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Scottish Marine and Freshwater Science Vol 8 No 8

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This report presents the results of marine and freshwater scientific work carried out for Marine Scotland under external commission.

Scottish Marine Animal Stranding Scheme

Final Contract Report

1 April 2012 to 31 March 2015

for Marine Scotland, Scottish Government

Prepared by Andrew Brownlow, Nick Davison & Mariel ten Doeschate

www.strandings

SRUC

Contents

Executive Summary

From the 1st April 2012 to 31st March 2015, 1449 marine animals were reported to the Scottish Marine Animal Stranding Scheme (SMASS); 798 seals, 638 cetaceans, five basking sharks and eight marine turtles. Of these, 251 cases (17.3%), comprising 161 cetaceans, 88 seals, and two marine turtles underwent a detailed necropsy to establish a cause of death. An additional 72 (4.9%) animals were tissue sampled, comprising 59 cetaceans, 10 seals, and three basking sharks.

The harbour porpoise, (*Phocoena phocoena)*, was by far the most commonly reported species, representing 43.8% (n=280) of all cetacean strandings. In subsequent, decreasing order of incidence are the long-finned pilot whale (*Globicephala melas*) 10.8% (n=69), short-

beaked common dolphin (*Delphinus delphis*) 9.7% (n=62) and white-beaked dolphin (*Lagenorhynchus albirostris*) 5.9% (n=38). This is a change to the previous three year period where after harbour porpoise, minke whale (*Balaenoptera acutorostrata*), white-beaked dolphin and Atlantic white-sided dolphin (*Lagenorhynchus acutus*) were the most commonly recorded animal. In contrast to other UK averages, Scotland sees a significantly higher number of pelagic dolphin and whale species than any other UK region with the possible exception of a cluster of common dolphin strandings in south-west of England.

This period saw an increase in seal carcases, attributed to increased reporting effort rather than mortality. Grey seals (*Halichoerus grypus*) made up the majority of reports representing 51% of all seal strandings. Physical trauma followed byinfectious disease, primarily pneumonia were the most commonly observed causes of death.. For cetaceans the picture is more complex as it is species dependent, although live strandings, pneumonia and generalised bacterial infections are commonly diagnosed.

Scanning surveillance for threats to marine mammals has shown a new type of traumatic lesion in seals and porpoises, characterised by a single, continuous spiral cut running caudally from the head of the animal with associated flensing of the skin and blubber from the underlying musculature. Termed 'corkscrew' lesions, the number of animals exhibiting these lesions has been increasing and represents a potential cause of concern. Recent observations over the last two years however demonstrated adult male grey seals predating both grey seal juvenilesand adult harbour seals . It is therefore likely that many of these type of trauma lesions oare the result of seal attacks. More detail about this is provided in section 11 of this report. Investigations into this emerging type of mortality involved collaborations with the Sea Mammal Research Unit (SMRU) and the Royal Society for the Prevention of Cruelty to Animals (RSPCA) and demonstrated the importance of an integrated and multi-discipline approach to marine mammal research.

Since early 2013, significant effort has been put into increasing the reporting of strandings to the scheme and availability of strandings data to both the scientific community and members of the public. In early 2014 a succession of volunteer training courses were undertaken with the aim of providing the scheme with a network of trained volunteers able to visit strandings and accurately collect photographs, data and samples from animals not deemed suitable or inaccessible for collection and necropsy. This 'citizen science' programme has proved very useful and its development is ongoing.

Section 1: History of the project

Information on UK stranded cetaceans has been routinely collected in the UK by the Natural History Museum (NHM) London since 1913. In 1988 a large number of dead or moribund harbour seals were found around the coast of the UK. The Sea Mammal Research Unit (SMRU) then operated as a NERC research unit from offices based at the British Antarctic Survey in Cambridge led studies into this for the UK. At that time the SAC Veterinary Centre in Inverness was managed by a veterinary surgeon with an interest in marine mammals and became involved in the seal investigation in collaboration with SMRU and the Scottish SPCA.

It became evident that this was the first recorded outbreak of morbillivirus in seals, a virus of similar type to that causing distemper in dogs and rinderpest in cattle, and subsequently termed Phocine Distemper Virus (PDV).

In 1990 The Institute of Zoology (IOZ) in London was awarded a research contract to investigate stranded marine mammals for the UK. It soon became apparent that there needed to be local input to this project in Scotland. Therefore on 1 January 1992, the SAC were awarded a three-year research contract to coordinate and investigate marine mammal strandings in Scotland.

In 2000, the separate projects were amalgamated into a single UK strandings investigation programme under the aegis of the CSIP (Cetacean Strandings Information programme) In 2001, the investigation of UK stranded marine turtles was formally incorporated into the CSIP remit, followed by the incorporation of stranded basking shark investigations in 2007. A consortium of organisations now collaboratively record information on all cetaceans, marine turtles and basking sharks that are found stranded around UK shores each year and retrieve a proportion of these strandings for examination at necropsy.

Contiguous 3-4 year long contracts have been awarded since, and currently by Defra, Scottish Government (SG) and Welsh Government. The scheme has had a number of staff with the original project being run by Bob Reid as the coordinator and Harry Ross as the Scheme's veterinary research officer. When Harry retired, Tony Patterson and later Jason Barley took on the veterinary aspect of the project.

Since 1992 the SAC run Scottish programme (which has become known as the Scottish Marine Animal Stranding Scheme (SMASS) since 2012) undertakes the most extensive marine stranding surveillance in the UK. In addition to the cetacean stranding investigation undertaken as part of the CSIP, Scotland is unique in investigating mortalities and undertaking necropsies on dead or euthanased seals. Marine Scotland funds the major part of the SMASS and the seal surveillance in its entirety. This work is in strong collaboration with other Scottish marine science institutions and current work adheres to recommendations made in 2008 following a review of the scheme.

Section 2: Policy objectives and project descriptor

The Joint Nature Conservation Committee (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."

The second policy objective is the seal conservation and Marine (Scotland) Act 2010.

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

2.1 Project overview

The principal requirement of this project is to provide a co-ordinated approach to surveillance of marine species (e.g. cetaceans, seals, basking sharks and marine turtles) strandings and to investigate major causes of death of stranded marine animals in Scotland. In addition, the project works towards increasing awareness of the research in order to improve reporting and investigations of strandings in Scotland with the ultimate purpose of further developing a Scotland wide strandings network. Details about the Scottish Scheme can be found at strandings.org. 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

2.2 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 (approximately 20-30 cetaceans and 40-50 seals) to determine major causes of death, including by-catch, physical trauma and the incidence of disease. A wide geographical spread of necropsies should be achieved unless specified otherwise.

- To provide an overall sample of both species of seal in Scotland, including areas of harbour seal decline, to determine cause of death and any potential contributing factors.
- Continue to support relevant research organisations (e.g., SMRU, The Scottish Association for Marine Science (SAMS), University of Aberdeen) and ongoing research to investigate the occurrence of seals exhibiting spiral seal lacerations. This will involve, but not be limited to, undertaking necropsies (in accordance with established criteria), working with SMRU on field trials, and scrutinising the current scheme in terms of its ability to effectively locate, monitor and respond to strandings of seals exhibiting spiral lesions across Scotland.
- Continue to expand and maintain a Scotland-wide volunteer network to assist with identification, triage and possible measurement and sampling of cases reported to the stranding scheme and include a range of individuals and organisations. This should allow for improved depth, accuracy and efficiency in the information recoverable from strandings.

- Continue to provide training courses and necropsy demonstrations to teach volunteers how to accurately and safely collect skin and blubber tissue samples from cases otherwise unsuitable for recovery. In addition to samples, volunteers will be trained to collect morphometric and locational data and a series of digital photographs.
- Continue working towards developing a monitoring protocol for targeted areas of marine renewable activity, (e.g., Pentland Firth) which will aim to collect baseline data on marine animal strandings in the region. This should incorporate partnerships and volunteers developed in the current contract, as well as industry and conservation advisors (e.g., Scottish Natural Heritage (SNH), JNCC).
- To investigate specific cases of strandings/causes of death as requested by Scottish Government.
- To provide scientific advice to the Scottish Government as necessary about major causes of death in stranded marine mammals, including any trends or unusual events.
- To maintain a standard Scottish database for seal strandings which brings together accurate and geo-referenced information on both strandings and necropsy data. Any cetacean data should be fed into the cetacean database for the "UK Cetacean Strandings Investigation Programme" which is held by the Institute of Zoology (IoZ).Contribute to the production of strandings training material and workshop events and raise awareness through publicity.
- Ongoing review of techniques used to determine the causes of death aimed at improving their accuracy, efficiency and cost-effectiveness.
- Review options for developing an online, secure searchable archive for data derived from the necropsies and ancillary tests
- Maintain a public-facing website to provide relevant information about reported cases back to the public to maintain interest.

Section 3: Twenty- year symposium

On 31st October 2012 the Scottish Marine Animal Strandings Scheme, Marine Scotland and the National Museums of Scotland jointly held a conference celebrating 20 years of the Scottish strandings scheme. Held at the National Museum of Scotland in Edinburgh, over 80 people from 32 different organisations attended a full day event. The morning session comprised a series of talks on the findings and processes and application of the scheme. This was followed by two workshops designed to brainstorm issues for the scheme going forward: how to improve the efficiency of data/sample collection and how to increase awareness of the scheme.

SMASS wish to thank all those who attended and contributed to a very successful event. The priority areas identified for action of each workshop and the progress where they were adopted are given below.

3.1 Workshop outcomes and priority areas identified for action and progress to date:

Workshop 1: 20 years onward: Are we doing the most with the samples we take?

Brief: Are the samples collected by SMASS useful, relevant and accessible and if not what improvements need to be made

Outcome	Progress	Remaining Questions
Develop a comprehensive database to list all samples that are routinely collected at the necropsy stage	Sample archiving and indexing of frozen and preserved samples was completed by late 2014. Costs for adding this functionality to the national database is approximately £6-8,000. At present the archive indexed is held in an Excel file. The requirement for sample tracking and collation of results will form part of the next phase of database development.	Current index doesn't permit online searches of archive. Is this functionality required?
Establish procedures to ensure that all data /results generated from samples collected through the	SMASS have compiled a list of current collaborations and this and the associated	Currently samples are provided FOC on the understanding that SMASS are credited and

Outcome	Progress	Remaining Questions
SMASS are fed back into the scheme database within a reasonable timeframe.	metadata is reported in each quarterly and annual report. For significant data or sample requests a memorandum of understanding is requested between SMASS and the requesting organisation covering sample use, return of results and publication rights Results from collaborators and subcontractors are fed into the database manually at present.	given co-authorship on publications arising from the data or samples. Is this acceptable? At present there is no standard time frame for results and samples to be fed back to the scheme. The online database was developed to allow collaborators to be given selected read-write access to allow collation of results. How important is this functionality and is it a priority in phase two of the database development?
Investigate opportunities to develop the sampling approach over the next few years to meet research and policy needs. Consideration to be given to the inclusion of more photographs (e.g., pelage shots, lateral shots) and new requirements for sample collection	A general review of sampling protocols is underway to better extract information from strandings throughout Europe. In particular, SMASS have improved methods for collecting information from cases which do not get a full necropsy. This includes basic morphometrics, tissue samples and photographs. The inclusion of more photographs is already being done, with photographs from all cases uploaded onto secure cloud storage. Pelage and lateral shots of both sides of all animals and in specific cases dorsal fin shots allow for possible identification by field biologists. The first volunteer stranding course ran on the 14th of March 2014 and to date, SMASS have	Any change of approach to sampling protocol needs to happen on a local national and perhaps international basis and must reflect changes in scientific methods and policy. It is important to respond to suggestions on sampling and research where all parties feel it meets a gap in data or a specific policy need. A next step could be a discussion forum on sample collection, assessing both historic collections (are they still the best way?) and the costs and benefits of new techniques for sample collection and storage.

Outcome	Progress	Remaining Questions
	run 10 training courses and over 100 volunteers have been trained in beach sampling techniques of animals that cannot go for necropsy. *More details in Section 4*	
Consider opportunities to engage with industry and the scientific community to discuss how strandings data could be used to 1) answer specific research questions and 2) feed into EIA/SEA and ongoing monitoring programmes.	There have been several talks given at meetings and industry conferences but so far no collaborations or requests for data have been forthcoming.	There is much scope for involving the marine industry in strandings monitoring, given several common aims and requirements. Trialling active or improving passive surveillance in targeted areas presents opportunities to improve information where data gaps have been identified. This would provide better baseline data in areas proposed for subsequent development by marine industries.
Develop a mass strandings protocol drawing on data gathered in the last 20 years of the scheme, and from experiences in other countries. The protocol should consider a 'priority' list of samples to be collected at the time of stranding, analyses/investigations to be undertaken, how to ensure the preservation of life history data how to respond to repeat events. In the case of large stranding numbers, consideration should be given to the feasibility of sampling a selection of the animals.	SMASS have developed a mass stranding triage document (*see Section 8*). This is a framework document put together using the knowledge gained from the last twenty years and in particular the three large MSE's in Scotland in 2011, 2012 and 2015. Findings from these investigations helped shape the protocol and in 2016 SMASS were invirted to present these data at an international workshop on mass strandings hoted by the IWC.	Much was learnt from the three most recent large MSEs; not only what needs to be prioritised in regard to necropsying the animals but also in the importance of gathering anthropogenic impact and environmental data. There is a need for change to necropsy procedure, with particular emphasis on rapid extraction of the most labile tissues, where rapid removal and preservation of ears (for acoustic trauma) and the brain/central nervous system (for neurological disorders, infection and acoustic trauma) are important

Outcome	Progress	Remaining Questions
Consider opportunities for convening a workshop focused on responses to mass strandings/unusual mortality events.	Changes to the mass stranding investigation protocol have been extensively discussed at a UK level within the CSIP, but a wider workshop involving all stakeholders (CSIP, rescue charities, NGO groups) is awaiting outputs and recommendations from the recent IWC meeting workshop.	Managing MSE or large single strandings often requires use of effective euthanasia solutions. There is currently **no** ideal option suitable for all cases, and discussions with IWC and other interested parties in the marine rescue coalition (MARC) are ongoing to establish a working protocol. This will need to include considerations of welfare, logistics, operator and bystander safety, public expectation and media.

Workshop 2: Closing the loop: Encouraging public engagement with the Scottish marine animal strandings programme to improve reporting

Brief: What strategies could improve public engagement with the work of SMASS to improve awareness and reporting

Outcome	Progress	Remaining Questions
Review the poster campaign and consider opportunities to widen its geographical extent through: i) consideration of permanent locations where the posters can be displayed (e.g., interpretation boards, ferries, TIC's); ii) collaborations with interested organisations to improve poster distribution; iii) incorporation of the posters into publications (e.g., newsletters, magazines). Consideration of more user-friendly posters that can be easily used and digested by interested individuals / groups (e.g., postcard versions, tear off strips etc.).	A review of the poster campaign was carried out and areas of under reporting specifically the Northwest Highlands and the Western Isles were targeted. Posters have been widely distributed in tourist information offices, beach side cafe's and camping sites as well as a number of tourist attractions and a limited number of small ferries. They have also been put up in remote beaches and beach car parks. A number of posters and leaflets were also left with WDC and BDMLR volunteers who will replace missing poster and continue to distribute them in areas they deem suitable. A "QR" code has now been added to the updated version of the poster. This was though preferable to the tear off option which would necessitate regular replacement of the poster and a "QR" code can be scanned with a smart phone. The poster also appears on our website and Facebook page and twitter feed. It has also been given to Police Scotland and local councils.	Does the poster need a redesign (simpler or more eyecatching, maybe detail reduced given the availability of data online?) Advantages of deploying area-specific posters which also reference an established local contact, eg HWDT, Orkney Seal rescue

Outcome	Progress	Remaining Questions
	We are also exploring the possibility of poster's going into libraries. Poster distribution and renewal is a continual requirement, and efforts are now focused on facilitating local SMASS volunteers to distribute posters on our behalf. BDMLR and WDC volunteers have proved particularly helpful in this respect.	
Development of an 'App' for smart phones that will enable fast and effective reporting of stranded animals.	This has not been taken forward yet although funding has been sought to cover development The QR code was thought a suitable substitute. This may be resurrected with a view to looking at effort for active surveillance for the renewable industries	Development of a 'beachcomber' app to allow for active surveillance and quantification of effort is an obvious evolution of the current surveillance
Organise one or two road show events in Scotland with participation from interested individuals/organisations to increase awareness of, and engagement in, the scheme. Consider feedback on the success of the event for a possible roll out in other areas.	Talks and necropsy demonstrations have been the main outreach events. There have been a number of talks given this period, details in Section 18, Appendix 3.	
Investigate opportunities to publicise the strandings scheme more widely. These could include the outputs of the 2012 event and the	The annual reports are now published online, both on the website and Facebook page. The importance of publicising the scheme has been	Articles and blogs in both online and printed media have been proven to be a useful way of

Outcome	Progress	Remaining Questions
publication of annual reports.	made explicit in communications with the media, and most articles appearing in press during the report period have included contact details for the scheme.	reaching the public maybe produce wider briefing notes for local government departments or statutory bodies that also need to be aware of SMASS.
Target areas of improvement and identify groups and individuals that are not engaged in the scheme through the collection of additional information from individuals reporting strandings (e.g., reason for being in the area, knowledge of the scheme). This should identify areas for improvement.	The collection of additional information from individuals reporting strandings (e.g., reason for being in the area, knowledge of the scheme) was trialled for a short period however the majority of people were not inclined to give any more information than was strictly necessary. It has been discontinued.	Collection of reporter metadata useful but potentially difficult due to data protection regulations.
Review procedures for acknowledging receipt of a reported stranding, taking in consideration additional information that could be provided by SRUC that could encourage awareness of, and continued engagement with the scheme.	All new reporters who provide an e-mail address get a copy of the poster as a PDF and information on the scheme. Those who provide extra help e.g. helping to recover animals, assisting in beach side necropsies, helping to transport animals or simply request it receive a PDF copy of the necropsy findings. They are also offered the opportunity of becoming a SMASS volunteer if they are considered suitable and are in an area that needs covering.	Smartphone app and associated webpage (outlined above) would provide a way of providing information back to the reporter which may potentially be useful
Review the existing feedback sheet provided to	The existing feedback sheet provided to	

Outcome	Progress	Remaining Questions
strandings reporters. Consider relevant information that should be included to encourage greater frequency of reporting, taking into account the age range of the reporter.	strandings reporters was reviewed and deemed fit for purpose. The updated report is freely downloadable from the interactive map on www.strandings.org. This website has recently been redesigned to incorporate some of this inforamtion	
Provision of educational material (e.g., pamphlets, worksheets) to primary schools to increase awareness of the strandings scheme. Consider opportunities to work with primary and secondary schools to encourage engagement with the scheme and the strandings data (e.g., visits to coastal schools, activities linked to strandings).	A strandings event was organised with Dunbeg primary school, Oban in June 2013. This involved a talk, and interactive demonstrations, "show and tell" and an outdoor event on a local beach using inflatable models to mimic a stranding. The pupils were shown what do if they found a stranded animal.	This so far hasn't resulted into an increased number of stranding reports from this area. This is the only event that has involved a school during that reporting period. Possible links with other school groups however, or SMASS could present at science events?
Establish a Facebook page for the SMASS which can be used to raise awareness of the scheme through the provision of updates on larger, more visible strandings. Investigate whether Facebook can be used to accept reports of strandings.	A Facebook page was launched in October 2012. SMASS post regular stranding reports, selected photos and requests for information on strandings or both. The feedback has been good and at the end of May 2016 Facebook has over 4000 likes and Twitter has 309 followers. Both have proved a valuable resource for the reporting of strandings to the scheme. In June 2014, SMASS launched a Facebook group especially for volunteers which make contacting	

Outcome	Progress	Remaining Questions
	these easier when needed.	
The development of a mass stranding protocol for sampling/investigative purposes should be expanded to include a communication strategy. This strategy should consider opportunities for liaising with local councils, rescue groups and the press during the stranding response to ensure effective dissemination of information. Options for a designated co-ordinator for the duration of the stranding should also be considered.	A mass stranding protocol for sampling/investigative purposes was produced in June 2014.	
The development of a 'press pack' that can be given to the media in the event of a MSE. This would include information on procedures and timescales (for necropsy results).	The development of the press pack has been developed in conjunction with MARC (Marine Animal Rescue Colalition). It has specific emphasis on euthanasisa options for large cetaceans and will be provided to media as required in any future strandings.	Lack of euthanasia options for large whales, and certain ambiguities as to who is responsible for killing, on welfare grounds, stranded cetaceans could potentially be a issue with future strandings.

Section 4: Development of a strandings volunteer network

4.1 Section 1: Background

As part of ongoing review of surveillance methods and a specific workshop held in October 2012, the Scottish Marine Animal Stranding Scheme was asked to address specific questions about improving the data collected from animals not suitable for collection and necropsy. An initiative was developed to recruit and train collaborators and members of the public in the safe, reliable and accurate measurement and sampling of dead stranded marine animals

4.2 Introduction

It was considered likely that a significant increase in strandings surveillance and data recovery could be achieved by improving public awareness of, and engagement with the Scottish Marine Animal Strandings Scheme (SMASS). Due to the relatively specialised nature of the data collection, and obvious safety considerations, this was implemented through a trained volunteer network. The purpose of the volunteer network was therefore to enable better data and in some case samples to be taken from animals not suitable for collection and necropsy. The most efficient and effective option for this and extend the reach of the strandings scheme to all parts of Scotland was to utilise volunteers trained by SMASS to accurately identify species, photograph, collect data and samples from such cases.

4.3 Training courses

4.3.1 *Techniques and approach of the stranding volunteer course.*

4.3.1.1 Course aims and objectives

The purpose of the training day is to demonstrate how to safely and accurately collect information and samples from stranded marine animals. This involves a cetacean necropsy which is used to demonstrate what samples to take and show how we conduct a full necropsy examination. There is no expectation for the volunteers to attempt examinations at this level of detail but we hope to show how even basic sampling and data collection can be of great benefit to the scheme.

The day has a set of modules and usually run in this order;

- Arrival and HSE brief.
- 45-50 minute talk on the stranding scheme and what is expected of those who sign up as a “SMASS Stranding Volunteer”
- Post mortem examination demonstration and sampling techniques.
- Hand out certificates and tags provision of sampling kits.

Health and safety documentation is supplied to the attendees via email beforehand and they are expected to have read and understood them all before attending the course. They sign a document to confirm this prior to entering the post-mortem room or observing the necropsy. During the necropsy demonstration each potential volunteer will be given the opportunity to

take samples and measurements from the animal as they would do when asked to attend a stranding on the beach. Each potential volunteer is assessed on their abilities and only if deemed competent will a stranding kit be issued.

4.3.1.2 Kit contents

All those that pass the assessment will be issued a stranding kit which consists of:

- Lunch box containing:
- PM knife
- Sampling pots
- Sampling bags
- Rule
- Measuring tape
- Cut proof gloves
- Disposable gloves
- Scale bar
- Pen
- Pencil
- Pliers
- Biobottle (for sending samples)
- Stranding Tags and cable ties
- Field sampling guide (report form)
- Stranding posters
- Prepaid postage labels
- Reference guides for sampling and posting
- CSIP leaflet (to aid with species identification)

These kits cost around £24-26 each in materials and are designed to be small enough to be easily carried and stored in the volunteer's car. With the exception of the gloves, biobottle and cut proof gloves, most components are sourced from supermarkets or basic hardware stores.

Figure 1: Sampling kit cut resistant glove not shown.

4.3.1.3 Courses run to date

The first volunteer stranding course ran on the 14th of March 2014 and had eight volunteers.

1. 14/03/14 Stranding Volunteers training course on data collection and sampling at Inverness.

2. 27/03/14 Stranding Volunteers training course on data collection and sampling at Inverness

3. 02/06/14-04/06/2014 Stranding volunteers training course on data collection in association with WDC Shorewatch talks on Eigg, Muck & Rum

4. 31/07/14 Stranding Volunteers training course on data collection and sampling as part of a lecture seminar given at SAMS in Oban

5. 14/08/14 Stranding volunteers training course on data collection and sampling for volunteers at Inverness.

6. 25/09/2014 Stranding volunteer training day was held at Inverness for staff from SNH and the John Muir Trust.

7. 8th-9th/2/15 Stranding volunteers training course on data collection and sampling for Volunteers, to the Orkney Field Club in collaboration in Orkney over two days.

By April 2015, 70 people have attending courses, of which 68 wished to be a volunteer and were considered competent to be issued with a kit. Two people felt faint when sampling so were not issued with a kit. Both are still volunteers but only to take photographs.

4.3.1.4 Make up of volunteers

Volunteers come from quite a wide range of backgrounds, however many have some affiliation to either an NGO or university.

4.4 Engagement with scheme since training

4.4.1 *Volunteer stranding visits*

Since attending a course 48 (68.5%) have been asked to attend a stranding of those 40 (83.3%) actually went and 21 (52.5%) of those actually sampled an animal. Twenty-three (32.8%) volunteers have yet to be asked to attend a stranding. This is largely due to no cases being reported in their area of coverage.

4.4.2 *Number of sampling visits by year*

In 2014 there were 26 sampling visits by trained volunteers with seven volunteers sampling at least two animals and a further five sampling one animal. These samples were from six species of cetacean and two species of seal.

In the first part of 2015 (January to March) there were nine sampling visits by trained volunteers with two volunteers sampling at least two animals and a further three sampling one animal. These samples were from four species of cetacean. A further two sampling visits were carried out by an untrained volunteer on South Uist to sample a much decomposed killer whale and Risso's dolphin.

4.4.3 *Issues with health and safety*

Involving members of the public tissue sampling of wild animals presents a number of potential health and safety risks. As a result this component of the work is made paramount in the lecture, the demonstration and through support documentation. As of this report date no health and safety issues have been encountered with trained volunteers, however an unsolicited sample sent by an untrained member of the public leak in the post. This did highlight the need to make sure samples are correctly packaged. All our volunteers have biobottles to enable the safe transportation of samples.

4.4.4 *Volunteer engagement post training*

The most enthusiastic volunteers are those that already volunteer with other organisations such as BDMLR. Volunteers from WDC, HWDT and the countryside ranger service have also been very willing to attend strandings.

4.4.5 *Help with carcase collection*

Several volunteers have helped with the collection of carcases for necropsy, mostly in Orkney. Here they can be taken to Northwards Transport in Kirkwall and transferred into sealed containers for onward transport to Inverness..

We still have good links with SMRU and although we have no trained volunteers both students and staff will collect carcases and freeze them for later collection. A freezer provided by SMASS to Hessilhead Wildlife Rescue Trust at Beith North Ayrshire allows them to provide a similar service.

4.5 Volunteer coverage

4.5.1 *Temporal spread of volunteers around Scotland*

By the end of March 2015 SMASS has a total of 70 trained stranding volunteers mostly on the east and west coasts. There are two volunteers on Shetland and Eigg. There are also three volunteers on Mull (all HWDT staff). There is one on the North West coast and also a single volunteer on Lewis. A number of SAMS students and staff have also been trained providing coverage in the Oban and Argyll areas. We have good coverage in the Forth of the Firth area and around the Aberdeenshire and Tayside coasts this is complimented by staff from SMRU. We have a trained volunteer on Kintyre who has proved invaluable to us by attending and sampling strandings along the entire Kintyre peninsula. There are now 22 trained volunteers on Orkney.

4.5.2 *Untrained samplers*

We have at present four people who have historically taken samples for the scheme. None of these have attended a training course; this is due to their remote locations. We hope at some point to address this and at some point formally train them. We have partially addressed this by providing them with a Biobottle, field sampling guide (report form), prepaid postage labels and reference guides for sampling and posting. Nevertheless their remote locations provide us with data and samples from animals we would otherwise get very little to no information from. There locations are one on Islay, two on South Uist and one on Lewis.

Figure 2: Map showing strandings volunteer network as of April 2015. Blue pins are volunteers not trained to sample.

4.6 Ongoing work

This programme is continuing and since March 2015 courses have been held for Mull, Skye the north coast, Ayrshire and Shetland. People are recruited mainly through social media and the courses have proved very popular. In light of the courses we have run already and the engagement of those already trained as volunteers it has been necessary to be somewhat selective as to who we train. In the first instance we look for people who live in or close to an area where at present we have no coverage. It has become apparent that some of the student applicants just use the training as a positive contribution to their CV and once trained disappear. We have a much better engagement from those who are already volunteering with NGO's like WDC or BDMLR.

Section 5: Marine species strandings around the Scottish coast (2012-2015)

5.1 Strandings overview

From the 1st April 2012 to 31st March 2015, 1449 marine animals were reported to the Scottish Marine Animal Stranding Scheme (SMASS); 798 seals, 638 cetaceans, five basking sharks and eight marine turtles. Of these, 251 cases (17.3%), comprising 161 cetaceans, 88 seals, and two marine turtles were necropsied to establish a cause of death. Additionally a further 72 (4.9%) animals were sampled, comprising 59 cetaceans, 10 seals, and three basking sharks.

Section 6: Necropsies

Carcases are subjected to a standardised cetacean necropsy within 24 hours of being reported where possible (Kuiken T. & Hartman M.G. 1991). Those that cannot be examined within that period are either chilled for up to a week or if not possible frozen at -20°C. A wide range of tissue samples, including whole brain, thyroid, lungs, heart, liver, spleen, kidney, adrenal, mesenteric lymph node, urinary bladder, testis and skeletal muscle are taken for histopathology, bacteriology, toxicology and virology.

6.1 Selection of samples for necropsy

Figure 1 show the spatial distribution of strandings, of all species, which were taken for necropsy. For each species subclass this section then shows density maps of regions where, in relation to the total number, there are respectively high densities of either necropsied or non-necropsied strandings.

Strandings are collected for necropsy based on a number of factors with condition of the carcase being the most significant. Carcases with condition score 3 or greater, indicating a significant amount of autolysis with the carcase bloating and skin peeling, are not routinely collected as the additional value added from necropsy is considered to be limited. Whilst significant effort is made to minimise the bias to the data of convenience sampling those carcases easy to collect on account of location or logistics, it can be seen there are regions of the country where less necropsies have been undertaken. Photographs, morphometrics and collection of tissues for archive are usually attempted for cases where a full necropsy is not possible or justified based on autolysis.

Regions with a good proportion of cetacean recoveries include Highland, Fife, Strathclyde and Fife. Not surprisingly, more inaccessible regions fare less well, in specific the west coast, Orkney and the Uists. Seal necropsy tends to be lower than cetaceans and this can be attributable to a greater number of reports of autolysed carcases unsuitable for necropsy rather than logistical constraints.

Table 1: Number of animals reported to SMASS (April 2012 – March 2015)

Species	2012 (Apr – Dec)	2013	2014	2015 (Jan – Mar)	TOTAL
Cetaceans					**638**
Harbour porpoise (*Phocoena phocoena*)	42	126	100	12	**280**
Long-finned pilot whale (*Globicephala melas*)	41	12	14	2	**69**
Short-beaked common dolphin (*Delphinus delphis*)	5	9	31	17	**62**
White-beaked dolphin (*Lagenorhynchus albirostris*)	12	13	13		**38**
Minke whale (*Balaenoptera acutorostrata*)	9	7	11		**27**
Striped dolphin (*Stenella coeruleoalba*)	3	9	4	5	**21**
Sperm whale (*Physeter Macrocephalus)*	3	5	6	4	**18**
Risso's dolphin *(Grampus griseus*)	5	4	2	3	**14**
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	2	3	5	1	**11**
Bottlenose dolphin (*Tursiops truncatus*)	3	4	3		**10**
Cuvier's beaked whale (*Ziphius cavirostris*)	1	1	6	2	**10**
Sowerby's beaked whale (*Mesoplodon bidens*)	2	4	2		**8**
Northern bottlenose whale (*Hyperoodon ampullatus*)	2		2		**4**
Killer whale (*Orcinus orca*)	1		1	1	**3**
Humpback whale (*Megaptera novaeangliae*)	1		1		**2**
Pygmy sperm whale (*Kogia breviceps*)		1	1		**2**
Beluga whale (*Delphinapterus leucas*)			1		**1**
Sei whale (*Balaenoptera borealis*)	1				**1**
Fin whale (*Balaenoptera physalus*)		1			**1**
Cetacean (indeterminate species)	9	8	11		**28**
Dolphin (indeterminate species)	5	5	3	1	**14**
Short-beaked common dolphin/striped dolphin (indeterminate species)	1		1	4	**6**
Lagenorhynchus (indeterminate species)	3				**3**
Baleen whale (indeterminate species)	4		1		**5**
Pinnipeds					**798**
Grey seal (*Halichoerus grypus*)	104	116	143	45	**408**
Harbour seal (*Phoca vitulina*)	33	43	55	5	**136**
Hooded seal (*Cystophora cristata*)	1		1		**2**
Seal (indeterminate species)	75	55	103	19	**252**
Others					**13**
Basking shark (*Cetorhinus maximus*)	3	1	1		**5**
Leatherback turtle (*Dermochelys coriacea*)			5		**5**
Kemps Ridley turtle (*Lepidochelys kempii*)			1	1	**2**
Marine turtle (indeterminate species)		1			**1**
GRAND TOTAL	**371**	**428**	**528**	**122**	**1449**

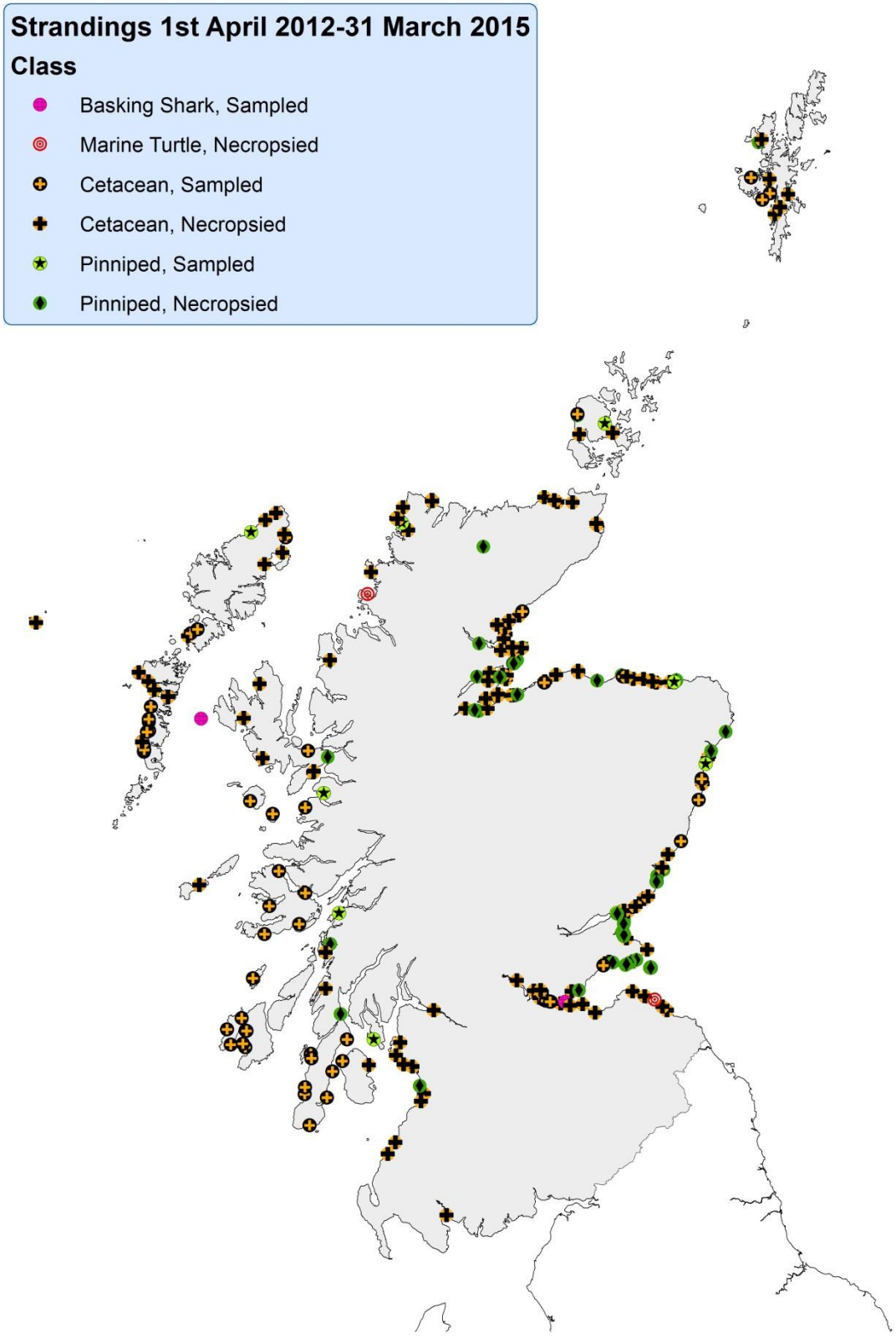


Figure 3: Map showing strandings sent for necropsy or for which tissue were sampled.

6.1 Necropsy protocol

Examination of all cetacean or seal carcases was conducted to a standardised protocol. Establishing a cause of death is attempted on every case taken to necropsy. The final diagnosis is made by a veterinary surgeon with experience of marine pathology and is based on the findings of gross necropsy supported in most cases by ancillary serological, bacteriological and histopathological tests.

The necropsy provides the gross pathology data used to establish a cause of death and quantify burden of disease and various additional samples are collected as part of the protocol. In addition to tissues taken for bacteriology and histopathology, a standardised array of tissue samples are archived at -20^{0}C. Gonadal tissues, teeth (for age determination) and stomach contents are collected and used by other research projects. Skeletal material from all marine carcases necropsied in Scotland is donated to National Museum of Scotland (NMS) for inclusion in the research collection. This all supports a broad range of multidisciplinary scientific research activities and collaborations, maximising the information gained from each stranding incident.

Table 2: Summary of stranded animals showing total necropsied, sampled and not necropsied. (April 2012 – March 2015)

Species	Sent for Necropsy	Sampled	Not Examined	TOTAL
Cetaceans				**638**
Harbour porpoise (*Phocoena phocoena*)	68	21	191	**280**
Long-finned pilot whale (*Globicephala melas*)	29	4	36	**69**
Short-beaked common dolphin (*Delphinus delphis*)	8	10	45	**62**
White-beaked dolphin (*Lagenorhynchus albirostris*)	16	1	21	**38**
Minke whale (*Balaenoptera acutorostrata*)	6	3	18	**27**
Striped dolphin (*Stenella coeruleoalba*)	5	1	15	**21**
Sperm whale (*Physeter Macrocephalus)*	3	3	12	**18**
Risso's dolphin *(Grampus griseus*)	4	2	8	**14**
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	1	5	5	**11**
Bottlenose dolphin (*Tursiops truncatus*)	4	1	5	**10**
Cuvier's beaked whale (*Ziphius cavirostris*)	1	4	5	**10**
Sowerby's beaked whale (*Mesoplodon bidens*)	6		2	**8**
Northern bottlenose whale (*Hyperoodon ampullatus*)	3		1	**4**
Killer whale (*Orcinus orca*)	2	1		**3**
Humpback whale (*Megaptera novaeangliae*)	1		1	**2**
Pygmy sperm whale (*Kogia breviceps*)	1		1	**2**
Beluga whale (*Delphinapterus leucas*)		1		**1**
Sei whale (*Balaenoptera borealis*)	1			**1**
Fin whale (*Balaenoptera physalus*)	1			**1**

Cetacean (indeterminate species)		2	54	**56**
Pinnipeds				**798**
Grey seal (*Halichoerus grypus*)	59	5	344	**408**
Harbour seal (*Phoca vitulina*)	29	3	104	**136**
Hooded seal (*Cystophora cristata*)		1	1	**2**
Seal (indeterminate species)		1	251	**252**
Others				**13**
Basking shark (*Cetorhinus maximus*)		3	2	**5**
Leatherback turtle (*Dermochelys coriacea*)	2		3	**5**
Kemps Ridley turtle (*Lepidochelys kempii*)			2	**2**
Marine turtle (indeterminate species)			1	**1**
GRAND TOTAL	**250**	**72**	**1127**	**1449**

6.2 Necropsy overview 2012-2015

Between April 2012 and March 2015, 250 cases underwent necropsy to establish a cause of death. This comprised of 161 cetaceans (18 species), 87 seals (29 harbour seals, 58 grey seals) and two marine turtles (both leatherbacks). This is a decrease in the number of harbour seals but an increase in the number grey seals when compared to the previous reporting period. Unlike the last reporting period there were no hard shelled turtles examined. Table 2 shows the number of strandings necropsied by species. Harbour porpoise were the most common cetacean examined (43%). This is a lower percentage than in the previous project period with a drop of around 10%. There has been an increase in the number of species other than harbour porpoise of around 20% to 57% of the total examined when compared to the previous period. This can be explained by the increased number of long-finned pilot whales examined, which is probably partly due to the MSE in 2012. Long-finned pilot whale was the second most commonly examined species during this period and accounted for 18% of the necropsies. The number of white-beaked dolphins also doubled making them the third most commonly examined species during this period and accounted for nearly 10% of the necropsies. There was a significant drop in the number of Atlantic white-sided dolphins necropsied with only one examined during this period compared to seven in the previous reporting period. The numbers of the other species examined was broadly similar to the previous reporting period with the exception of Sowerby's beaked whale which tripled. There were six species necropsied that did not appear in the previous reporting period; fin whale, sei whale, pygmy sperm whale, humpback whale, killer whale and Cuvier's beaked whale.

6.3 Cause of death categories

6.3.1 *Live stranding*

Evidence from clinical history or pathology suggesting the animal was alive when it stranded. Stranding and loss of buoyancy confers a range of pathological changes including impaired respiration, tissue trauma, hyperthermia and metabolic acidosis. Lung congestion

and hyperinflation, muscle bruising and necrosis, metabolic acidosis and renal failure are usual indicators. Simple external indicators for those not seen to live strand include abrasions to the beak, leading edge of the pectoral fins and tail flukes, beach material in mouth oesophagus and stomach, ventral bruising and rigor if really fresh.

6.3.2 *Bycatch*

Death due to incidental capture in fishing gear. Pathology usually characterised by healthy animals in good condition, evidence of recent feeding with lung pathology consistent with anoxic drowning (stable foam in bronchi and trachea). Sometimes net marks visible on fins, flukes or flank occasionally trauma to beak, removal of tail flukes and rarely fractures to vertebrae.

6.3.3 *Entanglement*

Usually only applies to large whales (particularly minke and other mysticetes) and leatherback turtles. Animals are often seen with gear still wrapped around their bodies, usually flukes and fins but occasionally through baleen plates in the mouth. Acute cases similar to bycatch, sub-acute cases result in exhaustion and impaired feeding. Chronic cases often very thin and debilitated and show chronic wounds caused by abrasion and pressure from entangled equipment.

6.3.4 *Bottlenose Dolphin (BND) attack*

Usually seen in porpoise from in regions with sympatric bottlenose dolphin *(Tursiops truncatus)* and is characterised by extensive trauma, rake marks on epidermis, fractured ribs or axial skeleton and/or internal injuries such as ruptures to internal organs. This cause of death is also documented in neonatal/juvenile bottlenose dolphin (commonly referred to as infanticide) and other cetacean species.

6.3.5 *Grey seal attack (cetaceans).*

Seen in harbour porpoise from regions with large sympatric grey seal *(Halichoerus grypus)* populations and is characterised by extensive trauma to blubber and underlying musculature. Often large sections of tissue (both blubber and muscle) are removed particularly the back muscle either side of the spine. Puncture marks through blubber often around the head and throat area. Blubber and skin often stripped of resulting in missing tissue and flaps of blubber. The internal organs and skeleton are often intact in very fresh cases. Rake marks in blubber and microhaemorrages in the tissue also indicators.

6.3.1 *Grey seal attack (pinnipeds), spiral or "corkscrew" seals.*

A diagnosis of corkscrew trauma is confirmed by the presence or absence of a number of attributes; a single linear lesion (one or more rotations), areas of skin or tissue missing, evidence of skeletal trauma and avulsion of one or both scapula. The lesion typically begins at the mouth with punctate lesions on muzzle. Rake marks in blubber and/or undermining of blubber are particular features and need to be distinguished from necropsy scavenging.

6.3.2 *Meningoencephalitis*

A diagnosis reached by histopathological examination of the brain showing lesions consistent with either suppurative or non suppurative meningoencephalitis or meningitis. This can have either a bacterial, viral or unknown aetiology.

6.3.3 *Pneumonia*

A broad diagnosis meaning that death was predominantly caused by severe lung pathology and consequent respiratory compromise as a result of one or several respiratory pathogens. Either one or several bacterial, fungal, or parasitic (verminous) respiratory pathogens can be involved occasionally the aetiology is unknown.

6.3.4 *Starvation*

Starvation is diagnosed when there is evidence that recent feeding activity or fat stores were inadequate to provide sufficient energy, resulting in physiological compromise and death. Adequate fat stores are essential for buoyancy, thermoregulation and hormone physiology, so starvation also includes cases where impairment of these factors appear to have been significant contributors to the death.

6.3.5 *Not established*

Insufficient data to reliably come to a single diagnosis, reasons include an incomplete sample range, carcase autolysis, inconclusive test results or simply the case did not display known patterns of pathology.

Section 7: Cetacean species found stranded in Scotland

The atlas of cetacean distribution in north-west European waters (Reid et al 2003) lists 25 species of cetacean that occur or have occurred in this region. There were 638 cetaceans reported to SMASS comprising 19 species from along the Scottish coastline during the period of this report. Fifty-five animals (8.6%) could not be identified to species level. Details of the species stranded are given below together with a notable single stranding. These are notable for reasons either of species, pathology or because they highlight a particular issue.

It is clear that the strandings dataset and tissue archive is has an important role in answering both specific questions on cetacean and seal biology but also questions about general ecosystem health, new and emerging diseases and the impact of climate change. SMASS are therefore committed to building collaborations with institutions working in these fields.

7.1 Harbour porpoise (*Phocoena phocoena*)

This is the most commonly stranded cetacean in Scotland with a total of 280 cases, which is 43% of the total amount of cetaceans reported. For Scotland, and indeed the whole of the UK, this is an increase of 27% on the number from the previous final report 2008-2011. The 1994 Small Cetacean Abundance in the North Sea and Adjacent waters study (SCANS) estimated a North Sea population of approximately 280,000 harbour porpoises, making it the most numerous cetacean species. This is a small cetacean typically 1.4m to 2m in length and are most often seen in small groups close to shore. They tend to be inconspicuous and

don’t often approach boats. Additionally most will float if they die at sea, which is a likely contributing factor to the high frequency of reported strandings for this species.

Characteristics:

- Feed on small fish such as gadoids, whiting, herring and sand eels.
- Calves born April to August
- Strand all year round with an increase from February towards a peak in March and April
- The most common cause of death in Scottish waters is attack by bottlenose dolphins

There is a strong and consistent seasonality in numbers of strandings with increasingly more strandings between February and April, after which numbers decrease throughout the summer months to a more constant low level between September and January (see figure 4). A small increase is also observed in June, which coincides with the calving season and is likely due to the contribution of neonate mortality which is largely absent throughout the rest of the year. In the reporting period, 69 individuals were sent for necropsy (25.6%), and another 21 were sampled by trained stranding volunteers (7.8%). The remaining 190 were either too inaccessible or too decomposed for any further examination to be carried out. The most commonly observed cause of death was attacks by bottlenose dolphins, with 20 of the necropsied cases (29%) attributable to this category of physical trauma. Sex was determined for 112 carcases (41.5%), with 58 female and 64 male individuals.

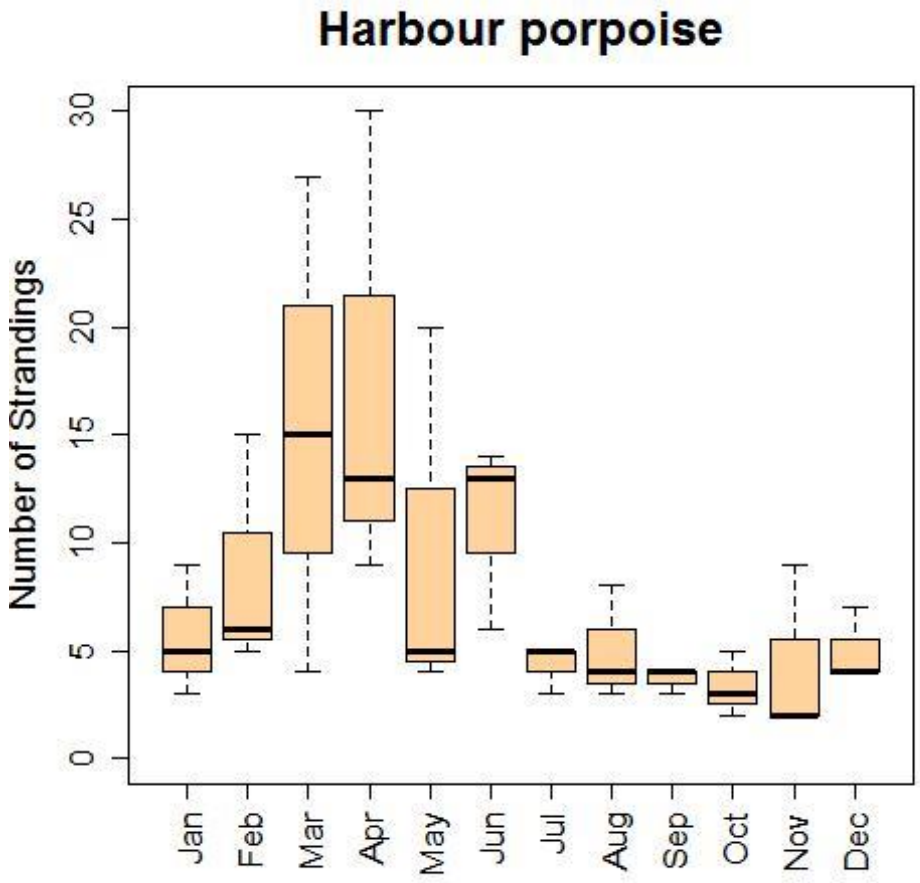


Figure 4 Boxplot of monthly variation in numbers of Harbour porpoise (*Phocoena phocoena*) strandings reported from April 2012 – March 2015

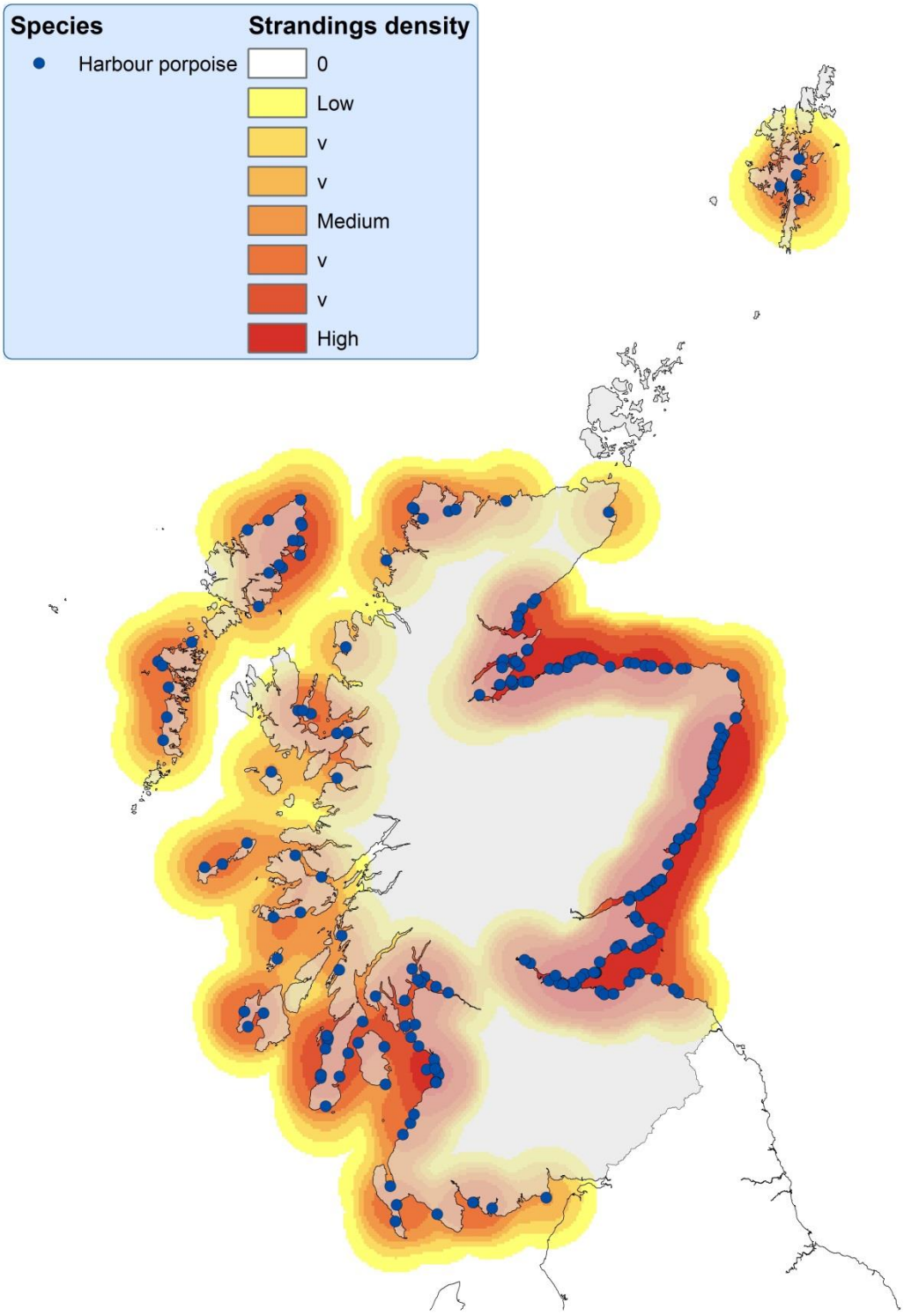


Figure 5: Distribution map of Harbour porpoise (*Phocoena phocoena*) strandings April 2012 – March 2015

The harbour porpoise dataset is unique amongst stranding species in that it is large enough to enable valid inference about the traumatic, toxic, metabolic and infectious processes at work on both this species and, potentially, coastal marine species in general. In this regard the use of porpoise as disease sentinels of marine health is potentially very valuable. Initial data inspection shows a clear spatial heterogeneity of cause of death, although much less of a temporal tend over time. This is being analysed in more detail and collaborations developed to incorporate the strandings data, pathology and disease burden analysis with life history and ecological parameters to investigate trends in more detail.

Table 3: Causes of death of harbour porpoises (*Phocoena phocoena*) examined at necropsy (April 2012 – March 2015)

Cause of death	2012	2013	2014	2015	Grand Total
Infectious Disease	**5**	**4**	**2**		**11**
(Meningo)encephalitis		1			1
Generalised Bacterial Infection/Septicaemia	2	1	1		4
Others			1		1
Pneumonia: Parasitic	2	1			3
Pneumonia: Parasitic and Bacterial	1				1
Pneumonia: Unknown Aetiology		1			1
Not Established	**1**				**1**
Not Established	1				1
Other	**7**	**9**	**2**	**2**	**20**
Dystocia/Stillborn	1		1		2
Live Stranding	2	6	1		9
Others				1	1
Starvation	3	3			6
Starvation (Neonate)	1				1
Starvation/Hypothermia				1	1
Trauma	**8**	**17**	**11**	**1**	**37**
Dystocia/Stillborn	1		1		2
Entanglement			1		1
Physical Trauma	1	3	1	1	6
Physical Trauma: Bottlenose Dolphin Attack	4	10	7		21
Physical Trauma: Bycatch	1	4	1		6
Physical Trauma: Spiral "Corkscrew" Lesions	1				1
Grand Total	**21**	**30**	**15**	**3**	**69**

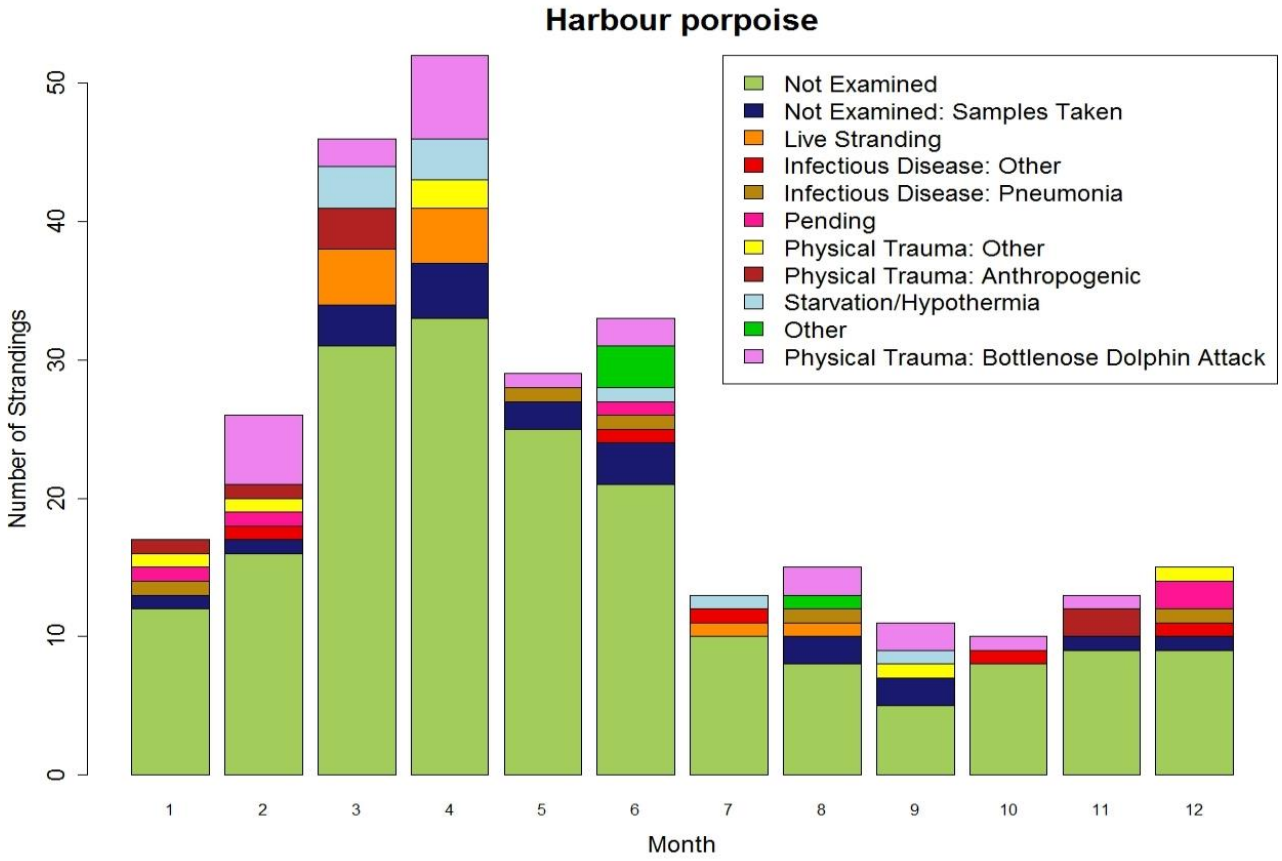


Figure 6 Total number of Harbour porpoise (*Phocoena phocoena*) strandings per month by findings (April 2012 – March 2015)

Example case: M38.2/14 Harbour porpoise (*Phocoena phocoena*)

This juvenile male harbour porpoise was one of two found dead at St. Cyrus, Angus on 16/02/2014. It was examined as part of a volunteer training event at SAMS. It was an archetypal BND attack with multiple extensive rake marks over most of the body. There was extensive sub-cut bruising and fractures to the entire right rib arcade. Fractures were also noted in the right scapula and three of the left ribs. All fractures had associated haemorrhages. The blubber thickness was thin and there were only scant ingesta in the cardiac stomach. There were also two granulating lesions on the tail stock. The cause of death in this animal was attack by bottlenose dolphins.

Figure 7: M38.2/14 Harbour porpoise (*Phocoena phocoena*) showing external lesions typical of a BND attack. © Caroline Weir.

7.2 Bottlenose dolphin (*Tursiops truncatus*)

This species accounted for 1.5% (n=10) of the cetaceans reported. Exactly the same number as reported in the previous reporting period. Photo Identification studies indicate a resident population of around 195 animals on the East coast of Scotland. There is also a second smaller population on the west coast of around 45 animals and a small population of around a dozen of animals centred around Barra with movement between these populations and outside these regions. The individuals in the bottlenose dolphin population surrounding Scotland are the biggest of any population of bottlenose dolphins, with the largest animals reaching 3.5 metres in length and approaching 300kg in weight.

Characteristics:

- Feed on fish such as mackerel, tuna, mullet but also squid with a tendency to take the most abundant prey
- Calves born between the months of May and October, with a peak during August
- There is no observed seasonality to their strandings
- There is no common cause of death in this species

In contrast to several other species, Tursiops tend not to be positively buoyant when freshly dead, so most cases are either live strandings or autolysed. Four animals were sent for necropsy (40%), one was sampled (10%), and the remaining five (50%) were not further examined. Sex was determined in five animals (50%), with two female and three male individuals.

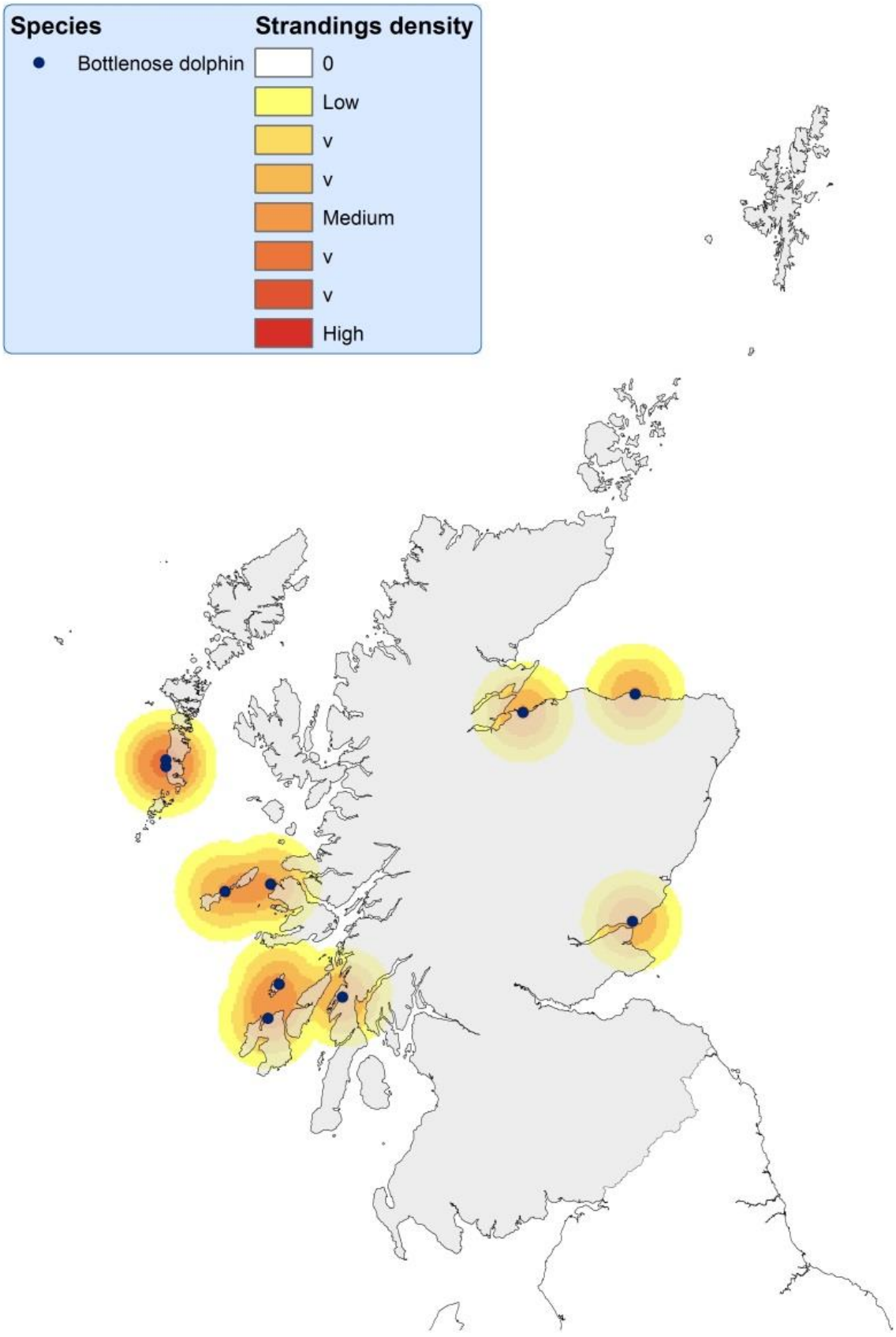


Figure 8: **Distribution of Bottlenose dolphin (*Tursiops truncates)* strandings April 2012 – March 2015**

Table 4: Summary of Bottlenose dolphins (*Tursiops truncatus*) examined at necropsy (April 2012 – March 2015)

M number	Date Found	Location	Sex	Age group	Cause of Death Category
M251/12	12/08/2012	Grampian	F	Neonate	Not Established
M133/13	23/04/2013	Strathclyde	M	Sub adult	Live Stranding
M193/14	21/07/2014	Grampian	F	Adult	Infectious Disease
M262/14	15/09/2014	Tayside	M	Sub adult	Not Established

Example case: M133/13 Bottlenose dolphin (*Tursiops truncatus*) This sub-adult male bottlenose dolphin was in thin body condition and showed indication of having live stranded and aspirated significant amounts of fluid. Traces of silt were present in the airways and the lungs were heavy and congested. In addition an abnormal volume of haematogenous fluid was in the thoracic cavity. Other organs were grossly unremarkable, the parasite burden was low and there was no indication of trauma apart for healing rake marks consistent with same-species aggression. There was no indication of recent feeding and the stomach contained largely silt and fluid, scant nematodes and volcano lesions. The brain was grossly unremarkable. The ears were not examined in detail. Bacteriological examination revealed only necropsy invaders. Histology revealed a severe, sub-acute to chronic, primarily cerebral, lymphocytic meningo-(polio) encephalitis, a severe, chronic-active, multi-focal mixed inflammatory cellbroncho-interstitial pneumonia, and a severe, chronic, generalised eosinophilic lymphadenitis and moderate, chronic-active, generalised hepatopathy. The severe brain lesions are the most likely ultimate cause of death in this animal. Although the nature of the lesions was not dissimilar to those found in neuro-brucellosis; the distribution is significantly different being primarily in the cerebrum. The pulmonary lesions were probably a combination of parasite infestation with secondary bacterial/viral involvement despite no parasite profiles being found. This is supported by the eosinophilic nature of the lymphadenitis of the pulmonary associated lymph node. The similar lesions observed in the mesenteric lymph node suggest a degree of hepatic/intestinal parasitism. The morphology of the adrenal gland is suggestive of severe chronic active stress or a severe endocrinopathy and those in the liver of a possible viral/toxic process. This animal had severe systemic disease resulting in lesions in many organs. No dolphin morbillivirus (DMV) RNA or herpes virus DNA detected by real time PCR.

Figure 9: M133/13 Bottlenose dolphin (*Tursiops truncatus*).

7.3 Long-finned pilot whale (*Globicephala melas*)

This species accounted for 10.8% (n=69) of the cetaceans reported. This was the second most commonly reported cetacean after the harbour porpoise. Although this is possibly due to two mass stranding event (MSE) involving this species during this period; one in Pittemween involving 31 individuals, and one in Portmahomack involving three animals, making a total of 34 individuals. Despite the bias introduced by the two MSE events, this is an increase in numbers compared to the previous contract period, when only 16 were reported in total. This species of dolphin is one of the largest with males exceeding 6m in length. The species inhabits the deep waters north of Scotland and south-east of the Faroes with most records from water deeper than 200m. They are the species most likely to mass strand.

Characteristics:

- Feed on squid, particularly *Todarodes sagittatus*, *Gonatus sp*. and *Illex sp*, and occasionally fish such as Mackerel
- Calving occurs in the summer months
- There is no obvious seasonality to their strandings in Scotland
- The most common cause of death in Scottish waters is live stranding

Of the 31 animals involved in the mass stranding at Pittemween; ten were refloated and 21 were subject to necropsy. From the mass stranding in Portmohomack one individual could be refloated whilst two individuals died and were necropsied (see detailed information in notable mass strandings section below). Six of the single stranded cases were subject to necropsy (17.1%), four were sampled (11.4%), and the remaining 25 were not further examined (71.5%).

Sex was determined in 17 of the single stranded cases (with eight female and nine male individuals), and 23 of the individuals involved in the mass strandings (with 15 females and eight males). This means that from the total of 40 animals for which sex was recorded, there was a relatively equal distribution of males (42.5%) and females (57.5%).

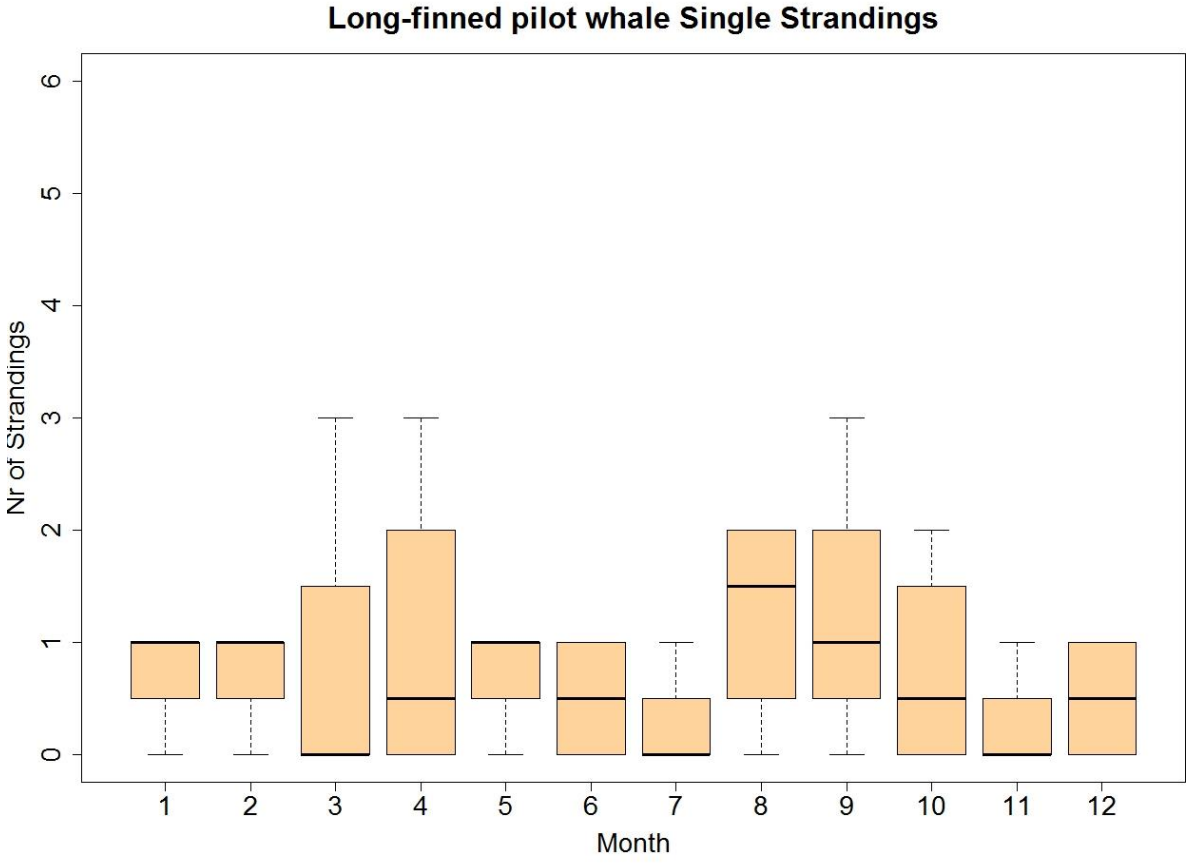


Figure 10: **Boxplot of monthly variation in total number of single stranded Long-finned pilot whales (*Globicephala melas*) reported from April 2012 – March 2015**

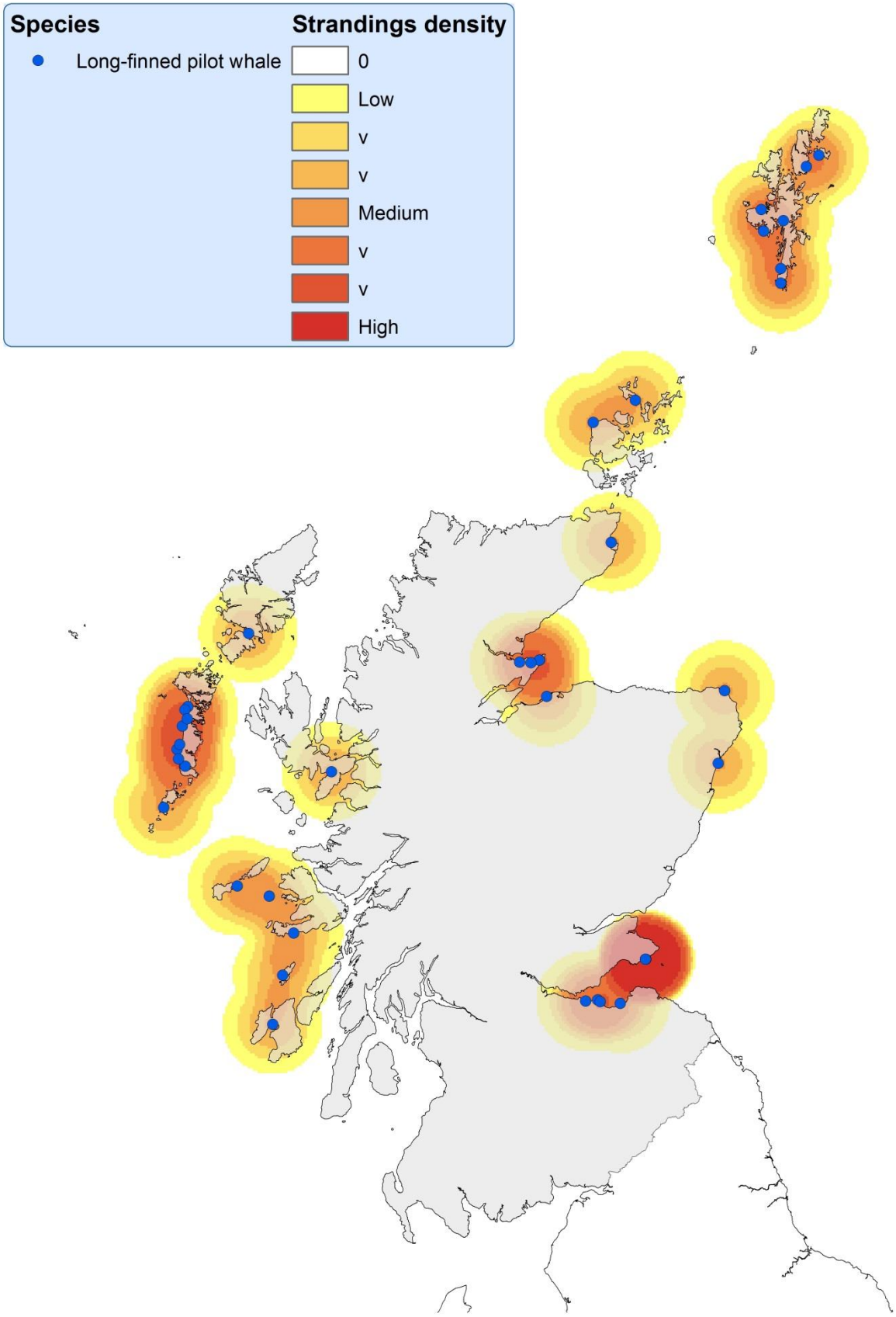


Figure 11: **Distribution map of Long-finned pilot whale (*Globicephala melas*) strandingsfrom April 2012 – March 2015**

Table 5: Summary of single stranded Long-finned pilot whales (*Globicephala melas*) subject to necropsy examination (April 2012 – March 2015)

M Reference	Date Found	Location	Sex	Age Group	Cause of Death Category
M100/12	02/04/2012	Highland	M	Adult	Live Stranding
M281/12	03/09/2012	Lothian	F	Adult	Infectious Disease
M288/12	08/09/2012	Fife	F	Juvenile	Live Stranding
M19/13	22/01/2013	Grampian	M	Subadult	Infectious Disease
M288/13	03/09/2013	Lothian	M	Subadult	Live Stranding
M316/14	25/10/2014	Highland	M	Subadult	Live Stranding

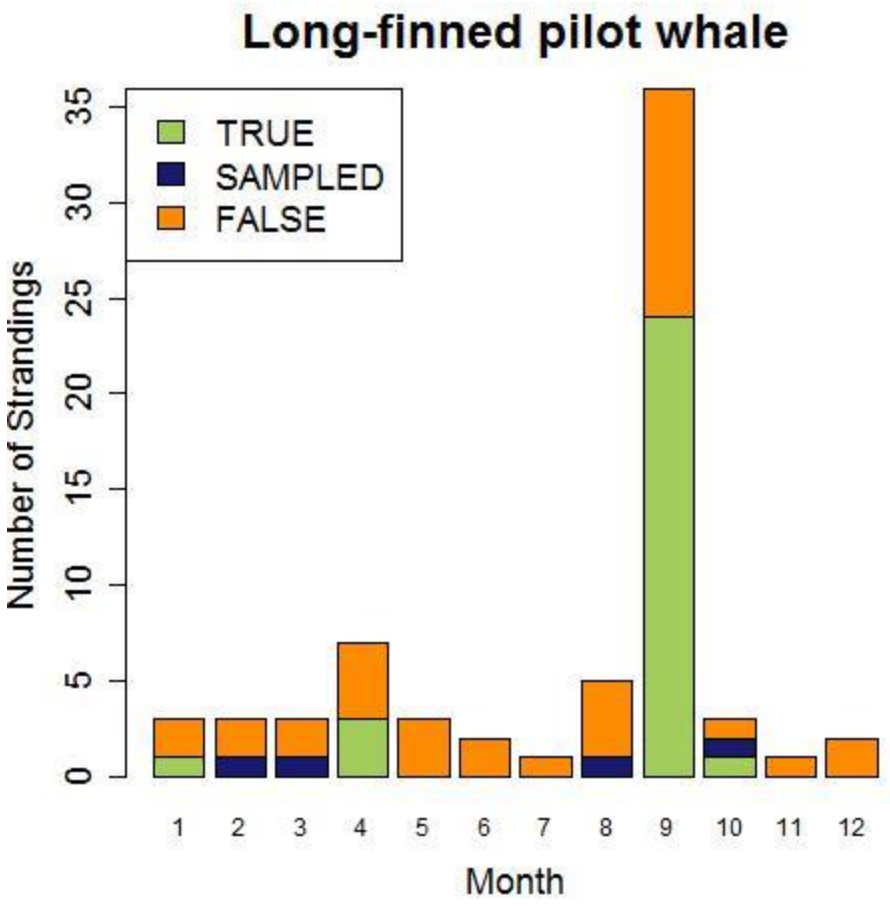


Figure 12: Total number of long-finned pilot whale (*Globicephala melas*) strandings, including both single strandings and mass stranding events, per month stacked for findings (April 2012 – March 2015)

Example case: M19/13 – long-finned Pilot whale *(Globicephala melas)*

A sub-adult male long-finned pilot whale was found dead stranded at Balmedie beach Aberdeenshire on the 22nd of January, it was in thin body condition and appeared to have agonally live stranded. The bladder was full and contained a large amount of dark red urine, possibly indicative of myoglobinurea. Ventral musculature did not appear grossly abnormal; however the kidneys appeared large and oedematous. Similar gelatinous oedema was noted in flank subcutis. The lungs were asymmetric, with some possible aspiration of stomach fluid into left lung. The gastrointestinal tract was empty, only containing bile stained fluid. No otiliths or squid beaks were noted. The brain appeared abnormal with large, dilated ventricles and there was an excess of cerebral spinal fluid (CSF). *Brucella ceti* was isolated in profuse pure growth from the CSF and scant pure growth from the brain. Histopathology confirmed a morphological diagnosis of severe, sub-acute to chronic generalised lymphocytic meningoencephalitis, as seen in other pelagic delphinids. The brain lesions are entirely consistent with brucellosis. This is the first reported case of Brucella associated meningoencephalitis in this species. This is now published: *Davison, et al 2015 First report of Brucella ceti-associated meningoencephalitis in a long-finned pilot whale Globicephala melas. Diseases of Aquatic Organisms 116; 237-241 doi:10.3354/dao02926.*

Figure 13: M19/13 long-finned pilot whale (*Globicephala melas*).

Example case: M316/14 – long-finned pilot whale (*Globicephala melas*)

This sub-adult long-finned pilot whale was found live stranded on mudflats and died before rescue could be attempted. Lung asymmetry, congestion, blood pooling in liver and significant and extensive bruising on the flank indicate a prolonged and possibly multiple live stranding processes. The myoglobinurea also suggests this. The occipital joint was fused over the right condyle with green, caseous and necrotic material within eroded and softened bone. The brain was autolysed but appeared abnormal around the brainstem. A section of cervical vertebrae was taken to assess the degree of invasion into the bone. Cultures of the CSF produced a mixed growth of E.coli, Edwardsiella hoshinae and Brucella ceti and a pure growth of Brucella ceti from the necrotic material from the atlanto-occipital joint. The *B.ceti* isolate is significant and points towards a Brucella associated arthritis and meningoencephalitis. Histology showed moderate chronic multifocal lymphoplasmacitic meningitis. These findings, although severely compromised by autolysis of the tissues examined at histology, are consistent with neurobrucellosis. This was only the second time this condition has been recorded in this species.

Figure 14: M316/14 long-finned pilot whale (*Globicephala melas*)

7.4 Sperm whale *(Physeter macrocephalus)*

This species accounted for 2.8% (n=18) of the cetaceans reported. This was the seventh most commonly reported species during this reporting period, with numbers almost

doubling compared to the previous reporting period. All the animals for which a sex has been recorded in the database have been male. Male sperm whales occur in deep waters north and west of Scotland and sightings are usually between July and December. Adult males can measure over 18m and weigh 57,000kg. The longest in the SMASS database was measured as 14.3m, and only one animal has ever been weighed at 26.600kg. Sperm whales are large and very iconic animals and they present quite a logistical problem as they decompose very rapidly inside once dead, this and there size often means a cause of death is often difficult to establish.

Characteristics:

- Feed primarily on mesopelagic squid, *Gonatus fabricii* is the most important prey item in the North Sea but octopus also has featured
- Calving, which does not occur in Scottish waters, is in the summer months
- There is no obvious seasonality to their strandings
- The most common cause of death is the significant crushing injuries sustained by live stranding

Three animals were sent for necropsy during this contract period (16.7%), another three were sampled (16.7%), and the remaining 12 cases (66.6%) were too decomposed for further examination.

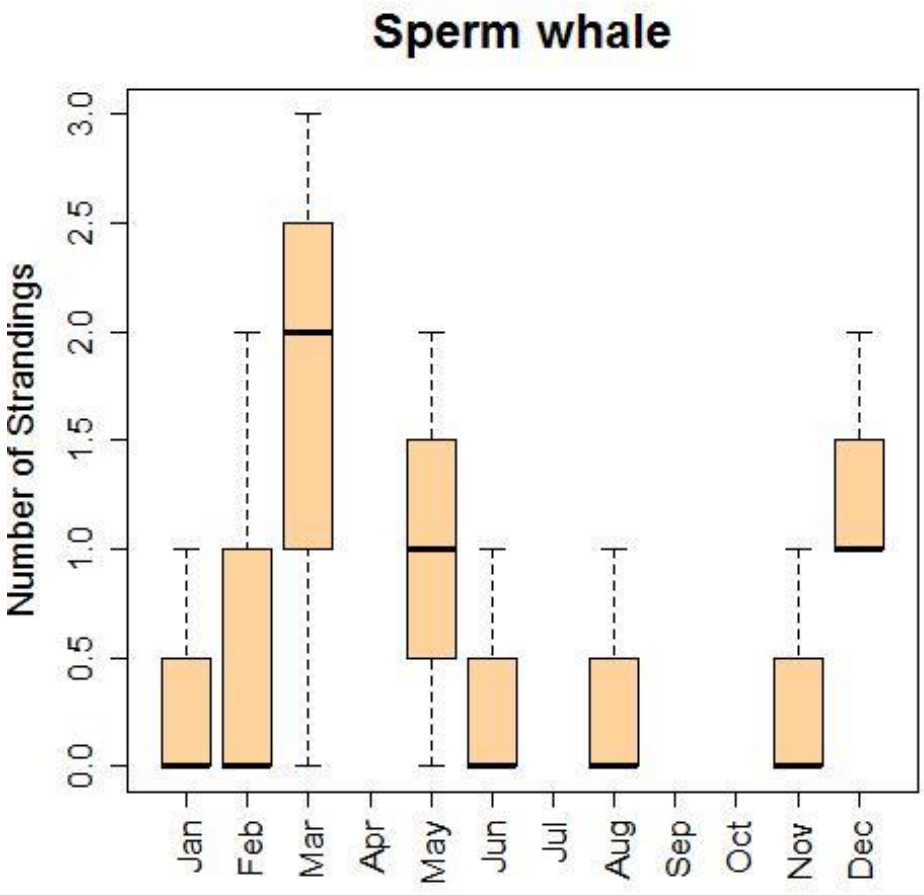


Figure 15: Boxplot of monthly variation in total number of stranded Sperm whale (*Physeter macrocephalus*) strandings reported from April 2012 – March 2015

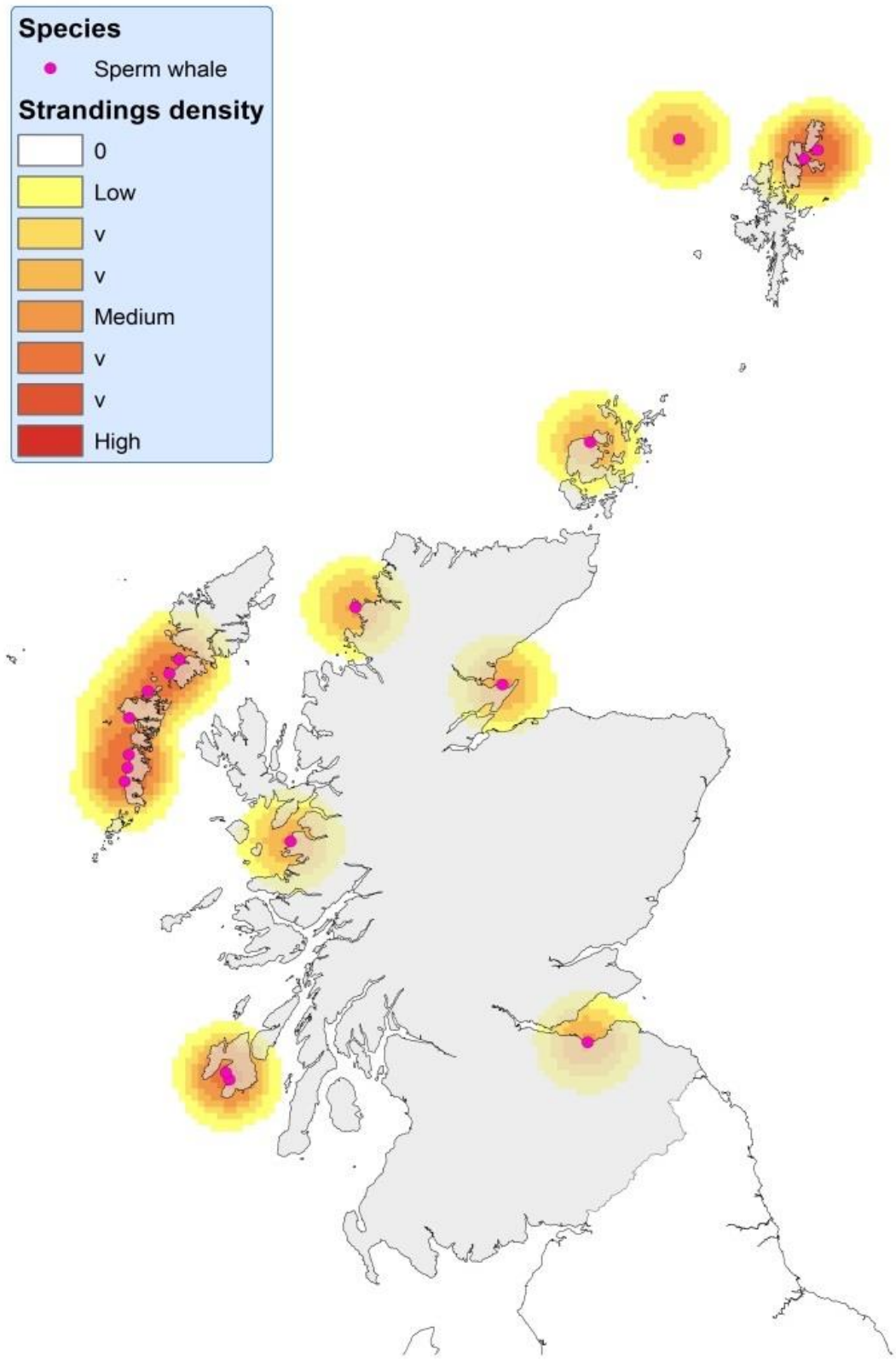


Figure 16: Distribution of Sperm whale (*Physeter macrocephalus)* strandings April 2012 – March 2015

Table 6: Summary of Sperm Whales (*Physeter macrocephalus*) examined at necropsy (April 2012 – March 2015)

M Reference	Date Found	Location	Sex	Age Group	Cause of Death Category
M133/12	18/05/2012	Western Isles	M	Subadult	Live Stranding
M11/14	11/01/2014	Lothian	M	Subadult	Live Stranding
M434/14	17/12/2014	Highland	M	Adult	Live Stranding

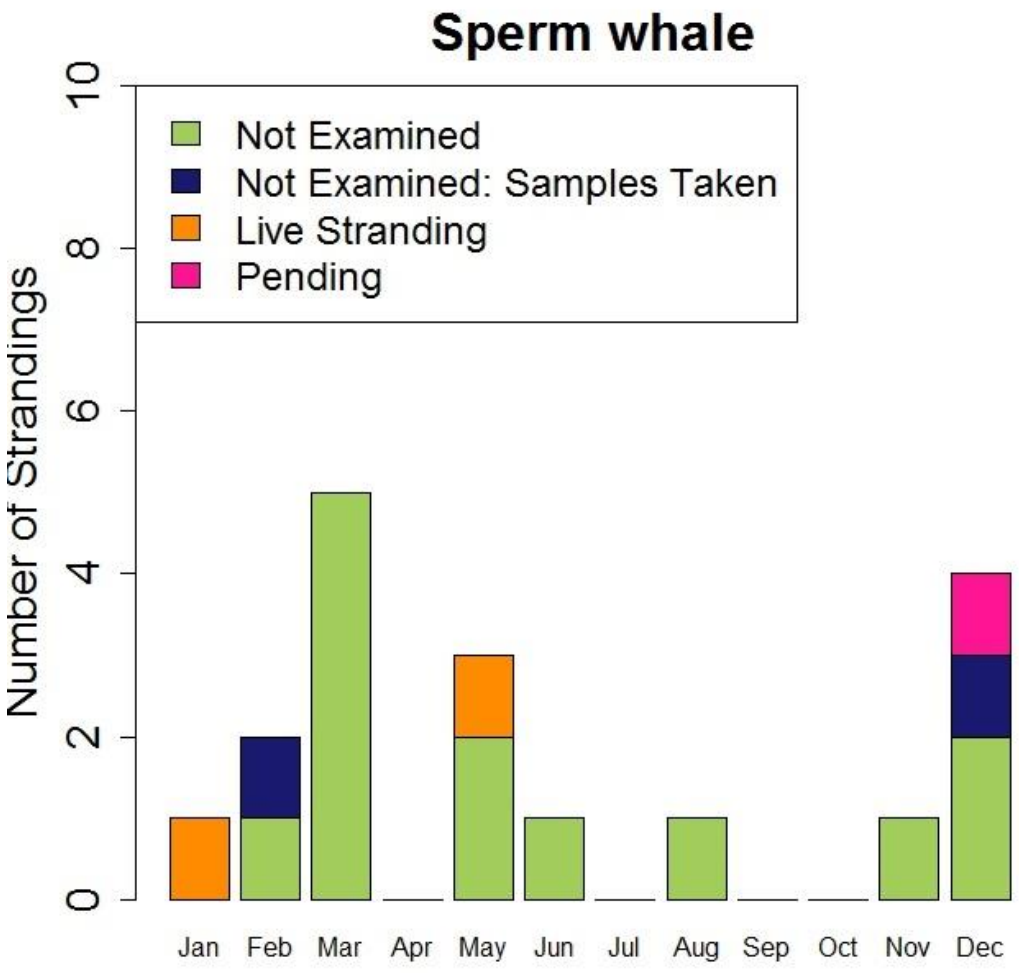


Figure 17: Total number of sperm whale (*Physeter macrocephalus*) strandings, per month stacked for findings (April 2012 – March 2015)

Example case: M11/14 – Sperm whale (*Physeter macrocephalus*)

This sub-adult male sperm whale was reported dead stranded in left lateral recumbency on Joppa beach, Edinburgh at dawn on 11th January 2014. Photographs appeared to show significant amounts of blood from the mouth and bruising around the throat grooves and ventral midline. Due to the logistics of recovery and disposal, the carcase was towed back to sea on the midday tide the following day and taken to Burntisland port, from where it was recovered from the water by crane and placed in a closed-sided vehicle for transport to landfill. A necropsy was undertaken on 13th January at the Viridor landfill site at Dunbar. The carcase was at least 54 hours dead at the point of necropsy and significant skin sloughing and bubbling was underway. There were identifiable conspecific rake marks over the head, but no indication of anthropogenic trauma. There was some external trauma but it appeared attributable to the stranding process, ventral bruising and trauma to the head and mouth would be consistent with live stranding. The tongue appeared to be lacerated, possibly due to teeth damage during stranding. Due to the logistical issues of necropsy and the size of the animal, samples were taken from the abdominal cavity and through the diaphragm into the thorax. Tissues were in a moderate to advanced state of autolysis, with loss of structure to the liver and kidney and significant gas autolysis of the musculature and serosal layers of intestine. The stomach contained over 1kg of squid beaks, on average 3-4cm long, but no evidence of recent ingesta. Stomach and intestines contained bile-stained mucus with no significant chyme of digestive fluid, indicating the animal had not fed for several hours, possibly days prior to stranding. It is probably this animal live stranded and this led to its death. Bacteriological was not undertaken and histological sampling was limited due to the autolytic nature of the carcase; teeth and squid beaks and toxicological and DNA samples were collected for subsequent analysis.

Figure 18: M11/14 sperm whale (*Physeter macrocephalus*) on route to landfill site.

Example case: M434/14 – sperm whale (*Physeter macrocephalus*)

This adult male sperm whale was found dead stranded on a shallow sand beach off the Ministry of Defence (MOD) Tain bombing range. There was an area of tissue missing from the right dorsal musculature sagittal and caudal to the dorsal fin, extending 3 – 4 meters along the flank. Visceral tissues including intestines appeared to have been ejected from this defect. A significant amount of white yellow waxy turbid material was evident around the lesion. The nature of this material is not clear, possibly solidified lipid or pus. Sampling the abdominal organs was not rewarding due to autolysis and difficulty accessing them without any mechanical assistance. The suspected source of the tissue defect are rupture following autolysis and gas build up either I) at an area of weakness due to abscessation, or II) at a region of weakness due to trauma (e.g. boat strike). At 1435cm this animal is the longest of this species necropsied by the SMASS team.

Figure 19: M434/14 sperm whale (*Physeter macrocephalus*)

7.5 Pelagic delphinids (excluding long-finned pilot whales)

This group, excluding long-finned pilot whales, accounted for 23.6% (n=151) of the cetaceans reported. Figure 20 shows the number of strandings per month by species and provides a summary overview of the pelagic delphinids (excluding long-finned pilot whales) sent for necropsy. Figure 21 shows the spatial distribution of strandings per species around the coast of Scotland.

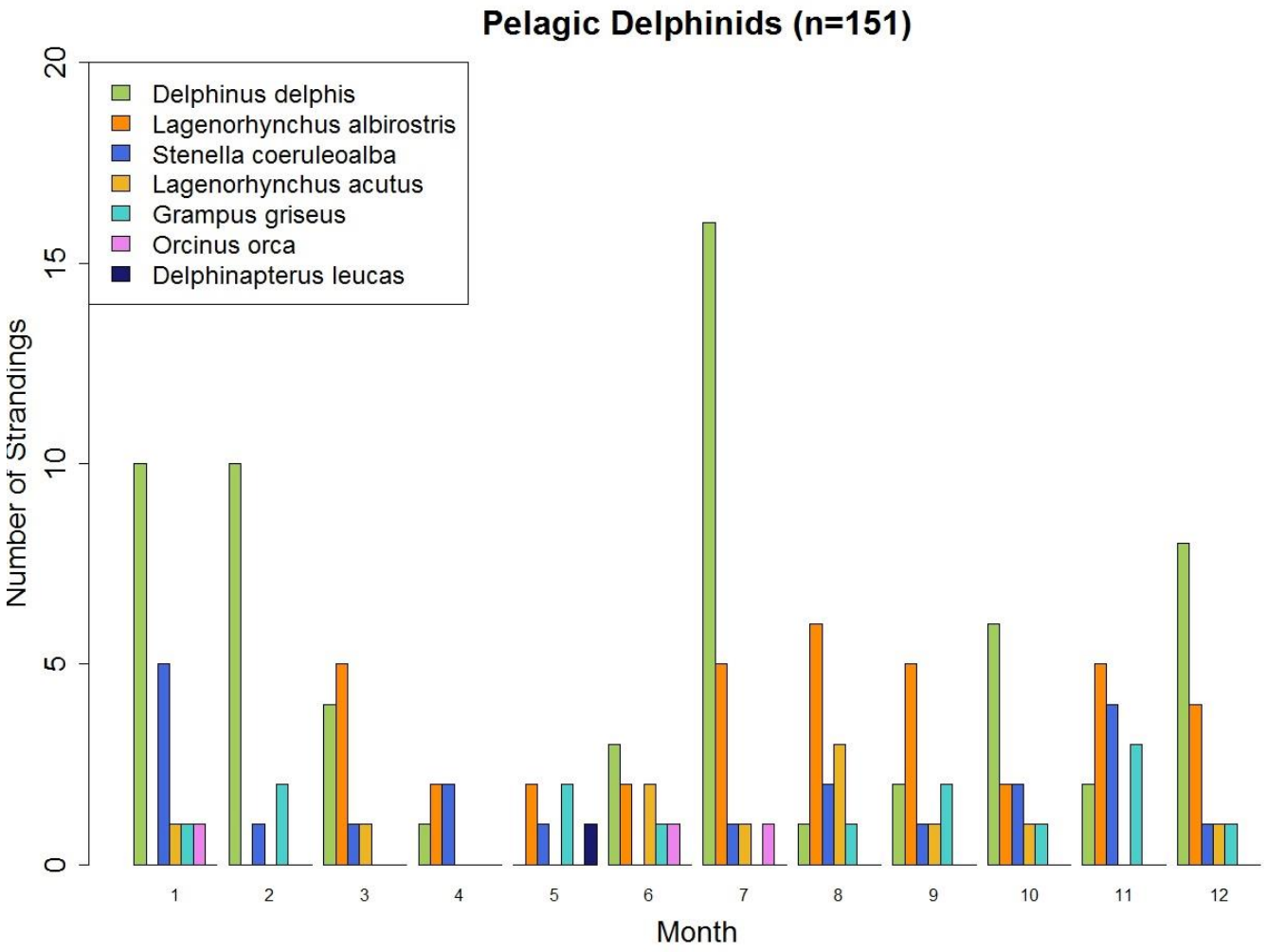


Figure 20: Number of pelagic delphinid (excluding long-finned pilot whales) strandings per month by species from April 2012 – March 2015

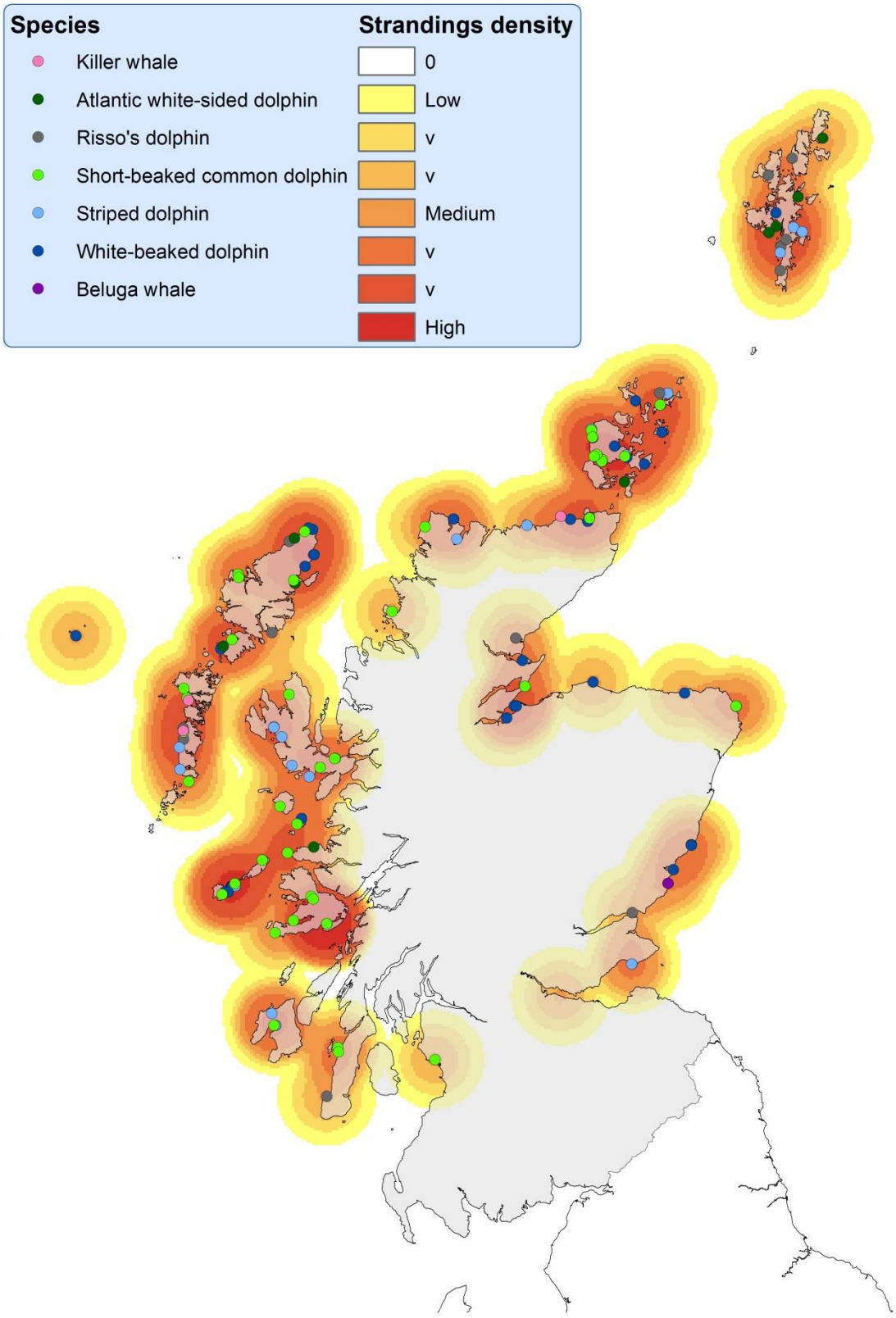


Figure 21: Distribution of Pelagic delphinid strandings (excluding long-finned pilot whales) from April 2012 –March 2015

Table 7: Summary overview of pelagic delphinids (excluding long-finned pilot whales) sent for necropsy from April 2012 to March 2015

M Ref	Species (Scientific)	Date Found	Location	Sex	Age Group	Cause of Death Category
M6/13	Delphinus delphis	07/01/2013	Strathclyde	M	Subadult	Infectious Disease
M253/13	Delphinus delphis	29/07/2013	Highland	F	Subadult	Not Established
M36/14	Delphinus delphis	11/02/2014	Highland	F	Adult	Live Stranding
M205/14	Delphinus delphis	31/07/2014	Western Isles	F	Juvenile	Infectious Disease
M421/14	Delphinus delphis	11/12/2014	Orkney	F	Juvenile	Physical Trauma
M32.1/15	Delphinus delphis	17/01/2015	Western Isles	F	Adult	Infectious Disease
M32.2/15	Delphinus delphis	17/01/2015	Western Isles	M	Juvenile	Live Stranding
M58/15	Delphinus delphis	31/01/2015	Western Isles	M	Subadult	Physical Trauma
M363/12	Grampus griseus	12/11/2012	Shetland	F	Subadult	Live Stranding
M291/14	Grampus griseus	03/10/2014	Shetland	F	Adult	Infectious Disease
M64/15	Grampus griseus	04/02/2015	Highland	M	sub adult	Physical Trauma
M82/15	Grampus griseus	16/02/2015	Shetland	F	Juvenile	Infectious Disease
M333/12	Lagenorhynchus acutus	16/10/2012	Western Isles	F	Adult	Infectious Disease
M198/12	Lagenorhynchus albirostris	11/07/2012	Grampian	F	Juvenile	Not Established
M271.1/12	Lagenorhynchus albirostris	23/08/2012	Highland	M	Adult	Live Stranding
M271.3/12	Lagenorhynchus albirostris	23/08/2012	Highland	M	Adult	Live Stranding
M271.2/12	Lagenorhynchus albirostris	23/08/2012	Highland	M	Adult	Live Stranding
M318/12	Lagenorhynchus albirostris	01/10/2012	Highland	F	Adult	Infectious Disease
M360.1/12	Lagenorhynchus albirostris	09/11/2012	Strathclyde	M	Subadult	Live Stranding
M360.2/12	Lagenorhynchus albirostris	09/11/2012	Strathclyde	M	Subadult	Live Stranding
M54/13	Lagenorhynchus albirostris	06/03/2013	Grampian	M	Subadult	Physical Trauma
M122/13	Lagenorhynchus albirostris	20/04/2013	Highland	F	Adult	Live Stranding
M70/14	Lagenorhynchus albirostris	22/03/2014	Highland	F	Adult	Physical Trauma
M131/14	Lagenorhynchus albirostris	02/06/2014	Western Isles	F	Adult	Live Stranding
M146/14	Lagenorhynchus albirostris	16/06/2014	Highland	M	Adult	Infectious Disease
M206/14	Lagenorhynchus albirostris	02/08/2014	Highland	F	Juvenile	Infectious Disease
M278.2/14	Lagenorhynchus albirostris	26/09/2014	Highland	F	Subadult	Live Stranding
M309/14	Lagenorhynchus albirostris	15/10/2014	Tayside	M	Adult	Live Stranding
M395/14	Lagenorhynchus albirostris	04/12/2014	Shetland	F	Juvenile	Physical Trauma
M143/12	Orcinus orca	10/06/2012	Highland	F	Adult	Live Stranding
M202/14	Orcinus orca	28/07/2014	Western Isles	M	Subadult	Infectious Disease
M341/12	Stenella coeruleoalba	25/10/2012	Orkney	M	Juvenile	Live Stranding
M119/13	Stenella coeruleoalba	17/04/2013	Shetland	M	Juvenile	Infectious Disease
M269/13	Stenella coeruleoalba	14/08/2013	Highland	M	Juvenile	Infectious Disease
M33/15	Stenella coeruleoalba	17/01/2015	Western Isles	F	Subadult	Infectious Disease
M101/15	Stenella coeruleoalba	08/03/2015	Highland	M	Juvenile	Infectious Disease

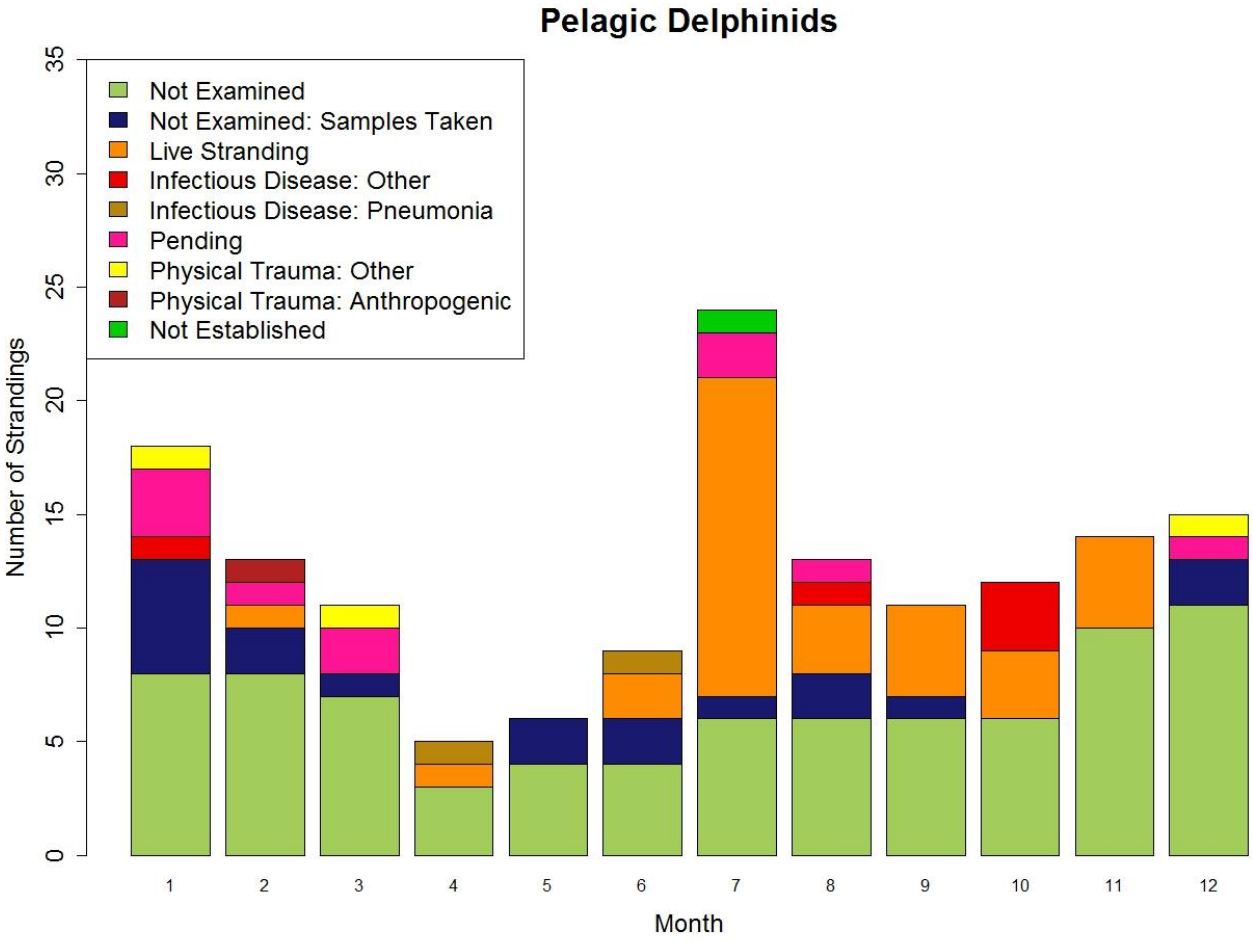


Figure 22: **Total number of Pelagic delphinid strandings, including both single strandings and mass stranding events, per month stacked for findings (April 2012 – March 2015).**

7.5.1 *Short-beaked common dolphin (Delphinus delphis)*

Short-beaked common dolphins were the most commonly reported pelagic delphinids with a total of 49 reports involving 63 individuals. The species accounted for 9.8% (n=63) of the total amount of cetaceans reported, and was therefore the third most commonly reported species during this period. This species has had a nearly fivefold increase in numbers compared to the previous period, though this may be explained partly by a MSE involving 14 animals in Mull in 2014. Short-beaked common dolphins are most commonly found off the west coasts of Britain and Ireland, notably in the western approaches and the Celtic sea. In Scotland they are most often seen in the sea of the Hebrides and the Minch during the summer months, though they occasionally appear in the North Sea. The population in the Celtic sea is estimated to be approximately 75,500 individuals. Most of the strandings for this species are recorded on the West coast and the Western isles.

Characteristics:

- Feed on schooling fish gadoid fish (*Trisopterus* sp.), gobies and mackerel (*Scomber scombrus*)

- Calves are born in the summer months (June to August)
- Most strandings occur in the winter months (December, January and February)
- Live stranding is the most common cause of death

Eight individuals were sent for necropsy (12.7%) and ten sampled by trained stranding volunteers (15.9%). The remaining 45 were either refloated or too inaccessible or decomposed for any further examination to be carried out. Sex was determined for 23 carcases (36.5%), with 11 female and 12 male individuals. Strandings appear to be more common in winter months (December to February, Figure 20. The observed peak in July was caused by a mass stranding event involving 14 animals on 24th July 2014 (see more details on this event below).

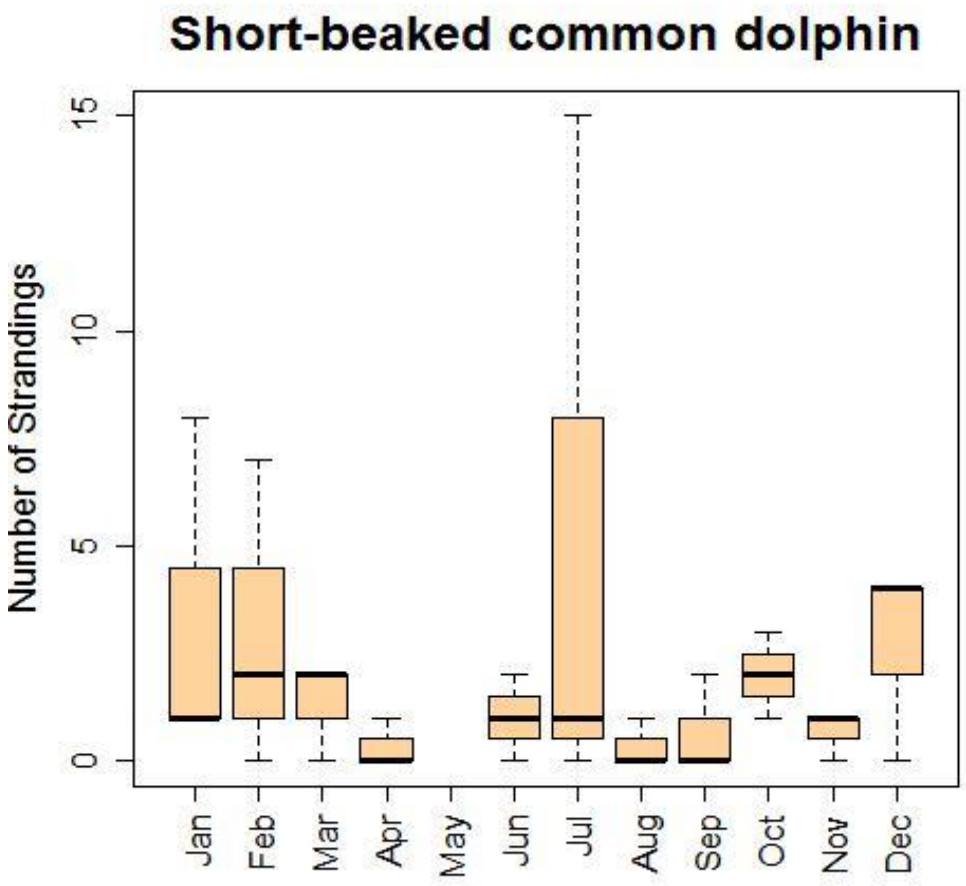


Figure 23: Boxplot of monthly variation in numbers of Common dolphin (*Delphinus delphis*) strandings reported from April 2012 – March 2015. The peak in July was due to an abnormal MSE.

Example case: M006/13 – short-beaked common dolphin *(Delphinus delphis)*

A sub-adult male short-beaked common dolphin was found dead stranded at Ardrossan north Ayrshire on 7th January 2013. The animal showed evidence of recent feeding and live stranding. There was unusual trauma to right flank, however given the tailstock was known to have been removed by a member of the public prior to collection, it was considered this was also necropsy trauma complicated by freeze/thaw damage. No skeletal trauma was

seen. Generalised evidence of debilitation was noted, however, there was a low parasite burden detected grossly in lung tissue. There was copious blood stained cerebral spinal fluid (CSF) present. *Brucella ceti* was isolated from both this fluid and brain tissue. Histological examination of the brain showed severe generalised freeze/thaw damage, however a severe, sub-acute to chronic, generalised primarily lympho-histiocytic meningitis was observed. These lesions are consistent with neurobrucellosis. Together with the isolation of *Brucella ceti* from the cerebro-spinal fluid (CSF) and brain, these lesions were considered severe enough to have significantly compromised this animal, leading to live-stranding. This is only the second report of this condition in this species.

Figure 24: M006/13 short-beaked common dolphin (*Delphinus delphis*).

Example case: M205/14 – Short beaked common dolphin (*Delphinus delphis*)

On the 31st July 2014 a juvenile female common dolphin was seen alive swimming erratically with an adult conspecific in Stornoway harbour. It died soon after live stranding and was frozen within 24 hours. It was in very poor body condition with a thin blubber layer and there was no evidence of recent feeding. There was a moderate nematode burden in lungs particularly in the terminal bronchi and cysts suggestive of *Pholeter gastrophilus* present in the pyloric stomach. There was an excess of cerebral-spinal fluid (CSF) present and the brain had a distinctly "wet" appearance. All other systems appeared unremarkable. Histopathology showed moderate, sub-acute, generalised lymphocytic meningitis. This along with the isolation of Brucella ceti from the cerebrospinal fluid confirms neuro-brucellosis. This is only the third confirmed case in this species.

Figure 25: M205/14 Juvenile common dolphin (*Delphinus delphis*)

7.5.2 *Striped dolphin (Stenella coeruleoalba)*

There were 20 reports of 21 striped dolphins accounting for 3.2% of the cetaceans reported. This was the sixth most commonly reported species during this reporting period and numbers have increased by a third compared to the previous reporting period. Striped dolphins are wide ranging throughout tropical and temperate waters. Sightings in UK coastal waters normally occur during the warmer summer months and tend to be in the southwest approaches and Celtic sea, where they are sometimes found with common dolphins. Sightings of striped dolphins are rare and usually off the west coast of Scotland. Population estimates or this species in the Eastern North Atlantic is thought to be in the region of 74,000.

Characteristics:

- Feed on a variety of small pelagic, mid water and bentho-pelagic fish including Pout, Blue whiting, cod and sand smelt
- Elsewhere there appear to be one or two calving peaks from summer to winter, calving has not been recorded in Scotland.
- Most strandings occur in the autumn and winter months (October-January)
- Live stranding is the most common cause of death closely followed by meningoencephalitis

Five animals were sent for necropsy (23.8%), one was sampled (4.8%), and the remaining 15 (71.4%) were either refloated, or too inaccessible or decomposed for further examination to be carried out. Sex was determined in nine animals (42.9%), with five female and four male individuals.

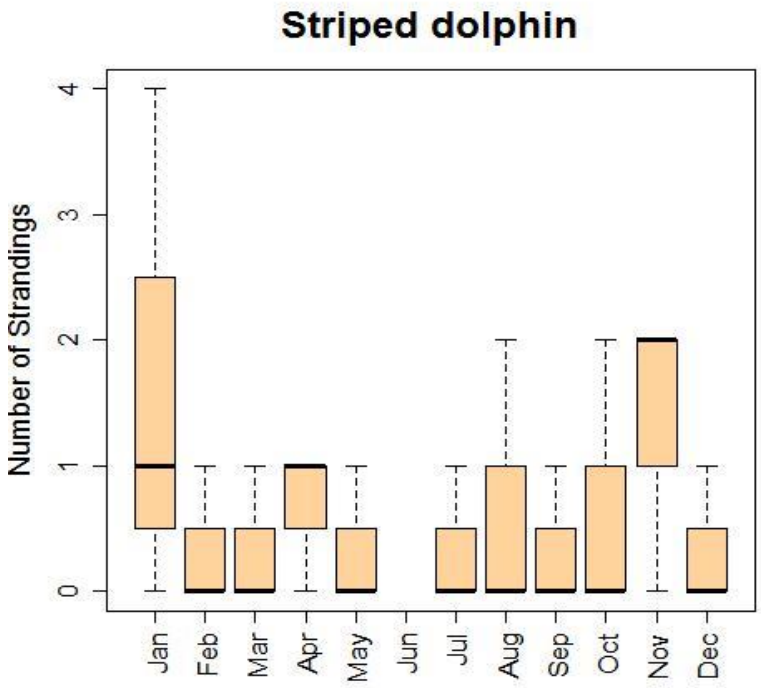


Figure 26: Boxplot of monthly variation in numbers of striped dolphin (*Stenella coeruleoalba*) strandings reported from April 2012 – March 2015

Example case: M269/13 – striped dolphin (*Stenella coeruleoalba*)

This juvenile male striped dolphin was in thin body condition and was observed swimming erratically close to shore at Loch Caroy, Isle of Skye. It was re floated by members of the public before re-stranding. There was evidence of live stranding with asymmetrical inflation of the lungs otherwise the visceral tissues were unremarkable. The exception to this was the asymmetry seen in the testes. The excess amount of cloudy cerebral spinal fluid, dilated ventricles and tacky meninges are highly indicative of meningoencephalitis. *Brucella ceti* was isolated from the cerebral spinal fluid (CSF) and spinal cord and confirmed by Animal and Plant Health Agency (APHA) Weybridge. Histology showed variably mild to severe, sub-acute to chronic, generalised lymphocytic meningo-encephalitis and mild to moderate, sub-acute, multi-focal granulo-suppurative broncho-pneumonia. It also showed mild to moderate, sub-acute to chronic, multi-focal necro-suppurative lymphadenitis. The key lesion in this case is the meningo-encephalitis which is typical in morphology and distribution to those seen in cases of neuro-brucellosis in cetaceans and there is evidence to support this animal live-stranded prior to death.

Figure 27: M269/13 striped dolphin.

7.5.3 *White-beaked dolphin (Lagenorhynchus albirostris)*

There were 31 reports of 38 white-beaked dolphins accounting for 5.9% of the cetaceans reported. This was the fourth most commonly reported species during this reporting period and has seen an increase in numbers compared to the previous reporting period. The population estimate for the North Sea and channel is about 8,000 individuals; although this data is fairly old and possibly outdated. The species prefers the temperate and sub-arctic waters of the North Atlantic. In the Hebrides, they are usually seen in open waters further from the coast though they have been seen in the Minch as well. They also occur in the waters around Shetland and Orkney.

Characteristics:

- Feed on a wide range of prey items from sand eels and herring to larger bottom-dwelling fish including cod, whiting and haddock. They are also known to eat molluscs, squid, octopus and some crustaceans
- Calves are born between May and September
- Most strandings occur predominantly in the summer months (June-September)
- The most commonly observed cause of death is live stranding

A total of 16 animals were necropsied (42.1%), one was sampled (2.6%), and the remaining 21 animals (55.3%) were either refloated or too inaccessible or decomposed for further examination. Sex was determined in 23 animals (60.5%), with 10 female and 13 male individuals.

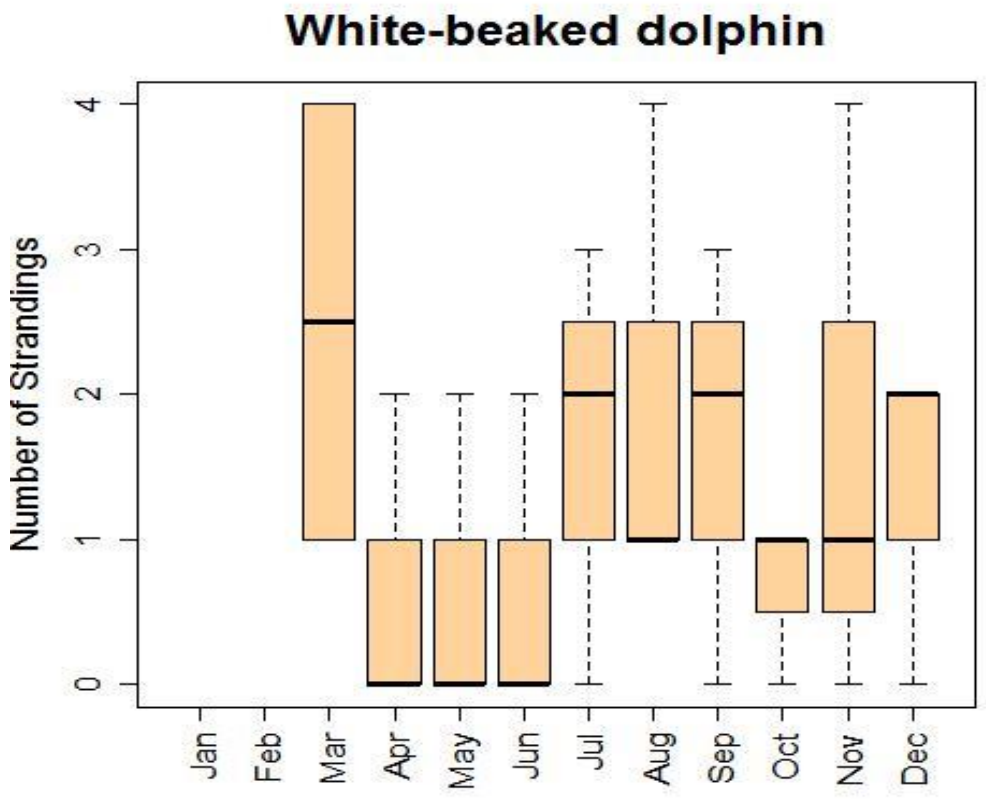


Figure 28: Boxplot of monthly variation in numbers of white-beaked dolphin (*Lagenorhynchus albirostris*) strandings reported from April 2012 – March 2015

Example case: M146/14 – White beaked dolphin (*Lagenorhynchus albirostris*)

This aged adult male white beaked dolphin was found dead stranded on Dunnet Bay beach. The animal had a severe pleuritis/pneumonia and fluid accumulation within the right pleural cavity was the cause of death. There was no indication of a point of entry for the observed thoracic pathology. The lesions may be possibly traumatic or neoplastic in origin as very asymmetric. The animal was in moderate condition so pathology is likely to be acute (7-14 days) due to absence of remodelling or cardiac changes. There was no evidence of recent feeding. Bacteriology examination of lung, pericardium, pulmonary associated lymph node and chest fluid resulted in the isolation of a mixture of *Streptococcus dysgalactiae equisimilis*, *Photobacterium damselae* and *Edwardsiella hoshinae*. *Streptococcus dysgalactiae equisimilis* is recognised as a cause of pleuropulmonary infections and pharyngitis in humans and animals. Histology revealed a moderate, sub-acute, focally extensive suppurative broncho-pneumonia, a moderate, sub-acute to chronic, focally

extensive suppurative epicarditis with fibrosis, and severe, acute, generalised systemic congestion.

There was a moderate, sub-acute to chronic, generalised glomerular nephrosis with a small amount of tubular involvement, a moderate, sub-acute to chronic, generalised adrenal hyperplasia (cortical and medullary) and moderate, per-acute, focal adreno-medullay haemorrhage. These findings are consistent with a severe bacterial infection in one lung, which has spread by extension to involve the heart which would have severely compromised the animal's ability to function.

Figure 29: M146/14 white beaked dolphin (*Lagenorhynchus albirostris*)

7.5.4 *Atlantic white-sided dolphin (Lagenorhynchus acutus)*

This species accounted for 1.7% (n=11) of the cetaceans reported. This was the ninth most commonly reported species during this reporting period with a drop in numbers by over a half when compared to the previous reporting period. This species is highly gregarious;

groups of tens to hundreds are regularly seen on the Atlantic side and super pods of over a thousand individuals are often seen offshore. The species tend to prefer the continental shelf, so are more often seen to the west of the Hebrides and North and west of Shetland and Orkney.

Characteristics:

- Feed on a wide range of prey items including cod, whiting, blue whiting, hake, herring and mackerel
- Calves are born in the summer months with apparent peaks in June and July
- Most strandings occur in July and August
- The most commonly observed cause of death is live stranding

One animal was necropsied (9%), five were sampled (45.5%), and the remaining five animals (45.5%) were either too inaccessible or too decomposed for further examination. Sex was determined in six animals (54.5%), with three female and three male individuals.

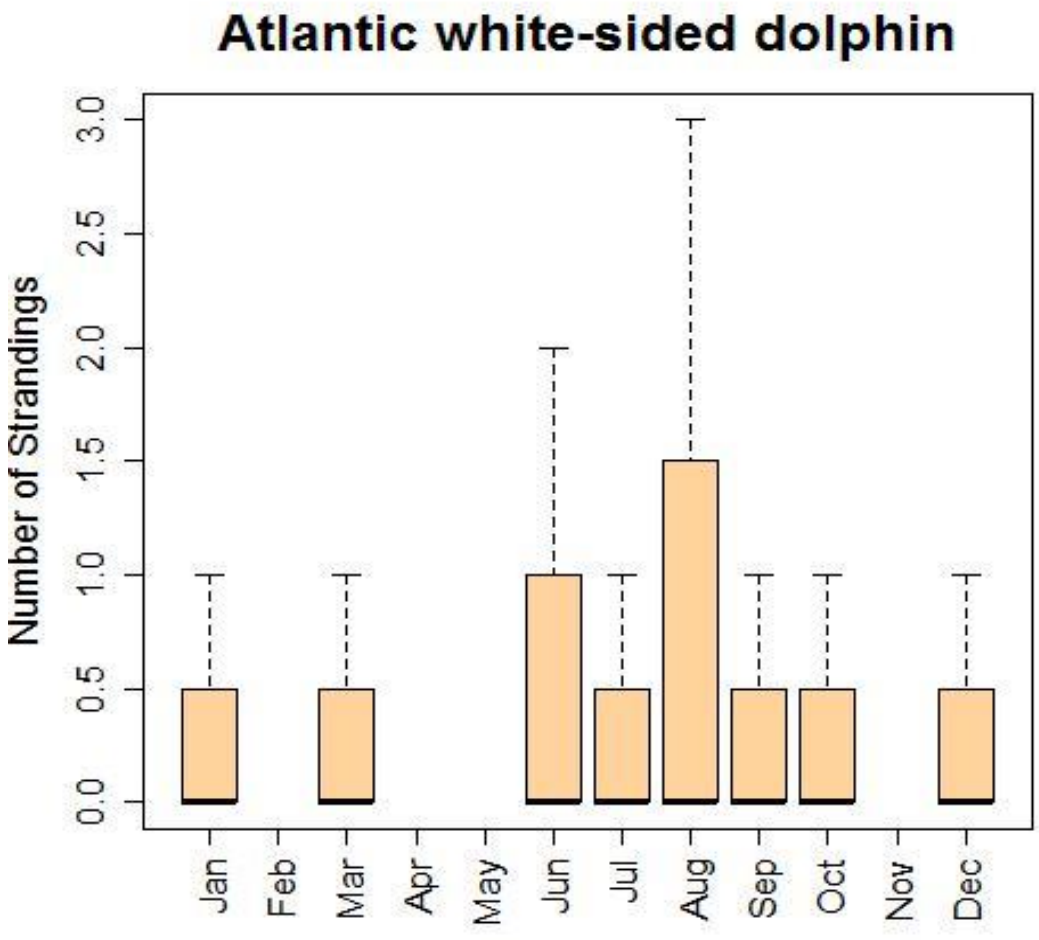


Figure 30: Boxplot of monthly variation in numbers of white-sided dolphin (*Lagenorhynchus acutus*) strandings reported from April 2012 – March 2015

Example case: M333/12 – Atlantic white-sided dolphin (*Lagenorhynchus acutus*)

On 17th October 2012 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. Histology revealed a moderate, chronic, generalised parasitism primarily affecting the lungs and integument. This animal was probably compromised with respect to the respiratory system and from the adrenal glands appears to be under a significant amount of chronic stress which coupled with the systemic brucellosis all probably contributed to a burden of disease which resulted in live-stranding.

Figure 31: M333/12 Necropsy demonstration of Atlantic white-sided dolphin (*Lagenorhynchus acutus*)

7.5.5 *Risso's dolphin (Grampus griseus)*

This species accounted for 2.1% (n=14) of the cetaceans reported. This was the eighth most commonly reported species during this reporting period, the same number as the previous reporting period. This does not appear to be particularly abundant in any of its range and there have been no attempts to estimate Risso's dolphin abundance in the North East Atlantic. A study in 1992 did identify 142 unique individuals in the North West Minch over two summers, and this population is currently being studied by the Whale and Dolphin Conservation society (WDC). Most of the sightings of this species are from waters surrounding the Western Isles, though there are also sightings from around Shetland and Orkney. The population in Scotland represents the northern limit for this species.

Characteristics:

- Feed mainly on octopus, squid and cuttlefish, though occasionally fish maybe taken
- Calving occurs in the summer months
- There does not appear to be any seasonality in their strandings
- There is no obvious common cause of death in this species

Four animals were necropsied (28.6%), two were sampled (14.3%), and the remaining eight animals (57.1%) were either too inaccessible or too decomposed for further examination. Sex was determined in six animals (42.9%), with three female and three male individuals.

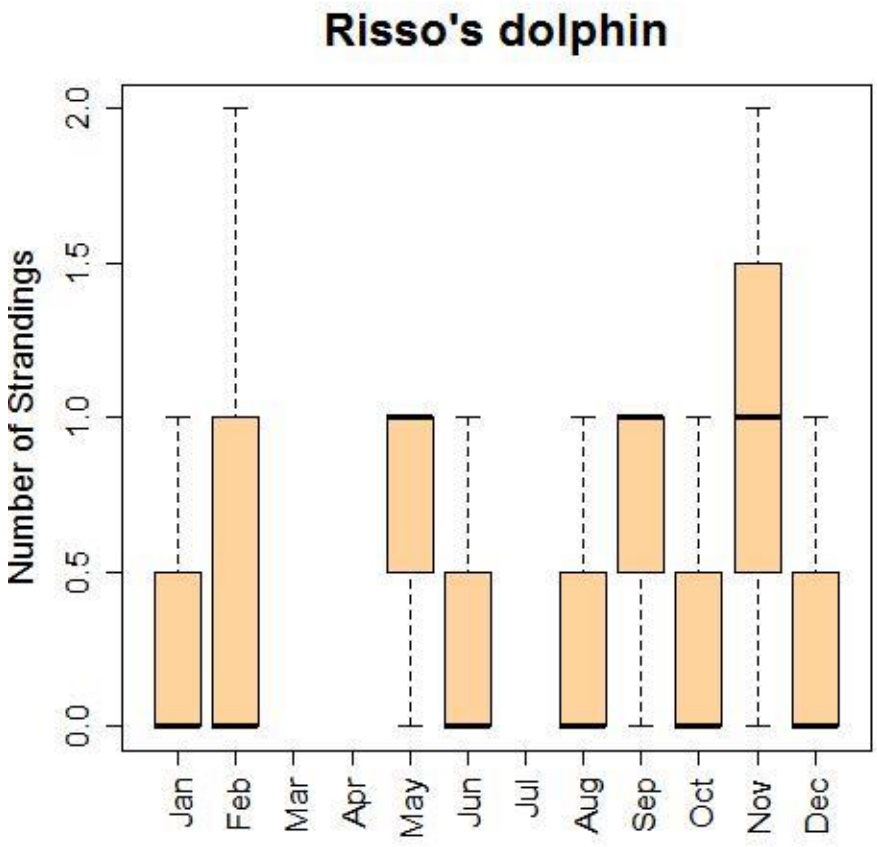


Figure 32: Boxplot of monthly variation in numbers of Risso's dolphin (Grampus griseus) strandings reported from April 2012 – March 2015

Example case: M291/14 Risso's dolphin (*Grampus griseus*)

This adult female Risso's dolphin from Urafrith, Shetland was in thin condition with no evidence of recent feeding. There was extensive peritonitis and associated fibrin adhesions. The kidneys were swollen with notable cortex/medulla petechiation. There was a marked lymphadenopathy with grossly enlarged adrenals, and the blubber had a jaundiced appearance. This suggests the peritonitis was chronic in duration. There was no obvious focal cause identified for the peritonitis. Bacteriology revealed a mixture of both aerobic

and non-aerobic organisms the significance of which at present is unclear but suggests a bacterial peritonitis. Histology may help to ascertain the role of these isolates in the peritonitis.

Figure 33: M291/14 Risso's dolphin (Grampus griseus) Urafirth, Hillswick, Shetland 3/10/14

7.5.6 *Killer whale (Orcinus orca)*

This species accounted for 0.4% (n=3) of the cetaceans reported, whereas there were none in the previous reporting period. This species is the most widespread of any cetacean. The group around the Western Isles (7 or 8 individuals) previously referred to as Type 2 look very different to those found elsewhere in the British Isles. The northern North Sea and the Northern Isles it seems there are two genetically differentiated populations, but with similar ecological spreads. Both seem to contain individuals that feed on fish or fish and seals. These have previously been referred to as Type 2. This dichotomous classification system was used by Foote *et al* (2009) but has since been abandoned (Foote pers. Comm). It is better to quantify the variation of different metrics (genetic, associations, stable isotopes etc.) among groups/populations and describe variation in those terms allowing for the identification of more fine-scale variation, rather than the labels type 1 and type 2. It seems like there are two genetically differentiated populations, but with similar ecological spreads. Both seem to contain those that feed on fish and those that feed on fish and seals. But again more data would be useful here to look at that in more detail.

Characteristics:

- Feeds on fish and or marine mammals depending on ecotype/form
- Calving occurs in Autumn and winter (though not recently recorded)

- Strand all year round but with a peak in the winter months
- There is no common cause of death in this species

Example case: M143/12 – Killer whale (*Orcinus orca*)

On the 10th of June 2012, an adult female killer whale stranded in Brims'ness in 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 polychlorinated biphenyls (PCB) accumulation and levels were found to be significantly higher than average. This PCB work is an ongoing collaboration with Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and will contribute to a forthcoming CSIP publication.

Figure 34: M143-12 Killer whale (*Orcinus orca*) stranding

Example case: M202/14 – Killer whale (*Orcinus orca*)

A sub-adult killer whale was found dead stranded on Baleshare Beach, North Uist on 28th July 2014. Necropsy examination was undertaken on site an estimated 48 to 72 hours post-mortem. The animal was in thin bodily condition and the blubber had a relatively 'dry' appearance, perhaps suggesting scant easily mobilisable lipid. The teeth were asymmetrically worn, and this perhaps suggests this particular animal is from the population which mainly suction feed on mackerel and herring (previously characterised as Type 1 population). No obvious traumatic or infectious processes were seen, although visceral organs were moderately autolysed. The brain was also autolysed but appeared more fluid than expected given the degree of decomposition. The cardiac stomach contained nematodes and some plastic/marine debris but no evidence of recent feeding. There was no evidence to suggest the debris was impacted or causing a problem for the animal. Mild asymmetry of the lungs may be indicative of agonal live stranding or peri-mortem congestion, however the lungs were otherwise grossly unremarkable. Debilitation and a lack of recent feeding may account for the

death of the animal in this case, with the mouth ulceration suggesting some form of immune-compromise could also be a factor. Bacteriological examination of lung, liver, kidney, spleen, brain and CSF resulted in a mixed growth of haemolytic and non-haemolytic *Edwardsiella tarda.* These isolates are most probably necropsy invaders. Diagnosis awaits results of further ancillary tests including toxicology. There have only been 24 reported strandings of this species since 1992 which includes 11 individuals that were part of a MSE and were refloated on Unst, Shetland, in December 1994. Of the remaining 13 animals only six (including this individual) have been examined at necropsy. Histology showed all tissues to be in an advanced state of autolysis however a moderate to severe, chronic, mural lympho-plasmacytic pneumonia was present which could be a response to pulmonary parasitism.

Figure 35: M202/14 Killer whale (*Orcinus orca*)

7.5.7 *Beluga whale (Delphinapterus leucas)*

This species accounted for 0.1% (n=1) of the cetaceans reported. This species did not appear in the previous reporting period, and this is the first and only stranding record of the species in the UK since the start of the CSIP in 1992.

Characteristics:

- Feed primarily on primarily but also take cephalopods and crustaceans
- Calving occurs between April and September (not occurring in Scotland)
- Considered vagrants in UK waters with limited sightings
- The last recorded beluga strandings in the UK occurred in 1932, and three in 1949

Figure 36: M117/14 Beluga whale (*Delphinapterus leucas*) skull found at Lunan bay (left) compared to Beluga whale specimen held at the National Museum of Scotland (right) © National Museum of Scotland.

Example case: M117/14 – Beluga whale (*Delphinapterus leucas*)

On 5th May 2014 a much decomposed unidentified odontocete cetacean was found at Lunan Bay in Angus, south of Montrose on the east coast. This was formally identified using the skull morphometrics at the National Museum of Scotland as a beluga. Unfortunately the carcase was significantly scavenged and autolysed so it was not possible to establish a cause of death. However, teeth and skin were collected, potentially allowing for the age and sex of the animal to be established. This was an unusual case; prior to this the last recorded beluga strandings occurred in October 1932 and three in 1949. Belugas are considered a vagrant in UK waters, where sightings are very rare. There have been 12 confirmed observations in the last 50 years, ten of which have been since 1987. These have all been in Scotland or northeast England, with the last seven all being from Shetland or the Highlands. Discovery of this stranding and the rapid identification and removal of samples was a good example of the benefits of digital and social media in reporting cases.

7.6 Beaked whales

This group accounted for 3.4% (n=22) of the cetaceans reported. Figure 35 shows the number of strandings per month by species based on the three year contract period. A summary overview of cases examined at necropsy can be found in table 8.

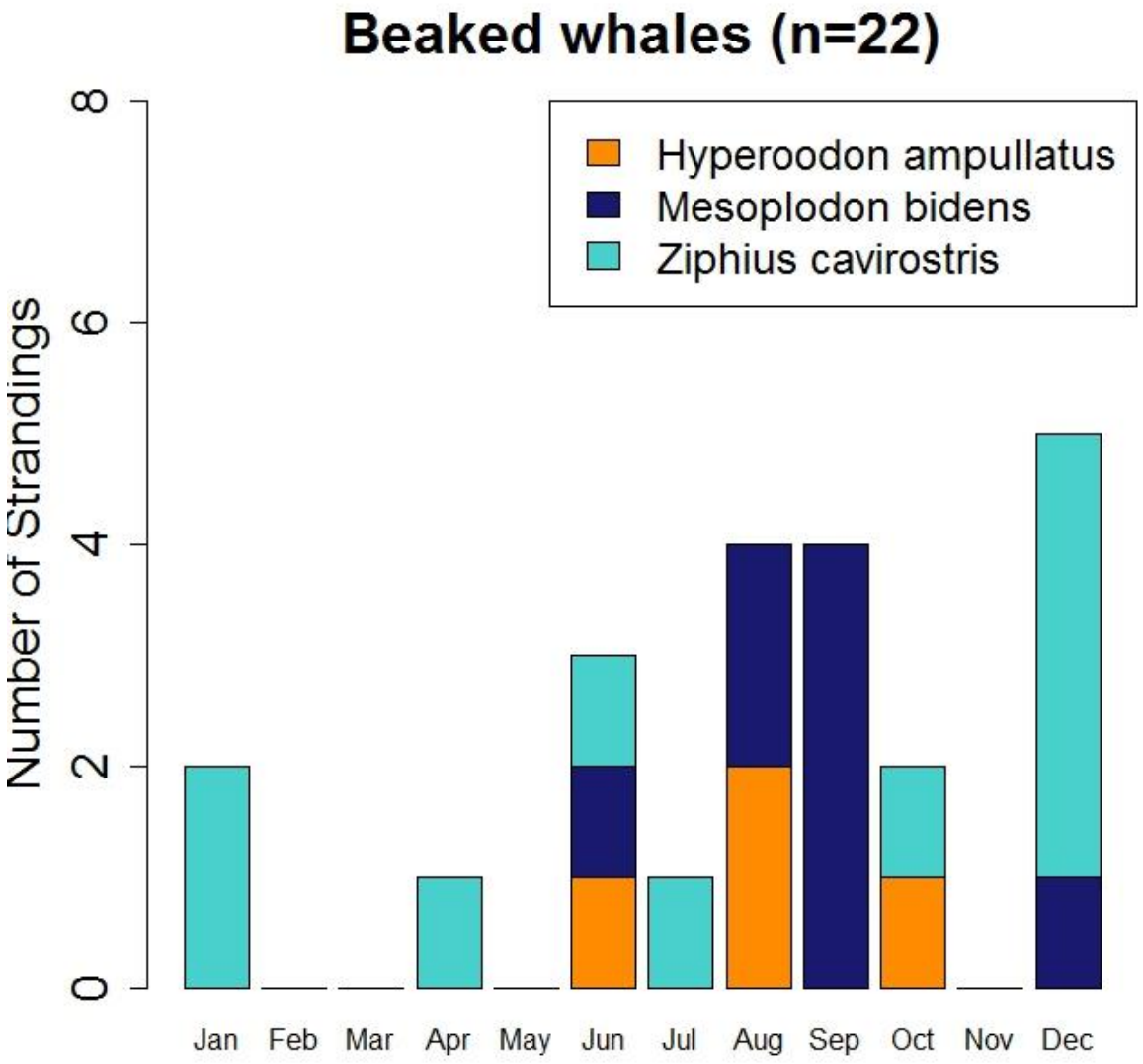


Figure 37: Total number of beaked whale strandings, including both single strandings and mass stranding events, per month stacked for species (April 2012 – March 2015

Table 8: Beaked whale cases sent for necropsy (April 2012 – April 2015)

M Ref	Species (Scientific)	Date Found	Location	Sex	Age Group	Cause of Death category
M337/12	Hyperoodon ampullatus	20/10/2012	Grampian	F	Subadult	Not Established
M246.1/14	Hyperoodon ampullatus	29/08/2014	Highland	F	Juvenile	Not Established
M246.2/14	Hyperoodon ampullatus	29/08/2014	Highland	M	Juvenile	Live Stranding
M256.1/12	Mesoplodon bidens	14/08/2012	Fife	F	Juvenile	Live Stranding
M256.2/12	Mesoplodon bidens	16/08/2012	Fife	F	Subadult	Live Stranding
M199/13	Mesoplodon bidens	13/06/2013	Highland	M	Subadult	Physical Trauma
M299.1/13	Mesoplodon bidens	12/09/2013	Western Isles	F	Adult	Live Stranding
M282.1/14	Mesoplodon bidens	30/09/2014	Highland	F	Adult	Live Stranding
M282.2/14	Mesoplodon bidens	30/09/2014	Highland	M	Neonate	Live Stranding
M83/14	Ziphius cavirostris	02/04/2014	Highland	M	Juvenile	Live Stranding

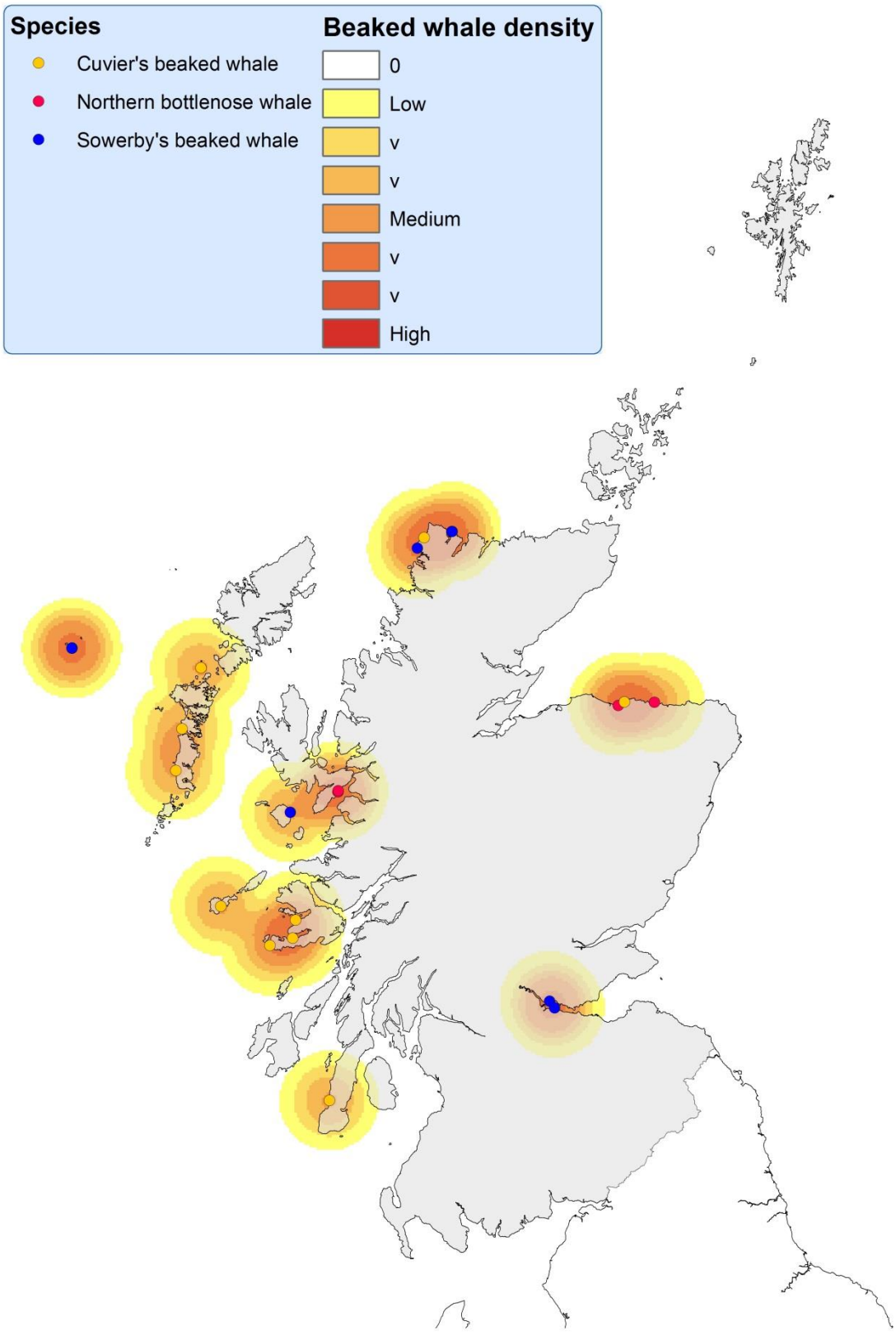


Figure 38: Distribution of beaked whale strandings from March 2012 to April 2015

7.6.1 *Cuvier's beaked whale (Ziphius cavirostris)*

This species accounted for 1.5% (n=10) of the cetaceans reported. This was the joint tenth most commonly reported species during this reporting period which is a slight increase in numbers compared to the previous reporting period. This is largely caused by the five individuals that stranded along the west coast during December 2014 and early January 2015. These individuals were all in an advanced state of decomposition, and the event was marked unusual considering the high number stranding in such a short time frame (details of this unusual mortality event (UME) in section 6).

There have only been two confirmed live sightings of this species in Scotland; once off Orkney and the other off the Western Isles, both in the summer months. They have a preference for deep water greater than 200m.

Characteristics:

- Feed mainly on Squid, although they also consume fish and crustaceans
- Calving period is not known
- Most often strand during the winter months (December and January)
- There is no common cause of death in this species

One animal was sent for necropsy (10%), four were sampled (40%), and the remaining five (50%) were too decomposed for further examination. Sex was determined in five animals (50%) with two females and three males.

Example case: M83/14 – Cuvier's beaked whale (*Ziphius cavirostris*)

This juvenile Cuvier's beaked whale was reported stranded at Sandwood bay north west Scotland on 6th April 2014. Due to access, weather and conference commitments it was not examined until the 18th April 2014. Given the superficial autolysed nature of the carcase, the abdominal and thoracic organs were in reasonably intact condition, albeit too autolysed for meaningful histology or bacteriology. However, of note, was a heavy nematode burden in the kidneys (suspect *Crassicauda boopis*) and evidence of recent successful feeding, including soft squid body parts in the cardiac stomach. The lungs were autolysed but there was a suggestion of asymmetry, with the left more congested, suggesting live stranding Superficial ventral bruising also suggested live stranding of an animal in otherwise good bodily condition. The liver was markedly autolysed and gaseous

Figure 39: M11/14 Cuvier's beaked whale (*Ziphius cavirostris*).

with obvious bubbles throughout the parenchyma. It was not possible to determine whether the bubbles were the result of autolysis necropsy or an ante mortem process such as decompression stress (DCS). The spleen was also markedly autolysed however the there was no evidence of gas bubble formation within the intestinal mesentery. This would appear to be a live stranding of a reasonably healthy animal though the underlying reason for this cannot be elucidated in any more detail.

7.6.2 *Sowerby's beaked whale (Mesoplodon bidens)*

This species accounted for 1.2% (n=8) of the cetaceans reported. This was the eleventh most commonly reported species during this reporting period with numbers doubling since the previous reporting period. This species is rarely sighted at sea, but when it is they are usually seen alone or in pairs though very occasionally groups of up to ten are reported. They prefer deep water trenches of greater than 1000m. Rare sightings occur of the North and West coasts of Scotland.

Characteristics:

- Feed on squid and small fish
- Calving period is not known; but from SMASS data two cow calf pairs with the calves close to the birth length stranding alive in September suggest a late summer early autumn calving period
- Strandings occur most commonly in August and September
- The most common cause of death is live stranding

Six individuals were sent for necropsy (75%), the remaining two (25%) were too decomposed for further examination. Sex was determined for the six necropsied cases with four females and two male individuals.

Example case: M199/13 – Sowerby's beaked whale (*Mesoplodon bidens*)

This sub adult male Sowerby's beaked whale was found dead stranded at Kinlochbervie on 13th June 2013. It was moderately autolysed at necropsy (on site) however there was evidence of multiple fractures and associated bruising and haemorrhage to both upper and lower jaw, with both lower mandibles smashed at the ramus so unable to close. An area of tissue around the labial commissure had been torn and appeared to show evidence of early stage granulation, possibly suggesting this trauma was not immediately fatal. The lungs were symmetrical, a suggestion of mild asymmetry but not sufficient to suggest prolonged live stranding. The stomach was empty of all contents and the pyloric stomach contained bile reflux and some nematodes. The liver was pale yellow and contained multiple bullae; - these were thought to be normal and there was no evidence of other trauma or emboli in the visceral tissues. The left ear was removed and there was no frank haemorrhage in the acoustic fat apart from that associated with skeletal trauma. It is likely this animal suffered blunt trauma, most likely boat or slow propeller strike and this caused significant trauma and prevented further feeding.

Figure 40: M199/13 Sowerby's beaked whale (*Mesoplodon bidens*).

7.6.3 *Northern bottlenose whale (Hyperoodon ampullatus)*

This species accounted for 0.6% (n=4) of the cetaceans reported. This was the twelfth most commonly reported species during this reporting period and numbers more than halved compared to the previous reporting period. North Atlantic sightings surveys suggested a population of 40,000 in the North Atlantic. Most of the sightings in Scotland have been made along the continental shelf edge with a water depth of 1000m. Most sightings occur between June and August in Scotland. They usually occur in groups of four to ten individuals.

Characteristics:

- Squid is their preferred prey species however their diet is apparently very varied, probably according to area and season, and may include fish (such as herring) and invertebrates (such as prawns and sea cucumbers)
- Calving period is spring to early summer (April to June)
- Strandings are most common between August and October
- The most common cause of death is live stranding

This species was involved in a Single Mass Stranding Event (MSE) involving two individuals during this reporting period (see section 6).

Figure 41: M337/12 Northern bottlenose whale (*Hyperoodon ampullatus*) Boyndie Quarry, Portsoy Aberdeenshire 21/10/12

7.7 Mysticetes

This group accounted for 4.9% (n=31) of the cetacean species reported during the period from March 2012 to April 2015.

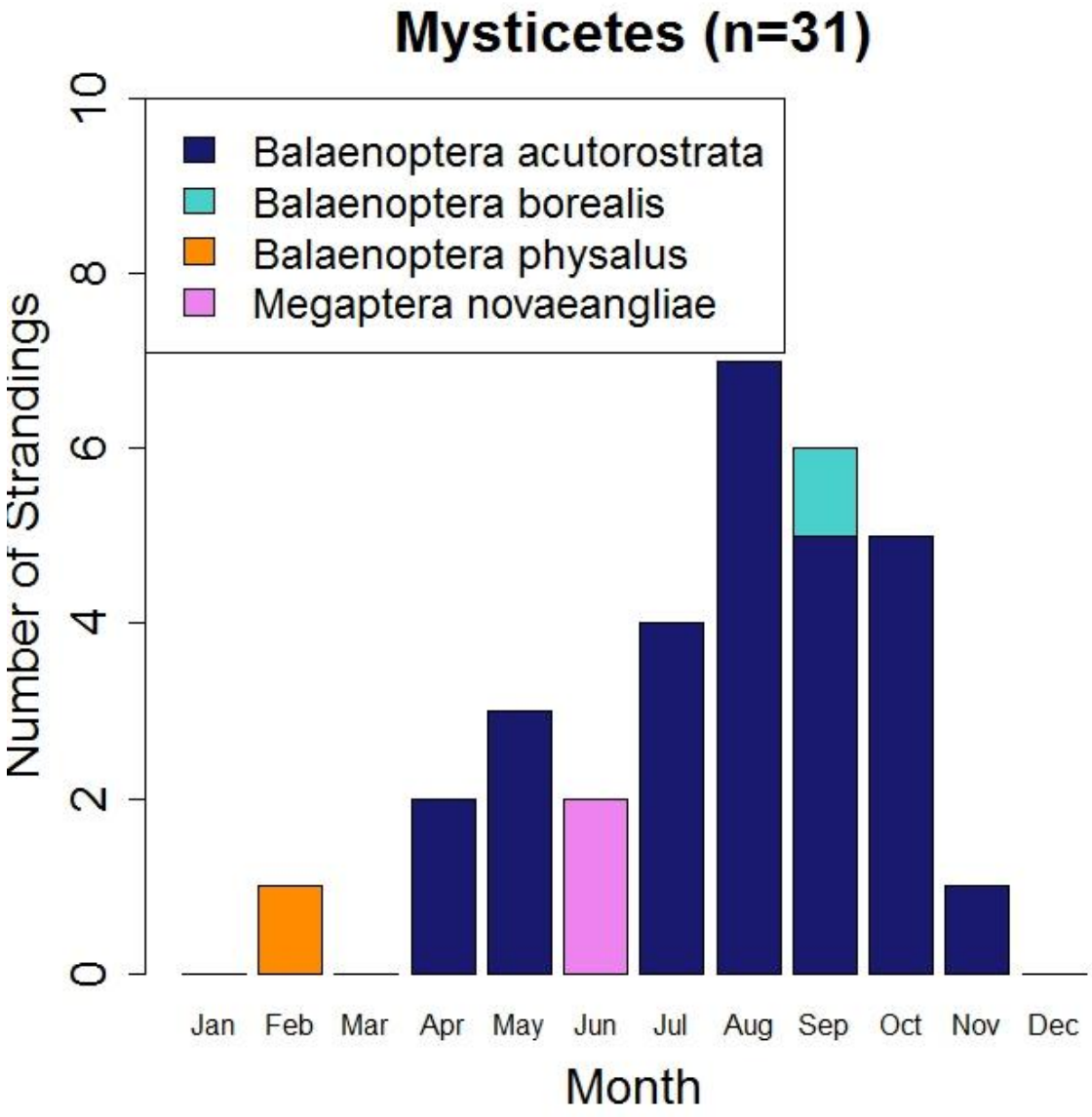


Figure 42: Number of Mysticete strandings per month by species from April 2012 – March 2015

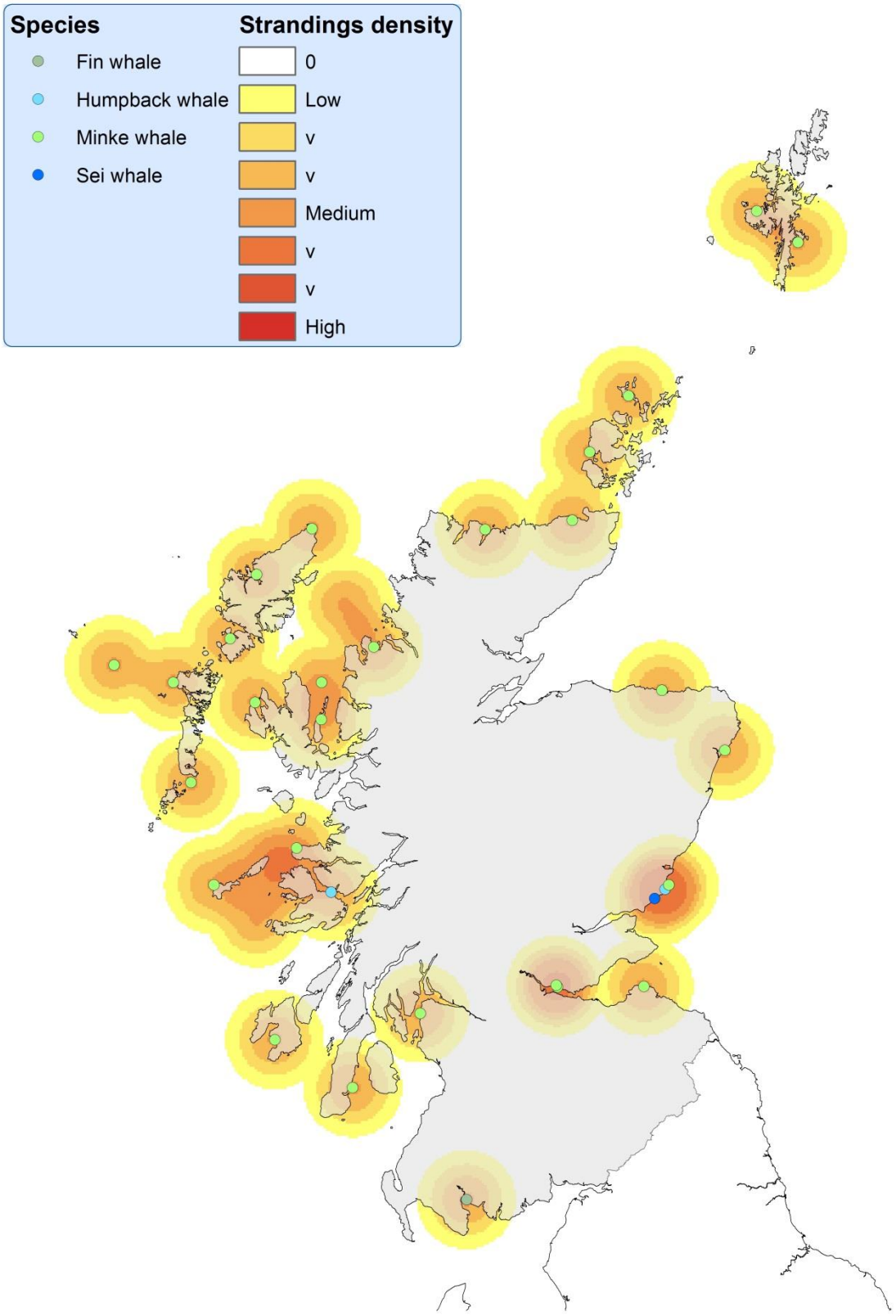


Figure 43: Distribution of Mysticete strandings from April 2012 to March 2015

Table 9: Mysticetes examined at necropsy (April 2012 – March 2015)

M ref	Species (Scientific)	Date Found	Location	Sex	Age Group	Cause of Death category
M98/12	Balaenoptera acutorostrata	03/04/2012	Lothian	M	Juvenile	Live Stranding
M226/13	Balaenoptera acutorostrata	09/07/2013	Highland	F	Adult	Physical Trauma
M292/13	Balaenoptera acutorostrata	06/09/2013	Fife	F	Juvenile	Live Stranding
M117/14	Balaenoptera acutorostrata	16/05/2014	Western Isles	M	Subadult	Live Stranding
M251/14	Balaenoptera acutorostrata	07/09/2014	Grampian	F	Adult	Live Stranding
M297/14	Balaenoptera acutorostrata	07/10/2014	Fife	M	Juvenile	Infectious Disease
M300/12	Balaenoptera borealis	14/09/2012	Tayside	M	Subadult	Infectious Disease
M37/13	Balaenoptera physalus	17/02/2013	Dumfries &Galloway	M	Subadult	Live Stranding
M159/14	Megaptera novaeangliae	25/06/2014	Strathclyde	M	Juvenile	Physical Trauma

7.7.1 *Minke whale (Balaenoptera acutorostrata)*

This species accounted for 4.2% (n=27) of the cetaceans reported. This was the fifth most commonly reported species during this reporting period and the most commonly reported mysticete. There has seen a slight decrease in numbers compared to the previous reporting period. This species occurs all along the Atlantic seaboard of Britain and Ireland it also occurs in the Northern North Sea as far south as the Yorkshire coast. They tend to inhabit the continental shelf in waters of around 200m or less in depth but can also be seen close to shore where the sometimes enter estuaries, bays or inlets. They are present all year round but most sightings are between May and September.

Characteristics:

- Feed on a variety of fish including; herring, cod, mackerel, haddock and sand eel
- Calving period is during the Winter
- Strandings are most common between June and October
- The most commonly observed cause of death is entanglement

Six animals were sent for necropsy (22.2%), three were sampled (11.1%), and the remaining 18 (66.7%) were not further examined. Sex was determined in 16 animals (59.3%) with an equal amount of males and females (eight each).

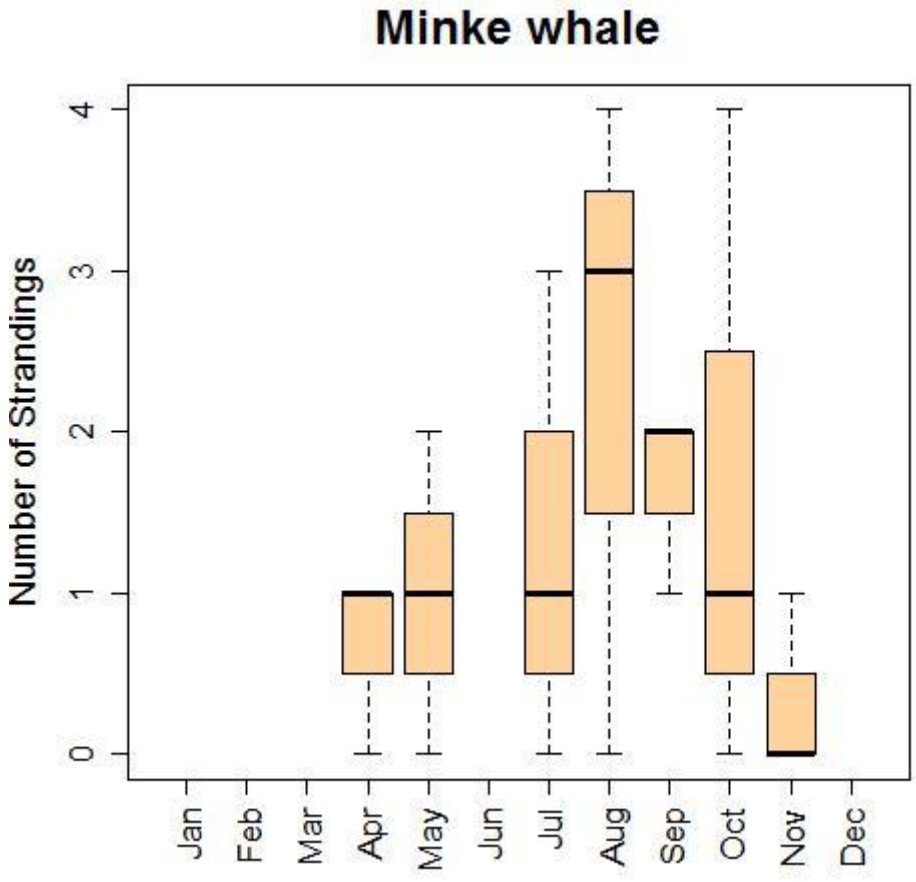


Figure 44: Boxplot of monthly variation in numbers of Minke whales (*Balaenoptera acutorostrata*) strandings reported from April 2012 – March 2015

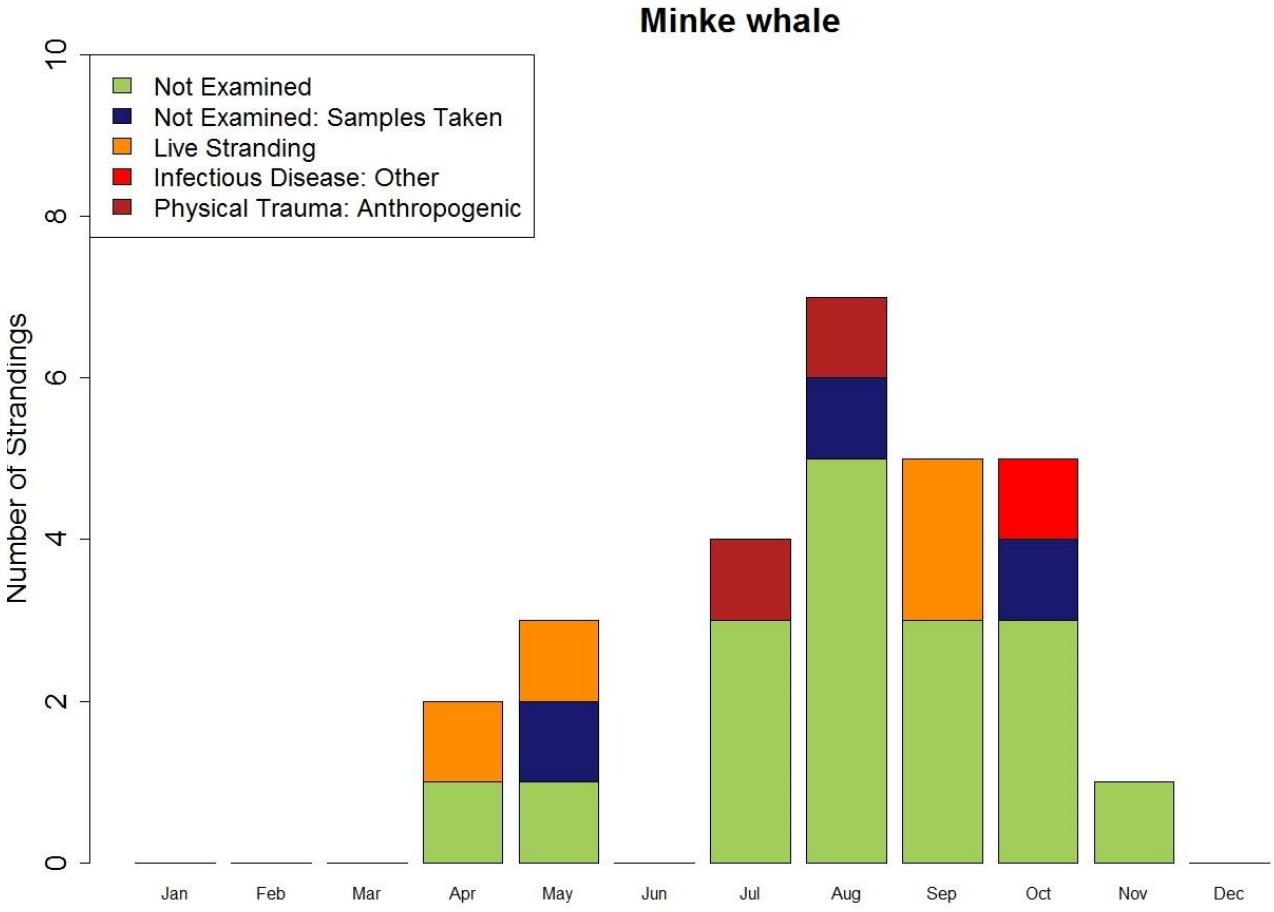


Figure 45: Total number of Minke whales (*Balaenoptera acutorostrata*) strandings from April 2012 – March 2015, by findings

Example case M251/14 – Minke whale (*Balaenoptera acutorostrata*)

This adult female minke whale was found stranded at Whitehill's in Aberdeenshire. Initial reports were of it being alive but an SSPCA officer confirmed the animal as dead when they attended. The animal was ion very good bodily condition with good blubber thickness and muscle mass. There were numerous excoriations to the ventral abdomen extending caudally from around the navel to the tailstock and fluke and cranially to a swelling in the throat. This swelling extended from the pharyngeal region to the thoracic inlet area. Upon incision this swelling was shown to be a very large abscess approximately 1 metre in length and full of watery yellow fluid and necrotic material. The associated retropharyngeal lymph nodes were fibrous and contained caseous yellow lesions 1mm to 3cm in diameter. There was no obvious associated foreign body or trauma associated with this. The animal was pregnant with a female foetus present in the left horn of the uterus. The stomachs were empty apart from a moderate nematode burden and watery fluid. The liver was moderately autolysed and had a rounded swollen appearance. There areas of fibrosis and numerous large (6cm) flukes present within the bile ducts confirmed by the Natural History Museum London as *Brachycladium goliath*. This has been recorded from minke and other baleen whales in the Atlantic and Pacific but not often. There was a large amount of pericardial fat present

something we have not seen in any cetacean before. The heart appeared normal. The lungs were not examined in detail however the right lung did appear hyper inflated.

The excoriations, haemorrhage within the blubber and preservation of the carcase would suggest the animal had live stranded at some point. There was no evidence of recent feeding. The large abscess found in this animal was long-standing but there was evidence suggestive of septicaemia spread in the liver. The presence of this in the animal is significant and may have hampered recent foraging by making swallowing difficult. This evidence for lack of feeding was born out by the fatty change seen in the liver histologically Cultures on the abscess revealed a pure and heavy growth of Brucella ceti. This isolate is significant and may well have caused the animals death. Cultures of liver lung kidney and RPLN were unrewarding. Molecular characterisation of the B. ceti isolate revealed it to be genotype ST26 this organism is normally associated with pelagic delphinids. This is only the third time a Brucella sp. has been isolated from this species. The previous isolates were of *B.pinnipedialis* (genotype 24) and *B.ceti* (genotype 23, normally associated with porpoises).

Figure 46: M251/14 Minke whale (*Balaenoptera acutorostrata*) showing fluid draining from large abscess after incision.

7.7.2 *Fin Whale (Balaenoptera physalus)*

This species accounted for 0.1% (n=1) of the cetaceans reported. This species did not appear in the previous reporting period. This species generally inhabits the waters beyond the

500m depth contour. When it is seen over the continental shelf it tends to be near the shelf edge in Northern Scotland. They usually occur between June and December. Sighting surveys suggest a population in the North Atlantic of around 47,000.

Characteristics:

- Feeds mainly on planktonic cructacea, Euphausids (Krill) and copepods but also fish such as Mackerel, herring and sand eel
- Calving occurs in midwinter (not occurring in Scotland)
- Strandings most commonly occur in February
- Live stranding is the most common cause of death (single case)

Example case M037/13 – fin whale (*Balaenoptera physalus*)

A sub-adult male fin whale was seen alive close to shore in the Cree estuary Wigton, Dumfries and Galloway, a large tidal region of soft sand and mud with, at time of stranding, a 4m tidal range. The animal was heard alive on the eve of 17th February 2013 and died overnight. It was recovered off the beach and following necropsy on site, buried in deep clay on the foreshore. Necropsy investigation was hampered slightly by the size of the animal but all major organ systems were visualised and sampled. The brain was sampled through the foramen magnum following removal of the head. The animal showed pathology consistent with aspiration drowning, specifically a large amount of fluid and stable foam in the airways and lung parenchyma. In addition, the animal was thin and moderately to severely jaundiced, most notably in the liver and kidney. Grossly, the liver did not appear pale or fatty and it is possible this is a physiological adaption to prolonged winter fasting. The pulmonary lymphatics also appeared grossly enlarged and had a dark, melanotic appearance to the cut surfaces. There was no evidence of recent feeding. No plastic ingesta was noted in the stomach and there was no indication of entanglement or traumatic lesions other than those associated with agonal stranding. It was originally hypothesised this animal live stranded and subsequently died due to entering this very tidal estuary at high water, possibly also becoming confused by the fishing groynes extending perpendicularly into the bay. Histopathology however revealed a severe, chronic, systemic granulomatous inflammation affecting many visceral organs and a mild to moderate, sub-acute to chronic, generalised non-suppurative encephalitis. The severity and systemic nature of the granulomatous inflammation is highly likely to have been severely debilitating and lead to the stranding of this animal. The aetiology is not obvious as no parasite profiles were found associated with the granulomatous lesions. Further examination of histology samples suggests the aetiology of the systemic infection may be due to morbillivirus infection. This case will be written up in more detail.

Figure 47: M0037/13 fin whale (*Balaenoptera physalus*).

7.7.3 *Sei Whale (Balaenoptera borealis)*

This species accounted for 0.1% (n=1) of the cetaceans reported. This species did not appear in the previous reporting period. There has only been one reported stranding of this species since 1992 in Scotland. Most records of sightings of this species in the British Isles come from waters deeper than 200m between the Northern Isles and the Faroes particularly in the Faroe-Shetland channel. They also occasionally occur in the coastal waters of the Western Isles and Shetland. Sightings occur in the North and West of Scotland between May and October with a peak in August.

Characteristics:

- Feeds mainly on surface planktonic cructacea, Euphausids (Krill) and copepods, but occasionally squid and fish
- Calving occurs in midwinter (not occurring in Scotland)
- The single stranding for this species occurred in September
- The only recorded stranded animal died due to infectious disease

Example case M300/12 – Sei whale (Balaenoptera borealis)

On 12th September 2012 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 gastroenteritis is the most likely cause of the live stranding of this animal.

Figure 48: M300/12 Sei whale stranding (*Balaenoptera borealis*).

7.7.4 *Humpback whale (Megaptera novaeangliae)*

This species accounted for 0.3% (n=2) of the cetaceans reported. This species did not appear in the previous reporting period. Photo Identification of the North West Atlantic population suggests that there are around 10, 600 individuals. Most sightings in the UK have come from the Northern Isles, but more recently animals have been spotted in the Moray Firth and the Minch as well as the Hebridean sea. Most sightings occur between May and September.

Characteristics:

- Feed mainly on krill, herring and cod when in British waters.
- Calving occurs in winter (not occurring in Scotland).
- There is no seasonality to their strandings.
- The most common cause of death is entanglement (single case).

Example case M159/14 – Humpback whale (*Megaptera novaeangliae*)

A juvenile male humpback was found in a very fresh condition trapped beneath the lower mesh of a salmon pen in Fishnish, Isle of Mull. It showed evidence of acute anoxic drowning in an otherwise clinically unremarkable case. The lungs and bronchi were bilaterally congested and fluid-filled, heavy and with no asymmetry. The stomach lining was very pale and this lack of pigment and absence of contents suggest little previous solid food ingestion. The stomach, however, contained a large amount of fluid, likely seawater. There was little developed keratinised epithelium in the cardiac stomach, consistent with a pre- or peri-weaning diet. Additionally, the muscles were pale, with little myoglobin pigment evident. These findings are consistent with a weaning, maternally-attached animal which underwent an acute death. The lack of inflammatory lesions, parasitism, or other signs of disease, plus the general state of the lungs found on histology are all supportive of death by drowning. The observed pathology and stranding history would be consistent with the animal

becoming entrapped beneath the salmon pen and subsequently drowning. The pen structure has a mesh base with 8 x 300kg weights for ballast and the animal was observed in the middle of one pen having lifted the base to the surface. Humpback juveniles are known to be very inquisitive and it could be speculated that the animal may have either been attracted to the salmon pen structure or the fish within them but became trapped underneath and subsequently drowned.

Figure 49: M159/14 humpback whale (*Megaptera novaeangliae*) being recovered for necropsy at deep water dock

Figure 50: Array of salmon pen similar to the set where the whale was entangled

7.8 *Kogia sp.*

Pygmy sperm whale (*Kogia breviceps*)

This species accounted for 0.3% (n=2) of the cetaceans reported. This species did not appear in the previous reporting period. There are very few records of sighting of this species in the European waters; those that are there are from the Bay of Biscay and the South Western approaches to the channel, though the species has also been reported in the North sea. This species occurs mainly in deep oceanic waters beyond the continental shelf edge. There are no estimates of abundance for this species.

Characteristics:

- Feeds predominantly on mesopelagic squid and occasionally fish and crustacean
- Calving occurs from March to August
- Strandings occur September to December with a peak in October

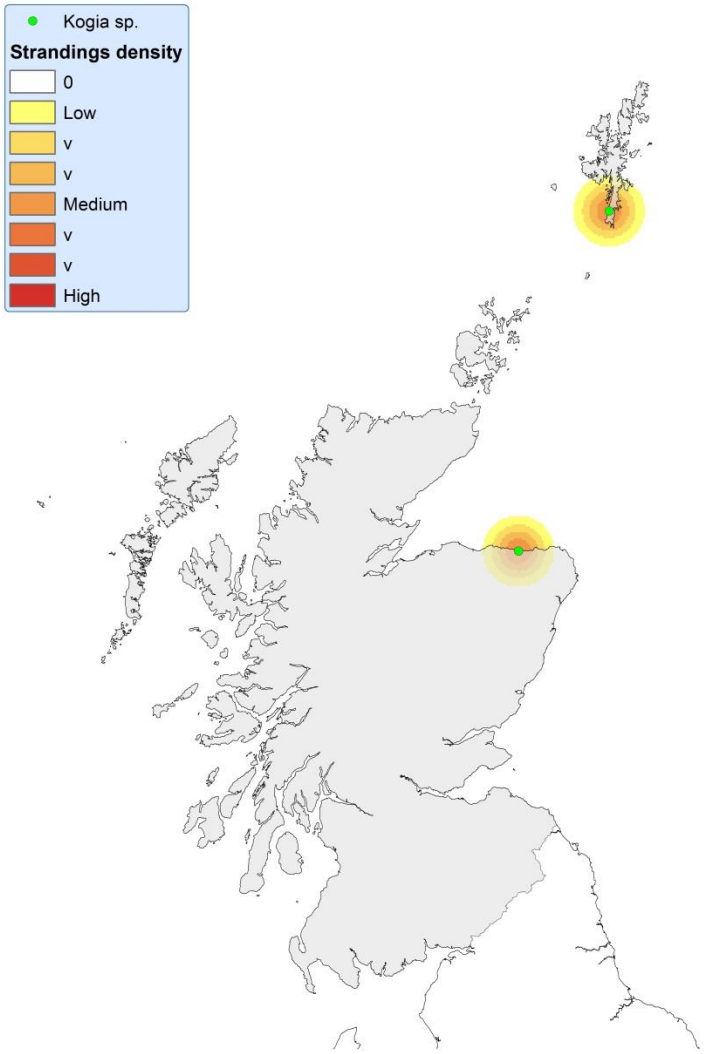


Figure 51: Distribution of pygmy sperm whales (*Kogia breviceps)* strandings from March 2012 to April 2015.

Example case M291/13 – pygmy sperm whale *(Kogia breviceps)*

This was a juvenile/sub-adult female pygmy sperm whale that live stranded at Banff. In general the animal appeared in good body condition. There was a large amount of stable foam in the lungs and asymmetric congestion consistent with a live stranding event. All other systems appeared unremarkable. The exception to this was a large amount of cerebral spinal fluid (CSF) and seemingly dilated ventricles within the brain. Bacteriology did not reveal any significant isolates. This is only the fifth time this species has stranded in Scotland since the scheme began and only the ninth record for the UK as a whole. Histology showed a severe, acute, locally extensive adrenal cortical haemorrhage and moderate, acute, multifocal cerebral haemorrhage, mild to moderate, per-acute, focal cardiomyopathy and severe, acute, generalised hepatic congestion. The haemorrhages in the adrenal gland and brain are suggestive of severe acute stress and the lesions in the heart and liver suggest the proximate cause of death was heart failure. The lungs are consistent with live stranding and your observation of skin easily sloughing along with the pattern of congestion and haemorrhage observed histologically in this organ may represent a reaction to hyperthermia and an attempt to lose heat. Unfortunately, all these findings are probably a result of the

live-stranding process rather than the ultimate cause of death which were unable to determine.

Figure 52: M291/13 pygmy sperm whale (*Kogia breviceps*).

Section 8: Mass stranding events (MSE's) multiple strandings and unusual mortality events

A mass stranding event (MSE) is defined as two or more animals that are not a cow/calf pair. We also had cow calf pairs strand during this period see 6.1.6 and 6.1.10

Cetacean mass stranding events (MSEs) elicit much interest from both the public and scientific community but the underlying reasons largely remain a mystery. Live stranding events and more specifically mass live stranding events are extreme situations in which public safety, animal welfare and conservation science issues have to be managed with an clear perception of priorities. Thorough investigation of these events usually requires the consideration of a number of natural and anthropogenic factors. The investigations are multidisciplinary and include not only the examination of the animals themselves but also of the environment they inhabit, so, climatic conditions, seismic activity (both natural and man-made), shipping and naval activities and natural predators are all included. Examination of the carcases themselves is extensive with gross pathology, bacteriology, virology, histopathology and toxicology all essential in reaching a diagnosis for each individual but also for the group as a whole. Additional assessment of age and sexual maturity and stomach contents is also conducted. Despite all this it is not always possible to establish a cause in all cases.

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

Two female Sowerby's beaked whales were reported on 14th and 16th August 2012 in Culross and Bo'ness, Fife. One was necropsied on site and the other taken 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. There was no infectious process found in either animal that would explain the live stranding.

Figure 53: M256.1/12: Sowerby's beaked whale (*Mesoplodon bidens*)

8.2 M271/12 - White-beaked dolphins (Lagenorhynchus albirostris)

Three male white beaked dolphins stranded on 23rd August 2012 at Ardesier in the Moray Firth. All were taken 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. 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 possibility. There was no evidence of interactions with the bottlenose dolphin population in the area.

Figure 54: M271/12 White-beaked dolphin (*Lagenorhynchus albirostris*)

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

Approximately 35 pilot whales stranded on 2nd September 2012 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 this mass stranding can be found at:

http://www.strandings.org/reports/MSE_Report_2012.pdf

Figure 55: M280/12 cases from long-finned pilot whale (*Globicephala melas*) MSE.

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

Three white beaked dolphins stranded on 9th November 2012 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. 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 this animal had a mild to moderate, sub-acute, multifocal mixed inflammatory cell primarily broncho-pneumonia and a mild to moderate, sub-acute multifocal necrotising splenitis and hepatitis. These findings are suggestive of a systemic infectious process affecting primarily the lung, spleen and liver. Although some form of visceral larval migrans is usually considered most likely in cetaceans we were unable to find any parasite profiles in any of the section. Therefore we cannot rule out some form of other infectious agent such as *Brucella ceti* for example. The other animal had only pathology associated with live stranding.

8.5 M132.1.2.3/13 and M138/13 – long-finned pilot whale (Globicephala melas)

Three long-finned pilot whales live stranded at Portmahomack on the 24th of April 2013. The MSE was attended by British Divers Marine Life Rescue (BDMLR) medics who re-floated two of the animals (M132.2/13 & M132.3/13). One animal died at the scene (M132.1/13) and was recovered for necropsy. There were no gross abnormalities seen in any of the viscera or systems. In particular there was no obvious haemorrhage in ears, no abnormalities present in blubber or acoustic fat. The brain appeared unremarkable and there was a normal volume of cerebral spinal fluid (CSF). There were no significant bacteria isolated from any of the visceral or neurological tissues sampled. Histopathological examination revealed severe, per-acute, generalised centrilobular hepatic congestion. Mild, chronic, focal, pulmonary nematode parasitism with associated mild, chronic-active, multi-focal mixed inflammatory cell broncho-pneumonia. Very mild, sub-acute to chronic, multi-focal lymphocytic encephalitis was also present. The hepatic lesions suggest the actual final cause of death was heart failure. However, this was probably a sequela of live-stranding rather than the cause. It was concluded this was a generally healthy animal with no evidence of underlying disease or trauma. The congestion and oedema in the lungs is also likely to have been a terminal event although the degree of verminous pneumonia did not appear to be sufficient to significantly compromise this animal.

A single pilot whale was found dead stranded at Inver near Tain on 27th April. Subsequent photo identification of the dorsal fin confirmed it as one of the three animals originally stranded at Portmahomack on the 24th April. This animal was refloated in the morning of the 24th April at Portmahomack, and again in the evening of the same day at Dornoch before being washed ashore dead three days later. This animal was necropsied as case ID M138/13 however was the same animal as originally allocated ID M132.3/13. It was body condition 3-4 and had been dead approximately 96 hours at point of necropsy and there was extensive gassing and autolysis. There was a large volume of fluid in thoracic cavity and congested lungs. There had been ingestion of silt and sand. There was mild ventral bruising, suggesting that the animal had previously live stranded. Culture of the cerebral spinal fluid (CSF) did not produce any significant bacteria. The autolytic state of the animal precluded the collection of samples for histopathology and the cause of the original live stranding was not established; however as with the previous case there appeared to be no indication of underlying disease.

Due to the coincidental operation of naval exercise “Joint Warrior” occurring in the region in the period immediately prior to these strandings, a FOI request was made to the Ministry of Defence (MOD) to establish if any acoustic generating activities were underway prior to the stranding. The data provided showed an amount of activity capable of generating underwater noise in the 48 period prior to the stranding. It was not clear however how this period differed from the normal level of disturbance from the permanent MOD bombing range. As this baseline data was not available, assessment of the relative significance of particular anthropogenic noise generating events was difficult and the significance of noise as a contributory factor in this mass stranding event was therefore inconclusive.

Figure 56: Second long-finned pilot whale (*Globicephala melas*) M138/12 dead stranded following two refloats attempts by BDMLR.

8.6 M299.1/13 – Sowerby's beaked whale (*Mesoplodon bidens*)

This adult female Sowerby's beaked whale live stranded together with a calf at St. Kilda on the 12th September 2013 and efforts were made by National Trust for Scotland (NTS) staff and members of the public to refloat both animals. Unfortunately the adult female died on the beach. The calf was successfully re floated, but the mother was still producing milk it is thought that the calf may not have been weaned so unlikely to survive. At necropsy the adult was found to be in good nutritional state. There was evidence of successful feeding due to the presence of otiliths in the stomach however there were no fleshy remains or squid beaks suggesting the animal had not fed recently. Stomach contents were of interest as they mainly contained otiliths rather than squid beaks. This supports the idea that Sowerby's are primarily fish rather than squid eaters. There was asymmetric congestion of the lungs and stable foam in the airways consistent with a live stranded animal. The uterus was red and possibly inflamed. All other visceral systems appeared normal. The brain on removal showed haemorrhage within the cerebral ventricles and congested meninges. There was also blood tinged cerebral spinal fluid. No gas bubbles were seen in the blood vessels surrounding the brain or within the mesenteric veins. Bacteriological examination did not reveal any obvious pathogens; however *Photobacterium damselae* was isolated from the brain and CSF in pure culture. Histopathology indicated that isolation of this organism was not significant in this case and was likely a necropsy invader. There was no evidence of infectious or pathologic metabolic processes in this animal and the proximal cause of death was live stranding. Histopathology also found spongiosis in the white matter of the brain, probably secondary to hepatic dysfunction (which can be due to inanition). Interestingly, vasculopathy was present in the central veins, suggestive of fibrinoid deposition, which would compromise hepatic function. This is usually associated with arteries and arterioles. However, hypertension, which may result from live-stranding stress, is one of the causes of fibrinoid deposition. As such, vasculopathy of the central veins may be one of the many sequelae of live-stranding, seen alongside small peri-vascular

haemorrhages in the brain and per-acute liquifactive necrosis of the myocytes of the skeletal muscles. The lungs are consistent with a live-stranded animal and the ovaries suggest the animal was undergoing reproductive cycles.

There was no evidence of infectious or pathologic metabolic processes in this animal and the proximal cause of death was live stranding. She was obviously healthy and in good nutritive condition at the time of death.

The topography of the island and its isolated location close to deep water would mean that the animals were in an area where they would possibly be resident. The fact that there is only one possible location for the animals to strand and that they chose this location to strand is noteworthy. It is possible that they may have been forced into the Village Bay area by an as yet unknown stimulus where the calf became disoriented by the unfamiliar topography and live stranded before the female.

Figure 57: M299.1/13 Sowerby's beaked whale (*Mesoplodon bidens*).

8.7 M201.1-M201.14/14 – Common dolphin (*Delphinus delphis*)

On 24th of July 2014 reports were received from the Hebridean Whale and Dolphin Trust (HWDT) and then local police of a MSE at Laggan Sands, Loch Buie, on Mull. This is a remote

area of coastline and it was initially unclear what species or how many animals were involved. Volunteers trained in sample collection from HWDT drove to the site to assess the situation. They found that there had been 14 common dolphins stranded on the sands, one of which had a piece of packing strap loosely around its pectoral fin. Twelve of these animals including the one with the packing strap (which had been removed) had been re-floated by members of the public. Two animals both adult males died at the scene. There were also a number of common dolphins in the loch that didn't strand. By the time volunteers from HWDT arrived only the two dead animals were left. It was late afternoon by the time HWDT were able to relay this information to us so the decision was taken not to PM those that had died. This was for several reasons. The stranding was in a remote location on Mull and access to the carcases was restricted with no feasible option for removing them for chilling. Due to high ambient temperatures, by the time SMASS pathologists would have made it to the site necropsy autolysis would most likely have been advanced. Additionally, as only two of the 14 animals died it was possible that examining them would be insufficient to establish the cause of the MSE. However HWDT sampled both the dead animals on our behalf and collected a full set of morphometrics.

Figure 58: M201/14 Common dolphin (*Delphinus delphis*) MSE refloat. Photo © Simon Lane.

8.8 M246.1/14 & M246.2/14 – Northern bottlenose whale (*Hyperoodon ampullatus*)

Two juvenile Northern bottlenose whales were found dead stranded in a shallow bay near the Isle of Ornsay, Skye. Severe autolysis hampered diagnostic investigation in the first animal. There was weak evidence for live stranding from the lung asymmetry. The presence of ingesta indicated good historic foraging but none close to death. The scrap of plastic sheeting found in its oesophagus may have been ingested whilst the animal was foraging for squid. Bacteriology did not reveal any significant isolates. The second animal was significantly less autolysed than the first animal. There was convincing evidence from the lung asymmetry, tail fluke injury and tailstock abrasions that the animal had live stranded. Similar to the first animal there was no evidence of recent feeding. However the presence of numerous squid beaks and good body condition suggest adequate feeding over recent weeks. The liver catabolism may also support a diagnosis of anorexia, likely due to poor foraging in local waters as evidenced by the presence of a sea cucumber found in the cardiac section of the stomach. No underlying infectious process was evident from gross pathology. Bacteriology did not reveal any significant isolates in either animal. Autolysis was too extensive in the first animal for meaningful histopathological examination. Histopathology on the second animal showed lesions consistent with the live-stranding process; however an underlying cause for the stranding was not evident from the tests undertaken.

Figure 59: M202/14 Northern Bottlenose whale (*Hyperoodon ampullatus*) MSE.

8.9 M278.1-& M278.2/14 – White beaked dolphin (*Lagenorhynchus albirostris*)

Two white-beaked dolphins live stranded at Balnakeil beach Durness on 26th of September 2014. One animal refloated itself without assistance the other was refloated by members of the public. Unfortunately only the latter animal was photographed. There were also unconfirmed reports of a third animal seen in the surf later the same day. On 27th September a sub-adult female, possibly one of the animals found live stranded on 26th September 2014, was found live stranded on the same beach. However as there are no photos available of this animal taken on Friday it is also possible it may be a different animal. The decision to euthanase the animal was taken and it was shot with a high velocity rifle. It was in fresh condition at examination and showed lung asymmetry consistent with live stranding. It had not recently fed, was in moderate to thin body condition and exhibited some renal petechiation possibly due to the previous stranding. There was no obvious disease process evident; however complete brain and ear assessment was obviously compromised by ballistic trauma. Parasitism was notably absent or very low burden. The bacteriology on this animal would suggest a possible septicaemia due to a Streptococcus sp. and histopathology showed a moderate sub-acute multifocal suppurative bronchopneumonia. It also had a moderate acute to sub-acute generalised suppurative gastritis, and a moderate to severe sub-acute generalised lymphadenopathy. Pneumonia, especially in the absence of any pulmonary parasites, and gastritis were probably clinically significant and may be responsible for the stranding of this animal. This highlights the need for rescuers to take photographs of all animals that are refloated so they can be identified if they re-strand at a later date.

Figure 60: M278.1/14 White beaked dolphin (*Lagenorhynchus albirostris*) the animal that live stranded and was refloated by members of the public.

Figure 61: M278.2/14 White beaked dolphin (*Lagenorhynchus albirostris*)

this animal is clearly not the animal pictured above so may be the second animal from the 26th or possibly a new animal.

8.10 M282.1-& M282.2/14 – Sowerby's beaked whale (*Mesoplodon bidens*)

Two Sowerby's beaked whales live stranded at Balnakeil beach Durness on 30th September 2014. This was the same beach as the white beaked dolphin MSE (M278/14) four days previously. They were an adult female and a male calf so thought to be a cow/calf pair. The female Sowerby's beaked whale live stranded in shallow water possibly following a neonate, assumed to be its calf that stranded at the same time. The asymmetry seen in the lungs was consistent with the animal live stranding. There was evidence of the animal having fed, but no recent feeding and the cardiac stomach contained only otiliths. The liver was moderately fatty but generalised autolysis complicated this picture. There were no notable emboli in the organs or mesenteric vasculature. The ears were not examined due to autolysis, and no underlying traumatic or infectious reason for the live stranding was evident. Bacteriology on both animals proved unremarkable. The adult animal was lactating. Foetal folds were still visible in the calf and there was some turbid liquid, possibly milk in the stomach, but no other digesta. The other organs were moderately autolysed but pathologically unremarkable. It is plausible that one of the pair became stranded in the shallow beach and the other followed, however an underlying reason was not evident from the tests undertaken.

Figure 62: M282.1/14 & M282.2/14 Sowerby's beaked whale (*Mesoplodon bidens*) cow and calf pair.

Due to the presence of two multiple stranding events on the same beach and within a few days of each other, concern was raised as to a common cause, possibly anthropogenic factors. Given the history of mass strandings in this region associated with underwater noise (2011 long finned pilot whale MSE), a request was made to both the Ministry of Defence and Department for Environment and Climate Change (DECC) requesting activity logs for the period between 22nd September and 1st October 2014. From the information provided (see appendix 6) and the absence of any pathological indication of recent acoustic trauma, there was no evidence to suggest an anthropogenic acoustic cause to these stranding events.

8.11 Cuvier's beaked whale (Ziphius cavirostris) UME

Between December 2014 and January 2015, five Cuvier's beaked whales stranded along the west coast of Scotland; two on the Western Isles (Benbecula and South Uist), one on Tiree, one at Westpoint Kintyre and finally one on Mull. The last animal, although reported to us at the beginning of January 2015, was reported to HWDT in December 2014. They were all in an advanced state of autolysis. During the same period, nine individuals of the same species stranded along the West coast of Ireland. It was not possible to determine the cause of death for any of the Cuvier's beaked whale carcases that stranded in Ireland or Scotland from December 2014 to January 2015. This was due to a lack of a necropsy scheme in

Ireland, and the advanced state of decomposition of those carcases that stranded in Scotland. The processes of decomposition were so advanced that both gross and histopathological interpretation would have been at best inconclusive. It is well documented that Cuvier's beaked whales are one of the most sensitive species to acoustic disturbance. There are many case studies from the Atlantic and Pacific Oceans and Mediterranean Sea where mass-strandings of this species were linked to exercises using military sonar. Stranded whales that are detected and reported represent a small proportion of those that actually die at sea. A carcase has to make landfall, be discovered and finally be reported in order to be registered as a stranding. The likelihood of this occurring is low, particularly along the Irish and Scottish western seaboard where the coastline is long and remote.

Nonetheless the strandings along the Atlantic seaboard are without question unusual in terms of absolute numbers and this incident merits careful consideration. In the absence of any pathological information to potentially rule in or out other factors, investigating any potential anthropogenic causal factor, e.g. underwater noise, would have to be done a priori. The wide spatial distribution of cases in various stages of autolysis makes it likely impossible to accurately identify a common point of origin in either time or space. To account for all the potential areas where the mortalities could have originated we would therefore require data logs of noise generating activities over a significant area of ocean and over a number of weeks. This is likely to involve both military and civilian activities and acquiring this data could be difficult, given, for example the potential role of foreign vessels which the MOD has no jurisdiction to report. Finally, there is no baseline data for noise and therefore to attribute any activity as being causal to this stranding we would need to be able to demonstrate that the activity in question, e.g. use of high levels of sonar deployed to find submarines, was significantly unusual in terms of duration, frequency, power or location, that it would be plausible for it to have caused injury or death.

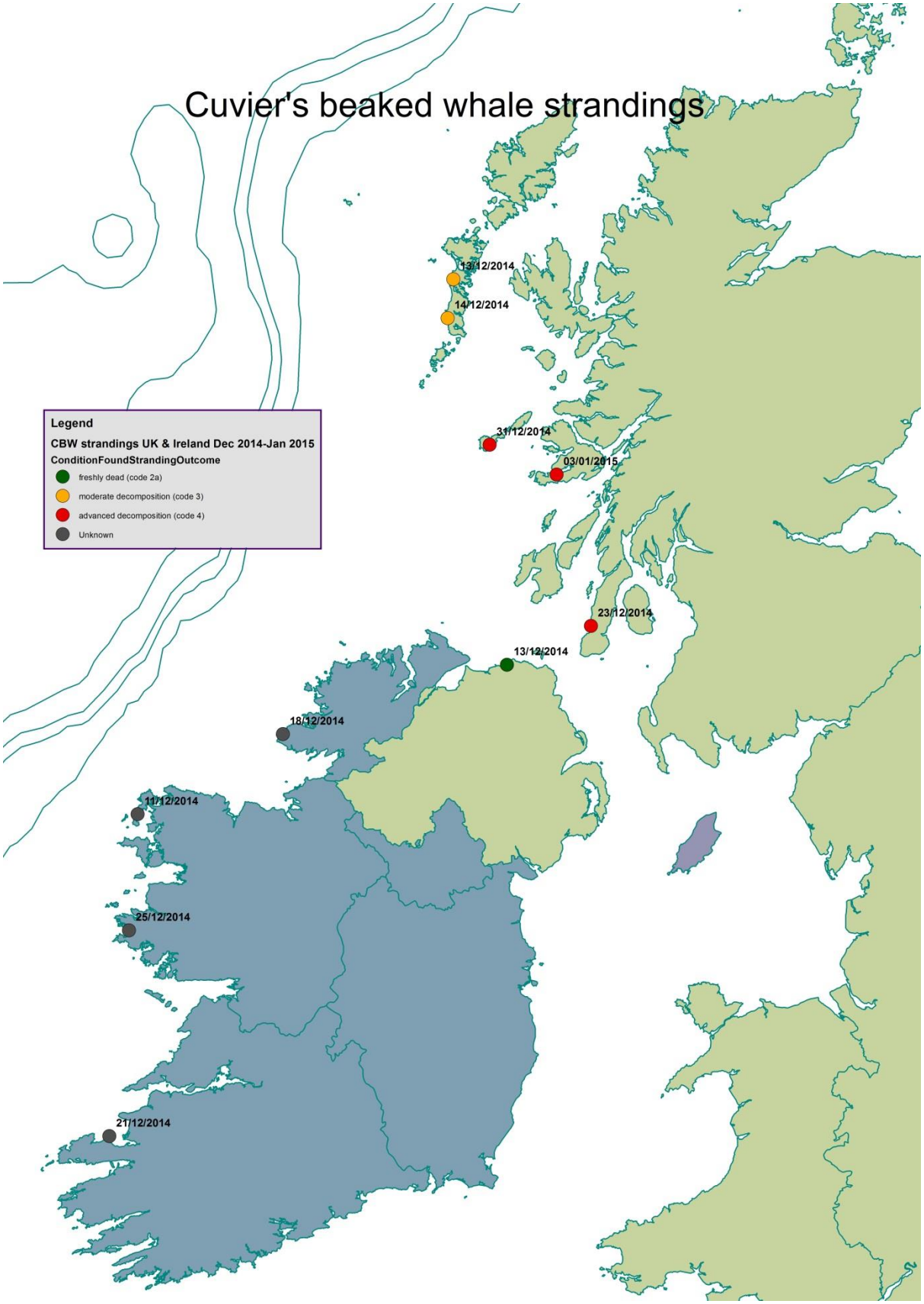


Figure 63 Map showing the distribution of the Cuvier's beaked whale (*Ziphius cavirostris*) strandings from December 2014 to January 2015.

Section 9: Seal species found stranded in Scotland

Two species of seal live and breed in UK waters: grey seals (*Halichoerus grypus*) and harbour (also called common) seals (*Phoca vitulina*). Other species occasionally occur in UK coastal waters, including ringed seals (*Phoca hispida*), harp seals (*Phoca groenlandica*), bearded seals (*Erignathus barbatus*) and hooded seals (*Cystophora crystata*) all of which are Arctic species. There was also a live Walrus (*Odobendus rosmarus*) recorded on Orkney during this reporting period.

There were 798 seals dead stranded along the Scottish coastline seals and reported to SMASS during the period of this report. This included three species; grey seals (n=408), harbour seals (n=136), and notably a hooded seal. Two hundred and fifty-two animals (31.5%) could not be identified to species level.

Twenty-six of the reported animals, 11 harbour seals and 15 grey seals, were subject to necropsy. These numbers do not include seals reported under seal management or seals with corkscrew lesions (more details on these can be found in section 11 of this report). Table 10 shows an overview of the causes of death observed excluding these two physical trauma categories, separated by age class. A further three harbour seals and five grey seals were sampled by trained volunteers. No animals went for necropsy between January and March 2015 and hence this year is excluded from the table. Infectious disease was the most common cause of death when corkscrew and seal management cases were not considered, with 12 cases (46.2%) dying of either pneumonia, or a generalised bacterial infection.

Details of the species stranded are given below, together with a more detailed overview of the individual necropsied cases, and notable single strandings. These are notable for reasons either of species, pathology or because they highlight a particular issue.

Table 10: Causes of death for harbour seals (*Phoca* vitulina) and grey seals (*Halichoerus grypus*), excluding corkscrew and seal management cases, reported between April 2012 and March 2015.

	2012	2013	2014	Grand Total
Infectious Disease	**1**	**8**	**3**	**12**
Generalised Bacterial Infection/Septicaemia			**1**	**1**
Juvenile			1	**1**
Pneumonia: Parasitic		**5**	**1**	**6**
Adult		3		**3**
Juvenile		2	1	**3**
Pneumonia: Unknown Aetiology	**1**	**3**	**1**	**5**
Adult	1	2	1	**4**
Unknown		1		**1**
Trauma	**1**	**1**	**1**	**3**

Entanglement (Known)	**1**			**1**
Adult	1			**1**
Physical Trauma: other		**1**	**1**	**2**
Juvenile		1	1	**2**
Not Established	**4**			**4**
Adult	3			**3**
Juvenile	1			**1**
Other	**1**	**3**	**3**	**7**
Dystocia/Stillborn	**1**			**1**
Pup	1			1
Starvation		**3**	**1**	**4**
Pup		2		2
Juvenile		1	1	2
Other				
Juvenile			2	2
Grand Total	**7**	**12**	**7**	**26**

9.1 Harbour (common) seal (*Phoca vitulina*)

Harbour seals have a circumpolar distribution in the Northern Hemisphere and are divided into five sub-species. The population in European waters represents one subspecies (*Phoca vitulina vitulina*). This species accounted for 17% (n=136) of the seals reported. This was the second most commonly reported species during this reporting period this is almost double the number as reported in the previous reporting period. Adult harbour seals typically weigh 80-100 kg. Males are slightly larger than females. Harbour seals are long-lived with individuals living up to 20-30 years. Approximately 30% of European harbour seals are found in the UK; this proportion has declined from approximately 40% in 2002. Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles. There estimated to be around 20,720 in Scotland.

- They take a wide variety of prey including sand eels, gadoids, herring and sprat, flatfish, octopus and squid. Diet varies seasonally and from region to region.
- Pups are born June and July.
- Most strandings occur December and January with another peak in July possibly reflecting the pupping season.
- The most common cause of death in Scotland is physical trauma
- The second most commonly observed cause of death (when corkscrew and seal management cases are not considered) is starvation/hypothermia followed by infectious disease

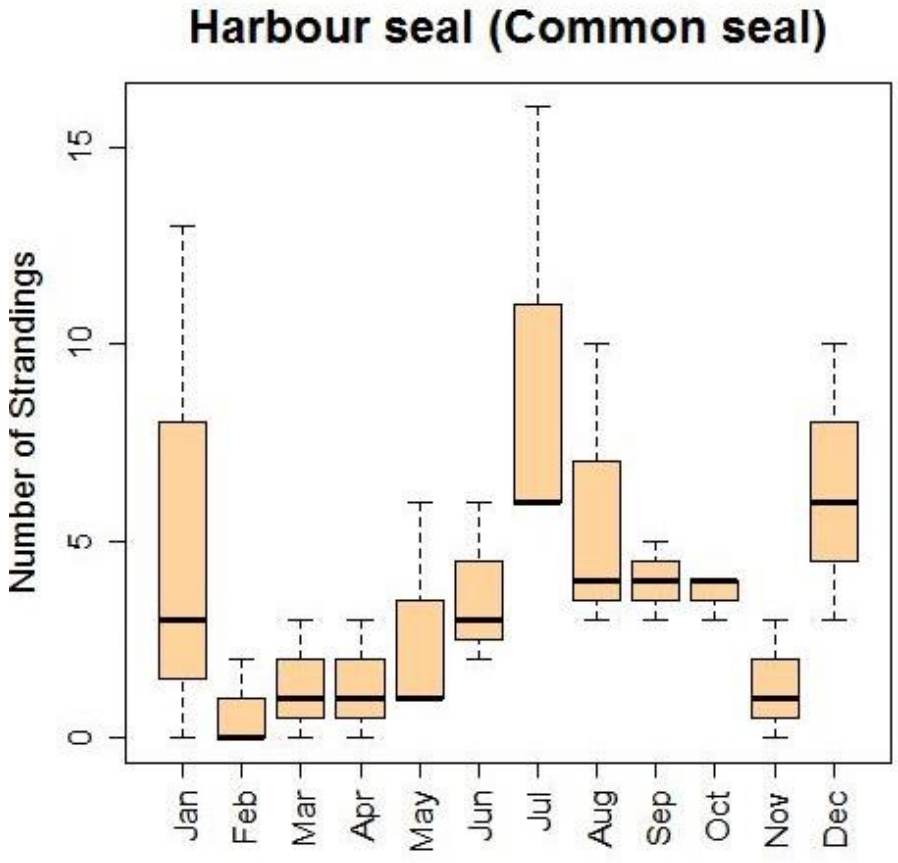


Figure 64: Boxplot of monthly variation in number of harbour seal (*Phoca vitulina*) strandings reported from April 2012 – March 2015

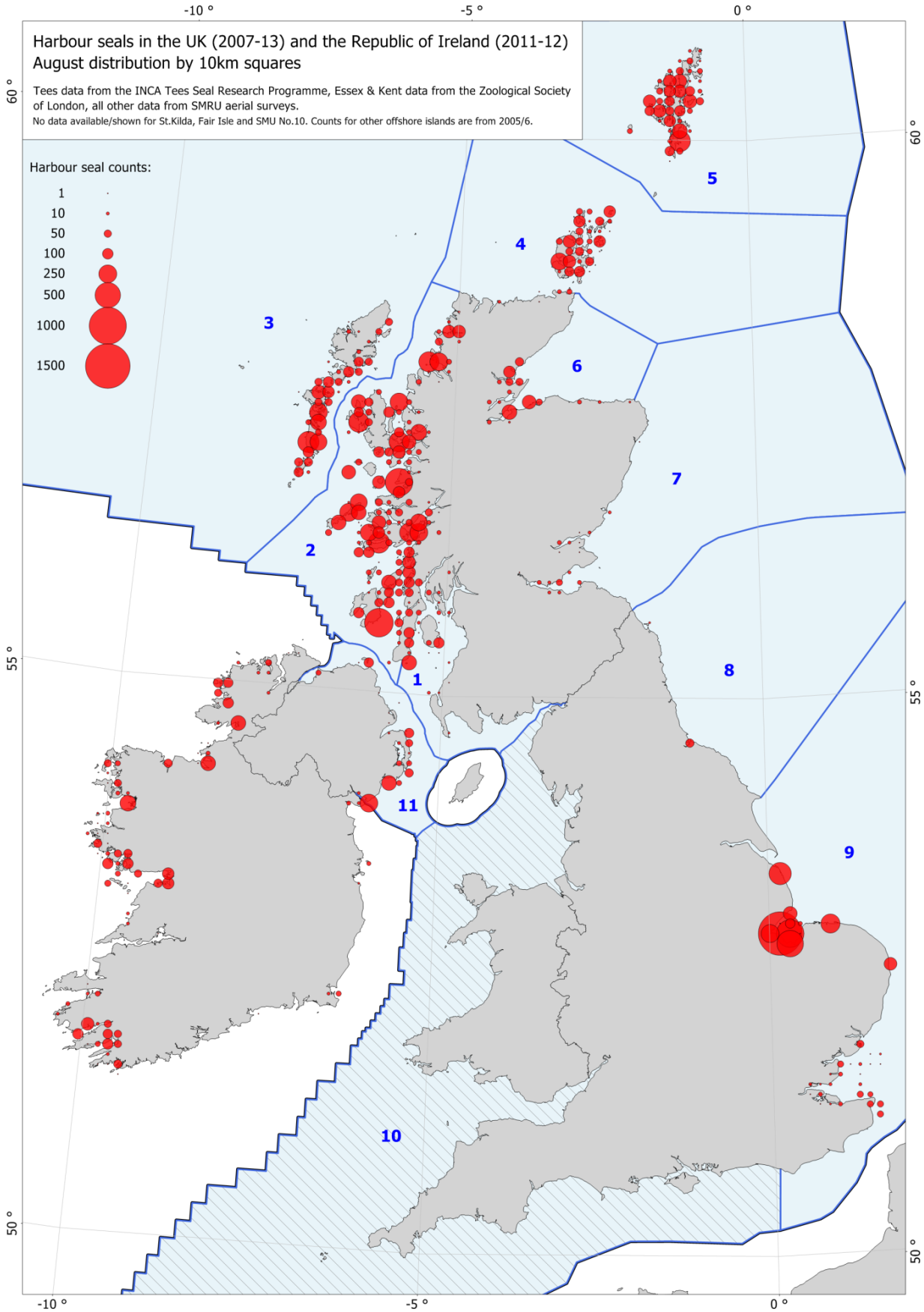


Figure 65 August distribution of harbour seals (Phoca vitulina) around the British Isles. Very small numbers of harbour seals (<50) are anecdotally but increasingly reported for the West England & Wales management unit, but are not included on this map SCOS2014.

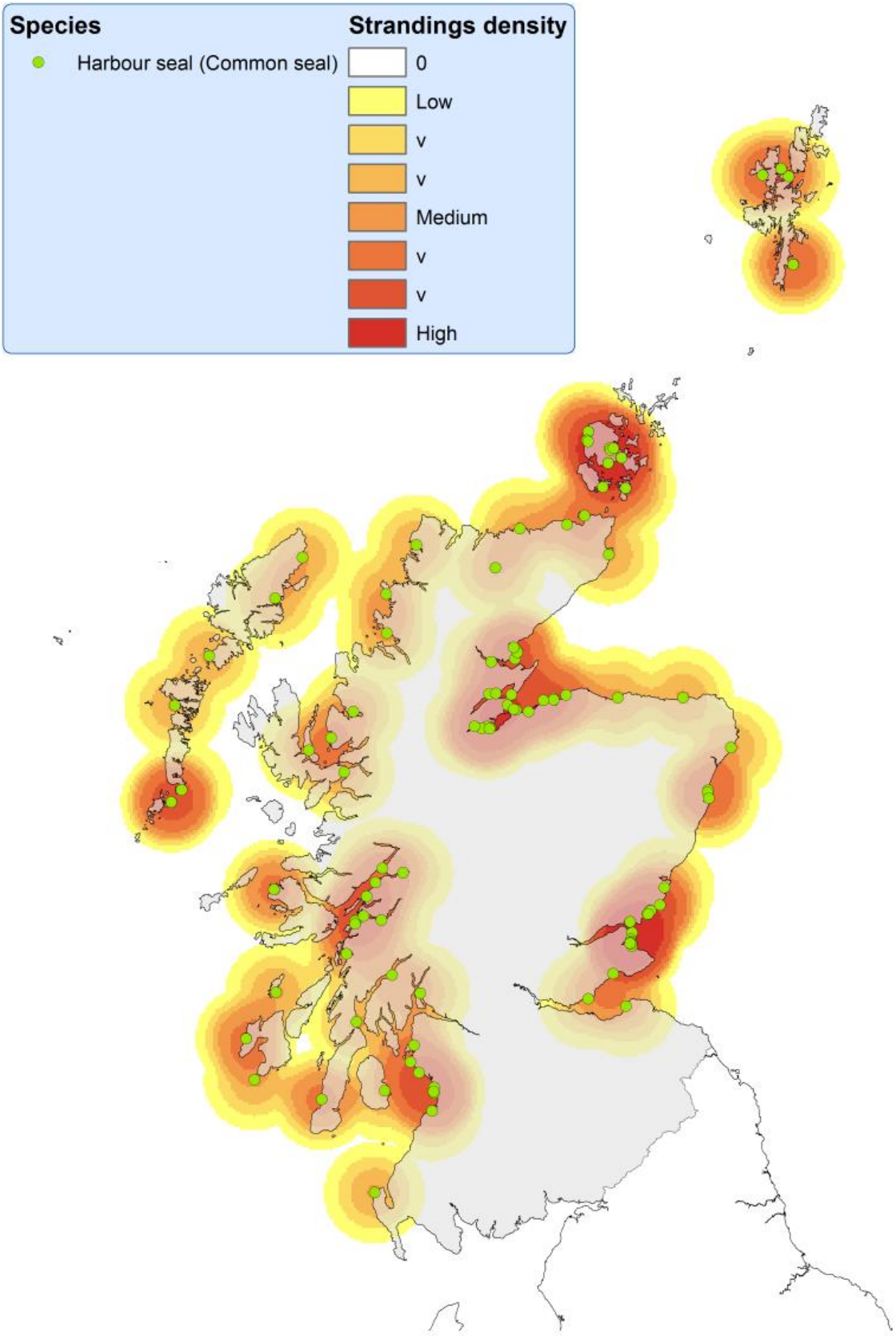


Figure 66: Distribution of harbour seal (*Phoca vitulina*) strandings April 2012-March 2015 the high density on East coast is possibly the result of high surveillance by various research centres

Table 11: Harbour seal (*Phoca* vitulina) cases at necropsy (excluding corkscrew and seal management cases) reported between April 2012 and March 2015

M reference	Date Found	Location	Sex	Age Group	Cause of Death Category
M164/12	18/06/2012	Angus	F	Adult	Not Established
M243/12	08/08/2012	Fife	F	Pup	Dystocia/Stillborn
M250/12	09/08/2012	Fife	M	Adult	Pneumonia: Unknown Aetiology
M301/12	16/09/2012	Highland	F	Adult	Not Established
M198/13	13/06/2013	Highland	F	Adult	Pneumonia: Unknown Aetiology
M243/13	24/07/2013	Orkney	M	Pup	Starvation/Hypothermia
M263/13	04/08/2013	Highland	F	Pup	Starvation/Hypothermia
M337/13	04/11/2013	Aberdeenshire	F	Juvenile	Pneumonia: Parasitic
M381/13	15/12/2013	Aberdeenshire	F	Juvenile	Starvation/Hypothermia
M5/14	03/01/2014	South Ayrshire	M	Juvenile	Physical Trauma
M26/14	31/01/2014	Fife	F	Juvenile	Starvation/Hypothermia

Example case M198/13 – harbour seal (*Phoca vitulina*)

A pregnant harbour seal from Kyle Rhea Skye, was close to term and showed evidence of lung congestion. She was in thin/emaciated body condition and showed no evidence of recent feeding; although a normal volume of faeces was present. The lungs were congested, dark red in colour some nematodes present. The lung pathology may be due to nematode migration; however the isolation of a *Pasteurella sp*. from the lung may also be significant. Histology showed marked, diffuse congestion throughout the lungs with diffuse, moderate alveolar and interstitial emphysema. It was difficult to establish the significance of the isolation of *Pasteurella spp.* from the lungs of this animal. The bronchial lesion was quite chronic and lacks the neutrophilic component that would typically be expected from such an infection. The final cause of death of this animal is unclear but it was not possible to rule out a process such as endotoxic shock.

Example case M337/13 – harbour seal (*Phoca vitulina*)

This juvenile female harbour seal was found with a laceration to the head and neck area with evidence of scavenger damage. It was in thin to emaciated condition and showed no evidence of recent feeding. The high respiratory nematode burden and associated emphysema would account for the debilitation and likely impaired dive capabilities. The epidermal trauma is likely necropsy damage by both terrestrial and avian scavengers. Histology showed extensive pulmonary parasitism and the presence of moderate emphysema and is most likely due to a combination of *Parafilaroides* and *Otostrongylus* nematodes. These lesions may have predisposed this animal to secondary bacterial infection (bacteria seen in bronchi).The reactive hepatitis and mild thickening of renal glomerular membranes seen in this seal are supportive of systemic septicaemia. Consequently the isolation of *Streptococcus phocae* from multiple organs may well be of significance. The point of entry is not clear but secondary infection of pulmonary lesions would be a strong possibility.

Figure 67: M337/13 harbour seal (*Phoca vitulina*).

9.2 Grey seal (*Halichoerus grypus*)

Grey seals only occur in the North Atlantic, Barents and Baltic Sea with their main concentrations on the east coast of Canada and United States of America and in north-west Europe. Grey seals are the larger of the two resident UK seal species. Adult males can weigh over 300kg while the females weigh around 150-200kg. Grey seals are long-lived animals. Males may live for over 20 years and begin to breed from the age ten. Females often live for over 30 years and begin to breed at about age 5. They are generalists, feeding mainly on the sea bed at depths up to 100m although they are probably capable of feeding at all the depths found across the UK continental shelf. Approximately 38% of the world's grey seals breed in the UK and 88% of these breed at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney. There are also breeding colonies in Shetland. There are approximately 111,300 grey seals in the UK.

- They take a wide variety of prey including sand eels, gadoids (cod, whiting, haddock, ling), and flatfish (plaice, sole, flounder, dab). Diet varies seasonally and from region to region
- Pups are born mainly between September and late November
- Most strandings occur in winter months (November to January)

- The most common cause of death observed in Scotland is physical trauma
- The second most commonly observed cause of death (when corkscrew and seal management cases are not considered) is infectious disease

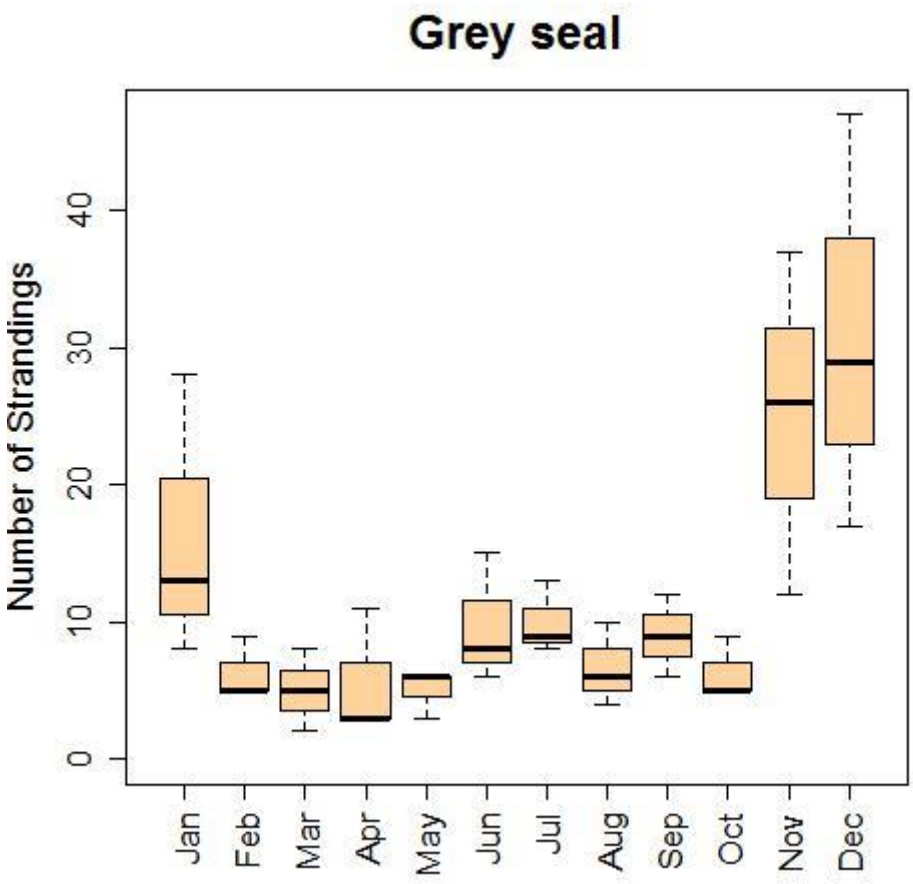


Figure 68: Boxplot of monthly variation in grey seal (*Halichoerus grypus*) strandings reported from April 2012 – March 2015

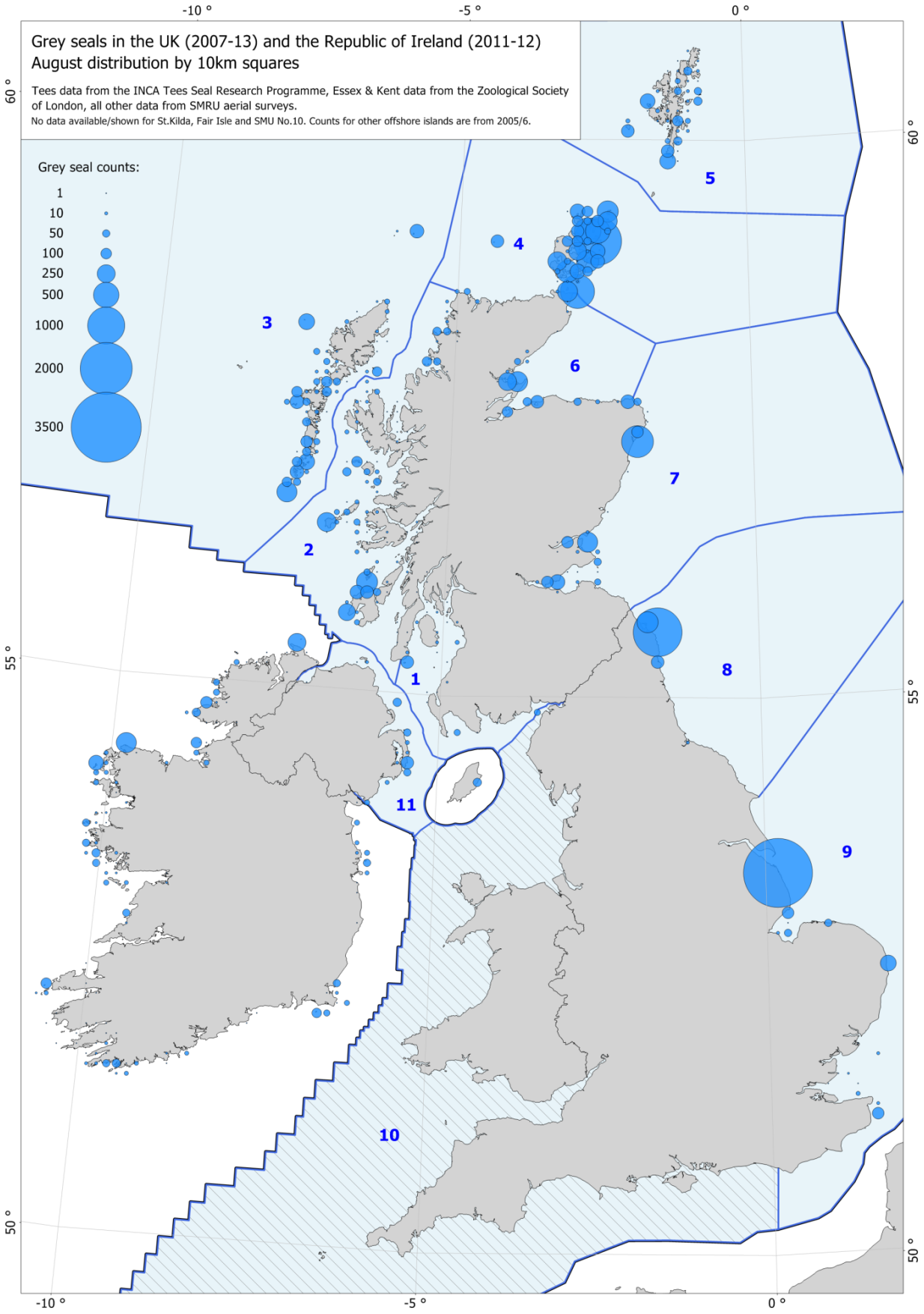

Grey seals in the UK (2007-13) and the Republic of Ireland (2011-12)
August distribution by 10km squares
Tees data from the INCA Tees Seal Research Programme, Essex & Kent data from the Zoological Society of London, all other data from SMRU aerial surveys.
No data available/shown for St.Kilda, Fair Isle and SMU No.10. Counts for other offshore islands are from 2005/6.
Grey seal counts:
1
10
50
100
250
500
1000
2000
3500
-10 °
-5 °
0 °
60 °
55 °
50 °
1
2
3
4
5
6
7
8
9
10
11

Figure 69: August distribution of grey seals (*Halichoerus grypus*) around the British Isles. Only few August counts are available for grey seals in the West England & Wales management unit. Current estimates would add approximately 1,300 animals for this unit, but these are not included on this map SCOS 2014.

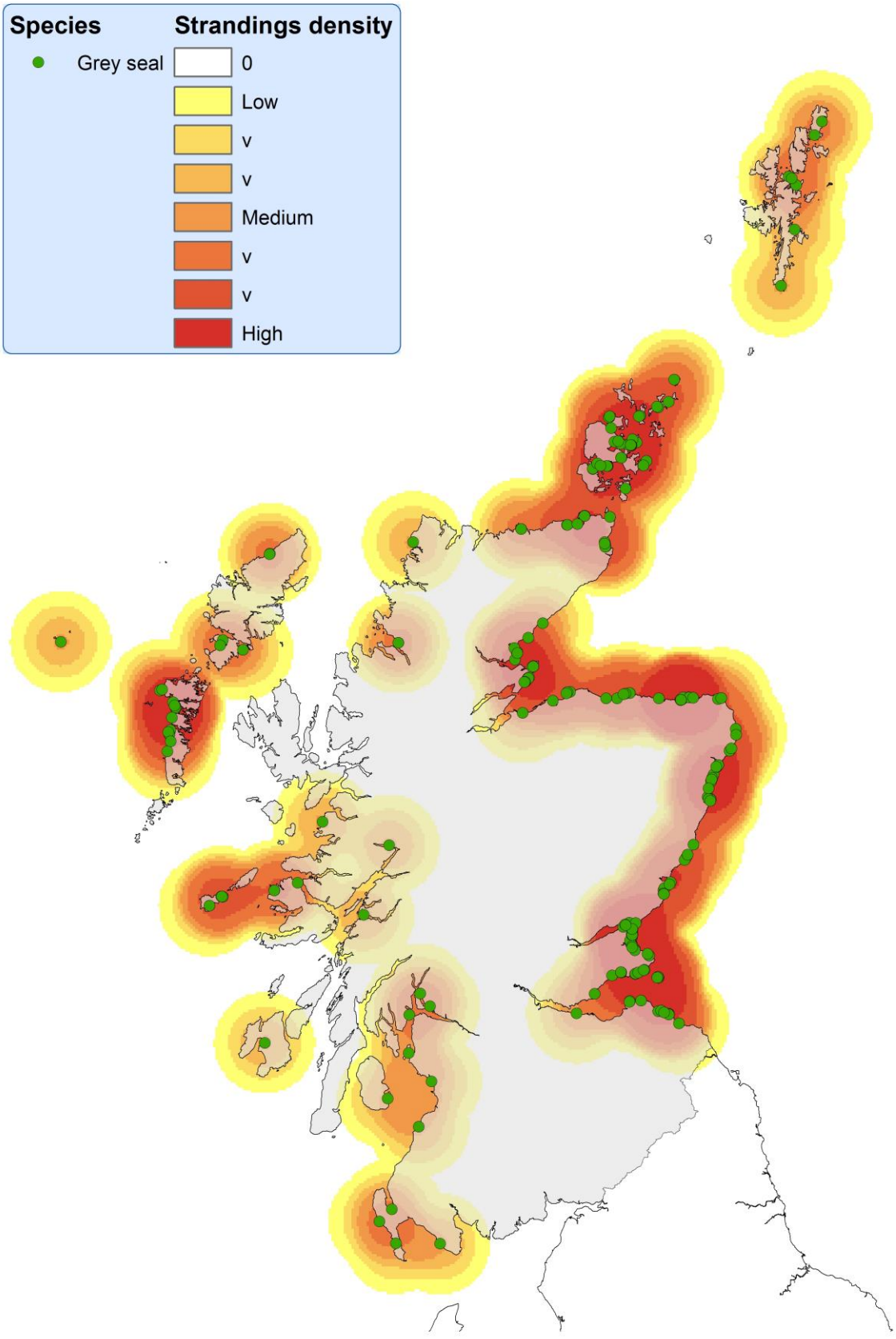


Figure 70: Distribution of grey seal (*Halichoerus grypus*) strandings April 2012-March 2015

Table 12: Grey seal (*Halichoerus grypus*) cases at necropsy (excluding corkscrew and seal management cases) reported between April 2012 and March 2015.

M reference	Date Found	Location	Sex	Age Group	Cause of Death Category
M199/12	11/07/2012	Fife	M	Juvenile	Not Established
M400/12	16/12/2012	Aberdeenshire	F	Juvenile	Physical Trauma
M423/12	29/12/2012	Highland	F	Adult	Entanglement (Known)
M93/13	04/04/2013	Moray	F	Juvenile	Pneumonia: Parasitic
M195/13	09/06/2013	Fife	M	Adult	Pneumonia: Parasitic
M196/13	11/06/2013	City of Dundee	F	Adult	Pneumonia: Parasitic
M197/13	12/06/2013	Fife	M	Adult	Pneumonia: Parasitic
M264/13	05/08/2013	Fife	F	Adult	Pneumonia: Unknown Aetiology
M309/13	30/09/2013	Fife	F	Unknown	Pneumonia: Unknown Aetiology
M19.2/14	22/01/2014	Fife	F	Juvenile	Others
M23/14	24/01/2014	Fife	M	Juvenile	Others
M271/14	22/09/2014	City of Dundee	M	Adult	Pneumonia: Unknown Aetiology
M383/14	01/12/2014	Grampian	F	Juvenile	Generalised Bacterial Infection/Septicaemia
M409/14	03/12/2014	Fife	F	Juvenile	Physical Trauma
M444/14	18/12/2014	Aberdeenshire	U	Juvenile	Pneumonia: Parasitic

Example case M383/14 – grey seal (*Halichoerus grypus*)

This sub adult female grey seal was found alive but moribund on Forvie Nature Reserve. The animal died before it could be euthanased. There was a severe bilateral purulent pneumonia, with turbid fluid filling both pleural cavities. There was evidence of systematic bacteraemia from vascular changes in the mesentery and elevated CSF volume. This appears to be reasonably acute however and the underlying cause is not apparent but lung parasite

burden was low. Cultures from all tissues samples produced pure and profuse growths of *Pseudomonas aeruginosa*. Histology revealed a very severe, sub-acute to chronic, focally extensive necro-suppurative lobar pneumonia. There was also a severe, sub-acute, generalised mixed inflammatory cell meningoencephalitis. These findings strongly support the diagnosis of a very severe bacterial pneumonia which had become systemic. The effects in either the brain or the lung would have been sufficient to result in death . This would appear to be a case of severe pneumonia and septicaemia due to *Pseudomonas aeruginosa*.

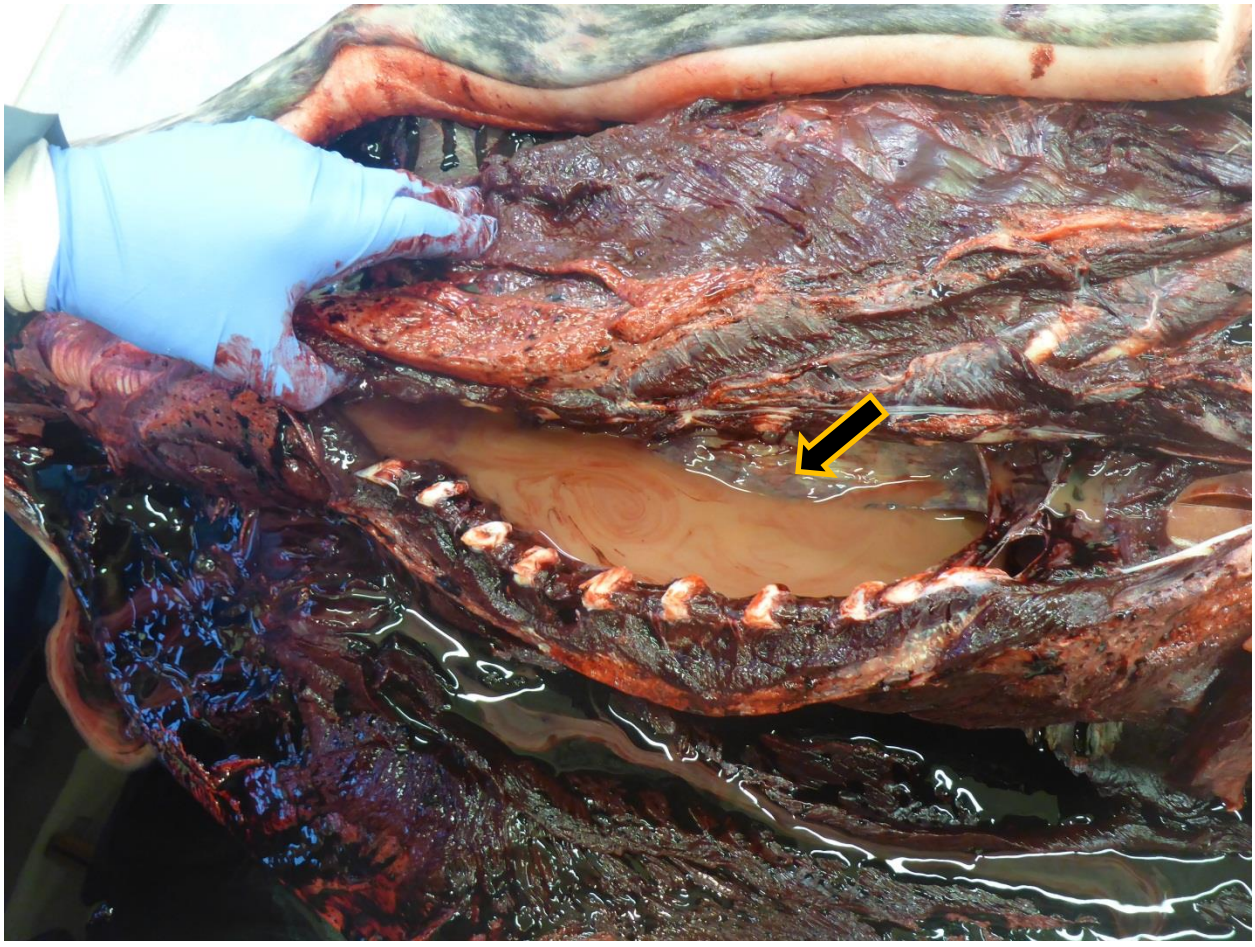


Figure 71: M383/14 grey seal (*Halichoerus grypus*) showing fluid filled pleural cavity (arrow). *Pseudomonas aeruginosa* was isolated from all tissues sampled.

9.3 Hooded seal (*Cystophora cristata*)

Hooded seals are found in the Arctic Ocean and in high latitudes ion the North Atlantic. They breed on the icepack and are associated with it for most of their lives, shifting their distribution with its seasonal fluctuations. There are for major pupping sites: the Gulf of St. Lawrence, north of Newfoundland and east of Labrador, in the Davis Strait and near Jan

Mayen. Hooded seals are known wanderers with animals turning up as vagrants in Scotland usually as “blue back” juveniles. They have also been reported as far south as Portugal and Morocco. One animal even found its way into the pacific and travelled as far south as California. The population estimates are around 500,000 animals. Only two animals of this species stranded during this period

- They take squid primarily but also Greenland halibut, cod, herring, capelin and several redfish species.
- Pups are born in March and early April on the icepack (not in Scotland)
- There no pattern to their strandings.
- There is no common cause of death in this species.

Example case M277/12 – Hooded seal (*Cystophora cristata*)

On 25th August 2012 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 HWDT took some measurements and tissue samples. A cause of death was therefore not established in this individual of a seldom recorded species in Scottish waters.

Figure 72: M277/12 Hooded seal (*Cystophora cristata*) “blueback”.

Section 10: Seal unusual mortality event (UME)

10.1 M212/12 – harbour 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 with suggestions that a pod of dolphins were responsible. 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 varied in age 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. The cause of death of the individual animals remains unknown.

10.2 M195/13, M196/13 & M197/13 – grey seal (*Halichoerus grypus*)

A cluster of three adult grey seals presented in June 2013 from the Tay region. All were in emaciated body condition and displayed similar severe lung pathology. M195/13, an aged adult male grey seal, was found on 9th June at Tentsmuir, Fife, with severe pulmonary emphysema, more notable over the dorsal areas. There was no evidence of recent feeding. Bacteriology on the lung showed a mixed growth of organisms none of which were considered significant.

M196/13, an adult female grey seal, was seen alive and swimming abnormally at Broughty ferry, Dundee. It was later rescued but died before transport to a rehab facility. It exhibited severe bilateral pulmonary emphysema.

M197/13, this aged adult male grey seal was seen hauled out in a moribund condition at Tentsmuir beach by SMRU staff but died 24 hours later. There was profound emaciation and with a body weight of 111kg was under half the normal body mass. There was no evidence of recent feeding; the stomach contained only bile and nematodes (possibly *Anasakis sp*.). The proximal duodenum contained inspisated bile and the ileum a high burden of spiny-headed worms (*Corynosoma sp*.). The lungs showed profound disseminated interstitial emphysema, extending to the aortic root.

Figure 73: M195/13 grey seal (*Halichoerus grypus*).

The pathology observed in all these cases was likely severe enough to compromise the animal's buoyancy and diving ability and therefore the ability to successfully forage. There was a moderate to high parasite burden in two cases and in one case, M197/13, potentially significant isolation of *Pasteurella spp*. from lung tissue.

Histology showed a series of changes likely to be secondary to parasite migration and systemic hypertension. The extensive alveolar and interstitial damage caused by massive release of parasite larval forms may have predisposed this tissue to secondary infection. Morbillivirus immunohistochemistry was carried out on all three cases to eliminate the unlikely role of phocine distemper virus in this pathology. The results in all three were negative.

Figure 74: Lung tissue M197/13 showing extensive interstital emphysema (arrows)

10.3 M378/14- harbour seal (*Phoca vitulina*), M384/14 & M385/14 – grey seal (*Halichoerus grypus*)

On 29th November 2014 a cluster of three adult seals (1 harbour and 2 grey) were found freshly dead on a private beach near Tarbert, Loch Fyne, Argyll and Bute. The animals were necropsied on site and all three had injuries to the head consistent with being shot. Two animals had a significant amount of pink digesta in the stomach, most plausibly salmonid fish. Seal management licences were in place for that region.

Section 11: Investigation into 'corkscrew' lesions

Seventy seven animals were reported as having trauma consistent with spiral injuries. These cases were reported from Fife, Aberdeenshire, Tayside, North Ayrshire, South Ayrshire Argyll & Bute, Highland, Orkney, Dumfries and Galloway. Table 9 shows the cases reported during this period the details for all pinniped cases considered to be potential spiral trauma cases. The final two columns display an adjectival description of a) how likely it is that the case matches the archetypal spiral 'corkscrew' lesion and b) given the recent new evidence, how likely is it that the lesions could be due to grey seal predation. Investigation of this phenomenon continues to be conducted in collaboration with the SMRU and identification of cases as spiral trauma is scored on a number of pathological attributes from either necropsy examination or photographs

Table 13: Scoring of suspected spiral trauma cases

SMASS ID	Species (common)	Date	OS grid	Sex	Would lesions fit with the archetypal 'corkscrew'/spiralled seal pattern?	Likelihood of Grey seal Predation
M106/12	Grey seal	05/04/2012	NO	F	Definite	Likely
M144/12	Harbour Seal	01/05/2012	NO	M	Definite	Possible
M197/12	Harbour Seal	11/07/2012	NO	M	Definite	Likely
M202/12	Harbour Seal	12/07/2012	NO	F	Possible	Possible
M203/12	Harbour Seal	13/07/2012	NO	F	Unlikely	Possible
M249/12	Harbour Seal	09/08/2012	NO	M	Definite	Likely
M262/12	Grey seal	15/08/2012	NO	M	Likely	Unknown
M298/12	Grey seal	10/09/2012	NH	U	Likely	Likely
M301/12	Harbour Seal	16/09/2012	NO	F	Unlikely	Possible
M304/12	Harbour Seal	18/09/2012	NF	M	Possible	Possible
M344/12	Seal (indeterminate species)	28/10/2012	HY	U	Possible	Likely
M359/12	Grey seal	08/11/2012	NT	U	Definite	Likely
M381/12	Grey seal	24/11/2012	NT	M	Definite	Likely

M385/12	Grey seal	28/11/2012	NT	M	Definite	Likely
M389/12	Grey seal	29/11/2012	NT	M	Definite	Likely
M390/12	Grey seal	29/11/2012	NT	M	Definite	Likely
M391/12	Grey seal	29/11/2012	NT	F	Definite	Likely
M392/12	Grey seal	29/11/2012	NT	U	No data	No data
M393/12	Grey seal	01/12/2012	NT	F	Definite	Likely
M394/12	Grey seal	03/12/2012	HY	U	No data	No data
M396/12	Grey seal	06/12/2012	NT	U	Unlikely	Possible
M404/12	Grey seal	06/12/2012	HY	F	Definite	Likely
M407/12	Grey seal	09/12/2012	NT	U	Definite	Likely
M403/12	Grey seal	17/12/2012	NT	M	Definite	Likely
M431/12	Grey seal	18/12/2012	NO	F	Definite	Likely
M104/13	Grey seal	12/04/2013	NO	F	Definite	Likely
M145/13	Grey seal	20/04/2013	NO	U	Likely	Likely
M143/13	Harbour Seal	01/05/2013	NO	F	Possible	Possible
M182/13	Harbour Seal	30/05/2013	NO	F	Likely	Likely
M184/13	Harbour Seal	02/06/2013	NO	M	Possible	Possible
M200/13	Grey seal	13/06/2013	NO	U	Unlikely	Unlikely
M230/13	Harbour Seal	14/07/2013	NO	U	Possible	Possible
M239/13	Harbour Seal	22/07/2013	NO	M	Definite	Likely
M247/13	Grey seal	25/07/2013	NO	M	Definite	Possible
M314/13	Harbour Seal	25/09/2013	ND	M	Likely	Possible
M358/13	Grey seal	03/12/2013	NH	U	Likely	Possible
M388/13	Harbour Seal	19/12/2013	NO	U	Definite	Possible
M2/14	Seal (indeterminate species)	01/01/2014	NH	U	Possible	Unknown

M19.2/14	Grey seal	22/01/2014	NO	F	Unlikely	Possible
M23/14	Grey seal	24/01/2014	NO	M	Unlikely	Possible
M3/14	Harbour Seal	04/01/2014	NH	U	Unlikely	Possible
M128/14	Grey seal	27/05/2014	NO	F	**Definite**	Likely
M148/14	Harbour Seal	17/06/2014	NH	F	**Definite**	Possible
M153/14	Harbour Seal	20/06/2014	NH	U	Possible	Possible
M182/14	Harbour Seal	27/06/2014	NH	U	**Definite**	Possible
M185/14	Harbour Seal	13/07/2014	NH	F	Likely	Possible
M180/14	Grey seal	08/07/2014	NO	M	Possible	Possible
M186/14	Harbour Seal	15/07/2014	NO	M	**Definite**	Likely
M187/14	Grey seal	12/07/2014	NO	F	Unlikely	Possible
M249/14	Harbour Seal	05/09/2014	NH	U	**Definite**	Likely
M310/14	Harbour Seal	21/10/2014	NO	M	Possible	Possible
M252/14	Seal (indeterminate species)	08/09/2014	NH	U	Unlikely	Unknown
M320/14	Hooded seal	25/10/2014	NW	U	Possible	Possible
M382/14	Grey seal	01/12/2014	ND	U	**Definite**	Possible
M409/14	Grey seal	03/12/2014	NT	F	Unlikely	Possible
M410/14	Grey seal	03/12/2014	NT	F	**Definite**	Likely
M411/14	Grey seal	03/12/2014	NT	M	**Definite**	Likely
M412/14	Grey seal	03/12/2014	NT	M	Unlikely	Possible
M413/14	Grey seal	03/12/2014	NT	F	Possible	**Definite**
M414/14	Grey seal	03/12/2014	NT	F	Unlikely	**Definite**
M415/14	Grey seal	03/12/2014	NT	F	Unlikely	**Definite**
M416/14	Grey seal	04/12/2014	NT	M	Possible	**Definite**
M417/14	Grey seal	05/12/2014	NT	M	Possible	**Definite**
M373/14	Grey seal	24/11/2014	NT	M	Likely	Likely
M439/14	Grey seal	18/12/2014	ND	U	Unlikely	Possible
M443/14	Grey seal	18/12/2014	ND	U	Unlikely	Possible
M387/14	Grey seal	02/12/2014	NT	M	Likely	**Definite**

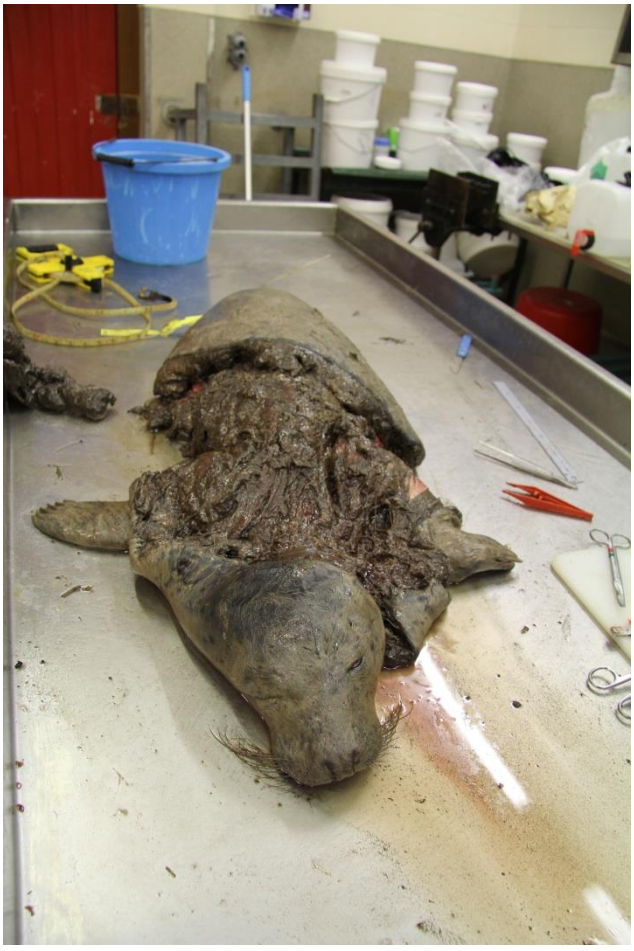
M431/14	Grey seal	07/12/2014	NT	U	Likely	**Definite**
M432/14	Grey seal	08/12/2014	NT	U	Likely	Likely
M433/14	Grey seal	09/12/2014	NT	U	Likely	Likely
M8/15	Grey seal	05/01/2015	HY	U	Unlikely	Possible
M12/15	Grey seal	07/01/2015	ND	U	Unlikely	Possible
M29/15	Grey seal	14/01/2015	ND	U	Unlikely	Possible
M40/15	Harbour Seal	19/01/2015	NS	U	Likely	Possible
M54/15	Grey seal	26/01/2015	NH	U	Unknown	Unknown
M77/15	Grey seal	11/02/2015	HY	M	Possible	Likely
M94/15	Grey seal	02/03/2015	NC	U	Possible	Possible

In December 2014 evidence emerged that this phenomenon may in some cases be caused by predation by adult grey seals. This evidence was in the form of video footage of an adult male grey seal actively predating upon grey seal weaners on the Isle of May. The resulting lesions produced by these attacks were consistent with those animals found dead with spiral (corkscrew) lesions. The impact of this means that at least in some of the seals found around our coast with "corkscrew" lesions may be due to predation by grey seals rather than an anthropogenic cause as previously thought.

http://www.smru.st-and.ac.uk/documents/2162.pdf

http://news.scotland.gov.uk/News/Research-into-seal-deaths-1597.aspx

Figure 76 shows an adult male grey seal (Halichoerus grypus) (a) capturing a weaned pup (b) lifting and dragging the seal towards a freshwater pool (c) and (d) forcing it under water to subdue it, (e) clamping its jaw around the scruff of the pups neck whilst locking its fore-flippers around its mid-section, (f) pulling upwards with its jaw whilst pushing downwards with its fore-flippers (g) tearing flesh from the carcase which now displays an open wound (h) resting after feeding on the pup which now displays a spiral or "corkscrew laceration.



A single animal is thought to be responsible for deaths of 14 grey seal pups on the Isle of May between the 28th of November and the 9th of December before leaving the island and heading across the North Sea to a set of sandbanks and small islands off the coast of Sylt, Germany. This area holds an established grey seal breading site and several harbour seal haul outs. The seals present location is 800km from the Isle of May breeding site but only 40km from Helgoland, Denmark where an adult grey seal was observed killing and eating harbour seals during the summers of 2013 and 2014.

Figure 75:M414/14 grey seal (*Halichoerus grypus*) weaner killed and partially eaten by adult male grey seal

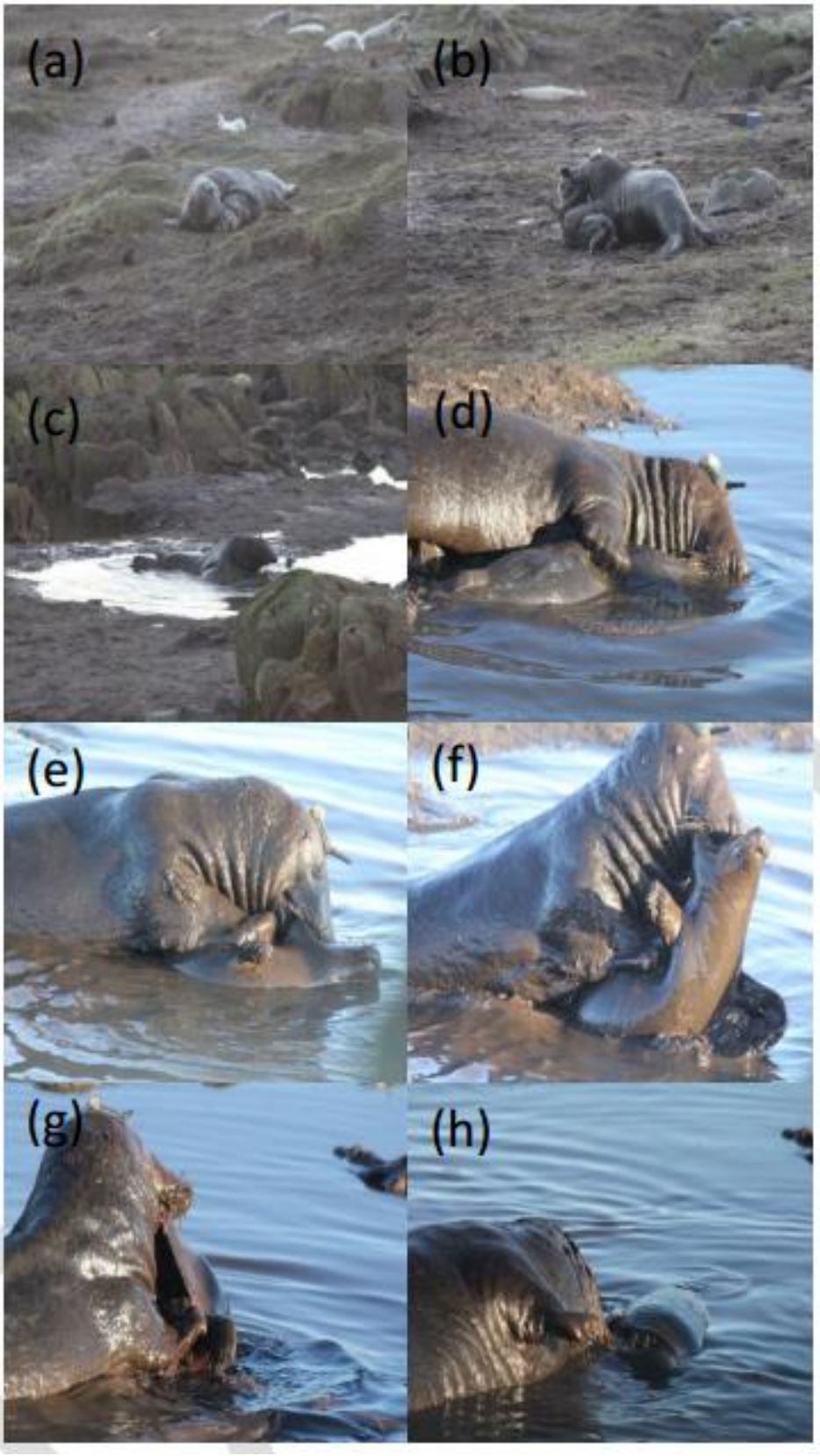


Figure 76 Stills from video sequence (SMRU/Amy Bishop showing predation event

Section 12: Basking sharks & marine turtle

12.1 Overview

Marine turtles became part of the strandings project in 2001 and basking sharks were included in 2007.

12.2 Basking sharks *(Cetorhinus maximus)*

The basking shark (Cetorhinus maximus) is the second largest living fish, after the whale shark, and one of three plankton-eating sharks besides the whale shark and mega mouth shark. It is a cosmopolitan migratory species, found in all the world's temperate oceans. It is a slow-moving filter feeder and has anatomical adaptations for filter feeding, such as a greatly enlarged mouth and highly developed gill rakers. Its snout is conical and the gill slits extend around the top and bottom of its head. The gill rakers, dark and bristle-like, are used to catch plankton as water filters through the mouth and over the gills. Adults typically reach 6-8 m (20-26 ft.) in length. Basking sharks are believed to overwinter in deep waters. In Scottish waters, basking sharks are seen most commonly off western coasts, and especially around the outer Firth of Clyde. Recent studies funded by SNH , collating data collected by the Wildlife Trusts, have confirmed two other hotspots for basking sharks: in Gunna Sound, between Coll and Tiree, and around the rocky islet of Hyskeir, southwest of Canna.

- Filter feed on zooplankton, small fish, and invertebrates
- Believed to give birth to live young though this has not yet been observed.
- Strandings occur primarily in the summer and autumn months.
- There is no common cause of death in this species.

There were five reported basking shark (*Cetorhinus maximus*) strandings in during the report period. None were necropsied, three were sampled. All but one were on the west coast.

Three animals were reported in 2012; one in May on the west coast of Skye, one in July on the west coast of North Uist and a final one in September on the Kintyre peninsula.

There was only one reported basking shark stranding in 2013, in June at South Queensferry, Edinburgh. Only the front half of the animal was present and cause of death may have been boat/ship strike. Autolysis precluded a full necropsy though tissue samples were taken.

Only one reported basking shark stranding occurred in 2014, on the 21st December at Barvas on the Isle of Lewis. Only the remains of the head were present, which was identified by the National Museum of Scotland. There were none reported in the first three months of 2015.

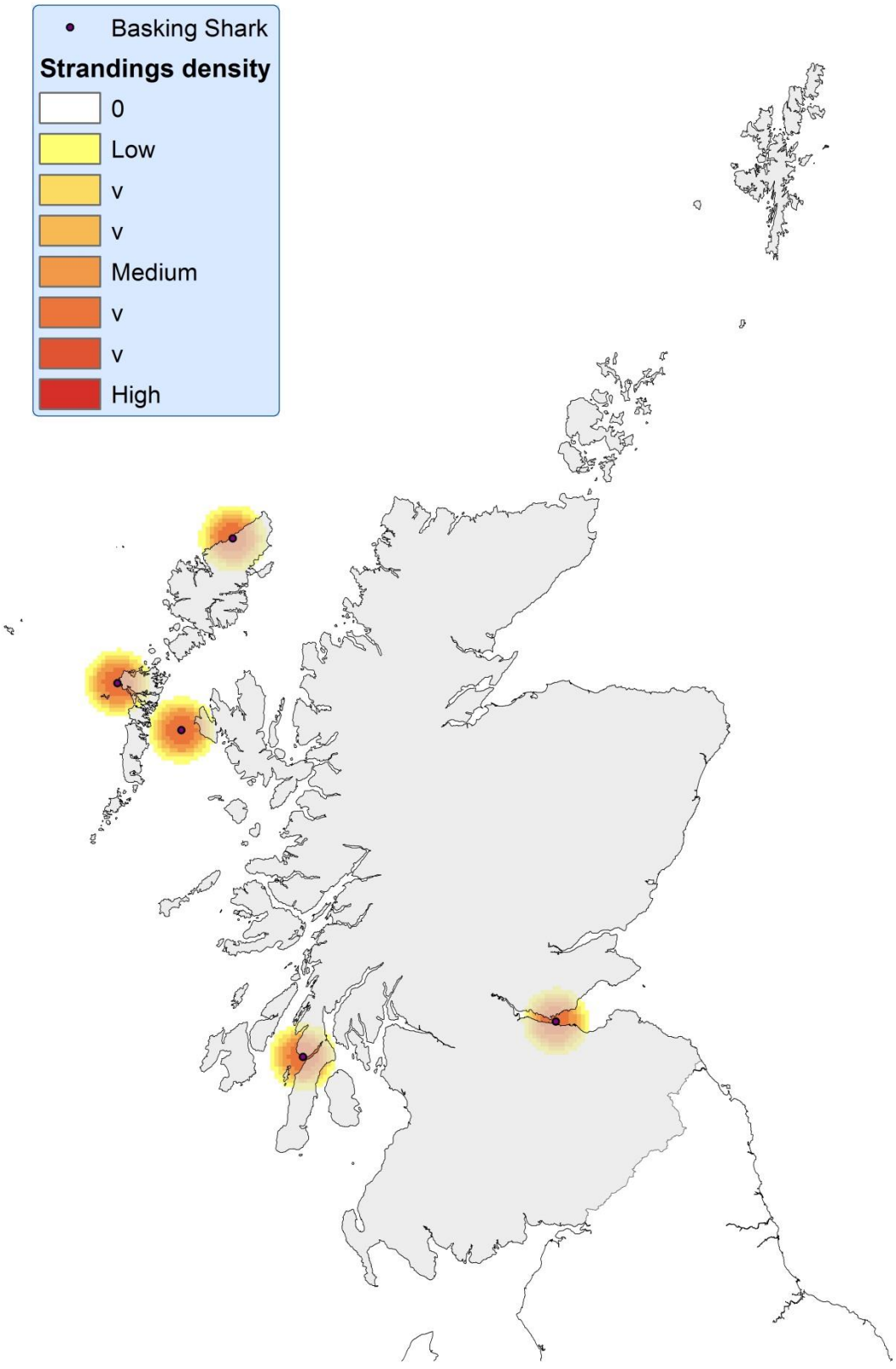


Figure 77: Distribution of basking shark strandings (*Cetorhinus maximus*) April 2012-March 2015.

12.3 Marine turtles

There were eight marine turtles reported during this period; One marine turtle was reported in 2013, an unidentified species seen floating in the sea off West Port beach, Macrihanish bay, Argyll and Bute on the 23rd of November, six marine turtle strandings were reported in 2014, five leatherback turtles (*Dermochelys coriacea*), one in May, and the rest in October, of which two were necropsied (see below). There were two Kemp's Ridley turtle (*Lepidochelys kempii*) reported one from Tarbet in Northwest Highland; however it was too decomposed for collection and examination. Another Kemp's Ridley turtle stranded on Tiree in January 2015.

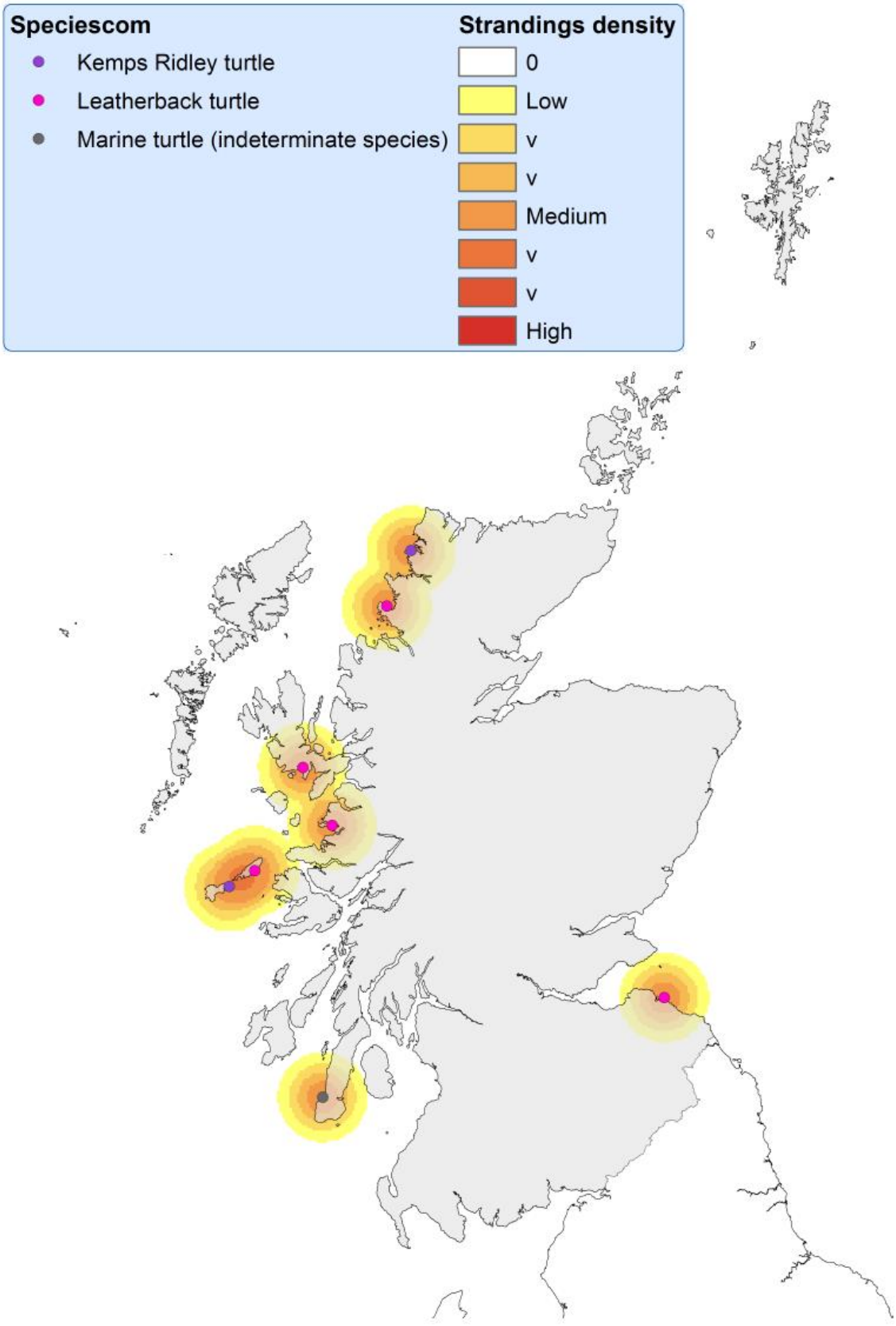


Figure 78: Distribution of marine turtle strandings April 2012-March 2015.

12.3.1 Kemp's Ridley turtle *(Lepidochelys kempii)*

Kemp's Ridley turtle is one of two living species in the genus *Lepidochelys* (the other one being *L. olivacea*, the olive ridley sea turtle). It is a small sea turtle species, reaching maturity at 60–90 cm (24–35 in) long and averaging only 45 kg. Kemp's ridley sea turtles generally prefer warm waters but inhabit waters as far north as New Jersey, They migrate to the Gulf of Mexico, and Florida. Their range includes the Atlantic Ocean and the Gulf of Mexico. Almost all females return each year to a single beach—Rancho Nuevo in the Mexican state of Tamaulipas to lay eggs.

- Feeds on molluscs, crustaceans, jellyfish, fish, algae or seaweed, and sea urchins.
- Nesting occurs April to August (not Scotland).
- Strandings occur primarily in the winter months?
- Cold stunning/hypothermia is the most common cause of death?

12.3.2 Leatherback turtle *(Dermochelys coriacea)*

The leather back turtle is the largest of all living turtles and is the fourth-heaviest modern reptile behind crocodilians. It is the only living species in the genus *Dermochelys* and family *Dermochelyidae*. It can easily be differentiated from other modern sea turtles by its lack of a bony shell. Instead, its carapace is covered by skin and oily flesh. *D. coriacea* is the only extant member of the family *Dermochelyidae*. The leatherback turtle has the widest distribution of any marine turtle, reaching as far north as Alaska and Norway and as far south as Cape Agulhas in Africa and the southernmost tip of New Zealand. The leatherback is found in all tropical and subtropical oceans, and its range extends well into the Arctic Circle. Adults average 1–1.75 m in curved carapace length (CCL), 1.83–2.2 m in total length, and 250 to 700 kg in weight. Leatherbacks have been viewed as unique among reptiles for their ability to maintain high body temperatures using metabolically generated heat, or endothermy. Initial studies on leatherback metabolic rates found leatherbacks had resting metabolisms around three times higher than expected for a reptile of their size. Rather than use a high resting metabolism, leatherbacks appear to take advantage of a high activity rate. Studies on wild *D. coriacea* discovered individuals may spend as little as 0.1% of the day resting. This constant swimming creates muscle-derived heat. Coupled with their counter-current heat exchangers, insulating fat covering, and large size, leatherbacks are able to maintain high temperature differentials compared to the surrounding water. Adult leatherbacks have been found with core body temperatures that were 18 °C (32 °F) above the water in which they were swimming. Leatherback turtles are one of the deepest-diving marine animals. Individuals have been recorded diving to depths as great as 1,280 m (4,200 ft.) Typical dive durations are between 3 and 8 minutes, with dives of 30–70 minutes occurring infrequently.

- Feeding almost exclusively on Jellyfish occasionally on tunicates and cephalopods.
- Nesting occurs between October and April in Africa. (not Scotland).
- Strandings occur primarily in the summer and autumn months?

- Entanglement is the most common cause of death?

Example case M300/14 Leatherback turtle (*Dermochelys coriacea*)

This male Leatherback was reported in found entangled in creel ropes in deep waters (55 metres), and brought ashore in Lochinver. It was in good condition, with evidence of recent feeding. Several hundred small copepods (shrimp) were present in the chyme, possibly themselves prey of jellyfish which had subsequently been eaten by the leatherback. The lungs were very congested with foam present in bronchi and a wet appearance to air sacs. Bacteriology did not reveal any significant isolates. There was no notable parasite burden and no indication of plastic ingesta in GIT, nor ulceration or trauma from foreign body ingestion. The bruising around the axilla, excoriations/rope imprints to the carapace and the lung pathology confirms drowning as a result of entanglement.

Figure 79: M300/14 leatherback turtle (*Dermochelys coriacea*).

Example case M311/14 Leatherback turtle (Dermochelys coriacea)

This adult leatherback turtle was found entangled in creel ropes off Dunbar East Scotland. Bruising and excoriations around the right flipper, head and flank are consistent with ante

mortem rope entanglement. This was supported by the wet and congested appearance of the lungs indicating immersion drowning. The stomach contained some gelatinous protein material suspected to be part of a recently ingested jellyfish. The small intestine also contained some gelatinous fluid and several copepods and larger cructacea whose exoskeleton appeared not to be as rapidly digested as the jellyfish. This suggested recent successful feeding. A length of polypropylene twine ~30cm long was recovered from the stomach. This did not appear to have caused any serosal damage and was considered to be an incidental finding. Bacteriology on all tissues cultured proved sterile. Note: dissection of the urogenital tract showed multiple globular structures consistent with ovaries; however a small 15cm structure likely to be a vestigial penis was also seen. Histopathology is awaited to confirm if this is a female or intersex.

Figure 80: M311/14 leatherback turtle (*Dermochelys coriacea*).

Section 13: Knowledge exchange and outputs

Since 2009, there has been an increased effort to try and improve public awareness of the stranding project. This has involved a number of methods, firstly through the design and distribution of a new poster and the launch of a website (www.strandings.org). This provides users with the opportunity to view strandings data in a graphical or tabulated format, or spatially using Google Maps. The website also provides users with a method for reporting strandings online, in specific an upload function to send digital images which has proved very useful. Since 2012 there have also been a programme of talks and demonstrations and in in 2014 the recruitment of volunteers to help collect data and samples from stranded animals not suitable for necropsy started. This has resulted in over 70 trained stranding volunteers during this period (see section 4). Facebook and Twitter pages were set up in October 2012, with regular stranding reports, selected photos and requests for information on strandings posted on both. Facebook in particular has proved useful in receiving stranding reports. In June 2014 a Facebook group specifically for the stranding volunteers was set up allowing the easy flow of information between them and ourselves.

All publications, conference presentations and posters, reports published and conferences and meetings attended during this reporting period are listed in Appendix 1

All media interest in the scheme during this reporting period are listed in Appendix 2

13.1 Website and digital media

Facebook and Twitter pages were set up in October 2012. SMASS post regular stranding reports, selected photos and requests for information on strandings on both. The feedback has been good and at the end of May 2015 Facebook has over 2000 likes and Twitter has 309 followers. Both have proved a valuable resource for the reporting of strandings to the scheme.

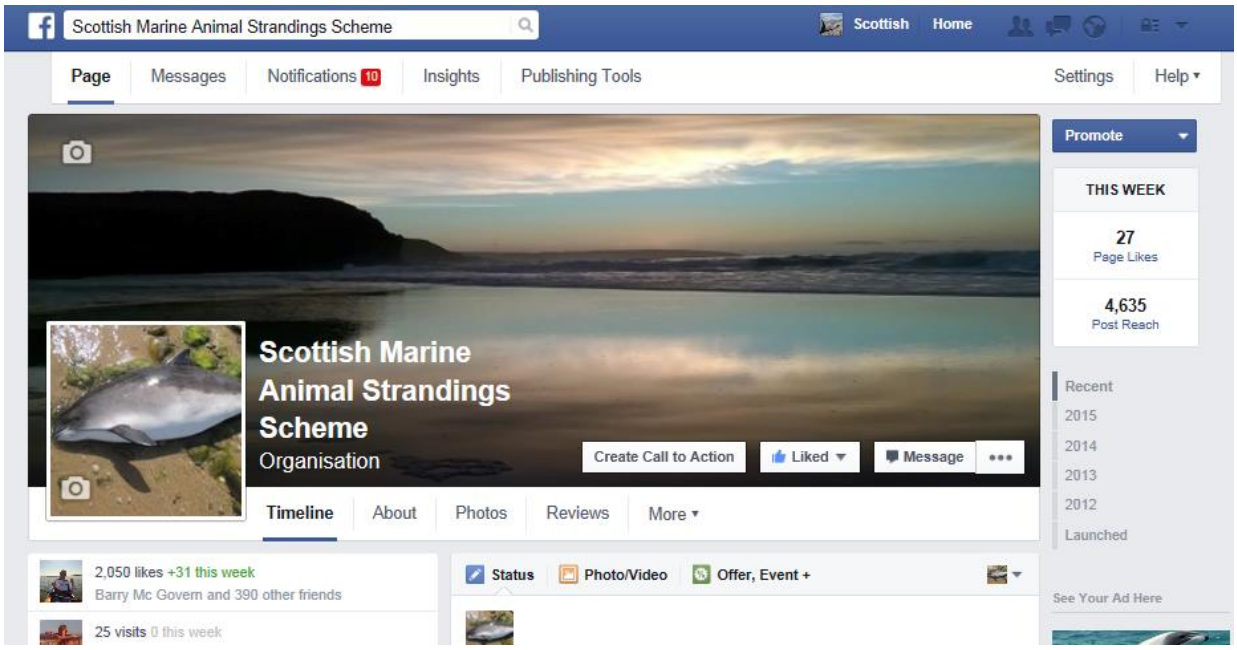


Figure 81: Facebook page

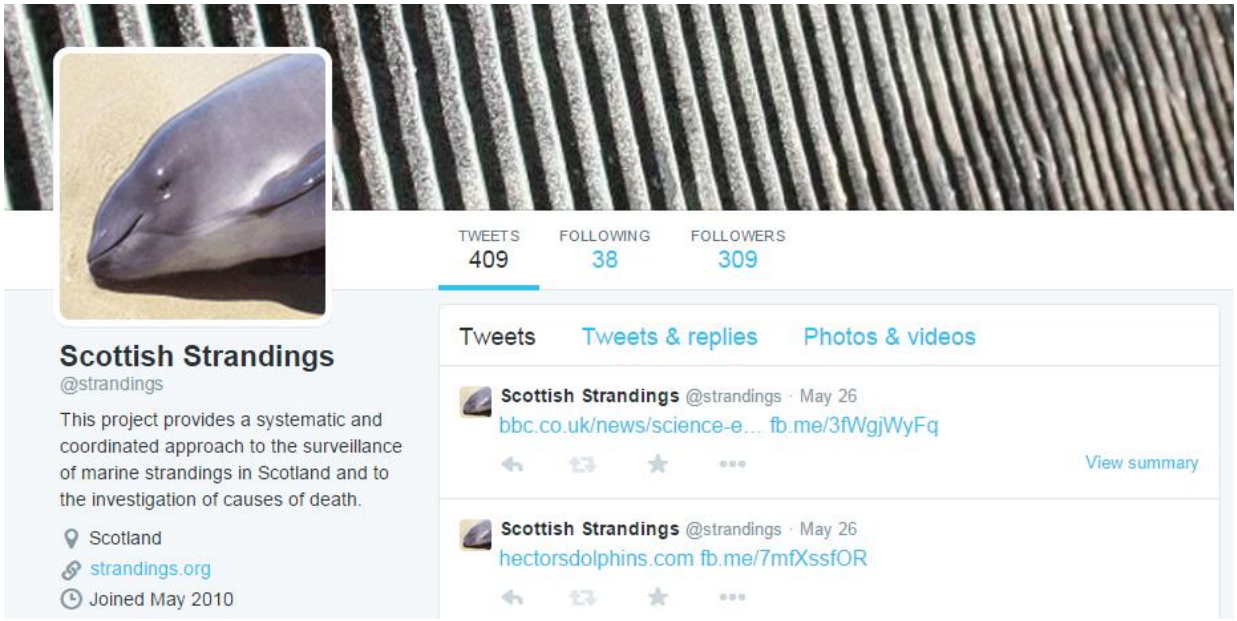


Figure 82: Twitter page

Section 14: 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, Barry left the Scheme in May 2013. Nick Davison joined in October 2012 as strandings coordinator and brought with him over 25 years of cetacean pathology experience assisting the CSIP veterinarians at the Animal Health and Veterinary Laboratories Agency (Now Animal and Plant Health Agency (APHA)), 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. Mariel ten Doeschate joined as a part time marine strandings administration assistant in September 2014 after completing a Masters in Applied Marine and Fisheries Ecology, replacing Alicia Coupe who filled the same role between June and August 2014.

Section 15: Publications

Between April 2012 and March 2015, Scottish Marine Animal Strandings Scheme scientists generated a total of 25 peer reviewed papers, 1 letter, 19 conference presentations, and 12 conference posters. Andrew was one of the supervisors for Mariel ten Doeschate's MSC masters project entitled "Seasonal patterns in strandings and occurrence of harbour porpoises along the east coast of Scotland".

- **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

- Brown, T.A., Belt, S.T., Ferguson, S.H., Yurkowski, D.J., **Davison**, **N.J.,** Barnett, J.E.F., Jepson, P.D. (2013) Identification of the sea ice diatom biomarker IP25 and related lipids in marine mammals: A potential method for investigating regional variations in dietary sources within higher trophic level marine systems. Journal of Experimental Marine Biology and Ecology 441 (2013) 99–104 http://www.sciencedirect.com/science/article/pii/S0022098113000324

- Delannoy, C. M. J., Crumlish, M., Fontaine, M. C., Pollock, J., **Foster, G.,** Dagleish, M. P., Turnbull, J. and Zadoks, R. N. (2013) *Human Streptococcus agalactiae strains in aquatic mammals and fish.* BMC Microbiology **13:**41.

- Paul D. Jepson, Robert Deaville, Karina Acevedo-Whitehouse, James Barnett, **Andrew Brownlow**, Robert L. Brownell Jr., Frances C. Clare, **Nick Davison**, Robin J. Law , Jan Loveridge, Shaheed K. Macgregor, Steven Morris, Sinead Murphy, Rod Penrose, Matthew Perkins, Eunice Pinn, Henrike Seibel, Ursula Siebert, Eva Sierra, Victor Simpson, Mark L. Tasker, Nick Tregenza, Andrew A. Cunningham and Antonio Fernández (2013) *What caused the UK's largest common dolphin (Delphinus delphis) mass stranding event?* PLoS ONE PLoS ONE 8(4): e60953. doi:10.1371/journal.pone.0060953 http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0060953

- J.E.F. Barnett, P. Booth, J.I. Brewer, J. Chanter, T. Cooper, T. Crawshaw, **N.J Davison**, A. Greenwood, P. Riley, N.H. Smith and M. Wessels. *Mycobacterium bovis* infection in a grey seal (*Halichoerus grypus*) (2013). *Veterinary Record Published Online First: 13 June 2013 doi:10.1136/vr.101152*

- **Geoffrey Foster**, Karen Stevenson, **Robert J. Reid**, **Jason P. Barley**, Johanna L. Baily, Robert N. Harris, and Mark P. Dagleish. (2013). Infection due to *Mycobacterium avium subsp. avium* in a Free-ranging Harbour seal (*Phoca vitulina*) in Scotland. Journal of Wildlife Diseases 49:732-734.

- Robin J. Law, Sara Losada, Jonathan. Barber, Philippe Bersuder, Rob Deaville, **Andrew Brownlow**, Rod Penrose, Paul D. Jepson Alternative flame retardants, Dechlorane Plus and BDEs in the blubber of harbour porpoises (*Phocoena phocoena*) stranded or bycaught in the UK during 2008. (2013) Environment International 60, 81–88

- **N.J.Davison,** J.E.F. Barnett, L.L.Perrett. C.E. Dawson. E.J. Stubberfield. R. Deaville, M. Perkins and P.D. Jepson (2013) Meningoencephalitis and arthritis associated with *Brucella ceti* in a short beaked common dolphin (*Delphis delphinus*) (2013). Journal of Wildlife Diseases, 49(3), 2013, pp. 632–636

- Godfroid, J., Nymo, I. H., Tryland, M., Cloeckaert, A., Jauniaux, T., Whatmore, A. M., Moreno, E. and **Foster, G.** (2013) *Brucella ceti* and *Brucella pinnipedialis* infections in marine mammals. In New Directions in Conservation Medicine pp. 257-269. Edited by A. A. Aguirre and R. S. Ostfield. New York: Oxford University Press.

- Nymo I., Tryland M., Frie A. K., Haug T., **Foster G**., Rødven R., Godfroid J. (2013) Age-dependent prevalence of anti-Brucella antibodies in hooded seals (*Cystophora cristata*). Diseases of Aquatic Organisms 106: 187-196.

- **Davison, N.J.,** Barnett, J.E.F., Stubberfield, E.J., Whatmore , A.M, Koylass, M., Deaville, R Perkins M. and Jepson P.D. *Helicobacter cetorum* infection in a striped dolphin (*Stenella coeruleoalba*) an Atlantic white-sided dolphin (*Lagenorhynchus acutus*) and two short-beaked common dolphins (*Delphinus delphis*) from the southwest coast of England. Journal of Wildlife Disease DOI: 10.7589/2013-02-047.

- Jennifer A. Learmonth, Sinead Murphy, Patricia L. Luque, **Robert J. Reid**, I. **Anthony P. Patterson**, **Andrew Brownlow**, Harry M. Ross, **Jason P. Barley**, M. Begoña Santos, Graham J. Pierce. Life history of harbor porpoises (*Phocoena phocoena*) in Scottish (UK) waters. Marine Mammal Science DOI: 10.1111/mms.12130

- C.E. van Elk, M.W.G. van de Bilt, T. Jauniaux, S. Hiemstra, P.R.W.A. van Run, **G. Foster**, A.D.M.E. Oesterhaus and T. Kuiken. Is dolphin morbillivirus virulent for white beaked dolphins (*Lagenorhynchus albirostris*)? 2014 Veterinary Pathology 51(6) 1174-1182

- Brombach, Christoph-Cornelius, Zuzana Gajdosechova, Bin Chen, **Andrew Brownlow**, Warren T. Corns, Jörg Feldmann, and Eva M. Krupp. 2014. "Direct Online HPLC-CV-AFS Method for Traces of Methylmercury without Derivatisation: A Matrix-Independent Method for Urine, Sediment and Biological Tissue Samples." Analytical and Bioanalytical Chemistry 407: 973–981.

- Fernández, Ruth, Graham J. Pierce, Colin D. MacLeod, **Andrew Brownlow, Robert J. Reid**, Emer Rogan, Marian Addink, Robert Deaville, Paul D. Jepson, and M. Begoña Santos. 2014. "Strandings of Northern Bottlenose Whales, *Hyperoodon Ampullatus*, in the North-East Atlantic: Seasonality and Diet." Journal of the Marine Biological Association of the United Kingdom 94 (6): 1–8.

- Fraga-Manteiga, Eduardo, Darren J. Shaw, Sophie Dennison, **Andrew Brownlow**, and Tobias Schwarz. 2014. "An Optimized Computed Tomography Protocol for Metallic Gunshot Head Trauma in a Seal Model." Veterinary Radiology and Ultrasound 55 (4): 393–398.

- Learmonth, Jennifer A, Sinead Murphy, Patricia L Luque, **Robert J Reid, I Anthony P Patterson, Andrew Brownlow, Harry M Ross, Jason P Barley**, M Begoña Santos, and Graham J Pierce. 2014. "Life History of Harbor Porpoises (*Phocoena Phocoena*) in Scottish (UK) Waters." Marine Mammal Science (April 1): n/a–n/a.

- Louis, Marie, Amélia Viricel, Tamara Lucas, Hélène Peltier, Eric Alfonsi, Simon Berrow, **Andrew Brownlow**, et al. 2014. "Habitat-Driven Population Structure of Bottlenose Dolphins, *Tursiops truncatus*, in the North-East Atlantic." Molecular Ecology: n/a–n/a.

- Monteiro, Sílvia, Marisa Ferreira, José V Vingada, Alfredo López, **Andrew Brownlow**, and Paula Méndez-fernandez. 2015. "Application of Stable Isotopes to Assess the Feeding Ecology of Long-Finned Pilot Whale (*Globicephala Melas*) in the Northeast Atlantic Ocean." Journal of Experimental Marine Biology and Ecology 465: 56–63.

- Jensen, Silje-Kristin, Jean-Pierre Lacaze, Guillaume Hermann, Joanna Kershaw, **Andrew Brownlow**, Andrew Turner, and Ailsa Hall. 2015. "Detection and Effects of Harmful Algal Toxins in Scottish Harbour Seals and Potential Links to Population Decline." Toxicon 97: 1–14.

- Karen B. Register, Yury V. Ivanov, Eric T. Harvill, **Nick Davison** and **Geoffrey Foster**. (2015) Novel, host-restricted genotypes of *Bordetella bronchiseptica* associated with respiratory tract isolates. Microbiology 161, 580-592

15.1 Reports to government

- Report to Defra variation to contract number MB0111 Investigation into the long-finned pilot whale mass stranding event, Kyle of Durness, 22nd July 2011. **Andrew Brownlow**, Johanna Baily, Mark Dagleish, Rob Deaville, **Geoff Foster**, Silje-Kirstin Jensen, Eva Krupp, Robin Law, Rod Penrose, Matt Perkins , Fiona Read, Paul Jepson. Pending publication.

- Report to Marine Scotland December 2013. Investigation into the long-finned pilot whale mass stranding event, Pittenweem, Fife, 2nd September 2012. **Andrew Brownlow**, Johanna Baily, Mark Dagleish, **Nick Davison**, Rob Deaville, **Geoff Foster**, Silje-Kirstin Jensen, Paul Jepson, Eva Krupp, Robin Law, **Barry McGovern**, Maria Morell, Rod Penrose, Matt Perkins, Fiona Read. http://www.strandings.org/reports/MSE_Report_2012.pdf

15.2 Other reports

- Special Committee on Seals (SCOS). Briefing paper for SCOS 2013 SCOS-BP 13/06 Pinniped strandings in Scotland 1992-2012 **Andrew C. Brownlow, Nick Davison and Geoff Foster** pages 145-155. http://www.smru.st-and.ac.uk/documents/1803.pdf

- Marine mammal Scientific Support Research Programme MMSS/001/11 Project report USD 1&6 supplement. Preliminary report on predation by adult grey seals on grey seal pups as a possible explanation for corkscrew injury patterns seen in unexplained seal deaths. Sea Mammal Research Unit Report to Scottish Government. 12/01/15 0.1 Dave Thompson, Joe Onoufriou, **Andrew Brownlow** and Amy Bishop. http://www.smru.st-and.ac.uk/documents/2173.pdf

Section 16: Appendix 1: Presentations, meetings and conferences

Staff from the Scottish Marine Animal Strandings Scheme attended and or spoke at 50 meetings or conferences.

- 22/07/12 Andrew Presented an overview of mass strandings at the WDA/EWDA biannual conference in Lyon, France.

- 28/9/2012- Geoff Presented at mecC Symposium, Sanger Institute, Cambridge.
- 15/10/2012 Geoff Presented at Veterinary, Biomedical and Pharma Sciences Conference, Birmingham.
- 08/11/12 – Andrew attended the UWSF meeting.
- 15/11/12 – Barry McGovern presented at the Scottish Marine Renewables Research Group
- 28/01/13 – Barry McGovern attended and gave a talk at the UK student chapter for the society of Marine Mammalogy annual conference.
- 1/04/13 – Andrew attended the ECS conference and presented on the spiral seal trauma cases 2009-2012.
- 20/04/13 – Nick attended the ECS conference and presented a poster on Brucella associated meningoencephalitis and arthritis in a Short-beaked common dolphin.
- 20/04/13 – Barry attended the ECS conference.
- 1/05/13 Andrew and Nick attended meeting with SMRU to discuss current work and findings investigating corkscrew seal trauma.
- 4-5/05/13 Andrew attended the workshop "Biology and ecotoxicology of large marine vertebrates and seabirds: potential sentinels of Good Environmental Status of marine environment, implication on European Marine Strategy Framework Directive in Sienna Italy.
- 20/06/13 Andrew and Nick visited the Hebridean Whale and Dolphin Trust (HWDT) to provide training in sample collection and discuss methods for improving stranding reporting and collection from their region.
- 21/06/13 Geoff gave a talk on the Zoonotic hazards of man's evolving relationship with marine mammals' to Celtic Microbiology Conference.
- 2/09/13 Andrew attended the SCOS meeting at SMRU and submitted a briefing paper prepared by SMASS summarising pinniped strandings in Scotland 1992-2012.
- 7/09/13 SMASS hosted the BDMLR/International Fund for Animal Welfare (IFAW) cetacean satellite tagging course at SAC Inverness. Training was given by Brian Sharp, Manager Marine Mammal Rescue and Research IFAW - International Fund for Animal Welfare, Yarmouth Port, Massachusetts USA. As a result both Andrew and Nick are trained to tag animals and the tagging kit for the whole of Scotland is held here at SAC Inverness. It is hoped that this equipment can be deployed at the next mass stranding event (MSE).
- 19/09/13 Andrew and Nick attended a meeting with CSIP at the Institute of Zoology, London to discuss current work, in specific euthanasia options for large cetaceans.
- 20/09/13 Nick and Andrew attended the Centenary celebration conference for the Natural History Museum's celebration of: A Century of Strandings.
- 29/09/13 Geoff gave a talk on the Zoonotic hazards of man's evolving relationship with marine mammals' to University of Copenhagen, Sep 29, 2013
- 11/10/13 Andrew gave a talk on the stranding scheme to the Moray Seal management forum at Scottish Natural Heritage Inverness.
- 12/10/13 Andrew was an invited speaker at the BDMLR annual conference Inverness.
- 26/10/13 Nick gave a presentation of an overview of the Scottish Marine Animal Strandings Scheme to the Cornwall Wildlife Trusts Marine Stranding Volunteers annual forum in Truro Cornwall.
- 02/11/13 Andrew participated in a MARC meeting concerned with euthanasia option for cetaceans.
- 12/11/13 Geoff gave a talk on the Zoonotic hazards of man's evolving relationship with marine mammals' to West of Scotland Microbiology Group.

- 12/11/13 Andrew gave a talk on the 2011 Pilot whale MSE at the Under Water sound Forum in Edinburgh.
- 13/11/13 Andrew attended the Defra steering group meeting in London.
- 14/11/13 Andrew represented SMASS at the WILDCOMS workshop in Edinburgh.
- 07/12/13 Andrew gave a talk on 2011 and 2012 pilot whale MSE's at the MSE workshop at the Society for Marine Mammalogy 20th Biennial conference at Dunedin New Zealand
- 12/12/13 Nick gave a short talk about the scheme to the SRUC Epidemiology Unit Inverness
- 13/12/13 Andrew gave a talk on corkscrew seals at the Society for Marine Mammalogy 20th Biennial conference at Dunedin New Zealand
- 27/01/14 Andrew attended the MSFD workshop in London.
- 28/01/14 Andrew and Nick attended MeyGen Workshop on the Pentland Frith and Orkney under water turbine instillation at the SNH Offices Battleby Perth.
- 20/02/14 Andrew and Nick were presented to HRH The Princess Royal at the Moredun Institute in Edinburgh where she was given a brief overview of the Stranding Project.
- 04/04/2014 Andrew attended a meeting at SAMS to discuss SAMS role in the stranding scheme and the possibility of designing a smart phone app for the scheme.
- 05/04/2014-10/04/2014 Andrew, Geoff and Nick attended the European Cetacean Society Annual Conference in Liege Belgium. Nick presented a poster on the first report of *Brucella Ceti* in long-finned pilot whales (*Globicephala melas*). Geoff gave a talk at the workshops on marine mammal Brucella entitled "Oceans of Brucella". Andrew gave a talk at the workshops entitled "Whale meet again; Protocols for future mass stranding events in the UK.
- 02/05/2015 Andrew gave an invited talk at the EIMR (the Environmental Interactions of Marine Renewable Energy Technologies) in Stornoway entitled "what can we learn from looking for and retrieving beach-cast carcases".
- 08/05/14 Andrew and Nick attended the Sharing Good Practice event 'Citizen Science 'at the SNH Offices Battleby Perth.
- 20/05/14 Andrew gave an invited talk at the workshops of the AECC (All Energy) Xodus Group/SMRU Underwater Noise Workshop) called; what can we gain from examining stranded marine animals as a method for assessing the impact of underwater noise?
- 05/06/2014 Andrew attended a meeting with SAMS and HWDT at SAMS to discuss volunteer involvement in the stranding scheme.
- 12/06/1014 Andrew attended (via teleconference) the GB Wildlife disease partnership.
- 17/07/14 Andrew attended a meeting at the Boyd Orr Institute, Glasgow to discuss Spatial Ecology collaboration with SMASS.
- 25/07/14 Nick and Andrew gave a necropsy demonstration on a porpoise as part of the workshop programme for the European Wildlife Disease Association Conference. Royal (Dick)Edinburgh Veterinary School.
- 25/07/14-29/07/14 Andrew attended the European Wildlife Disease Association Conference. Royal (Dick) Edinburgh Veterinary School.
- 10/09/14/-12/09/14 Geoff gave a talk at the Brucellosis 2014 conference in Berlin entitled ". First isolations of *Brucella ceti* from long-finned pilot whales (Globicephala melas) and a Sowerby's beaked whale (*Mesoplodon bidens*)". Presentation Brucellosis International Research Conference 2014 9th - 12th September
- 20/10/14 Andrew was an invited participant at the oiled wildlife preparedness workshop at the AECC in Aberdeen.

- 20/10/14 Mariel gave a talk entitled “Cetacean strandings and monitoring” to the annual Fulmar workshop at IMARES, Texel, Netherlands.
- 19/11/14 Andrew was an invited speaker at the oil and gas UK environmental seminar at the AECC Aberdeen. He gave a talk entitled “Marine strandings as a tool for environmental monitoring”
- 20/11/14 Andrew, Nick and Mariel met with Dr Eva Krupp, Dr Graham Pierce and Fiona Read to discuss ongoing and future collaborations.
- 13/02/15 Mariel gave a talk entitled “the pathology of Stranding’s data” to the Earth and Oceans science dept. University of Galway Ireland.
- 22/03/15 Andrew, Nick and Mariel attended the Pathology workshop at the European Cetacean Society Conference in St Julians, Malta.
- 23/03/15-25/03/15 Andrew, Nick and Mariel attended the European Cetacean Society Conference in St Julians, Malta. Where Andrew gave a talk on the ecological value of the strandings record as a monitoring tool, and Nick had a poster on Brucellosis in a Minke whale.

16.1 Conference presentations

- Paul Jepson, Rob Deaville, Jon Barber, James Barnett, **Andrew Brownlow**, **Nick Davison**, Antonio Fernandez, Marisa Ferreira, Tilen Genov, Joan Gimenez, Jan Loveridge, Angela Llavona, Vidal Martin, Sinead Murphy, Rod Penrose, Matt Perkins, Renaud de Stephanis, Nick Tregenza, Phillippe Verborgh & Robin Law. Disappearing killer whales (*Orcinus orca*) and coastal bottlenose dolphins (*Tursiops truncatus*) in Europe: What's causing the declines? Presentation European Cetacean Society workshops Setubal Portugal April 6-7, 2013
- Rob Deaville, **Andrew Brownlow**, Rod Penrose, Brian Smith, James Barnett, Matthew Perkins, Paul Jepson Turning the screw: Ship-strike in UK stranded cetaceans. Presentation European Cetacean Society Setubal Portugal April 8, 2013
- **Andrew Brownlow**, Steve Bexton, Ryan Milne, Ross Culloch, Dave Thompson Spiralling trauma? Describing a novel form of pinniped mortality in the United Kingdom. Presentation European Cetacean Society Setubal Portugal April 8, 2013
- Falko Steinbach, James Barnett, David Everest, **Nick Davison**, Paul Jepson, Rob Deaville, Christopher Finnegan, Akbar Dastjerdi. Identification of novel cetacean poxviruses in animals stranded in Southern England. 5th European Congress Virology Lyon 11-14th Sept 2013
- **Andrew Brownlow, Nick Davison**, Rob Deaville, Paul Jepson. Whale meet again: approaches to future mass stranding events in the UK. MSE workshop at the Society for Marine Mammalogy 20th Biennial conference at Dunedin New Zealand 7th December 2013
- **Andrew Brownlow**, Dave Thompson, Steve Bexton, **Nick Davison**, Ryan Milne, Ross Culloch. Corkscrew seals: Individual and population impact of a novel form of pinniped mortality. at the Society for Marine Mammalogy 20th Biennial conference at Dunedin New Zealand 13th December 2013
- **Andrew Brownlow, Nick Davison**, Rob Deaville, Paul Jepson. Whale meet again; Protocols for future mass stranding events in the UK. Talk at the European Cetacean Society Annual Conference, workshops, Liege, Belgium 05/04/2014-10/04/2014
- **Geoff Foster**. Oceans of Brucella. Talk at the European Cetacean Society Annual Conference, workshops, Liege, Belgium 05/04/2014-10/04/2014.
- Johanna L. Baily, Guillaume Méric, **Geoff Foster**, Sion Bayliss, Ben Pascoe, Eleanor Watson, Simon Moss, Jane Mikhail, Kim Willoughby, Romain Pizzi, David GE Smith, Robert Goldstone, Ailsa Hall,

Samuel K. Sheppard and Mark P. Dagleish. Evidence of land-sea transfer of a zoonotic human pathogen, *Campylobacter* spp., to a wildlife marine sentinel species, the grey seal (*Halichoerus grypus*) Talk at the European Cetacean Society Annual Conference, Liege, Belgium 05/04/2014-10/04/2014.

- **Andrew Brownlow**. What can we learn from looking for and retrieving beach-cast carcases. EIMR (the Environmental Interactions of Marine Renewable Energy Technologies) in Stornoway 02/05/2014
- **Andrew Brownlow**, Johanna Baily, Mark Dagleish , Rob Deaville, **Geoff Foster**, Silje-Kirstin Jensen, Eva Krupp, Robin Law, Stephen Marsh, Rod Penrose, Matt Perkins, Fiona Read, Paul Jepson. What can we gain from examining stranded marine animals as a method for assessing the impact of underwater noise? the AECC (All Energy) Xodus Group/SMRU Underwater Noise Workshop) Aberdeen 20/05/14
- **Geoffrey Foster**, Johanna Bailey, Adrian Whatmore, **Andrew Brownlow**, Mark P. Dagleish, Mark Koylass, Rob Deaville, Lorraine L. Perrett, , Emma Stubberfield, Robert J. Reid and **Nicholas J Davison**. First isolations of Brucella ceti from long-finned pilot whales (*Globicephala melas*) and a Sowerby's beaked whale (*Mesoplodon bidens*). Presentation Brucellosis International Research Conference 2014 9th -12th September.
- Long-term trends in diet and mortality in harbour porpoises in Scottish waters. Graham Pierce, Jessica Torode, Iris Thomsen, **Andrew Brownlow, Nicholas Davison,** Jennifer Learmonth , Fiona Read, Colin MacLeod , M. Begoña Santos. Presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015.
- 100 not out- a century of strandings monitoring in the UK. Deaville, R., Barnett, J., **Brownlow, A.,** Clery, M., **Davison, N.J.,** Lyal, R., Penrose, R., Perkins, M., Smith, B., Williams, R. and Jepson, P.D. Presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015.
- Global pollution (PCB) hotspots and European dolphin declines. Paul Jepson , Rob Deaville , Jonathan Barber , Àlex Aguilar , Asunción Borrell, Sinéad Murphy, Jon Barry, **Andrew Brownlow**, James Barnett , Simon Berrow , Andrew Cunningham, **Nick Davison**, Ruth Esteban, Marisa Ferreira, Andrew Foote, Tilen Genov , Joan Giménez , Jan Loveridge ,Ángela Llavona , Vidal Martin, David Maxwell , Alexandra Papachlimitzou , Rod Penrose , Matthew Perkins, Brian Smith , Renaud de Stephanis , Nick Tregenza, Philippe Verborgh, Antonio Fernandez. Presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015.
- Reproductive failure in UK harbour porpoises *Phocoena phocoena*: legacy of pollutant exposure? Murphy, S., Barber, J., Learmonth, J.A., Read, F.L, Deaville, R., Perkins, M. , **Brownlow, A., Davison, N.,** Pierce, G.J. , Law, R.J. and P.D. Jepson. Presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015.
- Evidence of acoustic trauma in long-finned pilot whale (September 2012 mass stranding, Scotland) Maria Morell, **Andrew Brownlow**, Robert E. Shadwick , Michel André Presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015.
- Application of stable isotopes to assess the feeding ecology of long-finned pilot whale (*Globicephala melas*) in the northeast Atlantic Ocean Silvia Monteiro , Marisa Ferreira , José V. Vingada, Alfredo López, **Andrew Brownlow**, Paula Méndez-Fernández. Presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015.
- Dead useful? Improving the ecological value of the strandings record as a monitoring tool. **Andrew Brownlow, Mariel ten Doeschate, Nick Davison**, Rob Deaville, Paul Jepson, Paul Thompson. Presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015.

16.2 Conference posters

- **Nick Davison**, James Barnett, Lorraine Perrett, Claire Dawson, Matt Perkins, Rob Deaville and Paul Jepson. First case of meningitis and arthritis associated with Brucella ceti in a short-beaked common dolphin (*Delphinus delphis*). Poster Presentation European Cetacean Society Setubal Portugal April 8-10, 2013
- James Barnett, **Nick Davison**, Rob Deaville, Jan Loveridge, Bob Monies, Sue Quinney, Vic Simpson, Stella Turk and Paul Jepson 27 years of cetacean necropsies in southwest England - a summary of pathology found. Poster Presentation European Cetacean Society Setubal Portugal April 8-10, 2013
- Johanna Baily, **Geoff Foster**, Simon Moss, Eleanor Watson, Kim Willoughby, Ailsa Hall, Mark Dagleish. Prevalence of *Salmonella enterica* and *Campylobacter spp*. in wild caught and stranded neonatal and juvenile grey seals (*Halichoerus grypus*) in Scotland. Poster Presentation European Cetacean Society Setubal Portugal April 8-10, 2013
- Graham J. Pierce, Jennifer A. Learmonth, Sinead Murphy, Fiona L. Read, Maria Begona Santos, **Andrew Brownlow**. Interpreting cetacean mortality rates using strandings data Poster Presentation European Cetacean Society Setubal Portugal April 8-10, 2013
- Matthew Perkins, Rob Deaville, **Andrew Brownlow**, Rod Penrose, Brian Smith, Paul Jepson Investigations of UK stranded beaked whales (1990-2011) Poster Presentation European Cetacean Society Setubal Portugal April 8-10, 2013
- **Nick Davison**, James Barnett, Lorraine Perrett, Claire Dawson, Matt Perkins, Rob Deaville and Paul Jepson. First case of meningitis and arthritis associated with *Brucella ceti* in a short-beaked common dolphin (*Delphinus delphis*). Poster Presentation Centenary celebration conference for the Natural History Museum's celebration of: A Century of Strandings 20/09/13.
- **Andrew Brownlow**, Johanna Bailey, Mark Dagleish, Rob Deaville, **Geoff Foster**, Silje-Kirsten Jensen, Ailsa Hall, Eva Krupp, Robin Law, Barbara Moriarty-Pearson, Rod Penrose, Paul Jepson. *Pilot error? Assessing the role of disease in a pilot whale mass stranding event.* Poster Presentation Centenary celebration conference for the Natural History Museum's celebration of: A Century of Strandings 20/09/13.

- **Nick Davison, Andrew Brownlow**, Mark P. Dagleish, **Barry McGovern**, Lorraine L. Perrett, Emma-Jane Dale, Mark Koylass, Rob Deaville, Rod Penrose, Matthew Perkins and **Geoffrey Foster**. The First Report of the Isolation of *Brucella ceti* in long-finned pilot whales (*Globicephala melas*). The European Cetacean Society Annual Conference, Liege, Belgium 7th-9th April 2014

- Norbert van de Velde, Brecht Devleesschauwer, Stéphane Decraeye, Lineke Begeman, Lonneke IJsseldijk, Sjoukje Hiemstra, **Andrew Brownlow, Nicholas Davison**, Jooske IJzer, Mardik Leopold, Thierry Jauniaux, Ursula Siebert, Pierre Dorny.
  Is a terrestrial cat-parasite really reaching marine mammals?
  Toxoplasma Poster presentation: European Cetacean Society Annual Conference in Liege Belgium 7th-9th April 2014

- Mattiucci S., Cipriani P., 2, Paoletti M., Marcer F., Frantzis A., **Brownlow A., Davison N., McGovern B.**, Webb S.C., Dougnac C., Nascetti G.
  Molecular identification of *Anasakis spp. (Nematoda: Anasakidae)* in stranded cetaceans from the Mediterranean Sea, NE Atlantic Ocean and SE-SW Pacific waters, with insights into the host-parasite co-phylogenetic aspects.
  Poster presentation: SOIPA 2014 (Italian Parasitology Society) 24-27th June 2014 Rome Italy.

- **Geoffrey Foster**, Johanna Bailey, **Andrew Brownlow**, Mark P. Dagleish, Mark Koylass, Lorraine L. Perrett, Claire Dawson, Emma Stubberfield, Ingebjorg Nymo, **Barry McGovern** and Adrian Whatmore. The first report of the isolation of *Brucella pinnipedialis* from a bearded seal (*Erignathus barbatus*).

Poster presentation: Brucellosis International Research Conference 2014 9th -12th September

- **Nick J. Davison**, Lorraine L. Perrett, Claire Dawson, Mark Koylass, Mark P. Dagleish, Gary Haskins, Kate Hannigan, **Andrew Brownlow, Geoffrey Foster**. Malta fever in a minke whale; the first confirmed report of the isolation of Brucella ceti in a minke whale (*Balaenoptera acutorostrata*) with associated pathology. Poster presentation: European Cetacean Society Annual Conference in St Julians Malta 23rd-25th March 2015

Appendix 2: Media coverage

In July 2012 BBC Reporting Scotland ran a story stating that the seals had been killed by bottlenose dolphins. 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).

- http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-18863460

In September 2013 there reports in the media on the pilot whale MSE AT Pittenweem Fife.

- http://www.bbc.co.uk/news/uk-scotland-19685146
- http://www.bbc.co.uk/news/uk-scotland-19455719

During the same month the stranding of a Sei whale stranding also attached significant media attention.

- 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/

In early June 2013 information was given to the Hebridean News (an online news resource for the Western Isles) on the Scottish Marine Animal Stranding Scheme following the live stranding of a pilot whale on Barra.

At the beginning of September 2013 there was numerous media coverage on the live stranded minke whale, pilot whale and pygmy sperm whale

- http://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-23994336

Figure 83: Screen grab showing media coverage, Sept 2013

Press release By the National Trust for Scotland in September 2013 for the Sowerby's beaked whale mother and calf stranding, media coverage below

- http://www.heraldscotland.com/news/home-news/rare-sowerbys-beaked-whale-dies-after-becoming-stranded-on-st-kilda.1379502432
- http://www.bbc.co.uk/news/uk-scotland-highlands-islands-24143838
- http://news.stv.tv/highlands-islands/239949-rare-whale-beaches-and-dies-in-stranding-in-shallow-water-off-st-kilda/
- http://www.scotsman.com/news/environment/whale-dies-after-becoming-stranded-on-st-kilda-1-3098807
- http://www.hebrides-news.com/rare_whale_stranded_on_st_kilda_18913.html
- http://www.bbc.co.uk/news/uk-scotland-highlands-islands-24143838

A press release on corkscrew seal cases on 29TH September 2013, media coverage below.

- http://www.heraldscotland.com/news/home-news/animal-welfare-groups-demand-take-action-now-to-stop-corkscrew-slaughter-of-seals.22281234

There were two sensationalised reports by the Hebrides News about a white beaked dolphin that stranded on 27th December 2013 and was buried by the local council before collection could be made by us. This was due to a mix up in communication. The animal had been euthanased by a local vet as it live stranded and refloating was not an option.

- http://www.hebrides-news.com/stolen_dolphin_271213.html
- http://www.hebrides-news.com/mystery_of_dead_dolphin_281213.html

The stranding of a juvenile male sperm whale on Joppa beach in Edinburgh in January 2014 caused quite a storm of media interest and photos of the animal being taken to landfill in a truck went around the world.

Unfortunately the media initially talked to NGO volunteers who speculated the animal had been struck by a boat. SMASS found no evidence for this at necropsy but despite talking to the press after the event, nearly all of the links below still refer to the animal as having been a victim of ship strike.

- http://www.telegraph.co.uk/news/newstopics/howaboutthat/10575347/Sperm-whale-washed-up-on-Edinburgh-beach-taken-by-lorry-to-landfill.html
- http://www.dailymail.co.uk/news/article-2539867/Sperm-whale-pictured-transported-lorry-landfill-site-washed-Scottish-beach.html
- http://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-25703059
- http://www.scotsman.com/news/environment/dead-sperm-whale-washes-up-on-edinburgh-beach-1-3264734
- http://metro.co.uk/2014/01/11/dead-sperm-whale-washes-up-on-an-edinburgh-beach-4259061/
- http://www.mirror.co.uk/news/uk-news/joppa-whale-dead-whale-washes-3010366
- http://www.independent.co.uk/news/uk/home-news/edinburgh-sperm-whale-is-taken-to-landfill-9061091.html
- http://www.thecourier.co.uk/news/scotland/boat-may-have-killed-sperm-whale-found-at-portobello-1.175700
- http://www.heraldscotland.com/news/home-news/sperm-whale-washed-up-on-to-portobello-beach-taken-to-landfill.23190371
- http://www.heraldscotland.com/news/environment/experts-probe-death-of-sperm-whale-washed-up-on-edinburgh-beach.1389444439
- http://www.itv.com/news/2014-01-15/beached-sperm-whale-transported-in-truck-to-landfill-site/
- http://www.theguardian.com/world/picture/2014/jan/13/eyewitness-joppa-edinburgh
- http://www.dailyrecord.co.uk/news/scottish-news/carcase-washed-up-sperm-whale-3014117

4th of March 2014 there were several sensationalised and inaccurate reports the media about a bottlenose dolphin attack that was photographed by Caroline Weir a week after she collected a couple of dead porpoises for us which showed evidence of bottlenose dolphin attack. Media interested was sparked after we posted both the photos of the attack and the dead porpoises on our Facebook page.

- http://www.dailymail.co.uk/news/article-2572968/Pictured-Horrific-moment-bottlenose-dolphins-attack-kill-two-porpoises-FUN-cat-mouse-game.html
- http://www.huffingtonpost.co.uk/2014/03/05/dolphins-kill-porpoises-pictures_n_4903116.html
- http://www.telegraph.co.uk/news/newstopics/howaboutthat/10676073/Dolphins-kill-two-porpoises-in-game-of-cat-and-mouse.html

On the 05/05/2014 a much decomposed unidentified odontocete cetacean was found at Lunan Bay in Angus, south of Montrose on the east coast. This was formally identified at the National Museum of Scotland using the skull this week as a beluga. This was picked up by the media and some odd ball blogs.

- http://us.whales.org/blog/nicolahodgins/2014/05/rare-beluga-skull-found-on-scottish-beach
- http://www.seawatchfoundation.org.uk/beluga-whales-in-the-uk-seriously/
- http://www.scotsman.com/news/national-museums-boon-after-beluga-whale-discovery-1-3430277
- http://www.thecourier.co.uk/news/local/angus-the-mearns/angus-arctic-whale-could-plug-200-year-research-gap-1.400324
- http://thecelestialconvergence.blogspot.co.uk/2014/06/disaster-precursors-latest-incidents-of_3.html

On the 25/06/2014 a humpback whale was discovered dead under salmon pens at a fish farm near Fishnish on the Isle of Mull. The recovery and subsequent necropsy by SMASS was widely picked up by the local and national media.

- http://www.bbc.co.uk/news/uk-scotland-glasgow-west-28158748
- http://news.stv.tv/highlands-islands/281500-carcase-of-seven-ton-young-humpback-whale-found-beached-on-mull/
- https://www.pressandjournal.co.uk/fp/news/islands/270445/scotlands-first-humpback-whale-necropsy-after-mull-stranding/
- http://www.islandnewsandadvertiser.co.uk/2014/06/mull-humpback-whale-necropsy-results/

- http://www.digitaljournal.com/news/environment/first-full-humpback-whale-necropsy-performed-in-scotland/article/388031
- http://www.sruc.ac.uk/news/article/898/humpback_whale_post_mortem_suggests_entanglement_in_salmon_farm

After the discovery of two dead and very autolysed seals at Rosemarkie on the Black Isle on the 29/06/2014 the local press ran a couple of articles on the "mystery". Both animals were autolysed, one actually skeletal remains; they had obviously been dead for some time and washed up over a period of a several days. Neither were suitable candidates for necropsy however and there was no sign of anthropogenic trauma.

- https://www.pressandjournal.co.uk/fp/news/news-comment/271812/fears-dead-seals/
- https://www.pressandjournal.co.uk/fp/news/highlands/271449/seals-found-dead-on-black-isle-beach/
- http://www.ross-shirejournal.co.uk/News/Mystery-over-seal-bodies-at-Black-Isle-beauty-spot-02072014.htm

On the 24/07/14 HDWT reported to us an ongoing mass stranding event (MSE) in Mull. Due to the remote location it was several hours before SMASS knew which species and how many were involved. There were 14 common dolphins that stranded on the beach and all but two were refloated by holiday makers on the beach. The two that died were adult males and were sampled by Staff from HWDT before being buried on site by the land owner.

- http://www.express.co.uk/news/uk/497089/VIDEO-Family-rescue-dolphins
- http://www.dailymail.co.uk/travel/article-2719795/Holidaying-family-use-luggage-straps-save-19-stranded-dolphins-got-stuck-chasing-mackerel-Scottish-coast.html
- http://www.nottinghampost.com/Trapped-dolphins-rescued-family/story-22218029-detail/story.html
- http://www.telegraph.co.uk/news/uknews/scotland/11022286/Family-on-holiday-saves-stranded-dolphins-with-the-help-of-luggage-straps.html
- http://www.scotlandnow.dailyrecord.co.uk/news/pictures-grandad-saves-pod-dolphins-4025337

On the 28/07/14 SMASS had a report of a dead killer whale on Baleshare beach , North Uist, once the species was confirmed, Andrew and Nick accompanied by Alicia Coupe attended and performed a necropsy on site. This generated quite a bit of media interest.

- http://www.mirror.co.uk/news/uk-news/killer-whale-washes-up-uk-3935680
- http://news.stv.tv/highlands-islands/284392-orca-expert-inquiry-after-killer-whale-washes-up-on-north-uist-beach/
- http://www.islandnewsandadvertiser.co.uk/2014/07/stranded-killer-whale-necropsy-takes-place-on-baleshare-beach-north-uist/
- http://www.news-cloud.co.uk/StvNews/2014/07/30/InvestigationAfterKillerWhaleWashesUpOnNorthUistBeach.html
- http://uk.whales.org/news/2014/07/dead-orca-washes-up-on-scottish-beach
- http://www.hebrides-news.com/killer-whale-ashore-in-north-uist-30714.html
- http://www.tumblr.com/search/baleshare

On the 07/09/2014 SMASS had a report of a live stranded minke whale at Whitehills, Aberdeenshire. The animal was attended by a SSPCA officer who reported it as dead. Nick assisted by staff from WDC and CRRU attended the animal on the following Monday and performed a Necropsy. The animal was a pregnant female which had a very large fluid filled abscess in the retropharyngeal region. A pure growth of Brucella ceti was isolated from this site.

- https://www.pressandjournal.co.uk/tag/whitehills/
- http://uk.whales.org/blog/katehannigan/2014/09/sad-day-on-beach
- http://whalesandmarinefauna.wordpress.com/2014/09/08/operation-under-way-to-remove-beached-whale-at-whitehills-scotland-uk/

A spate of leatherback turtle strandings (4 in total) including 2 that were necropsied created quite a bit of media interest. The two that were necropsied had died due to entanglement in creel ropes.

- http://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-29786330
- http://www.bbc.co.uk/news/uk-scotland-29801261
- http://www.scotsman.com/news/odd/mystery-over-scotland-s-dead-leatherback-turtles-1-3585328
- https://www.pressandjournal.co.uk/fp/news/islands/western-isles/378382/three-giant-turtles-found-dead-scottish-coast/
- http://www.heraldscotland.com/news/home-news/mystery-as-dead-leatherback-turtles-found-off-scottish-coast.25716581
- http://www.scotlandnow.dailyrecord.co.uk/news/pictures-rare-6ft-leatherback-turtle-4521180
- http://www.telegraph.co.uk/news/earth/wildlife/11191449/Mystery-over-deaths-of-giant-turtles-off-Scotland.html
- http://news.stv.tv/highlands-islands/296654-giant-leatherback-turtles-found-dead-on-western-scottish-beaches/
- http://www.deadlinenews.co.uk/2014/10/14/leatherback-turtle-may-have-been-killed-by-creel-ropes/
- http://www.eastlothiancourier.com/news/roundup/articles/2014/10/31/514286-giant-turtle-dies-off-dunbar-coast/

The unusual mortality event involving Cuvier's beaked whales stranding along the west coast of Scotland and Ireland in December created quite a bit of media interest.

- http://www.telegraph.co.uk/news/earth/wildlife/11395236/Hunt-for-Russian-sub-may-have-caused-spate-of-whale-and-dolphin-deaths.html
- http://www.scotsman.com/news/environment/spate-of-beaked-whale-deaths-puzzle-scots-experts-1-3652758
- http://www.thebigwobble.org/2015/01/spate-of-beaked-whale-deaths-puzzle.html
- http://www.whaledolphintrust.co.uk/news_article.asp?news_id=411
- http://www.sott.net/article/291010-Spate-of-deep-sea-beaked-whale-deaths-puzzle-experts-in-Scotland
- https://neptune911.wordpress.com/2015/01/08/marine-experts-baffled-by-cuviers-beaked-whale-deaths/

There was a small amount of media interest in a Risso's dolphin that live stranded and was euthanased at Embo on the 4th of February 2015.

- http://www.scotsman.com/news/environment/rare-dolphin-dies-after-loch-fleet-stranding-1-3682633

A report on the 4th of February 2015 describing corkscrew seal injuries being inflicted on grey seal weaners by an adult male grey seal produced by SMRU and Marine Scotland did not result in a huge amount of media attention as first thought.

- http://news.scotland.gov.uk/News/Research-into-seal-deaths-1597.aspx
- http://www.bbc.co.uk/news/uk-scotland-31146971
- http://www.dailymail.co.uk/news/article-2960808/Bizarre-seal-deaths-British-shores-featuring-corkscrew-injuries-blamed-cannibalism-hungry-adult-males.html
- http://news.stv.tv/highlands-islands/309114-grey-seals-behind-corkscrew-spinal-injuries-instead-of-ship-propellers/
- http://www.robedwards.com/2015/03/new-fears-over-corkscrew-injuries-to-seals.html
- http://www.ibtimes.co.uk/cannibal-seals-responsible-mystery-corkscrew-pup-deaths-scotland-graphic-image-1486763

Appendix 3: Volunteers, necropsy demonstrations and outreach

Staff at the Scottish Marine Animal Strandings Scheme presented 16 necropsy demonstrations to collaborating institutions, ran 8 volunteer training days, gave 7 seven talks to interested groups and hosted 4 students. Note the list below includes the specific volunteer training courses outlined in section 4

- 14/11/12 – Necropsy demo and talk for SAMS students.
- 16/10/12 – Necropsy demo and talk for CRRU volunteers.
- 21/01/13 – Corkscrew seal talk and demo for collaborating scientists from SMRU.
- 21/02/13 – Aberdeen University PM demo.
- 22/02/13 – University of Highlands and Islands PM demo.
- 06/03/13 – Necropsy demo and talk for SAC Aberdeen Students.
- 26/03/13 – Talk and demo for collaborating scientists from SMRU.
- 13/03/13 – Necropsy demo and talk for Edinburgh Vet School at Edinburgh Vet School.
- 17/04/13 – Andrew & Barry gave a talk for WDC Shorewatch volunteers at WDC Spey bay.
- 3/06/13 Visit from Chilean Veterinary Student Constanza Cifuentes Ortiz to see how the stranding scheme worked.
- 10/06/13- 13/06/13 Lucy Jennings and Will Fitzpatrick, students from Newcastle University volunteered to help sort out our serum database.
- 19/06/13 Andrew Brownlow and Nick Davison gave a talk to the Dunbeg primary School, Oban on the strandings project, including a demonstration on how to report a stranding on the local beach. This was part of an outreach programme run by Janie Steele and funded by Vodafone to encourage children's' involvement with the marine environment.
- 30-31/07/13 Leaflets and posters were fixed to notice boards and distributed at tourist sites throughout Harris and Lewis, namely at the Harris fair where WDC had a stand and subsequently after SMASS gave a talk on the strandings project to the WDC Shorewatch volunteers at the RNLI station Stornoway, Isle of Lewis.
- 17/08/13 Talk on the strandings project to the WDC Shorewatch volunteers at the Seadrift centre, Thurso.
- 06/09/13 Necropsy demonstration on the pygmy sperm whale for WDC staff at Inverness.
- 27/09/13 Necropsy demonstration for SMRU master students at Inverness.
- 04/11/13 Necropsy demonstration for SAMS master students at Inverness.
- 05/03/14 Necropsy demonstration for SAC (SRUC) Aberdeen campus MSC students at Inverness
- 06/03/14 Necropsy demonstration for Aberdeen University master students at Inverness.
- 14/03/14 Stranding Volunteers training course on data collection and sampling at Inverness.
- 27/03/14 Stranding Volunteers training course on data collection and sampling at Inverness.
- 02/06/14-04/06/2014 Andrew gave a stranding volunteers training course on data collection and sampling for Volunteers, SNH and Scottish Wildlife Rangers on Eigg, Muck & Rum on Eigg and Rum.
- 18/06/2014 Andrew gave an invited talk on the Joppa sperm whale and the stranding scheme to the Portobello Amenity Society in Edinburgh.
- 14/07/14-18/07/14 Olivia Casely a work experience student from Cornwall spent a week with the SMASS team.
- 25/07/14 Nick and Andrew gave a necropsy demonstration on a porpoise as part of the workshop programme for the European Wildlife Disease Association Conference. Royal (Dick) Edinburgh Veterinary School.
- 31/07/14 Talk by Andrew and a stranding volunteers training course on data collection and sampling for volunteers at SAMS.
- 14/08/14 Stranding volunteers training course on data collection and sampling for volunteers at Inverness.
- 25/09/2014 a stranding volunteer training day was held at Inverness for staff from SNH and the John Muir Trust.

- 30/09/14 in collaboration with WDC Andrew gave a talk at the Seadrift Centre Dunnet bay on the Stranding scheme to a group of potential volunteers.
- 01/10/14 Andrew and Nick gave a talk to the Orkney Field Club in collaboration with WDC in order to improve reporting of strandings from Orkney
- 31/10/14 Necropsy Demonstration for SMRU marine mammal science master's student
- 18/11/14 Necropsy Demonstration for SAMS Ecosystem- based management of marine systems master's students.
- 24/1/15 Andrew and Mariel gave a necropsy demonstration for Vet student's pathology club at Glasgow Vet School.
- 8th -9th/2/15 Andrew and Nick a stranding volunteers training course on data collection and sampling for Volunteers, to the Orkney Field Club in collaboration in Orkney
- 12/2/15 Necropsy Demonstration for Aberdeen University Masters students at Inverness.

Appendix 4: Data and sample requests

These are either part of ongoing collaborations or one off requests for data and or samples from SMASS's fixed, frozen tissue or data archive.

16.3 Samples provided to collaborators

- 01/05/13, 24/06/13 & 13/08/13- Urine and faeces samples to Silje-Kirsten Jensen SMRU, Biotoxin screening for levels of domoic acid.
- 16/01/13 Tom Brown, University of Plymouth, liver samples for identification of the sea ice diatom biomarker IP25 and related lipids in marine mammals.
- 23/03/13 Lindsay Wilson SMRU, skin sample from a male grey seal.
- 07/04/13 Paolo Cipriani Department of Public Health and Infectious Diseases, Section of Parasitology, "Sapienza - University of Rome", Italy. Characterisation of parasites of the genus *Anasakis* from *Physeter macrocephalus* (and other pelagic cetaceans).
- 01/05/13 Jo Kershaw SMRU, skin/muscle/blubber, toxicology.
- 08/05/13 Robin Law CEFAS, porpoise blubber samples, toxicology.
- 08/01/13 & 26/08/13- Teeth and gonads to Fiona Read, University of Aberdeen. Fiona now has a contract to look at age and life history for animals from 2009-2013.
- 04/10/13 Lilian Lieber University of Aberdeen, Skin & muscle from Basking shark M217/13 DNA analysis.
- 07/10/13 Katie Sculthorpe HERRIOT- WATT University, Parasites Various.
- 21/10/13 Georgia Clack Exeter University (Cornwall), seal whiskers from M31/13 & M102/13 for stable isotope analysis.
- 18/10/13 Norbert Van De Velde University of Ghent, sera for toxoplasmosis.
- 20/01/14 Kieran Tierney PhD student at the Scottish Universities Environmental Research Centre (SUERC) & The Scottish Association for Marine Science (SAMS)

Muscle samples from west coast animals to test for the Transportation and Bioaccumulation of Sellafield-derived radiocarbon (14C) in the Marine Environment: Analysing 14C in Marine Mammals.

- 04/06/14 Sinead Murphy Marie Curie Research Fellow, Institute of Zoology. Common dolphin blubber samples for Cetacean-Stressor project.
- 16/06/14 Chris Riggs Undergraduate summer project University of Aberdeen. Liver samples from harbour porpoise for Mercury levels.
- 27/06/2014 Dr Eva Krupp University of Aberdeen Liver and Kidney from white beaked dolphin for Daguerrotype photo of a cetacean using mercury extracted from the tissues.
- 09/09/2014 Eileen Harris Senior Curator Parasites & Vectors Division Department of Life Sciences Natural History Museum Cromwell Road London Brachycladium goliath fluke for molecular work on digeneans.
- 14/11/14 Frozen Skin Muscle and blubber samples to Jo Kershaw at SMRU for toxicology work.
- 14/11/14 Faeces and urine to Ailsa Hall SMRU for ongoing algal toxin work.
- 20/11/14 frozen tissue samples to Dr Eva Krupp Aberdeen University for toxicology work
- 20/11/14 fixed teeth and gonads to Dr Graham Pierce and Fiona Read Aberdeen University for live history work.
- 04/12/14 Fixed Skin Muscle and blubber samples to Jo Kershaw at SMRU for toxicology work.
- 26/01/14 Skin samples to Milaja Nykanen at University College Cork for Mitogenome work.

16.4 Data provided to collaborators

- 22/11/12 Kevin Robinson CRRU data on bottlenose dolphin and harbour porpoise interactions.
- 23/11/2012 Barbara Cheney Aberdeen University lighthouse research station data on bottlenose dolphin necropsies.
- 27/11/2012 Michael Beddington SAMS Strandings location data.
- 30/01/2013 Jan Loveridge & James Barnett CWTMSN/CSIP Cornwall Shot seal photo's to allow them to diagnose suspect cases in Cornwall.
- 23/01/13 Chris Booth Orkney cetacean recorder, details of striped dolphin M341/12.

- 11/02/13 Nienke van Geel SAMS, details on bottlenose dolphin.
- 18/02/13 Tom Brown University of Plymouth, details of liver samples held by SMASS.
- 20/03/13 Nicola Hodgins WDC, details of bottlenose dolphin strandings in the Clyde.
- 14/05/13 Meral Dalebout University of New South Wales, Details of Cuvier's beaked whale strandings in Scotland.
- 12/07/2013 Zena Floody National Museum of Scotland. Information on fin whale stranding M209/07.
- 12/08/13 Norbert Van De Velde University of Ghent, details of marine mammal sera samples for Toxoplasma study
- 14/09/13 David Lusseau. MASTS Senior Lecturer in Marine Top Predator Biology University of Aberdeen. Morphometrics on Minke whale M292/13.
- 05/12/13 Sarah Dolman WDC, details on minke whale strandings.
- 22/01/2014 Silje-Kirsten Jensen “SMRU" Location, species, date and sex of M195/13 M196/13 M198/13
- 25/02/2014 Katie Sculthorpe Herriot-Watt university Porpoise morphometrics 2009-2013
- 25/02/2014 Nienke Van Geel SAMS West coast BND data and photos.
- 24/04/2014 Chiara Giulia Bertulli, PhD student, University of Iceland data on white beaked dolphins from Scotland for project on body colouration patterns in white-beaked dolphins.
- 09/06/2014 Sinead Murphy Marie Curie Research Fellow, Institute of Zoology. Data on the reproductive status on female porpoises from Scotland.
- 08/07/2014 Milaja Nykanen, PhD Candidate School of BEES University College Cork Ireland, data on skin samples of bottlenose dolphin held for potential mitogenome work.
- 20/10/14 data on morphometrics of Northern bottlenose whales M246.1/14 &M246.2/14 and two Sowerby's beaked whales M282.1/14 & M282.2/14. Lucia Martina Martin Lopez SMRU
- 23/10/14 Information on recent leatherback strandings to Callum Duncan Scottish Conservation Manager Marine Conservation Society.
- 17/11/14 Data on entanglement and bycatch cases for ghost gear study to Dr Conor Ryan HWDT.
- 18/11/14 Data on recent porpoise and seal strandings from the west coast for possible future studies on Radiocarbon to Kieran Tierney, Scottish Universities Environmental Research Centre (SUERC) & The Scottish Association for Marine Science (SAMS).
- 03/12/214 data on Turtle stranding to Dr Christopher J. McInerny Reader, College of Medicine Veterinary and Life Sciences Davidson Building University of Glasgow for a chapter in a book on Amphibians and Reptiles of Scotland.

- 04/12/14 data on measurements of bottlenose dolphins from 2011 and 2014 to Research Fellow Lighthouse Field Station University of Aberdeen Cromarty
- 15/01/15 Data on Leatherback turtle (M311/14) from Dunbar, Zena Timmons National Museum of Scotland
- 04/02/15 Data on Leatherback turtle (M300/14) from Lochinver, Zena Timmons National Museum of Scotland
- 3/3/15 Data on Risso's strandings Nicola Hodgins Head of science and research WDC.

Appendix 5 : Collaborations between SMASS and external organisations

- 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 Beddington, 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 and Fiona Read University of Aberdeen, Oceanlab, Main Street, Newburgh, Aberdeenshire, Scotland, AB41 6AA, UK 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. Paolo Cipriani Department of Public Health and Infectious Diseases, Section of Parasitology, Sapienza - University of Rome", P.le Aldo Moro, 5, 00185 Rome – Italy Characterisation of parasites of the genus *Anasakis* from *Physeter macrocephalus* (and other pelagic cetaceans)
- Prof. Christina Fossi University of Siena Via Banchi di Sotto, 55, 4, 53100 Siena SI, Italy Samples sent for comparison of micro plastics and pollutants in baleen whales in the Mediterranean and NE Atlantic.
- Roger Ayling, BAC5 Mycoplasma dept., Animal and Plant Health Agency, New Haw, Addlestone, Surrey, KT15 3NB. Identification of *Mycoplasma sp*. isolates from marine mammals
- Lorraine Perrett, BAC3 Brucella Reference Laboratory, Animal and Plant Health Agency, New Haw, Addlestone, Surrey, KT15 3NB. Serological studies to assess exposure to *Brucella spp*. and typing of *Brucella* isolates.

- 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.
- Erasmus Medical Centre, Rotterdam, the Netherlands – bacteriological culture of samples collected following necropsy of marine mammals.
- James Barnett, CSIP stranding work, SW England– bacteriological culture of samples collected following necropsy of marine mammals. Following the loss of marine mammal bacteriology experience in APHA, 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.
- Lilian Lieber University of Aberdeen, Skin & muscle from Basking sharks for DNA analysis.
- Sinead Murphy Marie Curie Research Fellow, Institute of Zoology. Reproductive failure in UK harbour porpoises and common dolphin blubber samples for Cetacean-Stressor project.
- Norbert Van De Velde University of Ghent, Toxoplasma studies.
- Milaja Nykanen, PhD Candidate School of BEES University College Cork Ireland. Bottlenose dolphin mitogenome work.
- Dr Conor Ryan HWDT. Ghost gear study.
- Chiara Giulia Bertulli, PhD student, University of Iceland. Project on body colouration patterns in white-beaked dolphins.
- Kieran Tierney, Scottish Universities Environmental Research Centre (SUERC) & the Scottish Association for Marine Science (SAMS). Transportation and Bioaccumulation of Sellafield-derived radiocarbon (14C) in the Marine Environment: Analysing 14C in Marine Mammals.
- 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
- Dr. Kevin Robinson, CRRU. Bottlenose dolphin kills on harbour porpoises in Scotland.
- Dr Conor Ryan, GMIT/IWDG. Stable isotope analysis of sei whale baleen.
- May 2012 Ingebjorg Nymo, PhD student at Norwegian Veterinary Institute, Tromso, Norway. Spent one month at Inverness where she performed bacteriological culture of marine mammals.
- 2012 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.
- 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 IP25 and related highly branched isoprenoid (HBI) diatom biomarkers.
- Georgia Clack Exeter University (Cornwall), seal whiskers for stable isotope analysis.
- Rob Harris SMRU, Analysis stomach contents from seal management cases.

16.5 Other collaborations

13-15th October 2014 SMASS collaborated with SMRU on collision trials at Ardesier which contributed to two draft reports to SNH and Marine Scotland.

1. Collision Risk and Impact Study: Field tests of turbine blade-seal carcase collisions.

2. Data based estimates of collision risk: an example based on harbour seal tracking data around a proposed tidal turbine array in the Pentland Firth.

Appendix 6: Balnakiel bay activity summary 22nd September and 1st October 2014

Data provided by MOD

> "*We had completed a comprehensive sweep of MOD activity since 22 Sep and found very little going on and even less that might appear relevant to the MSE in Balnakeil Bay.*
>
> *In summary:*
>
> - *There had been no MOD vessel within 100 miles in the week preceding the strandings.*
> - *No low level rotary wing activity, including SAR at sea or along coasts.*
> - *Last military activity on Cape Wrath Range or Garvie Island was 1 Sep 14.*
> - *No in water explosive work although some was undertaken inland on Skye and Shetland.*
> - *The only mine countermeasures activity was in Ettrick Bay (Bute)*
> - *Exercise Joint Warrior has not yet begun.*
> - *There was some diving and ROV activity in the Sound of Raasay but this was on 30 Sep.*
> - *A foreign SM is currently en route to Faslane but this did not enter UK areas until 0700 on 1 Oct."*

Data provided by DECC

> *"We have checked our files and have no record of seismic survey or other noise-generating oil and gas activity North of the Scottish Mainland in proximity of Durness in September. I am attaching a spread sheet showing the seismic surveys that have been consented in the relevant area. There are a number, which might have impacted, but following checks with the operator, they were not carried out at the relevant time:*
>
> *1. Line 5 - GS/94/0 - Western Geco was completed on 22/08/14 2. Line 14 - GS/134/0 - Raven Navigator was completed on 14/08/14 3. Line 15 - GS/139/0 - TGS-NOPEC was cancelled.*
>
> *This would mean that any surveys that were conducted in September would have been to the West of Shetland, some distance from Durness."*

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