to high number of mortalities reported by SMRU from the Fast Castle pupping site in the Scottish Borders.

3.4 Harbour (Common) Seal

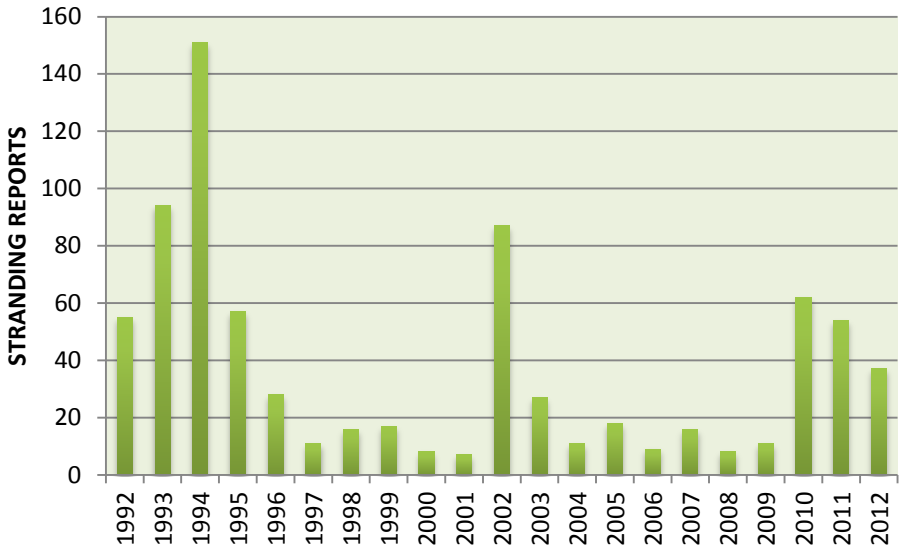


Figure 12: Annual harbour (common) seal strandings reports 1992 – 2012

Figure 12 above shows historic peaks in harbour (common) seal strandings. Similarly to grey seal reports, increased survey effort during the 2002/3 phocine distemper outbreak resulted in an increase in stranding reports (It is of note that fewer than 20% of cases reported during the PDV outbreak were diagnosed with morbillivirus as the most likely cause of death). From 2010 onwards it is thought that the increase in reporting is due to an increase in awareness and effort and represents a more accurate picture of harbour (common) seal strandings, therefore any subsequent analysis is based on these data.

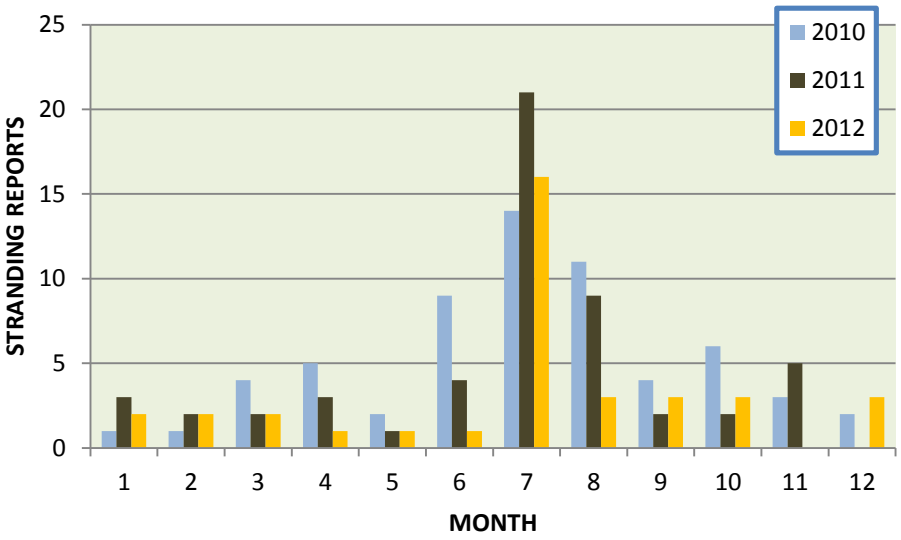


Figure 13: Monthly harbour (common) seal stranding reports 2010 – 2012

The 2012 monthly trend in harbour (common) seal strandings is similar to previous years showing a marked increase between June and August, coinciding with the pupping season (Figure 13).

3.5 Cause of death

The most common cause of death identified by necropsy for seals was trauma with spiral lesions (n=14). Inclusion of data from cases where the cause of death could be confidently ascribed from photographs increases this number to 19 cases.

The data on spiral trauma cases is heavily influenced by reporting biases, for example twelve of these cases were reported by SMRU scientists discovered whilst undertaking fieldwork in the Isle of May. This raises concerns that there may be underreporting in areas where the observer effort is lower.

Pinniped	**22**
Grey seal	**13**
Entanglement (Known)	1
Physical trauma: Other	1
Physical Trauma: Spiral "Corkscrew" lesions	10
Physical Trauma: Possible spiral "Corkscrew" lesions	1
Harbour seal (Common seal)	**8**
Dystocia & Stillborn	1
Physical Trauma	1
Physical Trauma: Spiral "Corkscrew" lesions	4
Pneumonia	1
Pneumonia: Parasitic and Bacterial	1
Bearded seal	**1**
Others	1

Table 7: Cause of death, where established, for seals necropsied Jan -Dec 2012

3.6 Spiral trauma cases

In addition to the seal cases two porpoise were examined with similar lesion patterns. Both cases were found in Fife in late March and early April. Figure 14 shows the distribution of the twenty-one 2012 spiral trauma cases by month and species.

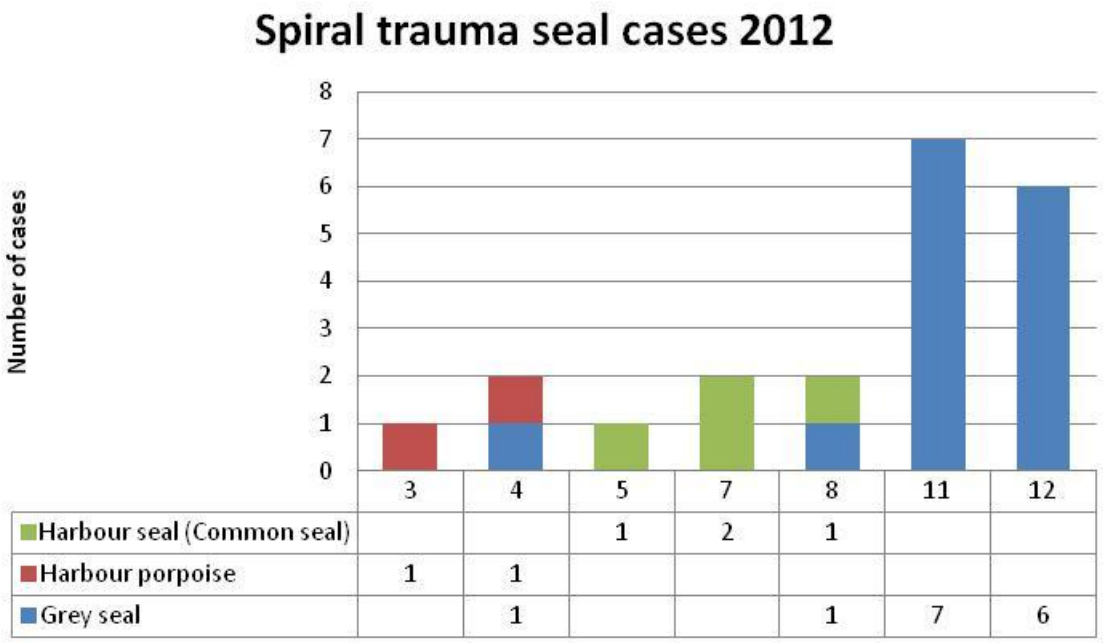


Figure 14: Spiral trauma cases 2012

A new classification system to attribute spiral trauma lesions to the cause of death was devised for assessing new and historic cases. The system consisted of a scoring chart, using different attributes agreed by SMASS and SMRU, which enabled the assessors to grade the confidence in diagnosis from low to high; this is particularly useful in cases that are unable to be collected for necropsy where photos are the only evidence. It was also decided to differentiate between cases that were diagnosed through necropsy and through photos to generate consistency at analysis stages.

In addition to data collected from a standard pinniped necropsy, the following criteria were added to cases suspected of undergoing spiral trauma.

3.7 Spiral lesion morphometrics and assessment factors

- Length of cut:
- Distance between cuts
- Rotation direction?

- Inclination of wound edge
- Single curvilinear cut around the body (one or more rotations) ?
- Smooth edged wound?
- Avulsion of one or both scapula?
- Do there appear to be areas of skin missing?
- Punctuate lesions on muzzle?
- Evidence of skeletal trauma to head?
- Evidence of skeletal trauma scapula?
- Other skeletal trauma

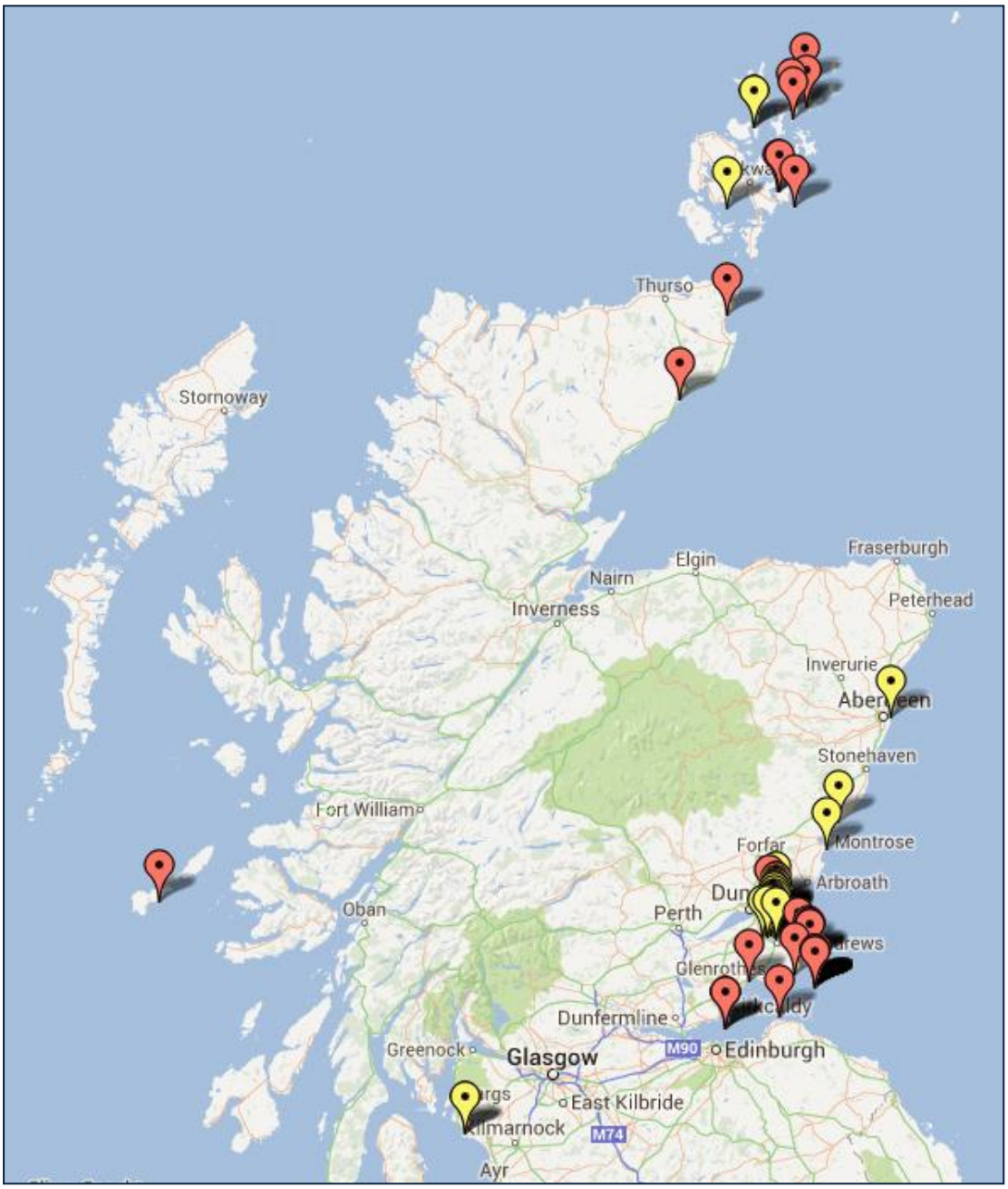


Figure 15: Map showing distribution of all 82 'spiral trauma' trauma cases reported 1988-2012. Yellow marker=Harbour seal, Red marker Grey seal

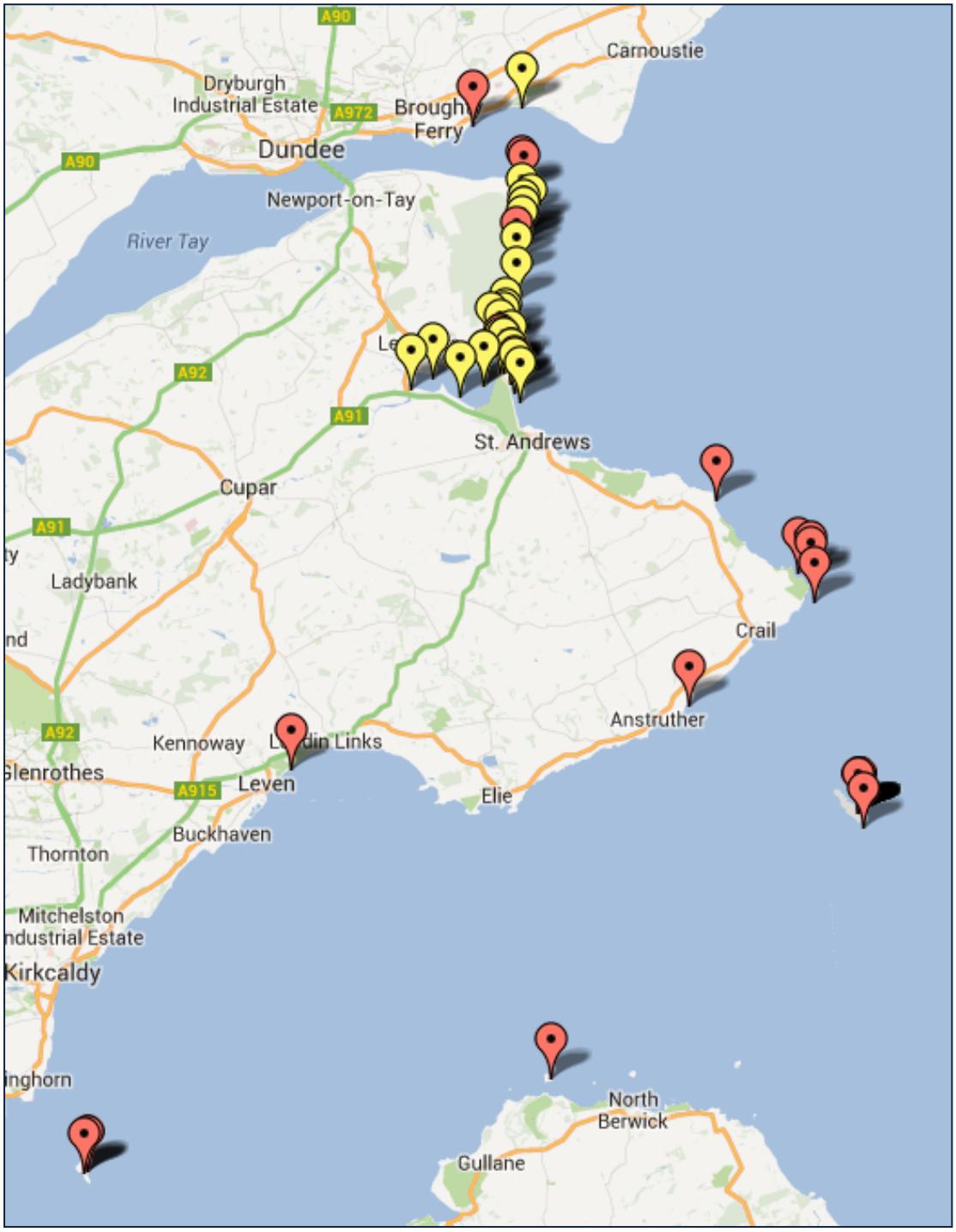


Figure 16:- Detail map of Tay and Forth estuary showing 'spiral trauma' trauma cases 1988-2012. Yellow marker=Harbour seal, Red marker Grey seal:

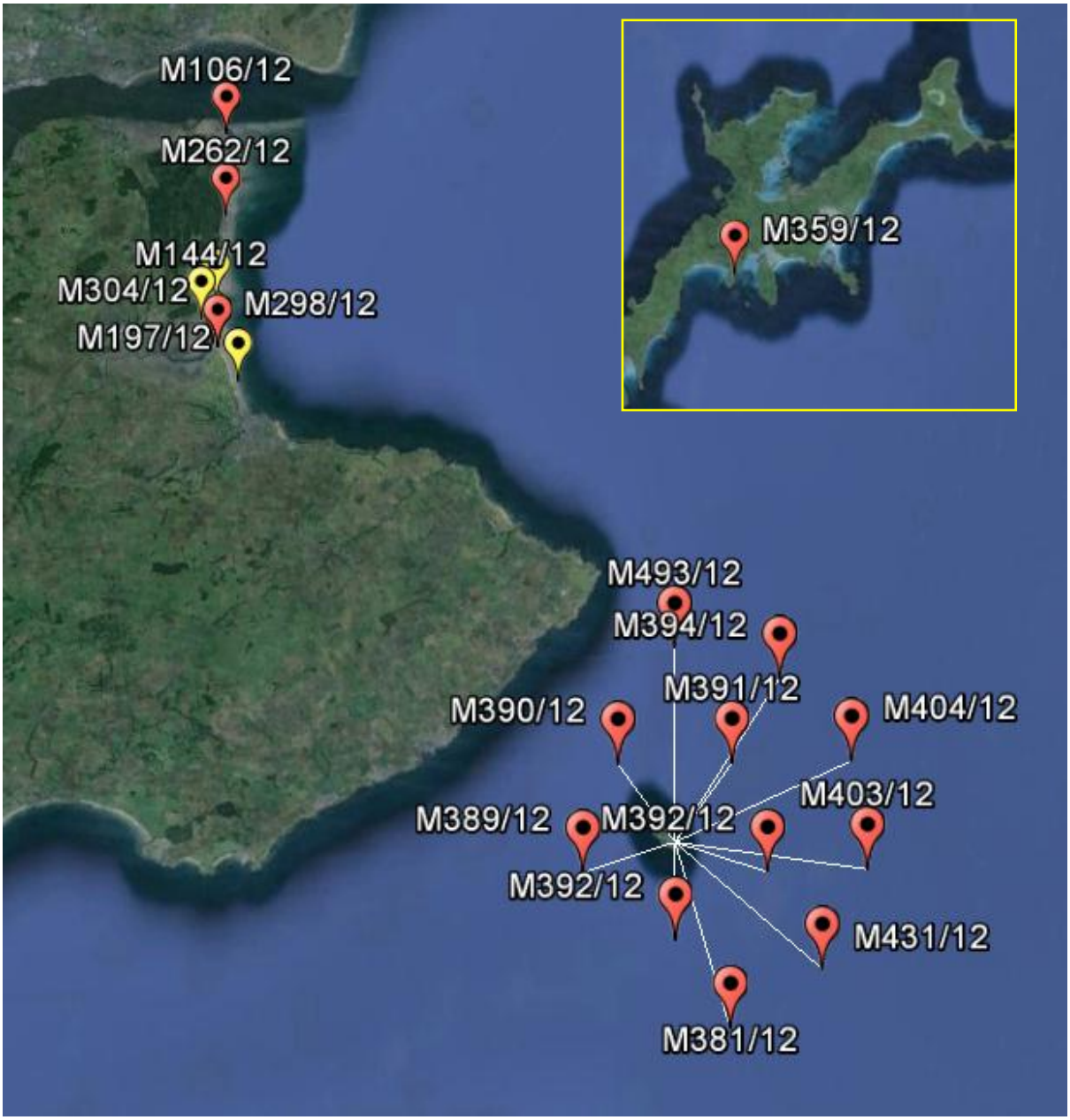


Figure 17:- Google Earth image of Tay and Forth estuary showing detail of 21 'spiral trauma' trauma cases 2012. Yellow marker=Harbour seal, Red marker Grey seal. Inset shows reports on Sanday, Orkney.

3.8 Other notable seal strandings

3.8.1 M061/12 – Bearded seal (*Erignathus barbatus*)

On 27th February a juvenile male bearded seal stranded in St Fergus, Peterhead. The animal was collected for necropsy in Inverness. It was in poor body condition and found to be malnourished. *Brucella pinnipedialis* was isolated from this animal (believed to be the first time from this species) and a systemic growth of *Vibrio alginolyticus* was found. Overall the seal appeared to have indications of chronic morbidity and malnutrition/pica which, given the ecology of the area this seal was found, may be due to novel pathogen exposure and inadequate feeding capacity. Changes in the adrenals, thyroid and skin are likely to

represent endocrinological disturbances such as adrenocortical hyperplasia, possible hyperthyroidism and atrophic hair follicles.

Figure 18: M061/12; Bearded seal showing alopecia and hyperkeratosis

3.8.2 M212/12 – Harbour (Common) seal (*Phoca* vitulina)

On 9th July anecdotal evidence of 17 stranded harbour seal pups in the Bay of Firth, Orkney, was received from a member of the public. The reporter had seen a pod of dolphins in the area and had presumed that they had attacked and killed the seals. BBC Reporting Scotland ran a story stating that the seals had been killed by bottlenose dolphins (http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-18863460)
SMASS found no evidence to suggest that the seals were attacked by bottlenose dolphins. Photographic evidence was only supplied for 10 individuals and no more information was obtained so only these individuals were listed as stranded. The photographs showed animals of varying levels of decomposition and so were treated as separate stranding events rather than a mass stranding event(s). It was considered that the increased number of cases was likely attributable, at least in part, to the prevailing winds prior to this event, and did not represent increased mortality.

3.8.3 M277/12 – Hooded seal (*Cystophora cristata*)

On 25th August a two year old "blueback" hooded seal was found on Inverie Beach, Loch Nevis. SMASS was unable to collect the carcase so trained members of the Hebridean Whale and Dolphin Trust (HWDT) took some measurements and tissue samples. A cause of death was therefore not established but this is a seldom recorded species in these waters.

Figure 19: M277/12 Hooded seal

Section 4: Cetaceans

4.1 Overview

As in previous years, harbour porpoise (*Phocoena phocoena*) was the most commonly reported species, representing 14% of all stranding reports (68 individuals, 66 stranding events) and 33% of cetacean strandings. The single mass stranding event (MSE) in September (31 individuals) accounted for the increase in long-finned pilot whale (*Globicephala melas*) strandings. This single event involved 9% of all 2012 reports and 21% of cetacean strandings. In total there were 42 long-finned pilot whale strandings in 12 stranding events. As in previous years, minke whale (*Balaenoptera acutorostrata*) was the most commonly reported mysticete species (2%). White-beaked dolphin (*Lagenorhynchus albirostris*) was the third most commonly reported cetacean (5% of all cetacean species). Thirteen percent of cetacean strandings could not be identified to species level. One of these cases was opportunistically sampled and identified as a *Lagenorhynchus* species but due to autolysis and rising tidal conditions could not be speciated further.

Species	Not necropsied	Necropsied	Grand Total
Atlantic white-sided dolphin	3	2	5
Bottlenose dolphin	3	2	5
Cuvier's beaked whale	1		1
Harbour porpoise	29	39	68
Humpback whale	1		1
Killer whale		1	1
Long-finned pilot whale	21	25	46
Minke whale	8	1	9
Northern bottlenose whale	1	1	2
Risso's dolphin	5	2	7
Sei whale		1	1
Short-beaked common dolphin	6	1	7
Sowerby's beaked whale		2	2
Sperm whale	2	1	3
Striped dolphin	1	1	2
White-beaked dolphin	4	8	12
Indeterminate species	24	1	25
Grand Total	109	88	197

Table 8: Cetaceans stranded 2012

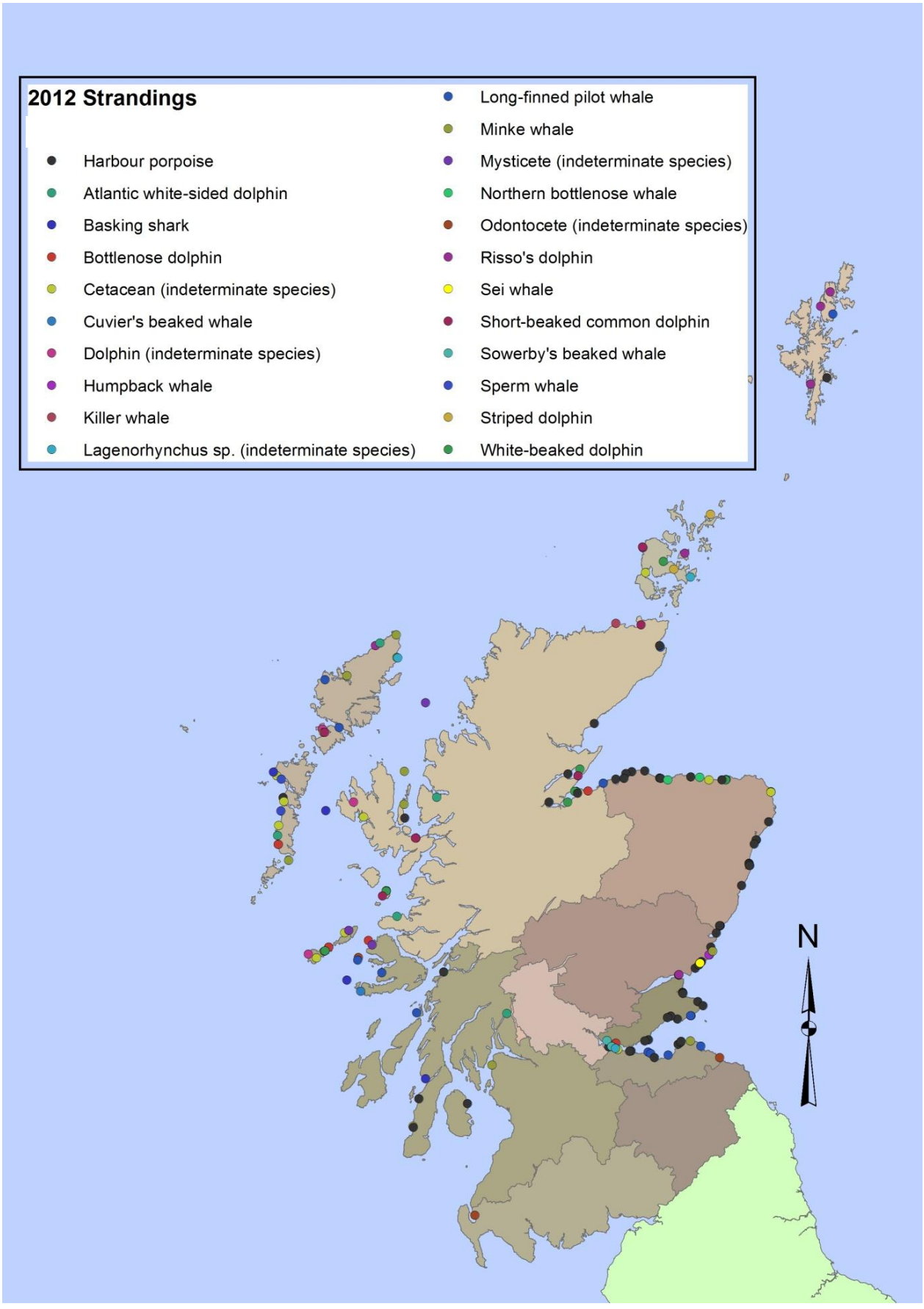


Figure 20: Cetacean strandings 2012

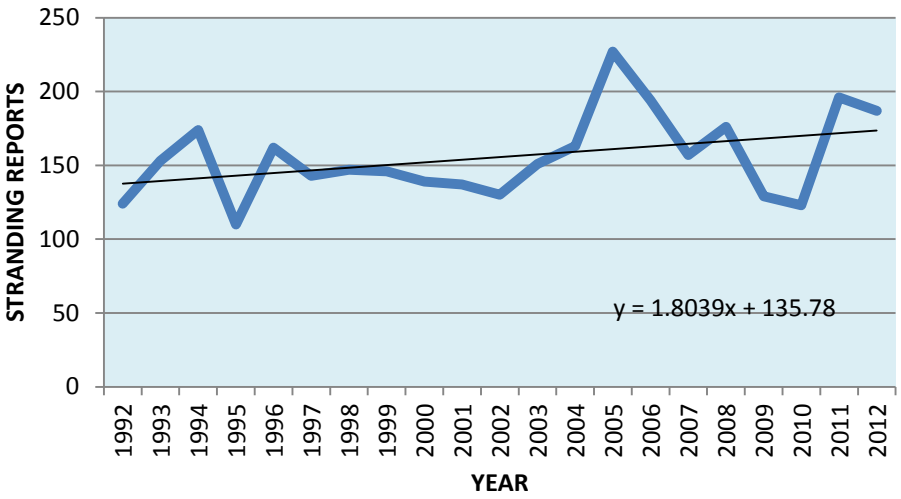


Figure 21: Annual cetacean stranding reports 1992 – 2012

Figure 20 maps the 2012 cetacean strandings and Figure 21 shows the fluctuation in reported cetacean stranding numbers 1992-2012. The same data is shown in Figure 22 by species subclass. No clear trends are identified in total or proportional strandings,. There is some indication of a decrease in porpoise numbers from a peak in 2005-6 and the pilot whale mass stranding events of 2011 and 2012 account for the increase in pelagic delphinid strandings.

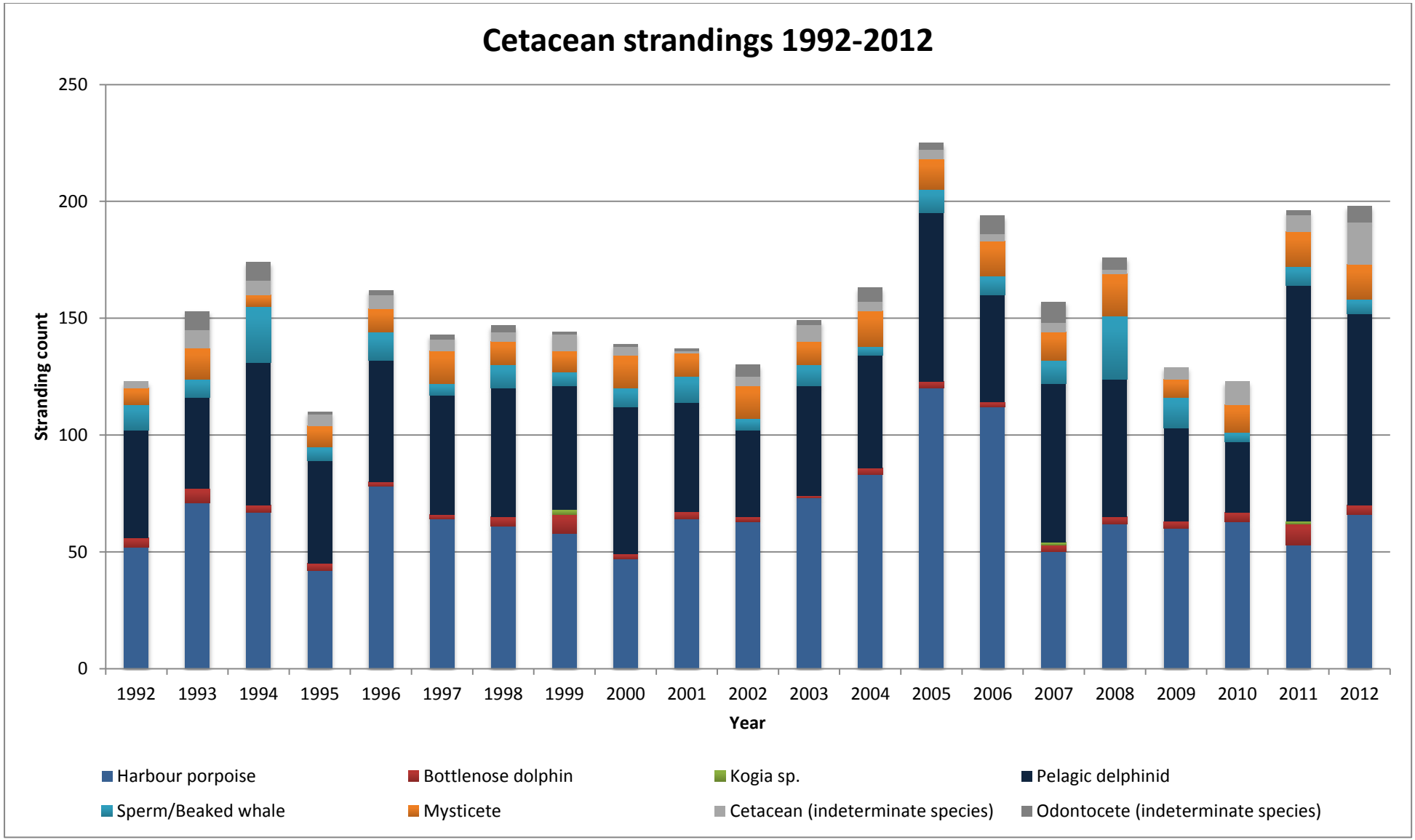


Figure 22: Cetacean strandings, by species subclass

4.2 Harbour porpoise

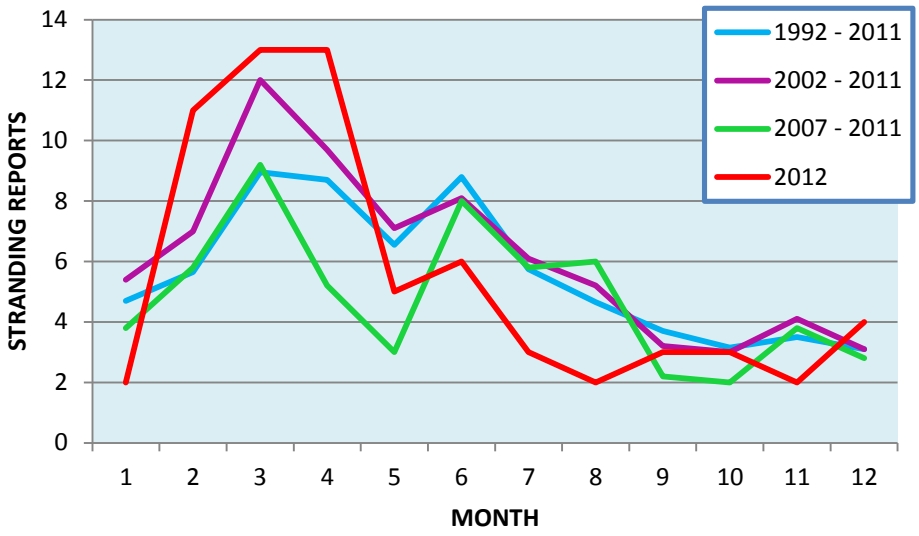


Figure 23: Monthly harbour porpoise stranding trends from 2012 with averages from the previous 5, 10 & 20 years

The 2012 harbour porpoise monthly strandings are similar to previous trends with higher reports occurring between February and April decreasing through the summer months to a low between September and January. As can be seen in Figure 23 this pattern is consistent over the past two decades. These trends are heavily influenced by the data from the east coast as this is where most porpoise strandings are reported. This pattern raises interesting questions as to the underlying cause. In specific, is this pattern a representation simply of seasonal variation in the numbers of coastal porpoise or, conversely, increased spring mortality in a more constant population? The higher number of reports in spring compared to summer would suggest that these results aren't effort related. The most likely hypothesis is this is due to prevailing spring easterly (onshore) winds increasing the number of cases washing up dead stranded on the east coast during these months.

In all years the age make up of harbour porpoise strandings differs depending on time of year with more juveniles and sub-adults stranding between January and June possibly as a consequence of loss of condition through the winter months. Neonates only occur between June and September, obviously coinciding with the calving season. Adults strand regularly throughout the year with the highest numbers occurring in June and July, mostly females this may reflect extra stress during the calving season. Fewer animals strand in the last three months of the year. Of those that do, most are either adults or juveniles with slightly more male animals stranding than females. There were no significant changes to this stranding pattern in 2012.

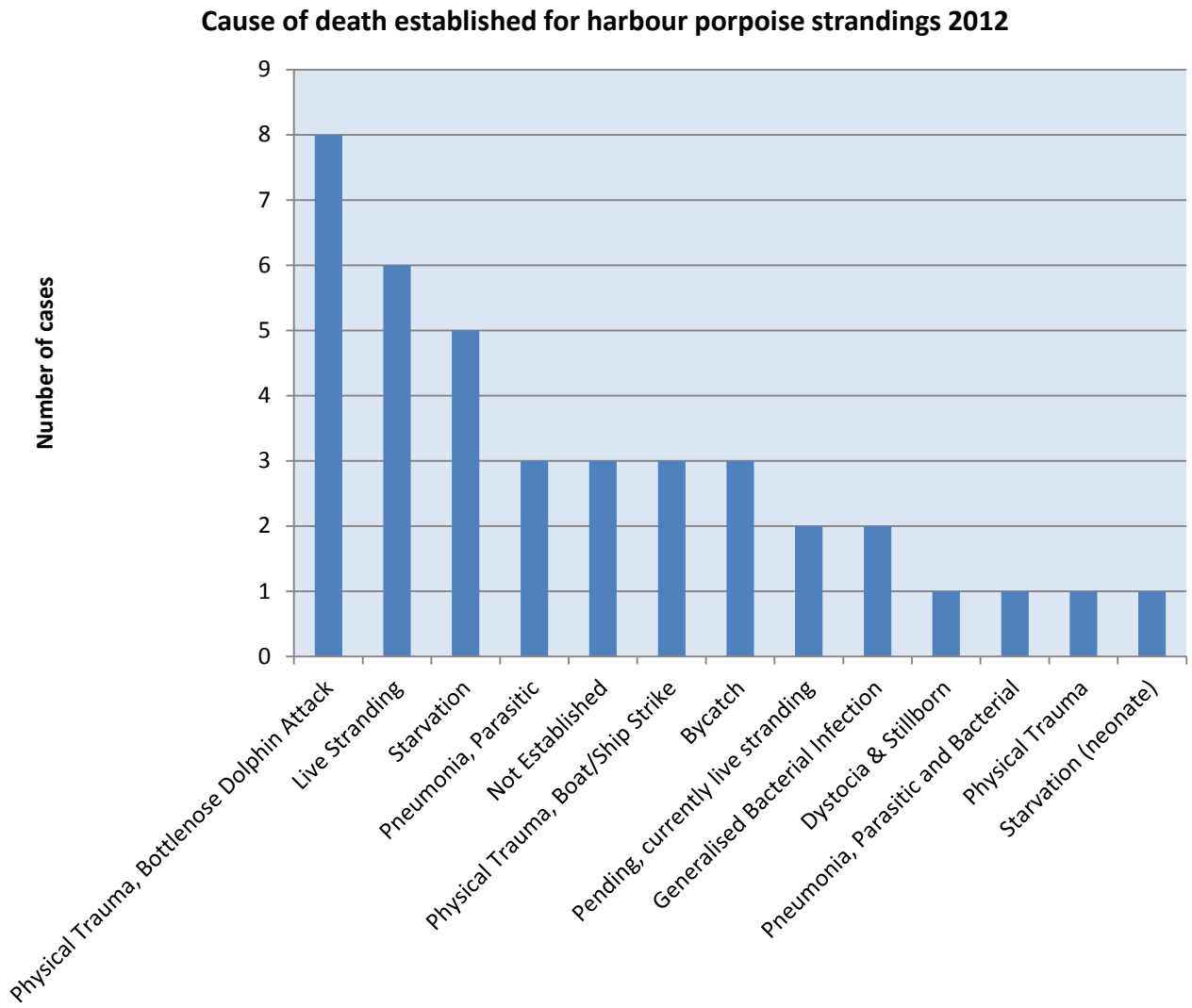


Figure 24: Cause of death of harbour porpoise 2012 (n=39)

The most common cause of death for harbour porpoises was bottlenose dolphin attack (11%) followed by live stranding (10%) and starvation (9%).

4.3 Cause of death for cetaceans

Cetacean	78
Bottlenose dolphin	**1**
Live Stranding	1
Harbour porpoise	**34**
Bycatch	3
Dystocia & Stillborn	1
Generalised Bacterial Infection/Septicaemia	2
Live Stranding	6
Physical Trauma	1
Physical Trauma: Boat/Ship Strike	1
Physical Trauma: Bottlenose Dolphin Attack	8
Physical Trauma: Spiral "Corkscrew" lesions	2
Pneumonia: Parasitic	3
Pneumonia: Parasitic and Bacterial	1
Starvation	5
Starvation (neonate)	1
Long-finned pilot whale	**25**
Live Stranding (MSE)	23
Meningoencephalitis	2
Minke whale	**1**
Live Stranding	1
Risso's dolphin	**2**
Live Stranding	1
Meningoencephalitis	1
Short-beaked common dolphin	**1**
Meningoencephalitis	1
Sowerby's beaked whale	**2**
Live Stranding	2
Sperm whale	**1**
Live Stranding	1
White-beaked dolphin	**7**
Live Stranding	5
Others	1
Pneumonia: Parasitic and Bacterial	1
Atlantic white-sided dolphin	**2**
Generalised Bacterial Infection/Septicaemia	1
Meningoencephalitis	1
Killer whale	**1**
Live Stranding	1
Sei whale	**1**
Gastritis and/or Enteritis	1

Table 9: Cause of death, where established, for cetaceans necropsied Jan -Dec 2012

The most common cause of death for other cetaceans was live stranding. This is defined as morbidity and eventual mortality as a result of the cascade of physical processes invoked by becoming stranded. This diagnosis is attributed to cases where there is good clinical or pathological evidence of live stranding and no other cause can be identified which would otherwise explain the stranding, for example trauma, poor body condition or concurrent infectious disease. The large number of live strandings in 2012 can be explained by the mass stranding of long-finned pilot whales (section below). Also of note is the prevalence of meningoencephalitis identified in pelagic delphinids, in some cases attributed to *Brucella* isolation. It appears meningoencephalitis attributable to *Brucella* infection is overrepresented in this group of cetaceans. Further investigation as to this association is underway and will be reported in due course.

Figure 25 shows distribution of all known anthropogenic causes of death, defined as boat strike, entanglement or bycatch.

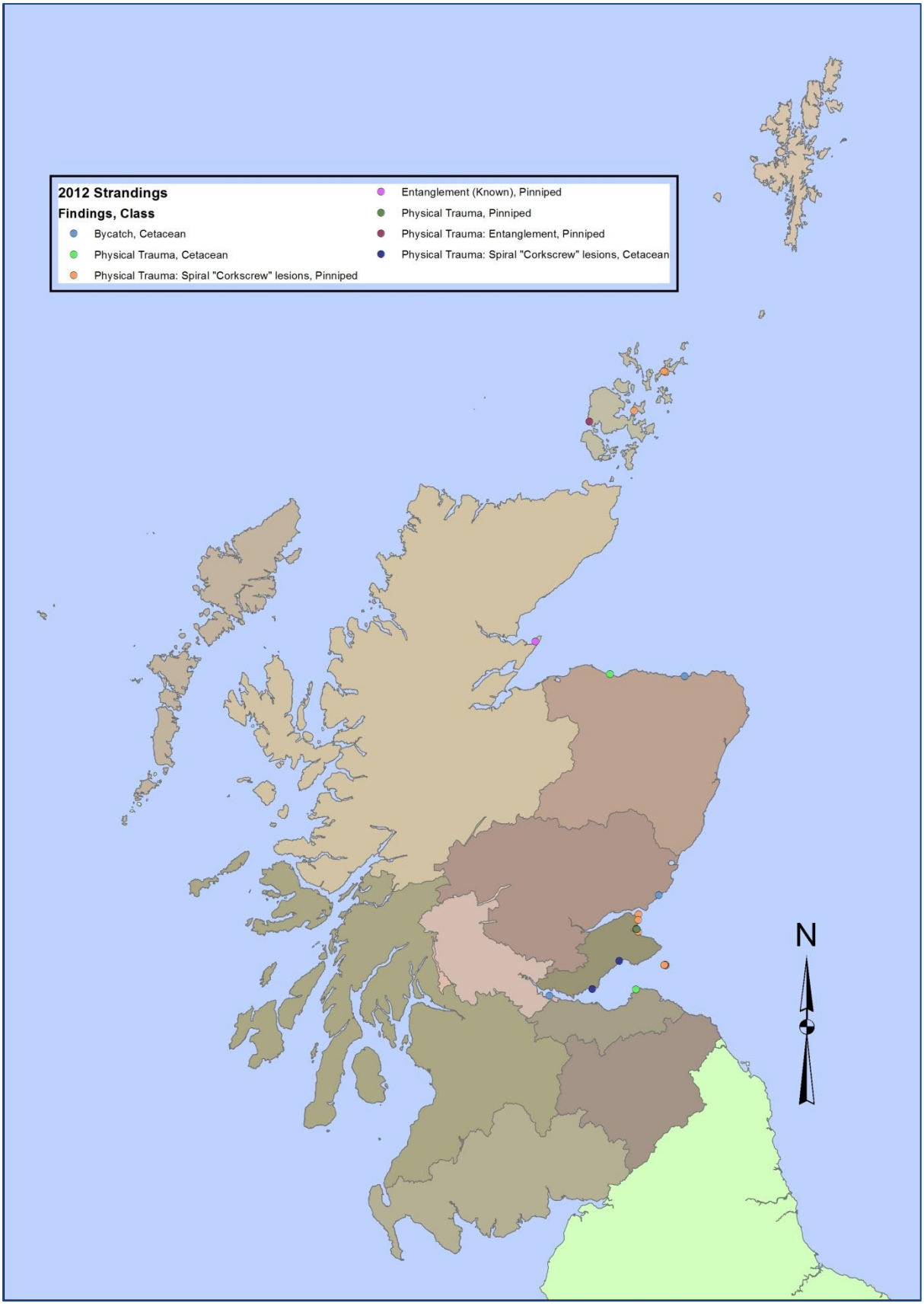


Figure 25: Anthropogenic cause of death

4.4 Mass stranding events (MSE's)

MSE's for this report are any strandings where more than one individual stranded within a relevant time scale and were not thought to be mother-calf pairs. There were five MSE's during 2012 consisting of 41 individuals. Two white-beaked dolphin MSE's and one harbour porpoise, Sowerby's beaked whale and long-finned pilot whale MSE. Figure 26 shows the total number of cetacean mass strandings since 1992. There is no obvious trend in the number of MSE's, although the average number of individuals has increased due to the two pilot whale MSE's in 2011 and 2012 which each involved tens of animals

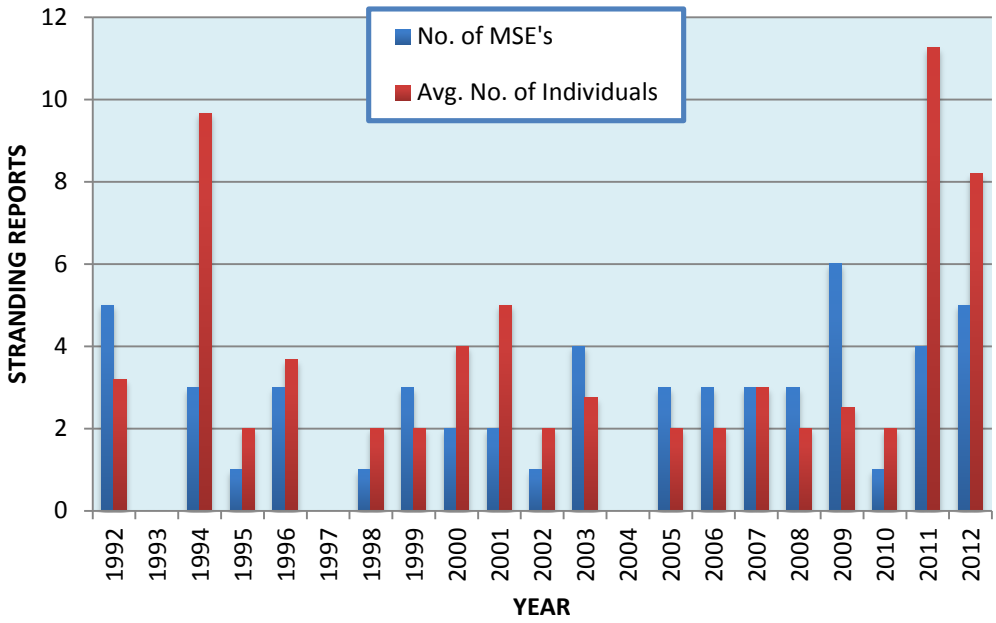


Figure 26: Total number of cetacean MSE's reported from 1992 – 2012 (blue) with the average number of individuals per MSE (red)

Species	Number of MSE's	Total number of individuals	Average number of individuals per MSE
Atlantic white-sided dolphin	**11**	**38**	**3.5**
Harbour porpoise	**10**	**20**	**2**
Killer whale	**1**	**11**	**11**
Long-finned pilot whale	**6**	**83**	**14**
Minke whale	**2**	**4**	**2**
Northern bottlenose whale	**1**	**2**	**2**
Pygmy sperm whale	**1**	**2**	**2**
Short-beaked common dolphin	**3**	**6**	**2**
Sowerby's beaked whale	**2**	**5**	**2.5**
Sperm whale	**2**	**17**	**8.5**
Striped dolphin	**4**	**8**	**2**
White-beaked dolphin	**10**	**31**	**3**

Table 10: Species breakdown of cetacean MSE's from 1992 - 2012

4.4.1 M062/12– Harbour porpoise (*Phocoena phocoena*)

Two harbour porpoises stranded on 28th February in Bo'ness, Fife. One, a female, was found dead and the other, a male, was alive but later died during transport for a refloat attempt. The cause of death in the dead animal was attributed to bycatch, while the reason for live stranding of the other animal remains unknown.

4.4.2 M256/12 – Sowerby's beaked whales (*Mesoplodon bidens*)

Two female Sowerby's beaked whales were reported on 14th and 16th August in Culross and Bo'ness, Fife. One was necropsied on site and one was brought to Inverness for necropsy. Both were found to have live stranded, most likely to have entered the relatively shallow waters and complex bathymetry of the Forth estuary which is an inappropriate location for this deep water species. A further three strandings of Sowerby's beaked whales occurred in England (South Gloucestershire, Norfolk and Yorkshire) within a few days of these strandings. The wide geographic distribution suggests a single cause is unlikely to have been responsible for all the strandings and instead may represent an increased prevalence of this species in UK coastal waters at this time.

Figure 27: M256.1/12: Sowerby's beaked whale

4.4.3 M271/12 - White-beaked dolphins (*Lagenorhynchus albirostris*)

Three male white beaked dolphins stranded on 23rd August at Ardesier in the Moray Firth. All were collected for necropsy in Inverness and were found to have live stranded and had no evidence of recent feeding. Meningoencephalitis was present in one animal suggestive of an infectious process, possibly viral; morbillivirus screening is being investigated by PCR. The reason for the other two animals live-stranding was not established but following a sick animal into the relatively complex topography of the area is a differential. There was no evidence of interactions with the bottlenose dolphin population in the area.

Figure 28: M271/12 Whte-beaked dolphin

4.4.4 M280 /12- Long-finned pilot whales (*Globicephala melas*)

Approximately 35 pilot whales stranded on 2nd September in Pittenweem, Fife. Ten of these were successfully refloated by British Divers Marine Life Rescue (BDMLR) volunteers. Twenty one died and were necropsied over the following two days with help from CSIP, SMRU and Moredun. A further three individual pilot whales stranded in the area over the following eight days, two of which were necropsied. While these cases are likely to be linked, these were treated these as separate stranding events.

A specific report into the 2012 Pilot whale mass stranding is in preparation for submission to Marine Scotland.

Figure 29: M280/12 cases from long-finned pilot whale MSE

4.4.5 M360 /12 – White-beaked dolphins (*Lagenorhynchus albirostris*)

Three white beaked dolphins stranded on 9th November on Tiree, Argyll and Bute. Two males were found dead and necropsied on site, both were found to have pathology associated with live stranding and subsequent sand and water aspiration was noted however no underlying infectious or traumatic process was obvious from gross pathology and the animals appeared to be in good body condition, with evidence of recent feeding. Histopathology results are pending. A sub-adult female was found alive and successfully refloated after several refloat attempts by locals and SMASS members. It is likely that this animal did not survive as it was in poor condition at the time of the refloat. *Brucella ceti* was isolated from one animal and the potential role of this in causing a live stranding is awaiting final histopathology screening.

4.5 Notable single strandings

4.5.1 M018/12 – Bottlenose dolphin (*Tursiops truncates*)

On 15th January an adult female bottlenose dolphin with severely worn teeth and no evidence of recent feeding stranded at the Ministry of Defence (MOD) base in Crombie, Fife. A necropsy was carried out on site. The animal was found to have live stranded age related lesions we found in the brain a combination of old age and starvation was a likely cause of the stranding. Fresh adult bottlenose dolphin strandings are very rare so this case was extremely valuable for sample collection purposes. The dorsal fin was not matched to any of the known animals from the Moray Firth population.

4.5.2 M133/12 – Sperm whale (*Physeter macrocephalus*)

On 18th May a sub-adult male sperm whale live stranded on Kirkibost Island, North Uist. Due to the location and absence of mechanical assistance, only a basic sample collection necropsy was possible. There was evidence of some recent feeding with squid beaks present in the stomach. The people who reported said that it had entered the area where it stranded on the high tide and stranded on the receding tide. Given the evidence, a navigational error is a plausible explanation for the live stranding.

Figure 30: M133/12: Sperm whale, Kirkibost, N. Uist

4.5.3 M143/12 – Killer whale (*Orcinus orca*)

On 10th June an adult female killer whale stranded in Brims'ness, Thurso. There was evidence of live stranding. The animal was in moderate/poor body condition and there was no evidence of recent feeding. Several of the teeth were found to have cavitations and associated abscesses however no significant bacterial isolates were cultured from them. One of the ovaries was active and enlarged. Starvation is a possible cause for the live stranding. Blubber samples from this animal were screened for PCB accumulation and levels were found to be significantly higher than average. This PCB work is in collaboration with Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and a CSIP publication on this will be submitted later in 2013.

Figure 31: M143-12 Orca stranding

4.5.4 M300/12 – Sei whale (*Balaenoptera borealis*)

On 12th September a sei whale was seen alive off the coast of Fife two days prior to it stranding. When investigated by members of SMRU its behaviour was suggestive of an animal that was likely to strand. On 14th September the animal was reported stranded on Arbroath beach. A full necropsy was carried out on site with the aid of the local council. The animal, a 12.75m young adult male, had moderate chronic multi-focal gastric parasitism and abscess formation caused by the Acanthocephalan parasite, *Bolbosoma turbinella* (identified by the Natural History Museum London) in the intestine. Parasitic gasteroenteritis is the most likely cause of the live stranding of this animal.

Figure 32: M300/12 Sei whale stranding

4.5.5 M333/12 – Atlantic white-sided dolphin (*Lagenorhynchus acutus*)

On 17th October an adult female Atlantic white-sided dolphin was seen swimming abnormally in Stornoway harbour, Lewis. It died after an unsuccessful refloat attempt and was sent to Inverness for necropsy. The animal was found to be in poor body condition with no evidence of recent feeding. *Brucella ceti* was isolated from several organs but most notably from the brain, meninges and the cerebral spinal fluid. Systemic Brucellosis was cause of this animal live stranding.

Figure 33: M333/12 Necropsy demonstration of AWS dolphin

Section 5: Basking shark & marine turtle

5.1 Overview

There were four reported basking shark (*Cetorhinus maximus*) strandings in 2012. None were necropsied, one was sampled and the causes of death were not established. All were on the west coast.

There was one marine turtle reported during 2012; a loggerhead turtle (*Caretta caretta*) on South Uist, it was not recovered for necropsy.

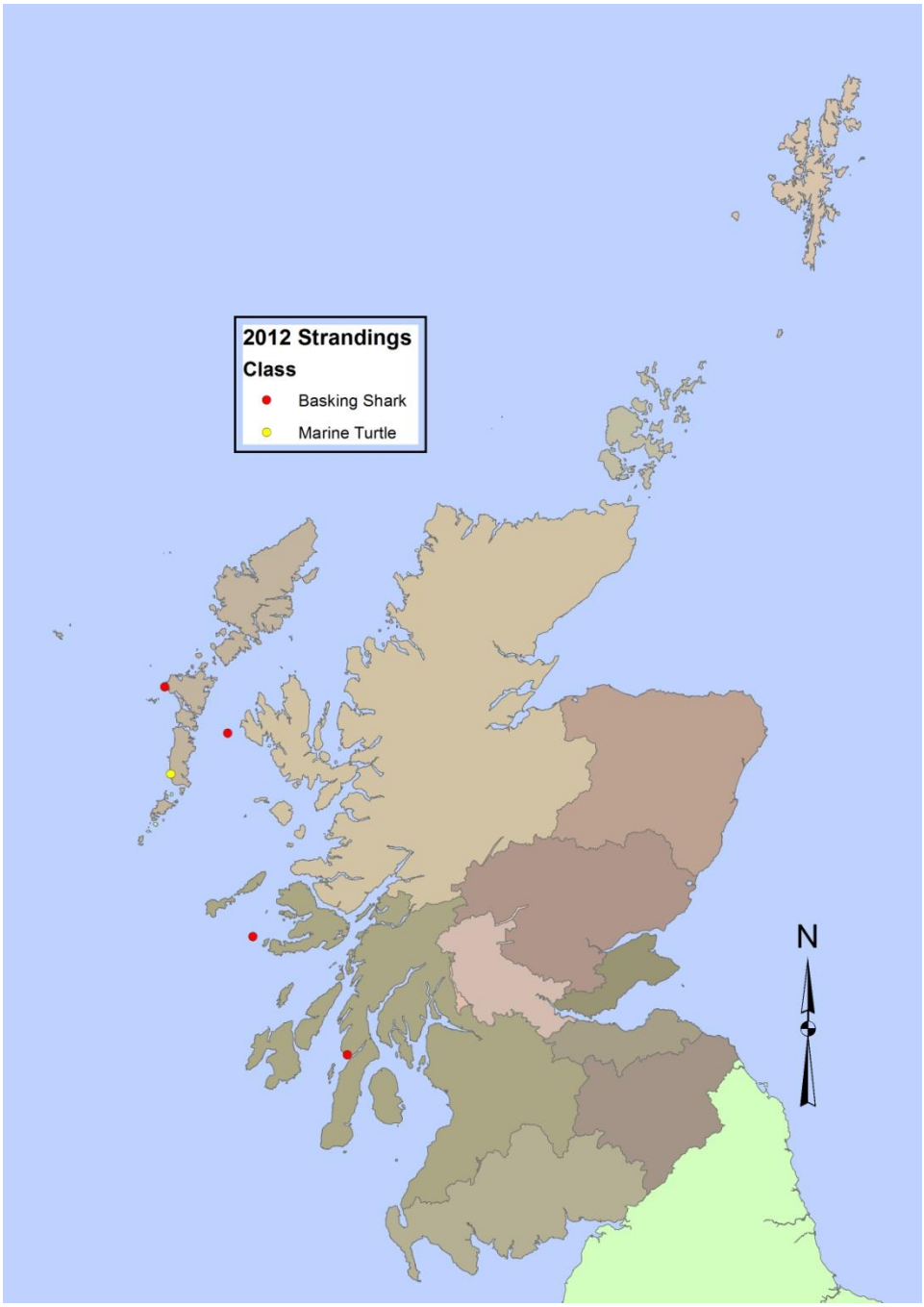


Figure 34: Basking shark and marine turtle stranding reports 2012

5.2 Trends

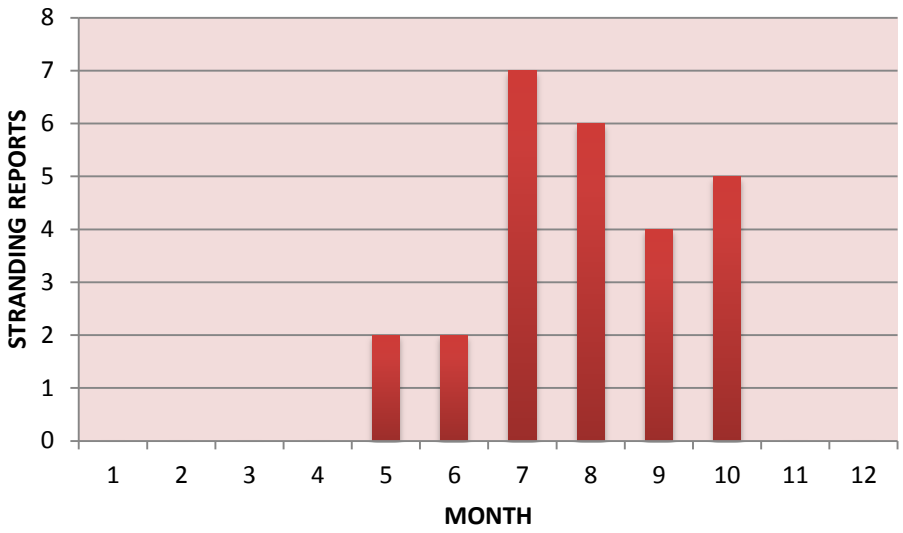


Figure 35: Basking shark monthly stranding reports 1992-2012

Monthly stranding trends for basking sharks coincide with sightings reports and the movement of the animals up the west coast of the UK (Figure 35).

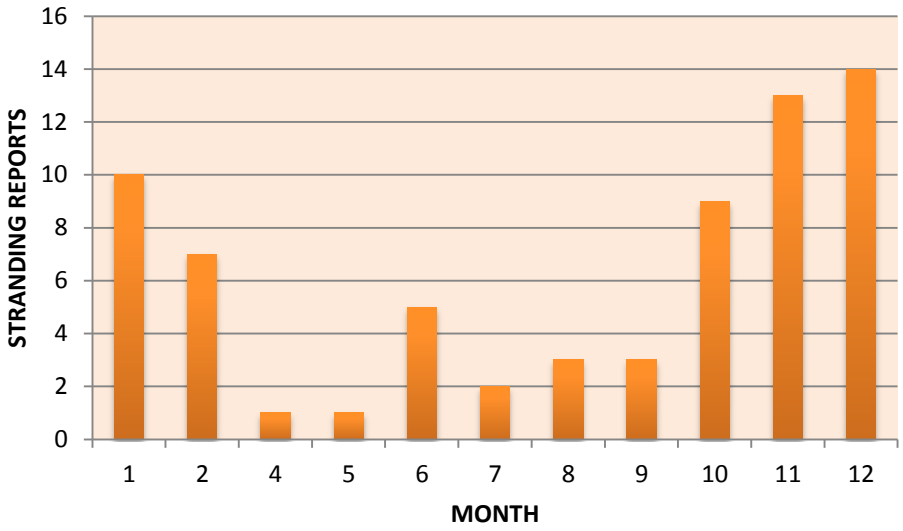


Figure 36: Marine turtle (all species) monthly stranding reports 1992-2012

Monthly trends show that most turtle strandings occur over the winter months, with the most common cause of death being cold stunned (Figure 36).

Section 6: Bacteriology

6.1 Brucella

During 2012, *Brucella ceti* was recovered from 5 cetaceans: 2 harbour porpoises, 2 white beaked dolphins, and 1 Atlantic white sided dolphin. *Brucella ceti* has been recovered from all of the aforementioned species in previous years and so the number of different host species from which Brucella has been recovered in Scotland remained at 9 cetaceans. Figures were slightly lower than for 2011, when *Brucella ceti* was recovered from 6 cetaceans, but were the same as for 2010.

There was a single isolation of *Brucella pinnipedialis*, which was made from a bearded seal. This extended the number of pinniped species from which Brucella has been recovered in Scotland to 4, as well as being the first isolate anywhere recorded from this host species. Figures were slightly lower than for 2011, when *Brucella pinnipedialis* was recovered from 2 pinnipeds and 2010, when there were 4.

6.2 Salmonella

The only Salmonella isolations during 2012 belonged to the monophasic group B Salmonella which is host-adapted to porpoises but seldom associated with disease. It was only recovered from two Scottish animals during the year. Since its discovery in 1991, this strain has been seen in porpoises during all years since, however after reaching a peak of 20 positive animals in 2005, a notable drop in isolations has occurred with an average annual incidence of 3.7 cases in the 7 years since, which contrasts with an annual average of 12 in the 7 years up to 2005.

6.3 Marine vibrios

Photobacterium damselae continued to be recovered on a regular basis, in particular from larger cetaceans, most notably in 2012, from 14 of 22 pilot whales, which had mass stranded in a single event. Other animals from which *P. damselae* was recovered included 2 white beaked dolphins, a Sowerby's beaked whale, a sei whale and a sperm whale. Three harbour porpoises were also yielded *P. damselae* in culture, reflecting the relatively lower recovery of this organism from this species.

Other vibrios recovered in 2012 included the fish pathogen *Vibrio anguillarum* from a pilot whale and *Vibrio alginolyticus* from 2 pilot whales and a sei whale.,

6.4 Plesiomonas shigelloides

Plesiomonas shigelloides is a recognized human pathogen associated in particular with food-poisoning by visitors to the Far East. It was recovered from 4 of the 22 live stranded pilot whales in 2012.

6.5 Pasteurellaceae

Actinobacillus delphinicola continues to be the most commonly isolated member of the *Pasteurellaceae* recovered from cetaceans with 7 isolations during the year made from 3 white beaked dolphins, 2 porpoises, a common dolphin and for the first time a sei whale. *Pasteurellaceae* that could not be identified as any of the species known to infect cetaceans were recovered from 2 porpoises, 2 pilot whales and a sei whale.

6.6 Streptococcus phocae

This pyogenic species adapted to seals was isolated from a grey seal and a bearded seal in 2012 as well as a porpoise.

6.7 Arcanobacterium phocae

Arcanobacterium phocae, a coryneform whose major habitat is pinnipeds, was recovered from a single grey seal. The related species *A. pluranimalium* which had first been recovered from a porpoise in 1994 and later in a deer from Sweden. has not been isolated since from a marine mammal in the years since and it is now recognized that this organism is involved primarily with infections of sheep and to a lesser extent cattle (Foster, G. and Hunt, B. (2011) Distribution of *Arcanobacterium pluranimalium* in animals examined in UK Veterinary Laboratories. Journal of Veterinary Diagnostic Investigation 23:962-964). It appears likely therefore that the original isolation of *A. pluranimalium* in Scotland was a spillover from a terrestrial animal.

6.8 Antimicrobial resistance

In 2011, a novel resistance element, designated mecC, was recognized in methicillin-resistant *Staphylococcus aureus* (MRSA) from cattle and humans. A search of historic *S. aureus* isolates at Inverness found that the same mecC element was present in a strain recovered from a seal in 1993. It is unclear how this element came to be in the seal isolate, however, it may be significant that the animal concerned was resident in a rehabilitation centre.

Following a report of a seal pup in England which had died of septicaemia due to a multidrug resistant (MDR) strain of *Klebsiella pneumoniae*, antimicrobial sensitivity testing was performed on *K. pneumoniae* isolates from seals stored at Inverness. Two strains were found to be resistant to 4 of the 6 antibiotics tested and therefore classed as MDR. Interestingly, both strains were recovered from animals which had been in rehabilitation centres.

Section 7: Outputs

7.1 Overview

In 2012 data and samples collected as part of the Scottish Marine Animal Strandings Scheme generated a total of 5 peer reviewed papers, one letter, three conference presentations, and four conference posters.

7.2 Publications

- Davison, N. J., Barnett, J. E. F., Ayling, R. D., Whatmore, A. M. and Foster, G. (2012) Isolation of Bisgaardia hudsonensis from a seal bite. Journal of Infection (letter) 64:231-232.

- Van Elk, C. E., Boelens, H., van Belkum, A., Foster, G. and Kuiken, T. (2012) Sub-species taxonomy of Staphylococcus aureus isolated from marine mammals. Veterinary Microbiology 156:343-346.

- Haase, J., Brown, D. J., Weill, F-X, Mather, H., Foster, G., Brisse, S., Wain, J. and Achtman, M. (2012) Population genetic structure of 4,12:a:- Salmonella from harbour porpoises. Applied and Environmental Microbiology 78:8829-8833.

- Paterson, G., Larsen, A., Robb, A., Edwards, G., Pennycott, T., Foster, G., Mot, D., Hermans, K., Baert, K., Peacock, S., Parkhill, J., Zadoks, R. and Holmes, M. (2012). The newly described mecA homologue, $mecA_{LGA251}$, is present in MRSA isolates from a diverse range of host species. Journal of Antimicrobial Chemotherapy 67:2809-2813.

- Robin J. Law, Jon Barry, Jonathan L. Barber, Philippe Bersuder, Rob Deaville, Robert J. Reid, Andrew Brownlow, Rod Penrose, James Barnett, Jan Loveridge, Brian Smith, Paul D. Jepson. (2012). Contaminants in cetaceans from UK waters: Status as assessed within the Cetacean Strandings Investigation Programme from 1990 to 2008.). Marine Pollution Bulletin 64: 1485-1494.

- Robin J. Law, Thi Bolam, David James, Jon Barry, Rob Deaville, Robert J. Reid, Rod Penrose, Paul D. Jepson.(2012). Butyltin compounds in liver of harbour porpoises (Phocoena phocoena) from the UK prior to and following the ban on the use of tributyltin in antifouling paints (1992–2005 & 2009). Marine Pollution Bulletin 64: 2576-2580

7.3 Conference presentations

- Andrew Brownlow, Mark Dagleish , Rob Deaville , Jamie Dyer, Geoff Foster, Ailsa Hall, Eva Krupp, Robin Law, Rod Penrose, Matt Perkins & Paul Jepson. Pilot error? Investigation into the Globicephala melas mass stranding event, Kyle of durness, northern Scotland, July 2011. European Cetacean Society annual conference Galway Ireland March 2012

- Paul Jepson, Rob Deaville, John Baker, James Barnett, Philippe Bersuder, Andrew Brownlow, Nick Davison, Tony Patterson, Rod Penrose, Matthew Perkins, Robert Reid, Mark Simmonds, Nick Tregenza, Robin Law. Investigating pollutant exposure and associated mortality in UK-stranded cetaceans (1990-2009): results of a 20 year study. European Cetacean Society annual conference Galway Ireland March 2012

- Colin D. MacLeod , Robert J. Reid, Jennifer A. Learmonth, Andrew Brownlow, Graham J. Pierce. A thermo-energetic model for cetaceans: a potential tool for calculating the biological significance of multiple and diverse anthropogenic activities. European Cetacean Society annual conference Galway Ireland March 2012

7.4 Conference posters

- Sinead Murphy, Rob Deaville , Paul D Jepson, Robert J Reid. Comparative aspects of reproductive seasonality in male common dolphins (Delphinus delphis) and harbour porpoises (Phocoena phocoena). European Cetacean Society annual conference Galway Ireland March 2012

- Ruth Fernandez, Colin C. MacLeod, Robert J. Reid, Andrew Brownlow, Paul D. Jepson, Robert Deaville, Emer Rogan, Marian Addink, Graham J. Pierce, M. Begona Santos. Stomach contents of Northern bottlenose whales (Hyperoodon ampullatus) stranded in the NE Atlantic. European Cetacean Society annual conference Galway Ireland March 2012

- Silvia Monteiro , M. Begona Santos, Marisa Ferreira, Ana Marcalo, Jose V. Vingada, Alfredo Lopez, Diana Feijo, Ana Moreno, Robert J. Reid, Andrew Brownlow, Pamela Walsham, Colin F. Moffat , Graham J. Pierce. The use of ecological tracers such as fatty acid profiles to discriminate pilot whale (Globicephala melas) population structure in Atlantic waters. European Cetacean Society annual conference Galway Ireland March 2012

- Joanna Kershaw, Andrew Brownlow, Robert Deaville, Ailsa Hall. Variability in the blubber lipid content of odontocetes with respect to body site and blubber depth: implications for estimating body condition. European Cetacean Society annual conference Galway Ireland March 2012

7.5 Media

Various interest surrounding the pilot whale MSE and Sei whale stranding, examples below:

http://www.bbc.co.uk/news/uk-scotland-19685146

http://www.bbc.co.uk/news/uk-scotland-19455719
http://news.stv.tv/tayside/190802-animal-welfare-charity-calls-for-investigation-into-whale-strandings/
http://news.stv.tv/tayside/190224-dead-baleen-whale-discovered-on-angus-beach-by-dog-walker/

7.6 Conferences/meetings

22/03/12 – ACB attended the ECS conference and presented initial findings on the 2011 pilot whale MSE.
22/07/12 ACB Presented an overview of mass strandings at the WDA/EWDA biannual conference in Lyon, France.
28/9/2012- GF Presented at mecC Symposium, Sanger Institute, Cambridge.
15/10/2012 GF Presented at Veterinary, Biomedical and Pharma Sciences Conference, Birmingham.
08/11/12 – ACB attended the UWSF meeting.
15/11/12 – BMG presented at the Scottish Marine Renewables Research Group

7.7 Volunteers, necropsy demonstrations and outreach

14/11/12 – Necropsy demo and talk for SAMS students.
16/10/12 – Necropsy demo and talk for CRRU volunteers.
10/11/12 – Sei whale baleen sent to HWDT and Macduff Marine Aquarium for demo purposes.

7.8 Website and digital media

Facebook and Twitter pages were set up in October. We post weekly stranding reports and selected photos. The initial feedback has been good and at the end of 2012 has about 250 followers.

7.9 Collaborations, data and sample requests

- Dr. Mark Dagleish,& Johanna Baily Moredun Research Institute, Pentlands Science Park, Bush Loan, Penicuik, Midlothian, EH26 0PZ, Scotland. Histopathological studies on cetacean tissues from Scottish cetaceans.
- Dr. Andrew Kitchener, Royal Museum of Scotland, Edinburgh, Scotland. Recording all marine mammal stranding events in Scotland. Marine mammal skulls and scapulae are sent to Dr. Kitchener for marine mammal morphometric studies.
- Joanna Kershaw, SMRU. Harbour porpoise and large cetacean blubber samples. Michael Bedington, SAMS. Strandings location details for tidal drift modelling.
- Silje-Kristin Jensen/Ailsa Hall SMRU. Biotoxin screening for levels of domoic acid

- Dr Eva Krupp, Aberdeen University. Metal residue analysis of tissues collected at necropsy
- Dr. Barbara Cheney, Aberdeen University. Bottlenose dolphin necropsy details for comparison with photo-id catalogue.
- Dr. Graham Pierce, University of Aberdeen, School of Biological Science, Oceanlab, George Street, Cromarty, Ross-shire IV11 8YJ. Collaboration on life history, dietary and toxicological studies of harbour porpoises and other cetaceans stranded in Scotland.
- Prof. Paul Thompson, University of Aberdeen, School of Biological Science, Lighthouse Field Station, George Street, Cromarty, Ross-shire IV11 8YJ. Collaboration on biological and genetic studies of harbour porpoises and bottlenose dolphins.
- Dr. Tom Brown, Biogeochemistry Research Centre, School of Geography, Earth and Environmental Sciences, Plymouth University, Drake Circus, Plymouth, Devon PL4 8AA, UK. Liver samples to test for regional variation in marine mammal diet determined using IP_{25} and related highly branched isoprenoid (HBI) diatom biomarkers.
- Dr. Paolo Cipriani Department of Public Health and Infectious Diseases, Section of Parasitology, Sapienza - University of Rome", P.le Aldo Moro, 5, 00185 Rome – Italy Characteriszation of parasites of the genus Anisakis from Physeter macrocephalus (and other pelagic cetaceans)
- Dr. Merel Dalebout Vice-Chancellor's Postdoctoral Fellow School of Biological, Earth and Environmental Sciences (BEES) University of New South Wales, Sydney NSW 2052, Australia. Genetic analysis of Cuvier's beaked whale
- Prof. Christina Fossi university of Siena Via Banchi di Sotto, 55, 4, 53100 Siena SI, Italy Samples sent for comparison of microplastics and pollutants in baleen whales in the Mediterranean and NE Atlantic.
- Roger Ayling, BAC5 Mycoplasma dept, Veterinary Laboratories Agency, New Haw, Addlestone, Surrey, KT15 3NB. Identification of Mycoplasma sp. isolates from marine mammals
- Lorraine Perrett, BAC3 Brucella Reference Laboratory, Veterinary Laboratories Agency, New Haw, Addlestone, Surrey, KT15 3NB. Serological studies to assess exposure to Brucella spp. and typing of Brucella isolates.
- Dr. Kevin Robinson, CRRU. Bottlenose dolphin kills on harbour porpoises in Scotland.
- Dr Conor Ryan, GMIT/IWDG. Stable isotope analysis of sei whale baleen.
- Dr. Maria Morell, Laboratori d'Aplicacions Bioacústiques. Examination of ear bones using scanning and transmission electron microscopy for indirect quantification of hearing ability in mass stranded pilot whale.
- Ingebjorg Nymo, PhD student at Norwegian Veterinary Institute, Tromso, Norway. Spent one month at Inverness where she performed bacteriological culture of marine mammals.
- Johanna Baily, PhD student at Moredun RI. Spent several weeks at Inverness where she was trained in and performed bacteriological culture from seals. A large number of samples from her project were also cultured at Inverness by SRUC staff.
- Erasmus Medical Centre, Rotterdam, the Netherlands – bacteriological culture of samples collected following necropsy of marine mammals.
- James Barnett, AHVLA. CSIP stranding work, SW England– bacteriological culture of samples collected following necropsy of marine mammals. Following the loss of

marine mammal bacteriology experience in AHVLA, SMASS now undertake bacteriology from most strandings necropsied in SW England.

- Scottish Salmonella Reference Laboratory – perform typing of *Salmonella* isolates
- Lesley Hoyles, Department of Food and Nutritional Sciences, University of Reading, Whiteknights, Reading – performs sequencing of bacterial isolates.

7.10 20 year symposium

On 31st October the Scottish Marine Animal Strandings Scheme, Marine Scotland and the National Museums of Scotland jointly held a conference celebrating 20 years of the strandings scheme. It was held in the National Museum of Scotland in Edinburgh and over 80 people from 32 different organisations were in attendance. A series of talks were given on various uses, findings and processes of the scheme. Two workshops were held in an effort to improve the efficiency of data/sample collection and increase awareness of the scheme. SMASS wish to thank all those who attended and contributed to a very successful event.

7.11 Staff

SMASS is based at the SRUC Wildlife Unit, Inverness and currently has three members of staff. Andrew Brownlow is the veterinary pathologist and has managed the project since 2009. Barry McGovern joined the team in April 2012 for a one year post. Barry completed a Masters of Research in Marine Mammal Science at St Andrews and worked for the Irish Whale and Dolphin group prior to coming to SRUC. Nick Davison joined in October 2012 as strandings administrator and brought with him over 25 years of cetacean pathology experience assisting the CSIP veterinarians at the Animal Health and Veterinary Laboratories Agency (AHVLA), Polwhele, Truro, Cornwall. Following 37 years with SRUC, Bob Reid left the project in March 2012. Bob had provided great support to the project since its inception in 1992 and we wish him well for the future.

7.12 Acknowledgements

The successful operation of a strandings project over a coastline the length of Scotland's is only possible with assistance from a large number of individuals and organisations in the identification, recovery, storage and transport of stranded animals. We are immensely grateful to all who helped us out in 2012, however particular thanks are due to the staff and students of the Sea Mammal Research Unit, the National Museums of Scotland, Colin Seddon and the team at the Scottish SPCA National Wildlife Rescue centre, British Divers Marine Life Rescue medics, Ross Flett,Whale and Dolphin Conservation (WDC), the Hebridean Whale and Dolphin Trust and Mark Dagleish and Johanna Baily at the Moredun Research Institute.

Section 8: Appendix : Glossary of terms for causes of death

Although it is sometimes not possible to arrive at a definitive cause of death for any individual carcass, a probable cause of death is ascribed wherever possible based on the collective findings from necropsy and other diagnostic investigations. Criteria used to establish selected cause of death categories are described below.

By-catch (entanglement in fishing gear) was ascribed as a cause of death in cetacean carcasses using established pathological criteria for by-catch diagnosis (Kuiken *et al*. 1994 and 1996).

Infectious Disease- a broad category consisting of a number of causes of death of infectious origin (Jepson *et al* 2005).

Live Stranding- attributed as the cause of death in cetaceans that were known or suspected (from necropsy examination) to have live-stranded in apparent good health and nutritional status. This category excluded severely diseased or emaciated animals that stranded alive (Jepson *et al* 2005).

Starvation- given as the cause of death in animals that were severely emaciated and, following necropsy examination, ascertained to have no other significant disease processes that could explain the poor nutritional status (Jepson *et al* 2005).

Starvation (neonate)- given as the cause of death in neonates that were severely emaciated and, following necropsy examination, ascertained to have no other significant disease processes that could explain the poor nutritional status. Some of these animals may have become maternally separated.

Fatal attack from one or more bottlenose dolphins- ascribed as a cause of death in cetacean carcasses using established pathological criteria (Ross & Wilson 1996, Jepson & Baker 1998).

Physical trauma (boat/ship strike)- physical trauma consistent with impact from a boat or ship. Includes blunt trauma to dorsal/lateral aspect of body wall and/or injuries consistent with propeller strike

Physical trauma (spiral/corkscrew lesion)- specific physical trauma comprising a single curvilinear lesion around the body, starting at the head and usually exhibiting significant tissue avulsion. Cause still unproven but hypothesised to be due to animal becoming drawn into ducted propellers.

Dystocia & Stillborn- attributed as the cause of death in animals which have died during the act or process of giving birth (mothers or calves)

Physical trauma (unknown origin)- where evidence of physical trauma is found at necropsy, but no obvious origin or other significant underlying factors. This category is likely to include some undiagnosed cases of boat/ship strike, by-catch or bottlenose dolphin attack.

Gas embolism- intravascular gas bubble formation that obstructs circulation and causes associated tissue injury.

Entanglement- a cause of death category largely confined to minke whales. Denotes evidence of entanglement in rope (creel etc) or discarded fishing gear/marine litter

Cold stunned- a cause of death category specific to hard shelled species of marine turtle, resulting from exposure to cold water around the UK coast, leading to immobility, hypothermia and eventual starvation

Neoplasia- where the cause of death is due to the formation of a tumour

Others- a broad category covering causes of death that cannot be categorised using existing criteria

Section 9: Appendix : Case triage

Following work undertaken as part of a scoping study to investigate options for improving the amount and quality of data collected from strandings, a triage system was developed to more formally catagorise reported cases. This broadly depends on two criteria: the degree of autolysis and the logistics of getting to the animal(s). Logistical constraints usually apply to cases where there has been a delay in the reporting or the case was reported at sea or on inaccessible islands or coastline. Autolysis and predation degrade the quality of information it is possible to glean by necropsy and an assessment is made in each case as to the value of recovering each carcass.

Carcasses are classified into three categories:

- **Category 1 –** Cases suitable for full diagnostic necropsy examination
- **Category 2 –** Cases unsuitable for full necropsy but worthy of tissue sampling
- **Category 3 -** Cases requiring the bare minimum of morphometric data

Category 1 cases are usually collected and examined by staff at SRUC or on site in the case of a large animal. Category 2 and 3 cases can be examined by intermediaries, collaborators or other third parties and increasing the involvement of this group in the stranding scheme is expected to improve the data collection from reported cases.

9.1 Triage category 1: Cases suitable for full diagnostic necropsy examination

These are cases where recovery for necropsy examination is desirable. The carcass will usually be relatively fresh and intact and in an area where either collection, or on-site necropsy, is possible. In some situations, such as trauma or entanglement cases, with rare or unusual species, carcasses in a higher state of autolysis may be given this category.

9.2 Triage category 2: Cases unsuitable for full necropsy but worthy of sampling

These cases are not suitable for full necropsy but collection of a standard set of samples and measurements are taken. These cases are usually in a more decomposed state, carcass recovery is not possible or an on-site necropsy is limited due to logistical or operational constraints, e.g. tide, access or disposal regulations. Significant value to the surveillance programme can be achieved by collecting standardised measurements and digital photographs from these cases. In addition, tissue samples for DNA and blubber toxicology are taken and frozen for archive. Sampling is usually undertaken by individuals trained in the necessary protocols and requires use of a scalpel to remove

tissues, and sometimes teeth, but not entering a body cavity. The carcass is subsequently collected for disposal by a council agency, or in some areas, left *in situ* for natural decomposition.

9.3 Triage category 3: Cases requiring the bare minimum of morphometrics data

These represent the bare minimum of data collection and are cases too autolysed or too remote for more detailed diagnostic sampling. Data in these cases is usually 'hands off' and comprises digital photographs and basic length and girth measurements. 'What, where and when' is the minimum data needed for a record in the strandings database. Speciation can be undertaken from images and in the case of animals reported as at-sea an approximate location recorded.

Figure 37 below shows the decision flowchart employed to manage reported cases in order to assess the amount of information each case is likely to yield.

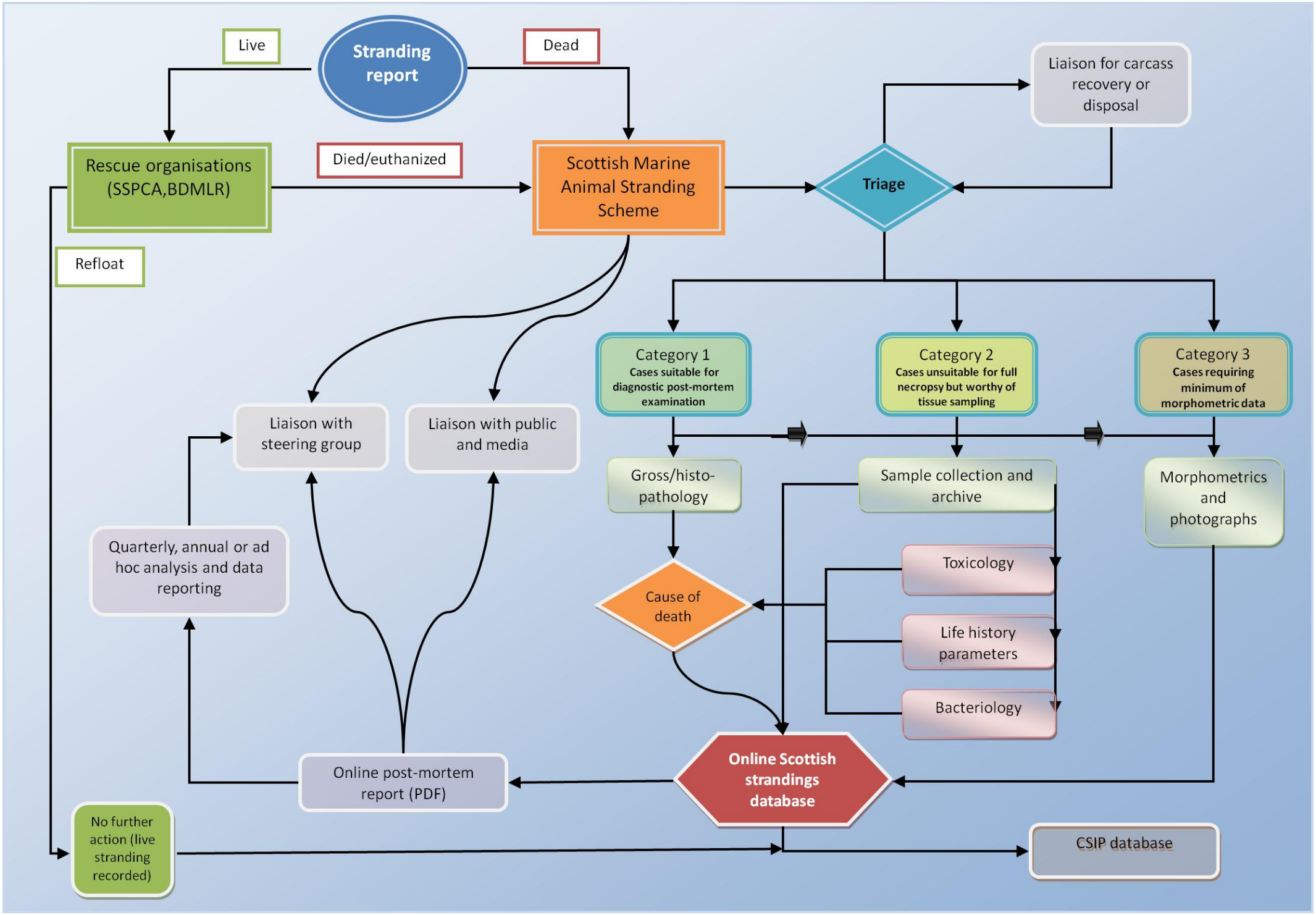


Figure 37: Triage flowchart