



Annual Report 2019

1 January to 31 December 2019
for Marine Scotland, Scottish Government



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Contents

<i>Contents</i>	2
Section 1: Executive Summary	7
1.1 Project overview	8
1.2 Contract specification.....	8
Section 2: Strandings	11
2.1 Strandings overview	11
2.2 Spatial maps of strandings.....	14
2.3 Pinniped strandings.....	17
2.3.1 ‘Corkscrew’ or spiral trauma cases	19
2.4 Pinniped age structure	19
2.5 Cetacean strandings	22
2.6 Harbour porpoise strandings 2019	25
Section 3: Cause of death/findings summary tables	27
3.1 Cause of death; direct anthropogenic versus other causes of death.	29
Section 4: Mass stranding events (MSE’s) and unusual mortality events (UME’s).	32
4.1 Mass stranding events (MSE’s) multiple strandings and unusual mortality events ...	32
4.2 M432.1- M422.2/19– short-beaked common dolphin (<i>Delphinus delphis</i>).....	32
4.3 M448.1- M448.3/19– harbour porpoise (<i>Phocoena phocoena</i>)	33
4.4 M485.1- M485.2/19– Sowerby’s beaked whale (<i>Mesoplodon bidens</i>).....	33
4.5 M533.1- M533.2/19– short-beaked common dolphin (<i>Delphinus delphis</i>).....	34
4.6 M604.1- M604.2/19– short-beaked common dolphin (<i>Delphinus delphis</i>).....	34
Section 5: Entanglement cases	36
5.1 Cetacean entanglement cases.....	36
5.1.1 M245/19– humpback whale (<i>Megaptera novaeangliae</i>)	36
5.1.2 M297/19– humpback whale (<i>Megaptera novaeangliae</i>).....	37
5.1.3 M509/19– Minke whale (<i>Balaenoptera acutorostrata</i>).....	39
5.1.4 M539/19– Sowerby’s beaked whale (<i>Mesoplodon bidens</i>)	40
5.2 Pinniped entanglement cases	41
5.2.1 M644/19 – Grey seal (<i>Halichoerus grypus</i>).....	42
Section 6: Grey seal predation (cetaceans)	42
6.1 Primary trauma cases suspected to be seal predation on harbour porpoise.....	43
6.2 Secondary infection possibly due to seal bite lesions on harbour porpoise.....	44
Section 7: Neurobrucellosis cases	44
7.1 M86/19 – striped dolphin (<i>Stenella coeruleoalba</i>)	45
7.1 M185/19 – striped dolphin (<i>Stenella coeruleoalba</i>)	46

Section 8:	<i>Other notable single cetacean strandings</i>	48
8.1	M119/19 – short-beaked common dolphin (<i>Delphinus delphis</i>).....	48
8.2	M167/19 – short-beaked common dolphin (<i>Delphinus delphis</i>).....	49
8.3	M189/19 – Sperm whale (<i>Physeter macrocephalus</i>)	49
8.4	M294/19– bottlenose dolphin (<i>Tursiops truncatus</i>)	50
8.5	M419/19– Minke whale (<i>Balaenoptera acutorostrata</i>)	51
8.6	M665/19 – Sperm whale (<i>Physeter macrocephalus</i>)	52
Section 9:	<i>Spiral “corkscrew” trauma seal cases</i>	55
Section 10:	<i>Other single pinniped strandings</i>	61
10.1	M40/19– Harbour seal (<i>Phoca vitulina vitulina</i>)	61
10.2	M109/19– Grey seal (<i>Halichoerus grypus</i>)	62
10.3	M154/19– Grey seal (<i>Halichoerus grypus</i>)	62
10.4	M175/19– Harbour seal (<i>Phoca vitulina vitulina</i>)	63
10.5	M186/19– Harbour seal (<i>Phoca vitulina vitulina</i>)	65
10.6	M187/19– Harbour seal (<i>Phoca vitulina vitulina</i>)	65
Section 11:	<i>Sharks and marine turtles</i>	66
11.1	Basking sharks (<i>Cetorhinus maximus</i>).....	66
11.2	Other sharks.....	67
11.3	Marine Turtles	68
Section 12:	<i>Bacteriology</i>	69
12.1	<i>Brucella</i> sp.	69
12.2	<i>Streptococcus</i> sp.	69
12.3	<i>Pasteurella</i> sp.	70
12.4	<i>Vibrio</i> sp.	70
12.5	<i>Yersinia</i> sp.	70
12.1	<i>Bordetella bronchiseptica</i>	70
12.1	<i>Clostridium</i> sp.	70
12.2	<i>Fungal isolates</i>	70
Section 13:	<i>Outreach and Volunteers</i>	71
13.1	SMASS Forum	71
13.2	Volunteer training	76
13.3	Other outreach.....	76
Section 14:	<i>Outputs</i>	77
14.1	Overview.....	77
14.2	Publications	77
14.3	Publications (Submitted).....	78
14.4	Non Peer reviewed publications	78

14.5	Conference Talks	79
14.6	SMM workshop presentations.....	80
14.7	Conference Posters	80
14.8	Media	81
14.9	Conferences/meetings.....	88
14.10	Other collaborations.....	89
14.11	Website and digital media.....	90
14.12	Data and sample requests	91
14.12.1	Samples sent	91
14.12.2	Data sent	91
14.13	Collaborators	92
Section 15:	Staff and facilities	93
Section 16:	Acknowledgments.....	95

<i>Figure 1: Total number of strandings reported 2010-2019. Red line shows the mean number of strandings over this 10-year period (581).....</i>	<i>11</i>
<i>Figure 2: Total number of species reported in 2019, by subclass</i>	<i>13</i>
<i>Figure 3: Cumulative number of cases all species by month for 2015 - 2019.....</i>	<i>13</i>
<i>Figure 4: Cases necropsied and sampled 2010-2019.....</i>	<i>14</i>
<i>Figure 5: Strandings necropsied or sampled 2019.....</i>	<i>16</i>
<i>Figure 6: Strandings not necropsied 2019</i>	<i>16</i>
<i>Figure 7: Kernel density plot of all strandings 2019. Colour spectrum from green (low) to red (high), density strandings per square km of coastline</i>	<i>17</i>
<i>Figure 8: Pinniped strandings (all species) 2015– 2019, separated by level of examination</i>	<i>18</i>
<i>Figure 10: Seasonal age class distribution for left: Grey seals and right: Harbour seals, reported to SMASS in 2019.....</i>	<i>20</i>
<i>Figure 11 Pinniped strandings 2019.....</i>	<i>21</i>
<i>Figure 12: Grey seal strandings density 2019.....</i>	<i>21</i>
<i>Figure 13: Harbour seal strandings density 2019.....</i>	<i>21</i>
<i>Figure 14: Cetacean strandings 2015-2019, all species</i>	<i>22</i>
<i>Figure 15: All cetacean strandings excluding harbour porpoise 2019, by species (left) and overall density (right).....</i>	<i>24</i>
<i>Figure 16: Incidence of harbour porpoise strandings by month and age group.....</i>	<i>25</i>
<i>Figure 17: Spatial distribution of Harbour porpoise strandings, by age class, and density 2019.....</i>	<i>26</i>
<i>Figure 18: Monthly distribution of cause of death findings for left: pinnipeds and right: cetaceans reported to SMASS in 2019; divided by direct anthropogenic, infectious, and other causes of death as well as cases necropsied but not established (n=2 for both cetaceans and pinnipeds). Note the different y-axis for both plots.</i>	<i>31</i>
<i>Figure 19: M432.1/19 short-beaked common dolphin being refloated by BDMLR at Culross, Fife.</i>	<i>32</i>
<i>Figure 20: M448.1/19 juvenile harbour porpoise on mudflats in the Solway Firth, the towel preventing the skin from drying out or abrading. This animal was successfully refloated. Image credit BDMLR.</i>	<i>33</i>

Figure 21: M485.1/19 juvenile female Sowerby's beaked whale being measured at Kames, near Tighnabruich, Argyll and Bute.....	34
Figure 22: M533.1/19 common dolphin (<i>Delphinus delphis</i>) from Buddon Ness, Angus about to be refloated. Image credit BDMLR.....	35
Figure 23: M604.1 & M604.2/19 common dolphin (<i>Delphinus delphis</i>) from Sands O'gill near Peirowall Westray, Orkney just after refloating.	35
Figure 24: M245/19 humpback whale (<i>Megaptera novaeangliae</i>) from Tynninghame, East Lothian.....	37
Figure 25: M297/19 humpback whale (<i>Megaptera novaeangliae</i>) from Scrabster, Highland.....	39
Figure 26: M509/19 minke whale (<i>Balaenoptera acutorostrata</i>) from Sanday, Orkney showing section of net lodged in the baleen.....	40
Figure 27: M539/19 Sowerby's beaked whale (<i>Mesoplodon bidens</i>) Gullane East Lothian, showing embedded rope encircling the region behind the head.	41
Figure 28: M644/19 grey seal (<i>Halichoerus grypus</i>) from Gott bay, Tiree with net entanglement around neck. 42	
Figure 29: M130/198 harbour porpoise (<i>Phocoena phocoena</i>) Opinan, Gairloch, Highland showing lesions typically associated with grey seal predation.....	44
Figure 30: M86/19 striped dolphin (<i>Stenella coeruleoalba</i>) South Ronaldsay, Orkney.....	45
Figure 31: M86/19 striped dolphin (<i>Stenella coeruleoalba</i>) showing severe dilation of lateral ventricles (arrows) of the brain.....	46
Figure 32: M185/19 striped dolphin (<i>Stenella coeruleoalba</i>) from Lochinver, Highland.....	47
Figure 33: M185/19 striped dolphin (<i>Stenella coeruleoalba</i>) brain showing enlarged lateral ventricles (yellow arrows).	47
Figure 34: M119/19 short-beaked common dolphin (<i>Delphinus delphis</i>) from the Briaghe, Stornoway Isle of Lewis.....	48
Figure 35: M167/19 short-beaked common dolphin (<i>Delphinus delphis</i>) from Balnakiel, Durness.	49
Figure 36: M189/19 female sperm whale (<i>Physeter macrocephalus</i>) from South Uist.....	50
Figure 37: M294/19 bottlenose dolphin (<i>Tursiops truncatus</i>) from Alturlie, near Inverness.....	51
Figure 38: M419/19 minke whale (<i>Balaenoptera acutorostrata</i>), Uig, Lewis.....	52
Figure 39: M665/19 Sperm whale (<i>Physeter macrocephalus</i>), Seilebost, Harris	53
Figure 40: M665/19 Sperm whale (<i>Physeter macrocephalus</i>), Seilebost, Harris showing marine debris and squid beaks in the cardiac stomach.	54
Figure 41: M665/19 Marine debris removed from sperm whale (<i>Physeter macrocephalus</i>) cardiac stomach Seilebost, Harris.	54
Figure 42: M384/19 harbour seal (<i>Phoca vitulina</i>) from Gott bay, Tiree, Argyll and Bute showing typical corkscrew/spiral grey seal predation lesions	55
Figure 43:- Distribution of seal predation cases 2019.....	56
Figure 44: M40/19 harbour seal (<i>Phoca vitulina vitulina</i>) from Loch Etive Highland.....	61
Figure 45: M109/19 grey seal (<i>Halichoerus grypus</i>) from Nairn, Highland.	62
Figure 46: M154/19 grey seal (<i>Halichoerus grypus</i>) from Dale of Walls, Shetland.....	63
Figure 47: M175/19 harbour seal (<i>Phoca vitulina vitulina</i>) from Achnacloich, Oban, Argyll and Bute.....	64
Figure 48: M186/19 harbour seal (<i>Phoca vitulina vitulina</i>) from Gruniard bay, Highland.....	65
Figure 49: M187/19 harbour seal (<i>Phoca vitulina vitulina</i>) from the mouth of the River Spey, Moray.	66
Figure 50: M508/19 Basking shark (<i>Cetorhinus maximus</i>) from near Brora, Highland.	67
Figure 51: M508/19 Porbeagle shark (<i>Lamna nasus</i>) from Westport, Arbroath.	67
Figure 52: M181/19 Loggerhead turtle (<i>Caretta caretta</i>) North Uist.....	68

<i>Figure 53: M692/19 Green turtle (Chelonia mydas) Barra.</i>	69
<i>Figure 54: Dr Andrew Brownlow talking about an extraordinary year at the Forum</i>	74
<i>Figure 55: Delegates enjoying tea and coffee at the SMASS forum</i>	74
<i>Figure 56: Sarah Dolman WDC Policy Manager talking about 10 years of Shorewatch</i>	75
<i>Figure 57: Georg Hantke, National Museums Scotland Cold cases identifying cetacean & pinniped bones and the importance of skeleton collection workshop</i>	75
<i>Figure 58: To refloat or not to refloat; post mortem data to inform rescue & rehabilitation decisions workshop with Dan Jarvis, BDMLR & Dr Mark Dagleish, Moredun Research Institute</i>	76
<i>Figure 59: Marie Petitguyot from Université Pierre et Marie Curie - UPMC Paris, examining a harbour porpoise in February 2019</i>	90
<i>Figure 60: Facebook front page, Feb 2020</i>	91
<i>Figure 61: Mobile necropsy trailer, funded by Marine Scotland</i>	94
<i>Figure 62 Inside of trailer, showing necropsy table, sink and lab area</i>	95
<i>Table 1: Summary of stranded animals 2019</i>	12
<i>Table 2: Age structure of pinniped strandings 2015 – 2019</i>	19
<i>Table 3: Cetaceans necropsied or sampled 2019</i>	27
<i>Table 4: Reasons why carcasses were NOT taken for necropsy, 2019</i>	28
<i>Table 5: Cause of death/findings for pinnipeds, basking sharks and marine turtles reported 2019. This excludes pinnipeds shot under licence.</i>	29
<i>Table 6: Scoring of suspected spiral trauma cases 2019</i>	57

Section 1: Executive Summary

Fewer strandings were reported the Scottish Marine Animal Stranding Scheme (SMASS) compared to 2018 however 2019 still had a higher than average incidence of reports. From the 1st January to 31st December 2019, 765 reports of 770 marine animals were reported to SMASS, comprising 491 seals, 269 cetaceans, 7 sharks and three marine turtles. Of these, 52 cases (6.8%), comprising 34 cetaceans, 17 seals and one turtle were necropsied to establish a cause of death. A further 89 (11.6%) animals, comprising 57 cetaceans, 30 seals and two sharks were sampled by the SMASS volunteer network. In those cases not necropsied, advanced autolysis or carcase accessibility were the most common reasons precluding further examination.

There were five mass stranding events (MSE), all but one of which of these involved only two animals: Three pairs of short beaked common dolphin (*Delphinus delphis*), MSE's in Fife, Angus and Westray, Orkney, and two Sowerby's beaked whales (*Mesoplodon bidens*) at Tighnabruaich, Argyll and Bute. Three harbour porpoise stranded together in the (*Phocoena phocoena*) in the Solway Firth, an unusual cluster for this species

Seals exhibiting lesions consistent with grey seal predation continue to be reported with 89 cases, mostly from Orkney. The majority were grey seal juveniles (weaners) (*Halichoerus grypus*) reported in the winter months, although harbour seals (*Phoca vitulina*) were also reported, as were suspected seal attacks on harbour porpoise (*Phocoena phocoena*). The impact of grey seal predation on sympatric species is being investigated as part of a PhD in collaboration with SMRU, St Andrews.

In March, SMASS held the second SMASS forum this time in conjunction with Whale and Dolphin Conservation (WDC) at the Centre for Health Studies in Inverness. It was well attended with over 120 volunteers and public attending a programme of morning talks and afternoon workshops.

A beta version of the Beach Track app (beachtrack.org) was released to volunteers for testing at the forum and subsequently released to the public in June. Currently the app has logged 285 tracks, comprising 600Km of survey effort and included 162 sightings reports.

Closure of Disease Surveillance Centre (DSC) at Drummondhill, Inverness caused a significant constraint to the operational capacity of the programme. The DSC facility had provided a base of operations, including necropsy, laboratory and sample archive storage capacity to the SMASS programme since inception, however following a review of veterinary surveillance provision by SRUC the facility was closed in May 2019. The SMASS team were provided with alternative offices at An Lochran, on the University of the Highlands and Islands campus. This site also provided access to a Cat 3 laboratory which enabled microbiological components of the work to continue. Marine Scotland also provided funding for a mobile investigation unit- a bespoke conversion of a covered trailer which provides a degree of necropsy capability for smaller cetaceans and pinnipeds, operational support for field post mortems, and a base for volunteer training. Unfortunately, completion of the replacement site which would serve as a base for the mobile unit, and offer some necropsy and tissue storage capability and was significantly delayed, resulting in a significant limit to necropsy capacity for the remaining eight months of the year. The site, at Alcaig near Conan Bridge site, finally became operational

in February 2020, however there remains a number of cases frozen awaiting necropsy. The lockdown surrounding COVID-19 pandemic has further curtailed completion of these cases.

Strandings continue to attract significant media attention and effort has been maintained to provide strandings and case updates through social media channels. There was media interest in the forum at the beginning of the year, and in a paper, SMASS co-authored on microplastics. Media interest in SMASS continued to grow during the year with several entanglement cases, namely two humpback whale (*Megaptera novaeangliae*) cases in April and May, a Sowerby's beaked whale in October. In December, media interest peaked with of a stranded sperm whale with approximately 100kg of marine debris in its stomach. We had media interest from 14 countries including the UK.

1.1 Project overview

This work is delivered under the Scottish Marine Animal Strandings Research Programme, issued on 28th May 2018 by Scottish Ministers, with work running for between 8th June 2018 and 8th March 2020. The project is currently managed by SRUC and, until May 2019, was run from their Veterinary Disease Investigation Centre, Drummondhill, Inverness. The principal aim of the project is to provide a coordinated approach to surveillance of cetacean, seal, basking shark and marine turtle strandings, and to investigate major causes of death of stranded animals in Scotland. Where required, efforts should be made to expand and develop the established volunteer network to improve reporting and strandings investigations. This project therefore has the following objectives:

1.2 Contract specification

- i. 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 where possible. It will also involve an ongoing review of techniques used to determine the causes of death aimed at improving their accuracy, efficiency and cost-effectiveness.
- ii. A small number of priority species should be identified in each year of the project for more in depth and targeted studies, which will involve additional analysis and testing (e.g. age, diet, contaminant and toxin exposure and reproductive state). The number of individuals and species will be determined in collaboration with the steering group, but it is likely to involve 20/25 individuals and primarily focus on the following species: harbour seals, harbour porpoise, bottlenose dolphins and minke whales.
- iii. Undertake post mortem examinations on marine wildlife (e.g., cetaceans, seals, turtles and sharks) stranded around the Scottish coast to determine major causes of death, including by-catch, physical trauma and the incidence of disease. A wide species and geographical spread of post mortems should be achieved, and this will be informed by decisions within the project steering group.

- iv. Increased efforts should be made to collect data (via the stranding network or post mortem) from harbour seals reported stranded around the Scottish coast to inform current work investigating harbour seal decline in Scotland. Seals in all stages of decomposition should be targeted.
- v. Provide scientific advice to the Scottish Government as necessary about major causes of death in stranded marine mammals, including any trends or unusual events.
- vi. Maintain the database for all Scottish strandings, which brings together accurate and geo-reference data on both strandings and necropsy data. All data should be fed into the cetacean database for the “UK Cetacean Strandings Investigation Programme” (UKCSIP) which is held by the Institute of Zoology (IoZ).
- vii. Maintain and expand the Scotland-wide volunteer network to assist with identification, triage and possible measurement and sampling of cases reported to the stranding scheme. This should allow for improved depth, accuracy and efficiency in the information recoverable from strandings.
- viii. Provide training courses and refresh training courses, and post mortem 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.
- ix. Support relevant research organisations (e.g. SMRU, SAMS, University of Aberdeen) and ongoing research streams in relation to marine mammals. This will involve, but not be limited to, undertaking post mortems, working with SMRU on field trials, and scrutinising the current scheme in terms of its ability to answer questions that are identified through collaborative research programmes (e.g. harbour seal decline and interactions between marine mammals and marine renewable energy devices).
- x. Investigate opportunities to form collaborations with new academic and scientific partners. This objective should involve biannual workshops/meetings with appropriate research institutes to investigate opportunities for collaborative working as well as identifying new research streams and funding opportunities.
- xi. Increase awareness of the project through ongoing publicity. Contribute to the production of strandings training material and workshop events, and maintain a public facing website and social media presence.
- xii. Maintain the tissue archive for all samples collected under the current and previous projects, to ensure that there is a time series of samples for all individuals sampled or necropsied.
- xiii. A review of archived samples should be undertaken as part of the project and in partnership with relevant organisations to determine future storage options. This should be undertaken with input from the wider UK and Scottish steering groups.
- xiv. Ensure that the catalogue of data and samples is or can be made readily accessible on request. The appropriate detail on what data are available should be clearly stated and should be accessible either through the project’s website or through meta data archives. Advertise the holdings in the scientific community to widen the access and the potential for collaboration.

- xv. Contribute to existing Scottish Government, and wider marine mammal projects as required.
- xvi. To make information on strandings and post mortems results available to the Scottish Government on a quarterly basis and publicly available by annual reports.

Section 2: Strandings

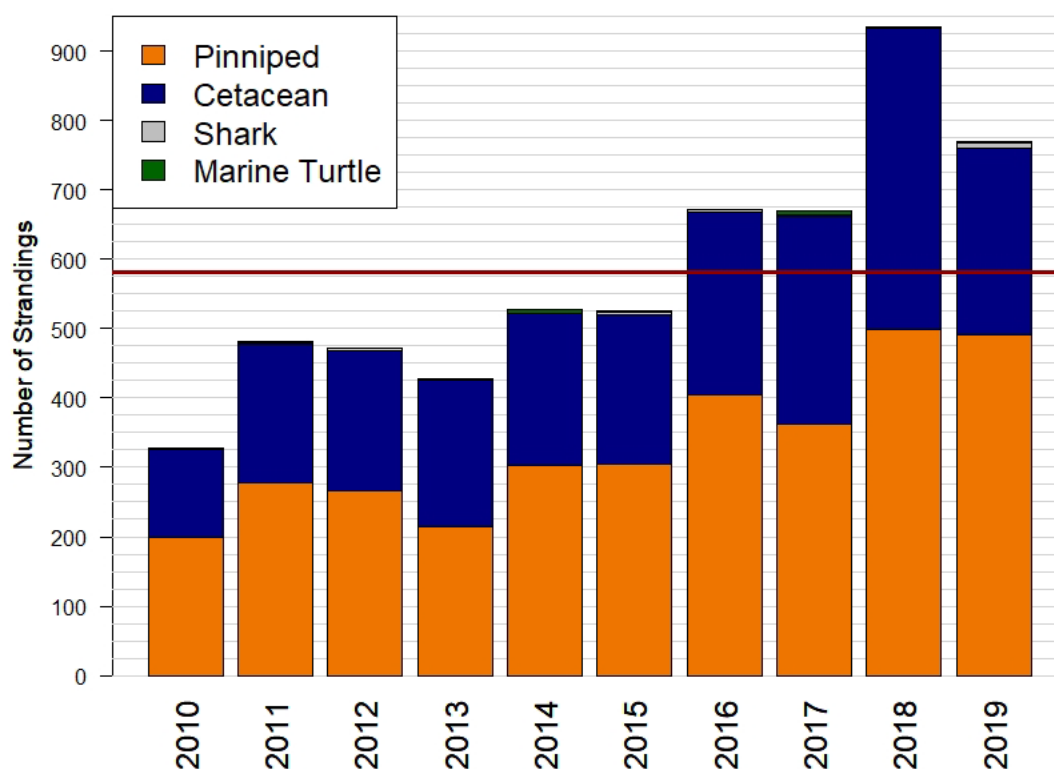


Figure 1: Total number of strandings reported 2010-2019. Red line shows the mean number of strandings over this 10-year period (581)

2.1 Strandings overview

From the 1st January to 31st December 2019, 770 marine animals were reported to the Scottish Marine Animal Stranding Scheme (SMASS), comprising 491 seals, 269 cetaceans, seven sharks and three marine turtles (Table 1). Figure 1 shows the total number of animals per species subclass for 2019. Fifty-two cases (6.8%), comprising 34 cetaceans, 17 seals, and one marine turtle were necropsied to establish a cause of death. A further 89 (11.6%) animals, comprising 57 cetaceans, 30 seals, and two sharks, were sampled by trained volunteers. In those cases not necropsied, advanced autolysis was the most common reason precluding further examination with 295 (38.3%) cases being too decomposed to allow further examination. Figure 2 shows the breakdown of strandings by subclass for 2019. Figure 3 shows the cumulative number of strandings by month for each individual year since 2015 and shows that there was no significant inflexion point in 2019 which would indicate a change in mortality reporting rate. Figure 1 presents the total number of strandings reported to SMASS since 2010 and shows that while numbers were lower than in 2018, the annual total has still increased compared to the previous years. This is likely due to reporting effort, although the increasing population of grey seals may account for the increased number of mortalities in that species.

Table 1: Summary of stranded animals 2019

Species	Sent for Necropsy	Sampled	Not Examined	Total
Cetaceans	34	57	178	269
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>)		2		2
Bottlenose dolphin (<i>Tursiops truncatus</i>)	1	1	1	3
Cuvier's beaked whale (<i>Ziphius cavirostris</i>)			1	1
Fin whale (<i>Balaenoptera physalus</i>)			2	2
Harbour porpoise (<i>Phocoena phocoena</i>)	16	33	83	132
Humpback whale (<i>Megaptera novaengliae</i>)	2		1	3
Killer whale (<i>Orcinus orca</i>)		1		1
Long-finned pilot whale (<i>Globicephala melas</i>)		2	6	8
Minke whale (<i>Balaenoptera acutorostrata</i>)	1	6	15	22
Northern Bottlenose whale (<i>Hyperoodon ampullatus</i>)			1	1
Risso's dolphin (<i>Grampus griseus</i>)		1	7	8
Short-beaked common dolphin (<i>Delphinus delphis</i>)	5	4	25	34
Sowerby's beaked whale (<i>Mesoplodon bidens</i>)	3	1		4
Sperm whale (<i>Physeter macrocephalus</i>)	2	2	2	6
Striped dolphin (<i>Stenella coeruleoalba</i>)	2	2	2	6
White-beaked dolphin (<i>Lagenorhynchus albirostris</i>)	2	1	3	6
Cetacean (indeterminate species)			12	12
Baleen whale (indeterminate species)			2	2
Dolphin (indeterminate species)		1	15	16
Pinnipeds	17	30	444	491
Grey seal (<i>Halichoerus grypus</i>)	5	21	281	307
Harbour seal (<i>Phoca vitulina</i>)	12	9	74	95
Hooded seal (<i>Cystophora cristata</i>)			1	1
Seal (indeterminate species)			88	88
Other	1	2	7	10
Green turtle (<i>Chelonia mydas</i>)			1	1
Leatherback turtle (<i>Dermochelys coriacea</i>)			1	1
Loggerhead turtle (<i>Caretta caretta</i>)	1			1
Basking shark (<i>Cetorhinus maximus</i>)		1	5	6
Porbeagle shark (<i>Lamna nasus</i>)		1		1
GRAND TOTAL	52	89	629	770

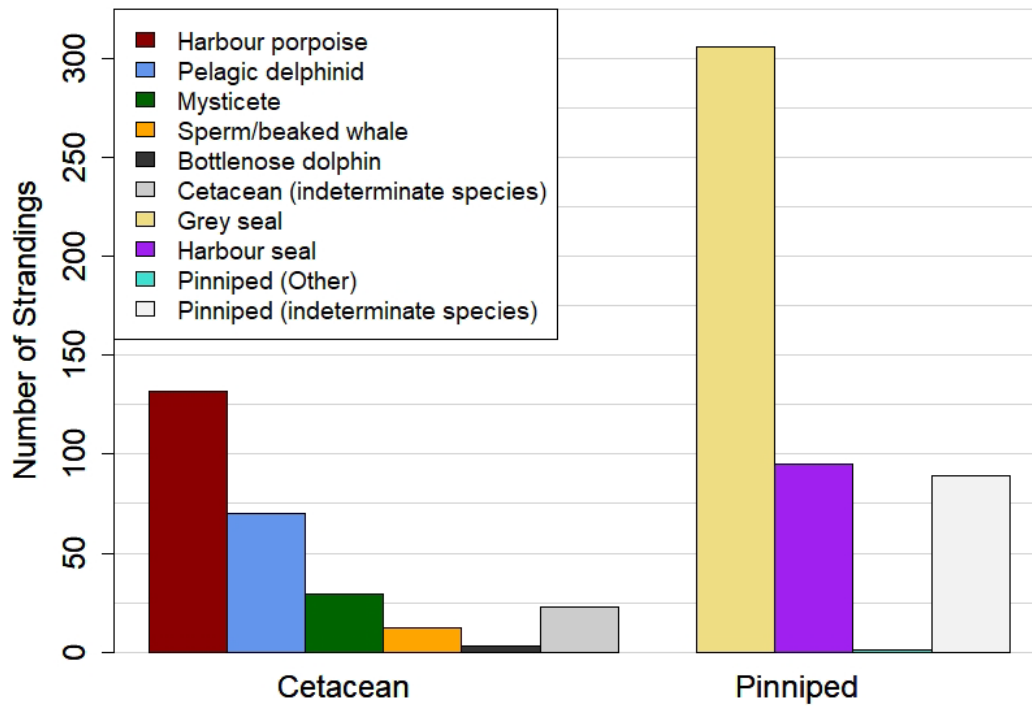


Figure 2: Total number of species reported in 2019, by subclass

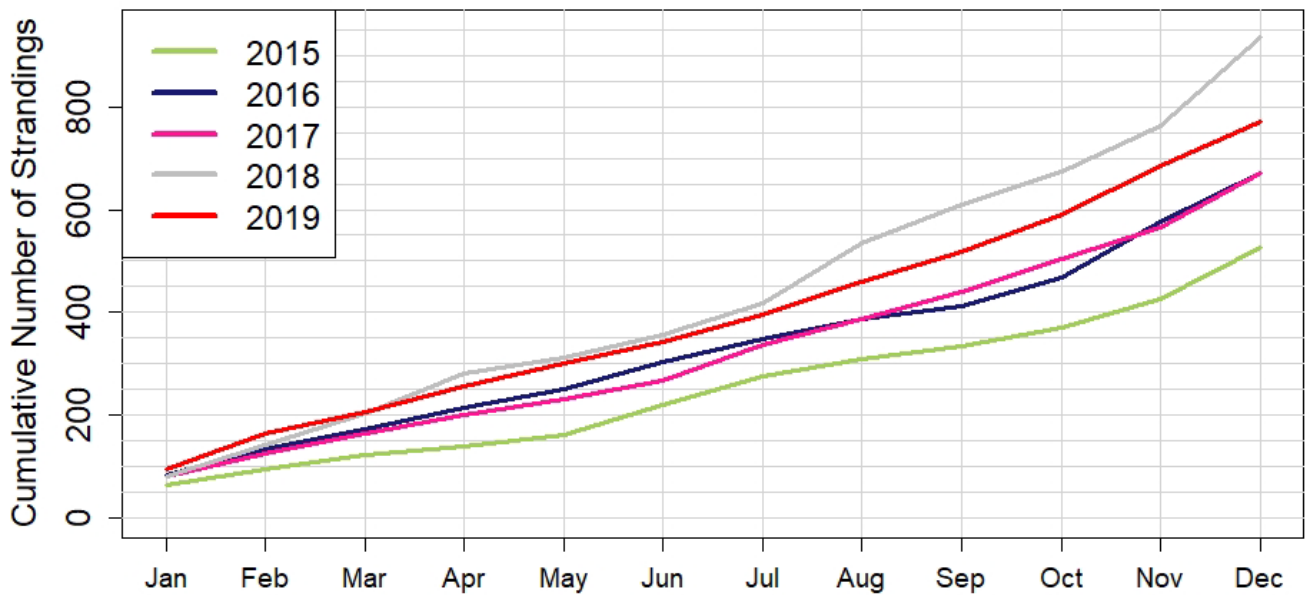


Figure 3: Cumulative number of cases all species by month for 2015 - 2019

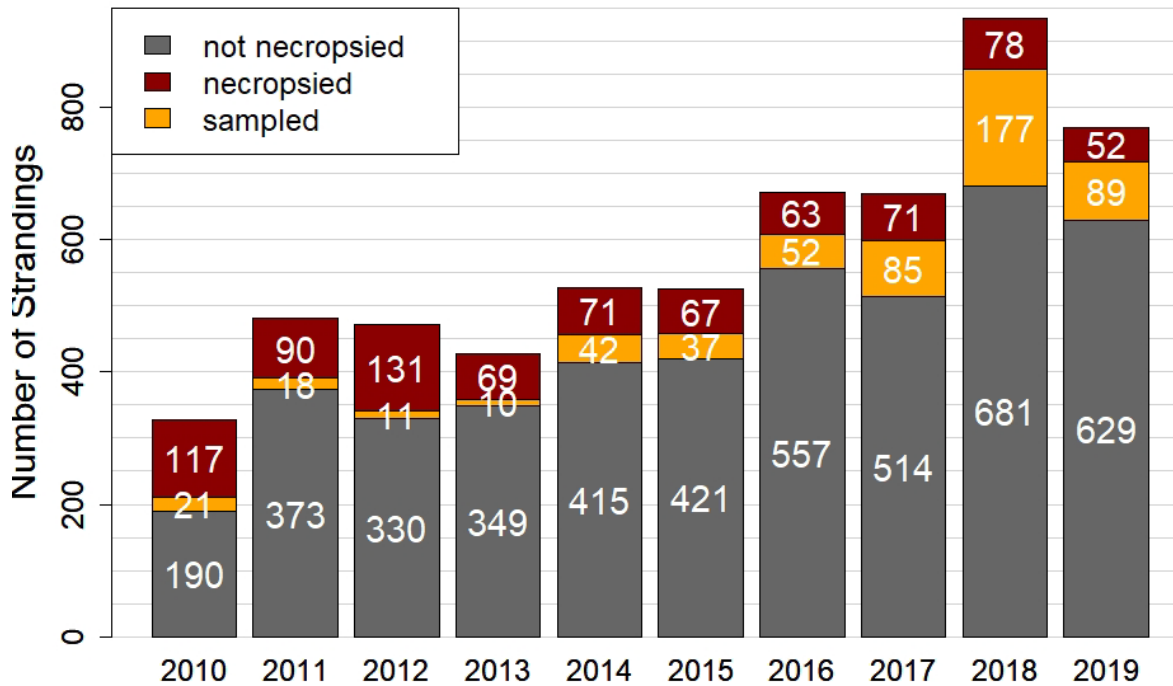


Figure 4: Cases necropsied and sampled 2010-2019

Figure 4 shows the number of cases necropsied, sampled, and not necropsied respectively during 2019 compared to the past ten years. There was again a drop in the number of cases sampled by trained volunteers, with 11.5% of the cases being sampled compared to only 18.2% last year. The percentage of cases necropsied (6.7%) was also slightly lower than 2019 when 7.7% of the total number of strandings were necropsied. Given the difficulties regarding necropsy facilities during this period, this is only a modest drop and indicates that cases were either necropsied on site or stored frozen. The latter is not desirable as the freeze/thaw process can compromise the pathological interpretation of cases. Cases may be unsuitable for collection for a number of factors, with autolysis being the most common reason. A more detailed overview of this as well as findings at necropsy can be found in Section 3 of this report.

2.2 Spatial maps of strandings

There were cases reported in all coastal regions, although notable clusters of strandings were seen around Fife and the south east, Orkney and the south west (Clyde area). In addition, a high number of strandings were observed on the Western Isles, likely due both to this island chain catching carcasses from the Atlantic and active beach monitoring from volunteers (more information on this can be found in section 4). Recovery of carcasses and obtaining data from animals stranded in the southwest of Scotland was largely constrained by logistical difficulties, or poor information about the stranding, whereas the cluster of non-recovered animals from the eastern coast from Fife to Aberdeen was usually due to animal condition rather than the capacity for recovery.

Continued and hugely valued assistance from our trained volunteers around the coastline, the Hessilhead Wildlife Rescue Trust, North Ayrshire, and Hillswick Wildlife Sanctuary and

Scottish Natural Heritage (SNH) in Shetland has enabled many animals suitable for necropsy to be recovered, or stranding morphometrics to be recorded.

The maps below show the spatial distribution of strandings necropsied (Figure 5) and not necropsied (Figure 6) during 2018. Figure 7 is a density map showing areas, in red, of high stranding reports for all species. A density plot is a surface calculated from individual stranding points using a kernel function to fit a smoothly tapered surface, and is a way of visualising areas of high stranding density.

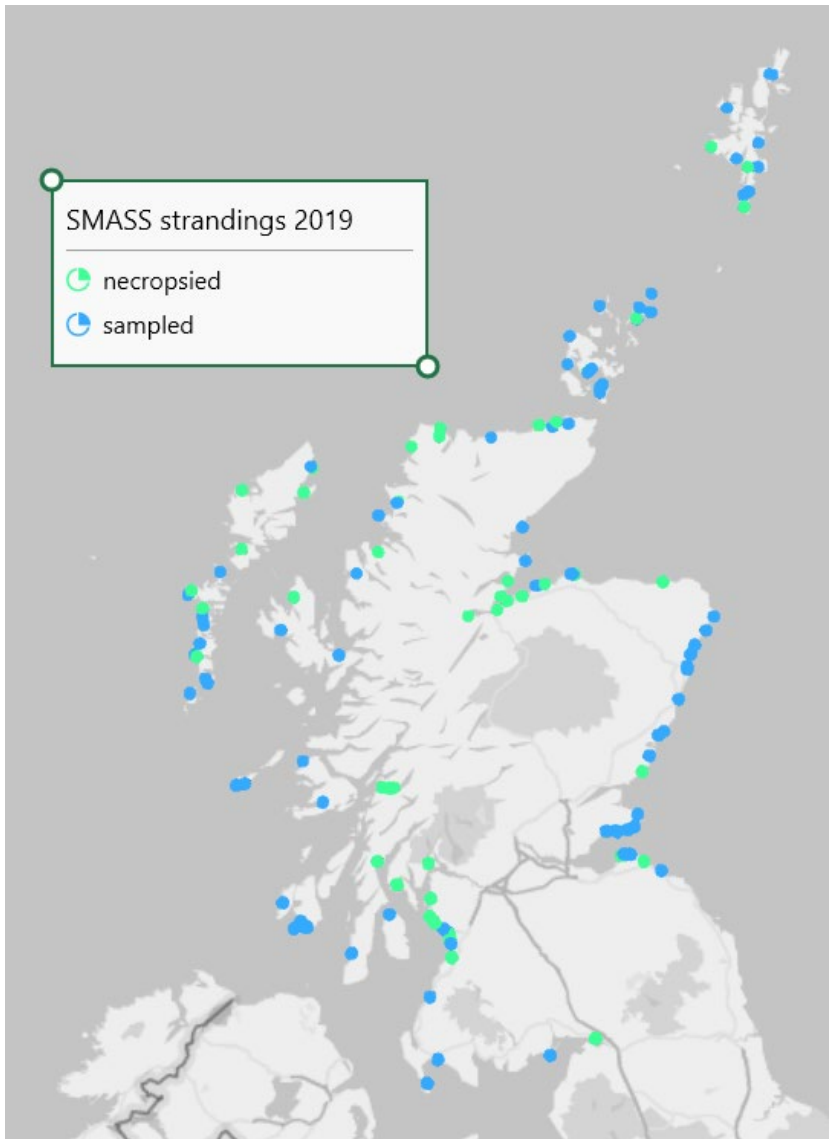


Figure 5: Strandings necropsied or sampled 2019

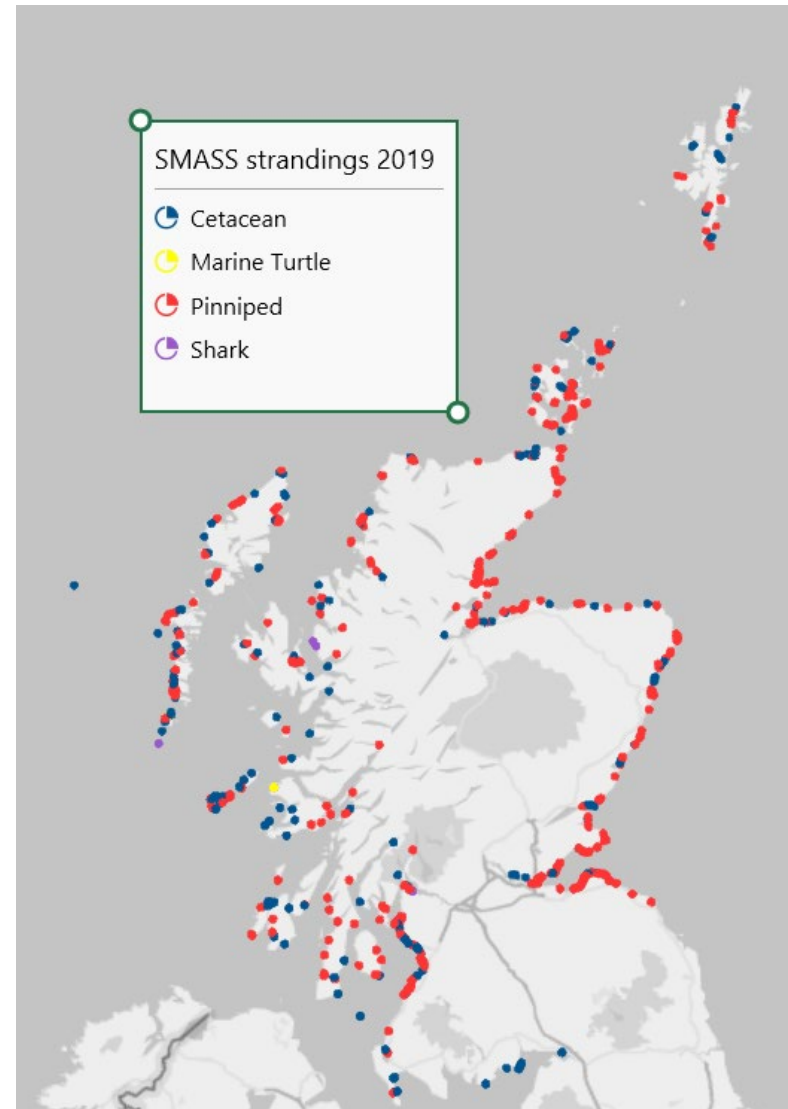


Figure 6: Strandings not necropsied 2019

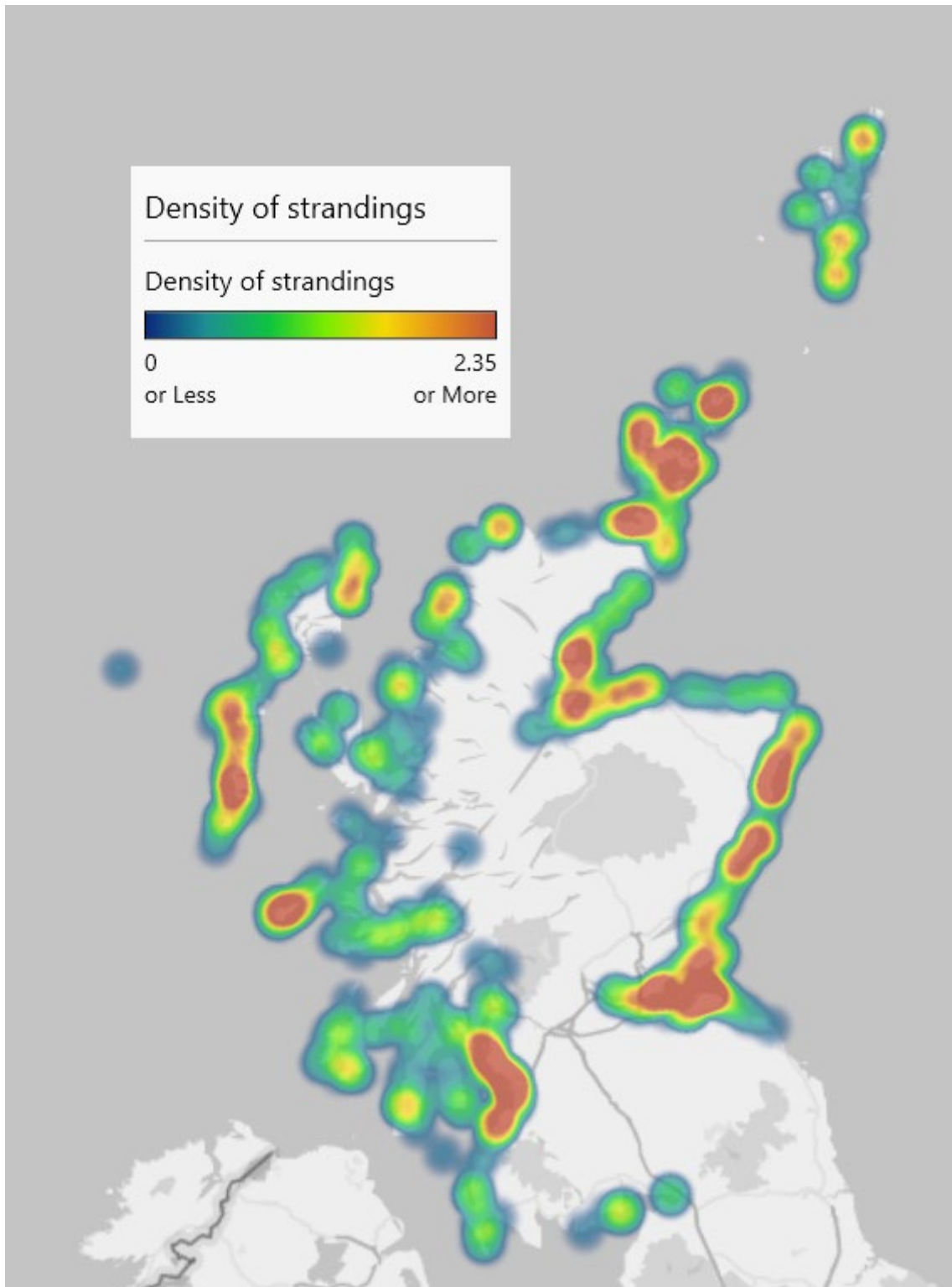


Figure 7: Kernel density plot of all strandings 2019. Colour spectrum from green (low) to red (high), density strandings per square km of coastline

2.3 Pinniped strandings

Four hundred and ninety-one seals were reported to SMASS in 2019 comprising of 307 grey seals (*Halichoerus grypus*), 95 harbour seals (*Phoca vitulina*), a single hooded seal (*Pagophilus*)

groenlandica) and 88 pinnipeds that were too autolysed or data deficient for accurate speciation (Figure 10, Table 2). Of those reported, the majority (90.4%) were not recovered for necropsy, mainly due to the carcass being an advanced state of autolysis, or insufficient information available when the case was reported. It is seldom a pinniped carcass is discovered in a suitable state of preservation to make it justifiable to recover for necropsy. Nevertheless, 30 (6.1%) cases were sampled by volunteers. Given the importance of investigating harbour seal mortality, efforts were made to recover or obtain as much information about these strandings as possible information through their volunteer network. In many instances this provides SMASS with more data, but often no volunteers were available or the volunteer couldn't find the carcass based on the reporter's description. Strategies for further improving data recovered from priority species such as harbour seals have been developed and await discussion with the steering group.

Seventeen cases (3.5%) were recovered for necropsy. Physical trauma attributable to grey seal predation was the most common finding for both grey (n=69) and harbour (n=13) seals. Three grey seals died as a result of entanglement, one harbour seal was diagnosed as being shot at necropsy. One harbour and one grey seal died due to starvation, two harbour seals were found to have died as a result of parasitic pneumonia. In two animals, a cause of death was not established.

This report does not include the detail on cases reported as shot under seal management licences (n=2). Information regarding these cases is available from Marine Scotland or online at:

<http://www.scotland.gov.uk/topics/marine/licensing/seallicensing>.

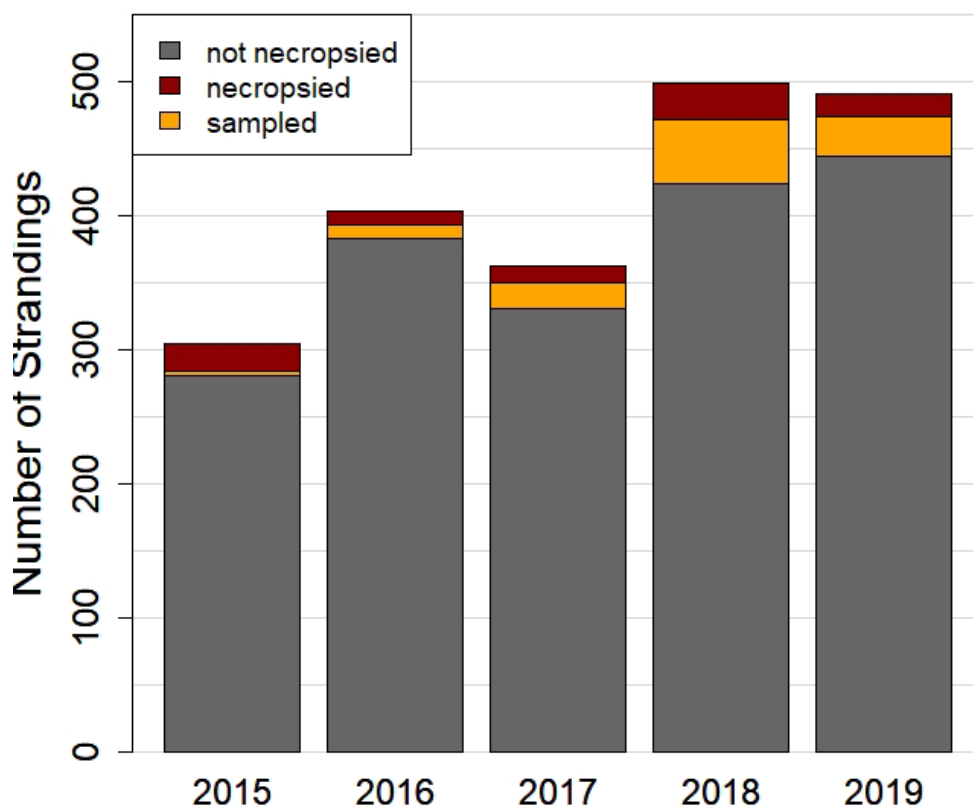


Figure 8: Pinniped strandings (all species) 2015– 2019, separated by level of examination

2.3.1 ‘Corkscrew’ or spiral trauma cases

Eighty-nine seals were reported as having trauma consistent with spiral or corkscrew injuries. These cases were reported from 12 different regions of Scotland. The majority of these were grey seals (n=69): harbour seals (n=13) and those too decomposed or data deficient to be identified (n=7). It is now considered highly likely that the majority of historic “spiral or corkscrew” cases were due to predation, most likely by adult grey seals. More detail can be found in Section 6.

2.4 Pinniped age structure

Table 2 shows the age structure of pinnipeds reported to SMASS for the five-year period from January 2015 to December 2019. Figure 10 graphs the structure for 2019 only.

Between 2015 and 2019, there were 2060 strandings of seals, of which the age could not reliably be established in 47.8% of the cases. Of those where the age could be determined, 30% were pups, 45% were juveniles and 25% were adult animals. By species, adults made up 26% of grey seals and 22% of harbour seal strandings.

In 2019, the age class could not be established for 53.4% of the 491 reported strandings. Where age class could be ascertained, 12.6% were pups; 22.4% were juveniles and 11.6% adults. By species, adults made up 15% of grey seals and 10.4% of harbour seal strandings. Figure 10 shows the age structure of cases by month, and for both species, there is an increase in strandings after the harbour seal and grey seal breeding seasons in early summer and late autumn respectively. Figure 11 to Figure 13 to shows the spatial distribution of pinniped strandings by species and show the majority of harbour seal strandings are on the west, with grey seal stranding clusters on the inner firths of the east coast, Angus, Fife and Orkney. This unsurprisingly correlates with areas of increased seal density as derived from aerial surveys (SCOS 2018)

Table 2: Age structure of pinniped strandings 2015 – 2019

	Pup	Juvenile	Adult	Unknown	Grand Total
Grey seal	235	354	206	468	1263
Harbour seal (Common seal)	55	111	46	166	378
Harp seal		1			1
Hooded seal		1			1
Seal (indeterminate species)	28	20	18	351	417
Grand Total	318	487	270	985	2060

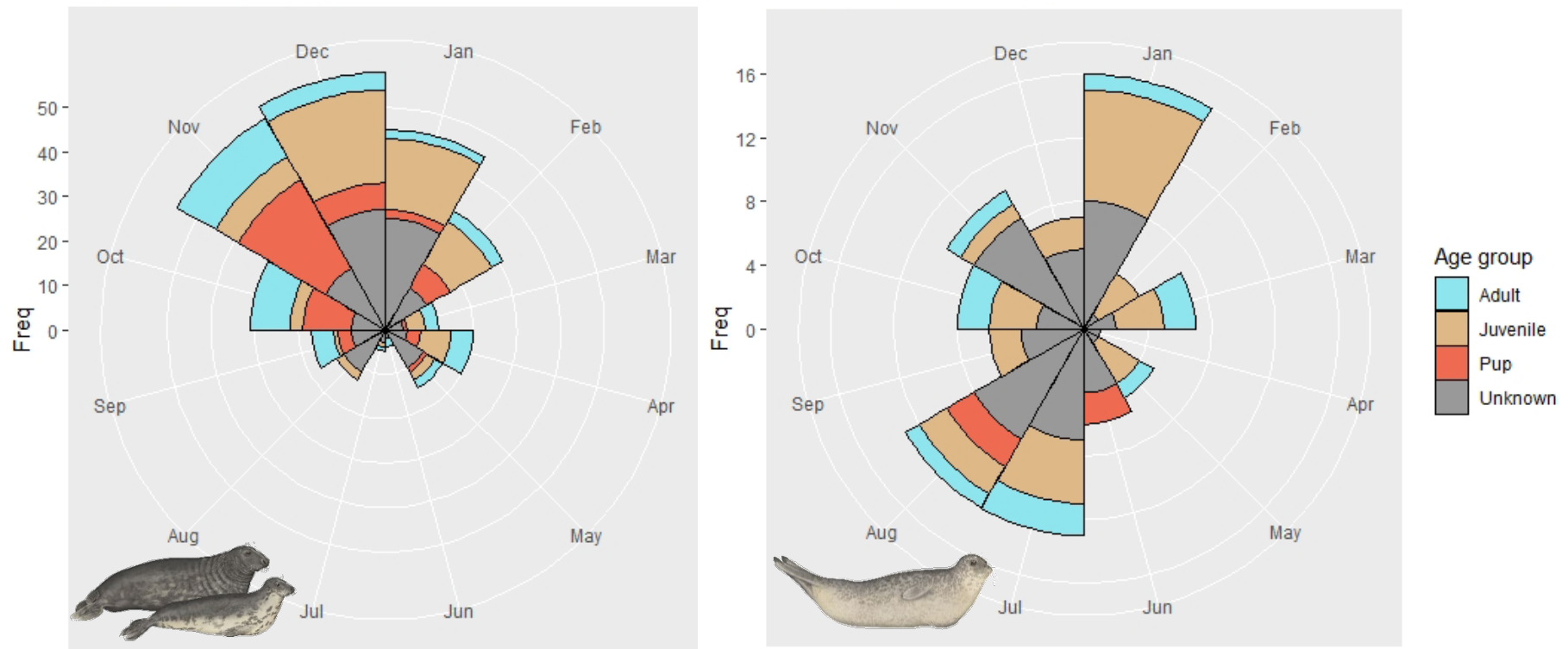


Figure 9: Seasonal age class distribution for left: Grey seals and right: Harbour seals, reported to SMASS in 2019

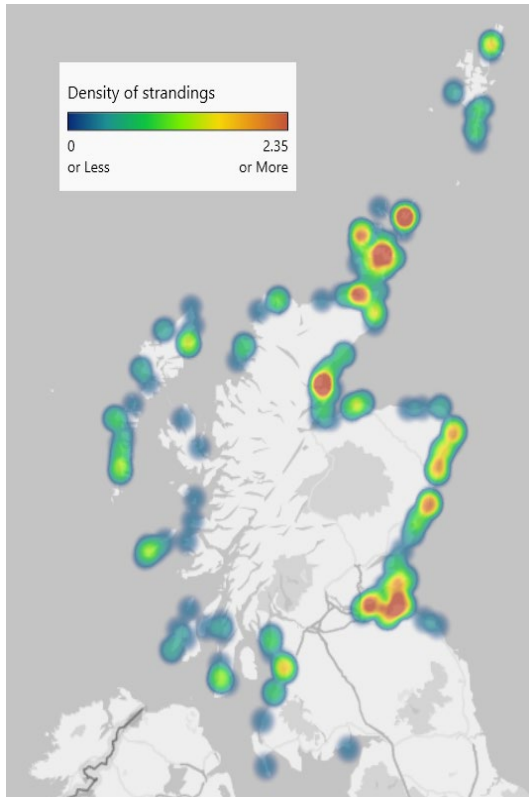


Figure 11: Grey seal strandings density 2019

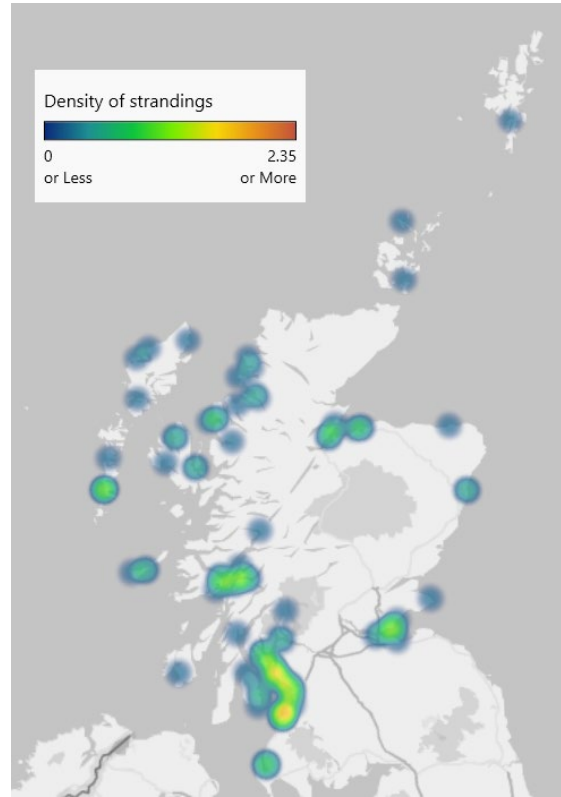
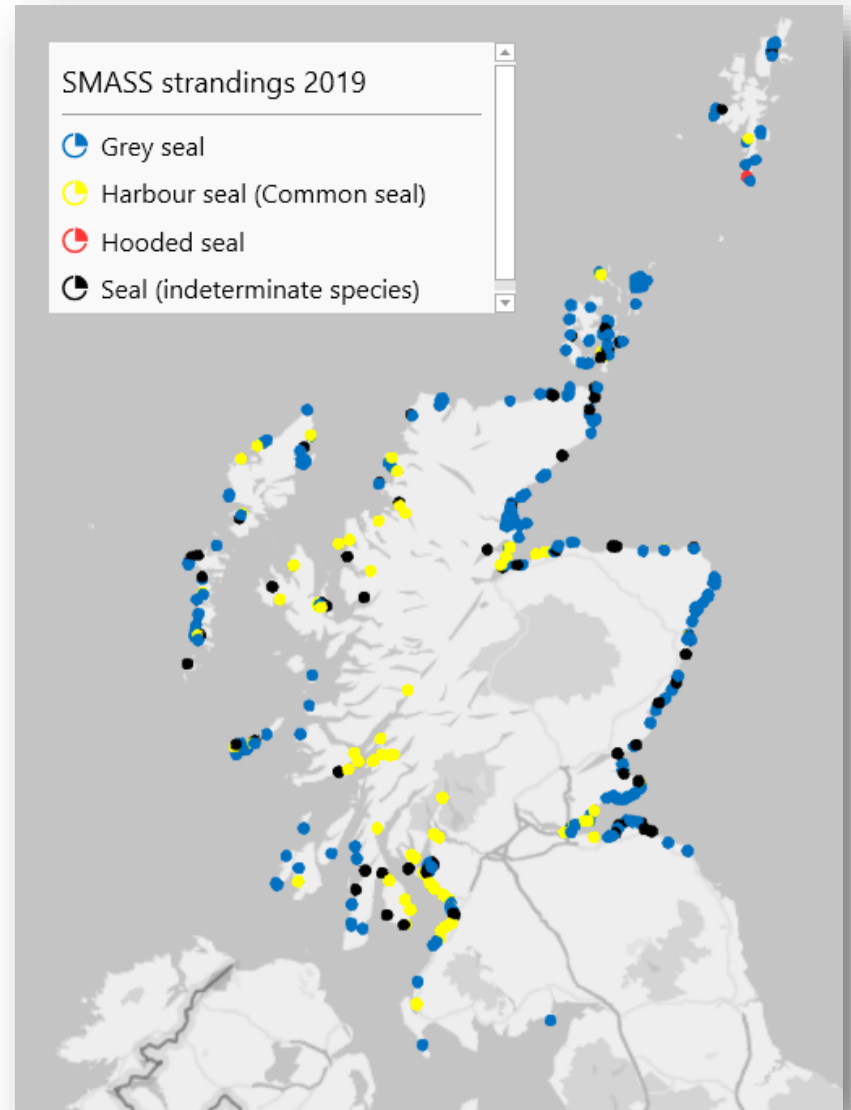


Figure 12: Harbour seal strandings density 2019

Figure 10 Pinniped strandings 2019



2.5 Cetacean strandings

Two hundred and sixty-nine cetaceans, comprising of 16 different species were reported to SMASS in 2019. The most frequently reported species as in most years was the harbour porpoise (*Phocoena phocoena*) (n=132, 49%), a small decrease on the number reported in 2018. Given the coastal distribution of this species, it is unsurprising there was no geographical bias to strandings. Short-beaked common dolphins (*Delphinus delphis*) were the second most commonly reported species in 2019 (n=34, 12.6%) which is an increase on the previous year. Minke whales (*Balaenoptera acutorostrata*) were the next most commonly reported species (n=22, 8.1%). Long-finned pilot whales (*Globicephala melas*) and Risso's dolphin (*Grampus griseus*) were both reported in equal numbers (n=8, 2.9%). White beaked dolphins (*Lagenorhynchus albirostris*), sperm whale (*Physeter macrocephalus*) and striped dolphins (*Stenella coeruleolba*) were reported in equal numbers (n=6, 2.2%). Sowerby's beaked whale (*Mesoplodon bidens*) (n=4, 1.4%). Bottlenose dolphin (*Tursiops truncatus*) and Humpback whale (*Megaptera novaeangliae*) (n=3, 1.1%). Atlantic white-sided dolphin (*Lagenorhynchus acutus*) and fin whale (*Balaenoptera physalus*) (n=3, 0.7%). Northern bottlenose whales (*Hyperoodon ampulatus*), Killer whale (*Orcinus orca*) and Cuvier's beaked whale strandings were each a single cases (0.3%).

Of the 269 animals, 34 (12.6%) cases were necropsied. This was a slight decrease in numbers compared to 2018. A further 56 (20.8%) were sampled by volunteers. Figure 14 shows the spatial distribution (excluding harbour porpoise) of cetaceans, and Figure 16 shows the spatial distribution of harbour porpoise cases for 2019.

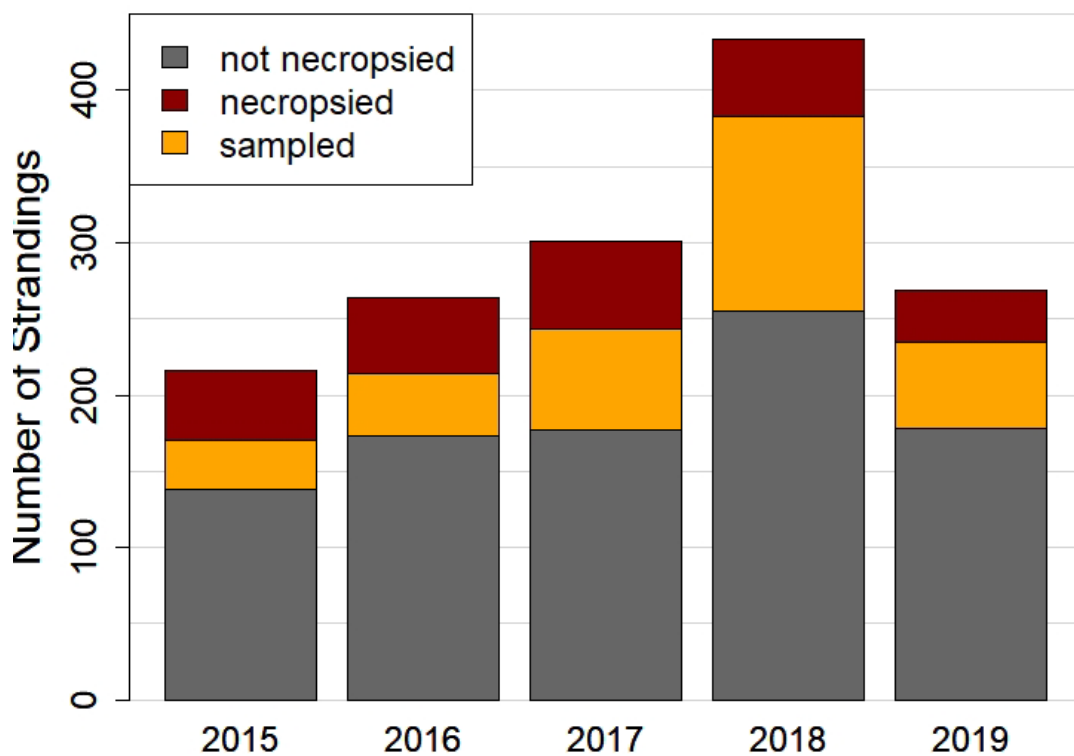


Figure 13: Cetacean strandings 2015-2019, all species

As in previous years, the most common cause of death for other cetaceans was live stranding. This is defined as morbidity and eventual mortality as a result of the sequence of physical processes invoked by becoming stranded. This diagnosis is attributed to cases where there is good clinical or pathological evidence of live stranding and no other cause can be identified which would otherwise explain the stranding, for example trauma, poor body condition or concurrent infectious disease. A detailed overview of the findings/cause of death of all cetaceans necropsied, sampled and not necropsied in 2019 can be found in Tables 3 and 4 in Section 3 of this report.

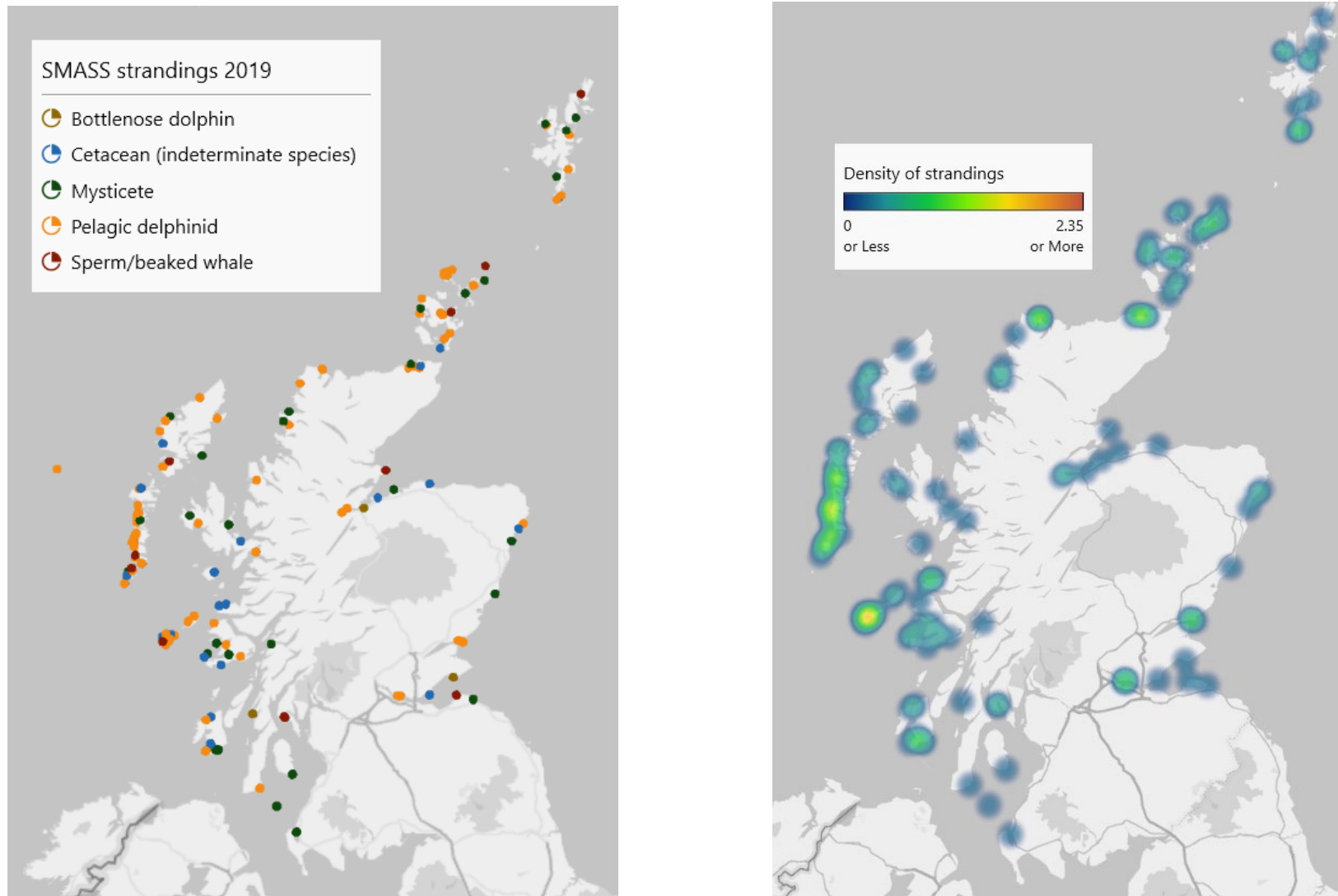


Figure 14: All cetacean strandings excluding harbour porpoise 2019, by species (left) and overall density (right)

2.6 Harbour porpoise strandings 2019

There were 132 harbour porpoise strandings in 2019. This comprises of 49% of the total cetacean strandings for the year. Figure 15 shows the incidence of harbour porpoise cases in 2019 by age group and Figure 16 the spatial distribution of reported cases. As in previous years, the age make up of harbour porpoise strandings differs depending on time of year with more juveniles and sub-adults stranding between January and June, most likely as a consequence of loss of condition through the winter months. Neonates are obviously only found during and immediately subsequent to the calving season between June and October. Adults strand regularly throughout the year with the highest incidence in June and July. The majority are females and this may be attributable to extra stress during the calving season. Fewer animals are reported in the last three months of the year.

Sixteen harbour porpoise were subjected to necropsy, comprising 47% of the total number of cases necropsied by SMASS in 2019. This is a higher proportion to 2018 when 30.3% of the cases necropsied were harbour porpoise. Unlike last year the most common causes of death in harbour porpoise were grey seal attack (n=9) followed by starvation/hypothermia (n=5) with bottlenose dolphin attack (n=3) the fourth most common after live stranding (n=4).

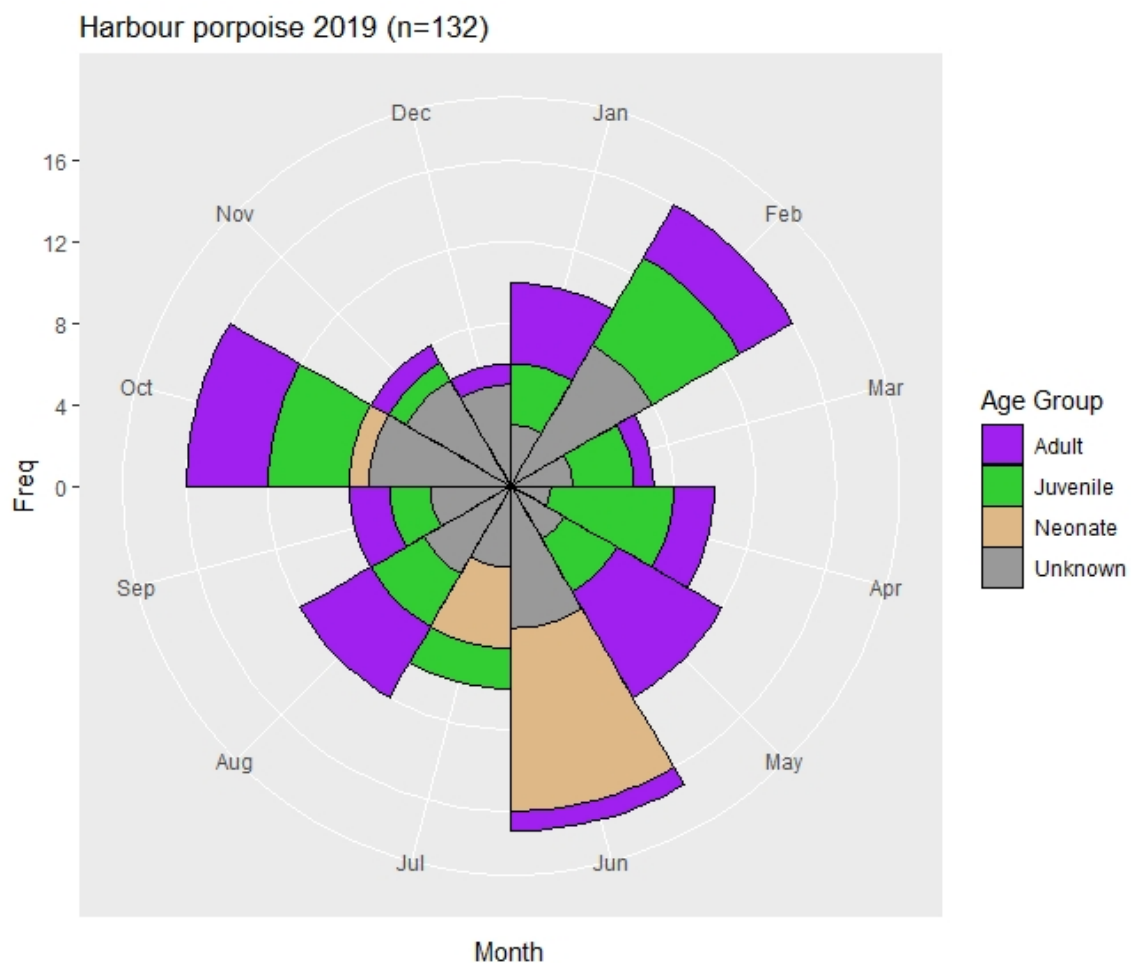


Figure 15: Incidence of harbour porpoise strandings by month and age group

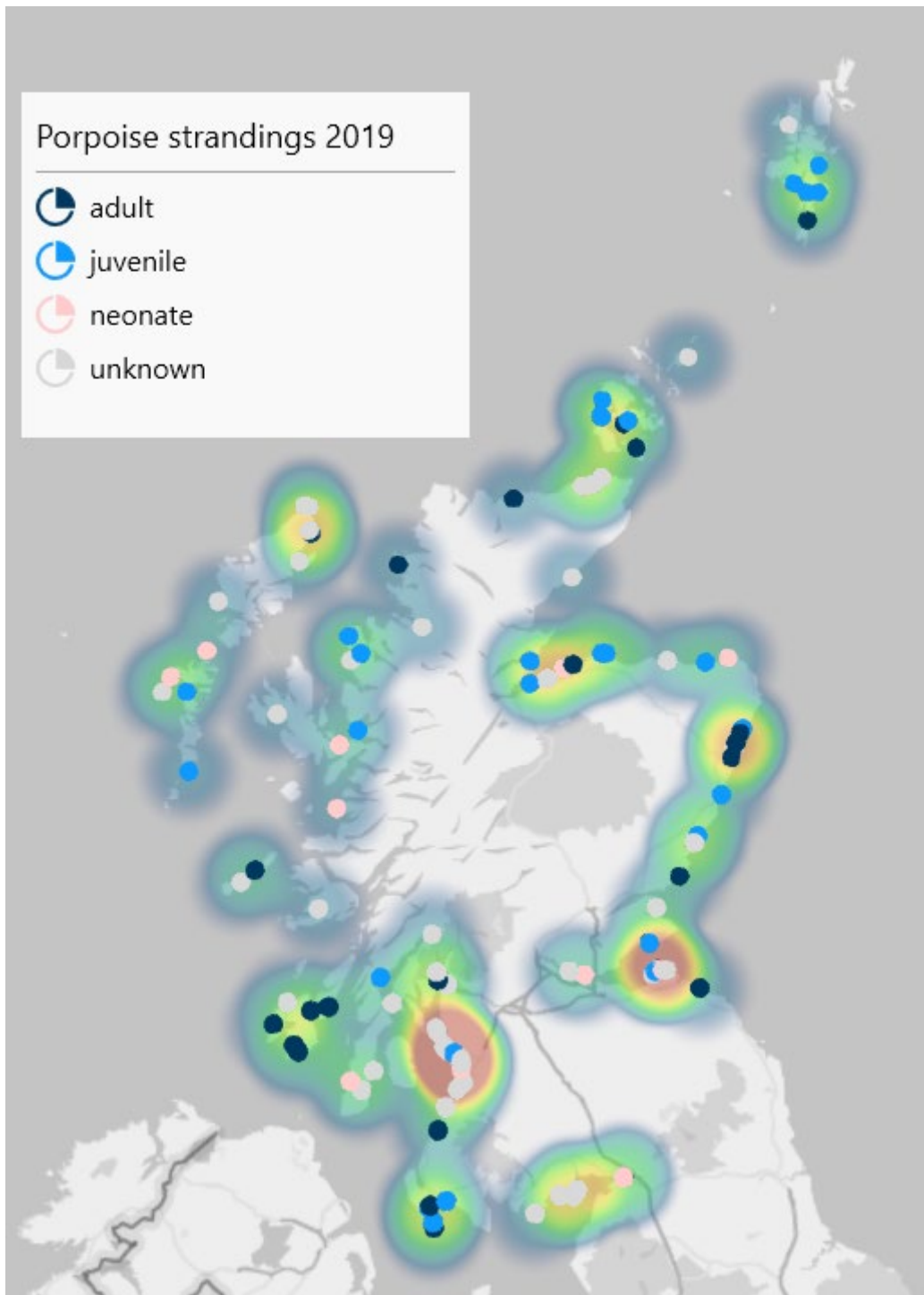


Figure 16: Spatial distribution of Harbour porpoise strandings, by age class, and density 2019

Section 3: Cause of death/findings summary tables

Table 3: Cetaceans necropsied or sampled 2019

		Gastritis and/or Enteritis	Generalised Bacterial Infection or Septicaemia	Live Stranding	Live Stranding: Successful refloat	Maternal Separation/Starvation	Meningoencephalitis	Physical Trauma: Bottlenose dolphin attack	Physical Trauma: Entanglement	Physical Trauma: Possible Grey Seal Attack	Starvation/Hypothermia	Pending	Not Established	Not Examined: Samples Taken	Total
Bottlenose dolphin				1										1	2
Harbour porpoise		1	1	4	3	1		3		9	4	1	1	31	59
Odontocete (indeterminate species)					1									1	2
Mysticete	Minke whale			1					8					2	11
	Humpback whale				1				2						3
Pelagic delphinid	Atlantic white-sided dolphin													2	2
	Killer whale													1	1
	Long-finned pilot whale													2	2
	Risso's dolphin													1	1
	Short-beaked common dolphin			2	8							3		4	17
	Striped dolphin						2							2	4
Sperm/beaked whale	White-beaked dolphin				2							2		1	5
	Sowerby's beaked whale			2					1					1	4
	Sperm whale				1							1	1	2	5
Total		1	1	10	16	1	2	3	11	9	4	7	2	51	118

Table 4: Reasons why carcasses were NOT taken for necropsy, 2019

		Advanced Autolysis	At Sea	Carcase Incomplete/Scavenger Damage	Insufficient Data	Morphometrics taken	No volunteers available	Removed by Council	Removed by Tide	Weather/travel difficulties	Total
Bottlenose dolphin		1									
Harbour porpoise		38		20		1	4	1	4	5	73
Mysticete	Minke whale	5	6								11
	Fin whale	1	1								
	Humpback whale										
Pelagic delphinid	Long-finned pilot whale	6									6
	Risso's dolphin	7									7
	Short-beaked common dolphin	8		4			2		1	2	17
	Striped dolphin									2	2
	White-beaked dolphin									1	1
sperm/beaked whale	Cuvier's beaked whale								1		1
	Northern bottlenose whale	1									1
	Sperm whale	1									1
Indeterminate Species	Baleen whale (indeterminate species)	1		1							2
	Cetacean (indeterminate species)	3		3	5				1		12
	Dolphin (indeterminate species)	12			2						14
Total		84	7	28	7	1	6	1	7	10	151

Table 5: Cause of death/findings for pinnipeds, basking sharks and marine turtles reported 2019. This excludes pinnipeds shot under licence.

	Grey seal	Harbour seal (Common seal)	Hooded seal	Seal (Indeterminate species)	Green turtle	Leatherback turtle	Loggerhead turtle	Basking shark	Porbeagle shark	Grand Total
Cases with findings	85	27	7				1	1		121
Cold Stunned							1			1
Physical Trauma: Entanglement	3							1		4
Physical Trauma: Possible Grey Seal Attack	72	14		7						93
Physical Trauma: Shot	5	2								7
Pneumonia: Parasitic		2								2
Starvation/Hypothermia	1	1								2
Other		1								1
Not Established	1	1								2
Pending	3	6								9
Not Examined: Samples Taken	17	8						1	1	27
Not Examined	204	60	1	80	1	1		4		351
Advanced Autolysis	146	37		25				3		211
At Sea	1	2		1				1		5
Carcase Incomplete/Scavenger Damage	16	4	1	8		1				30
Carcase Not Found				1						1
Carcase Unrecoverable	1									1
Delay in Reporting	2	4		1						7
Insufficient Data	5	3		38						46
Morphometrics taken	2	1								3
No volunteers available	5									5
Not Priority	7									7
Other	1									1
Removed by Council		1								1
Removed by Tide	8	4		6	1					19
Weather/travel difficulties	10	4								14
Grand Total	306	95	1	87	1	1	1	6	1	499

3.1 Cause of death; direct anthropogenic versus other causes of death.

Cause of death (COD) findings were usually determined following a full necropsy examination undertaken by Andrew Brownlow; a veterinary pathologist with experience of marine mammal necropsies. In the case of grey seal predation and bottlenose dolphin attacks, some of these cases had lesion patterns sufficiently pathognomonic to also enable reliable diagnosis from examination of photographs. Total number of cases with an assigned diagnosis at publication of this report was: 44 cetaceans (excluding animals that live stranded and were refloated), 110 pinnipeds (excluding pinnipeds shot under licence), one loggerhead turtle, and one basking shark. Seven cetaceans and nine pinnipeds are still pending either necropsy, or histopathology results required to assign a diagnosis.

Table 5 shows the monthly distribution of cases for which a cause of death could be diagnosed, divided in four main categories based on if their likely cause of death was due to direct human impact, infectious disease, all other causes of death, or whether it was not

established despite an animal having gone for necropsy. There is a separate graph for pinnipeds and cetaceans, and these exclude cases that are still pending necropsy, pending histopathology to attribute a diagnosis, as well as pinnipeds shot under licence and cetaceans that were found alive and were successfully refloated.

In 2019, the direct anthropogenic causes comprised entanglement, and seals diagnosed to have been shot outwith a licence. The infectious category includes animals that died of gastritis and/or enteritis, meningoencephalitis, generalised bacterial infection or septicaemia. The remaining causes of death were categorised under “other”, and include: starvation/hypothermia, maternal separation/starvation, live stranding, (possible) grey seal attack, bottlenose dolphin attack, and metabolic disease. There were four cases, two cetaceans and two seals, for which the cause of death could not be established by necropsy.

For cetaceans stranded in 2019, mortality due directly to anthropogenic activity comprise 11 animals, or about 25%, of the cases with a diagnosis, and for pinnipeds, 10 animals or 9.1%, of cases. Together this means there are 21, or about 13.6%, of the total number of cases, which are finalised where the cause of death is directly attributable to human impact. This is comparable to 2018, where 16% of cases were diagnosed to have a direct anthropogenic cause of death. It should be noted that this is a crude level overview. This does not account for indirect anthropogenic impact, or mortality due to chronic or cumulative effects, for example due to contaminant exposure, prey depletion or disturbance. Six cases are still pending a final diagnosis.

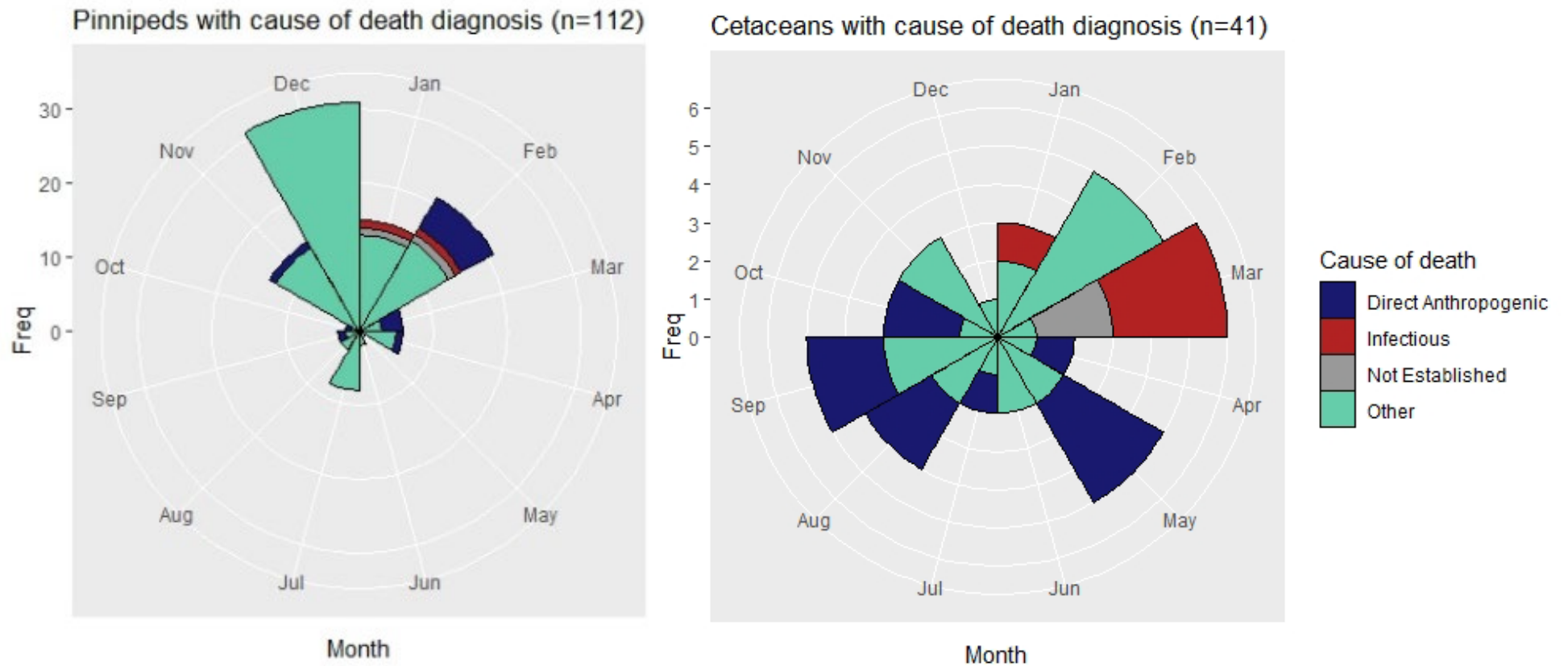


Figure 17: Monthly distribution of cause of death findings for *left*: pinnipeds and *right*: cetaceans reported to SMASS in 2019; divided by direct anthropogenic, infectious, and other causes of death as well as cases necropsied but not established (n=2 for both cetaceans and pinnipeds). Note the different y-axis for both plots.

Section 4: Mass stranding events (MSE's) and unusual mortality events (UME's).

4.1 Mass stranding events (MSE's) multiple strandings and unusual mortality events

Note: A mass stranding event (MSE) is defined as two or more animals that are not a cow/calf pair. There were four MSE's during 2018. An unusual mortality event (UME) is usually defined as a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response.

(<https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-unusual-mortality-events>)

4.2 M432.1- M422.2/19– short-beaked common dolphin (*Delphinus delphis*)

On the 16th of August, two short-beaked common dolphins were found stranded on mudflats at Culross, Fife. One animal managed to re float itself without any assistance, the second animal was refloated by BDMLR medics. One of these animals later re -tranded further along the coast where it was refloated again by BDMLR.



Figure 18: M432.1/19 short-beaked common dolphin being refloated by BDMLR at Culross, Fife.

4.3 M448.1- M448.3/19– harbour porpoise (*Phocoena phocoena*)

On the 26th of August, three harbour porpoise were found live stranded on mudflats near Brow Houses, on the Solway Firth. The adults were successfully reloaded but one juvenile animal was considered non-viable and was euthanased by intra cardiac injection of barbiturate. The animal was in good nutritional condition with good blubber deposits. There was evidence of subcuticular bruising around the occipital region of the skull, mandible, dorsal, thoracic and peri renal regions. This was likely exacerbated by the freeze/thaw process. There was no evidence of recent suckling and the liver was icteric. The lungs were asymmetric consistent with live stranding but otherwise appeared normal. This is consistent with a maternally dependant animal live stranding possibly because of the other animals live stranding in shallow water. There was no underlying evidence of disease or congenital abnormalities.



Figure 19: M448.1/19 juvenile harbour porpoise on mudflats in the Solway Firth, the towel preventing the skin from drying out or abrading. This animal was successfully reloaded. Image credit BDMLR.

4.4 M485.1- M485.2/19– Sowerby's beaked whale (*Mesoplodon bidens*)

Two juvenile Sowerby's beaked whales live stranded at Kames near Tighnabruich, Argyll and Bute on the 17th of September. Despite several attempts to refloat, the animals repeatedly re-stranded. Both animals were euthanased on welfare grounds. The larger female animal was in moderate nutritional condition with reasonable blubber deposits and back muscle mass. The smaller male was in poor nutritional condition with thin blubber deposits and back muscle mass. There was evidence of trauma from the live stranding process in both animals with excoriation to the ventral surface of both and the tip of the lower mandible, with the tail fluke of the female animal being almost devoid of skin. There was no evidence that either animals had recently fed, with only scant otoliths and fish lenses present in the stomachs in the female and a single otolith present in the pyloric stomach of the male. There was a very mild nematode burden in both animals; in the male, this was associated with several gastric ulcers. The liver of both animals were congested and friable, either indicative of a hepatopathy or simply a result of the barbiturate. The spleen was enlarged again possibly due to the barbiturate. There was severe congestion of the left lung in the female due to blood

pooling on that side and severe congestion of both lungs in the male, but no strong evidence for gas bubble emboli indicative of barotrauma. There was some congestion of the brain of both animals but no bubbles present in the blood vessels. There was a very mild nematode burden in the cochleas, in the female; both animals also had some froth present. All other organs appeared normal. Bacteriology did not reveal any significant isolates and histology revealed no significant pathology other than would be expected due to the live stranding process. Examination of the cochleas for auditory trauma are pending. The proximal cause of death is live stranding, likely as a result of both animals entering shallow water with complex bathymetry.



Figure 20: M485.1/19 juvenile female Sowerby's beaked whale being measured at Kames, near Tighnabruich, Argyll and Bute.

4.5 M533.1- M533.2/19– short-beaked common dolphin (*Delphinus delphis*)

Two common dolphins live stranded at Monifieth/ Buddon Ness, Angus on the 10th of October. Both animals were successfully refloated by BDMLR medics.

4.6 M604.1- M604.2/19– short-beaked common dolphin (*Delphinus delphis*)

Two common dolphins live stranded Sands O'gill near Peirowall Westray, Orkney on the 2nd of November. Both animals were successfully refloated by local fishermen.



Figure 21: M533.1/19 common dolphin (*Delphinus delphis*) from Buddon Ness, Angus about to be refloated. Image credit BDMLR



Figure 22: M604.1 & M604.2/19 common dolphin (*Delphinus delphis*) from Sands O'gill near Peirowall Westray, Orkney just after refloating.

Section 5: Entanglement cases

The term entanglement usually only applies to large whales (particularly mysticetes), leatherback turtles and occasionally basking sharks. More recently, the term entanglement has also been applied to pinnipeds that have become entangled in fishing gear or other marine debris.

Animals are occasionally seen alive with gear attached, usually flukes and fins but occasionally through baleen plates in the mouth. Over 70% of dead stranded cases are discovered with no material remaining on the animals and diagnosis is made by lesion pattern and pathological evidence supportive of entanglement. Acute cases similar to bycatch, sub-acute cases result in exhaustion and impaired feeding and evidence of water aspiration or drowning. Chronic cases are arguably the most significant anthropogenic welfare issue impacting and animals are often very thin and debilitated and show chronic wounds caused by abrasion and pressure from entangled equipment.

There was a single case of entanglement involving a basking shark (see section 11).

5.1 Cetacean entanglement cases.

There was an unprecedented number of cetacean entanglement cases in 2019 with eleven confirmed or suspected cases reported. Two humpback whales, eight minke whales and one Sowerby's beaked whale. Both of the humpbacks and the Sowerby's beaked whale were subjected to a complete necropsy. A single minke whale was pro-sectioned by volunteers on Orkney under SMASS supervision. Three further animals from Barra, Shetland and Mull were photographed in detail and sampled by the volunteer network. The remainder, four animals three of which were at sea and one much decomposed animal from Benbecula were not sampled.

5.1.1 M245/19– humpback whale (*Megaptera novaeangliae*)

This juvenile male humpback whale had been observed to have been chronically entangled for several weeks prior to having been found stranded at Tynninghame, East Lothian on the 23rd of April. This was supported by the chronic nature of the entanglement lesions, including deep full-thickness rope abrasions with associated remodelling of the tissue margins and evidence for chronic bacterial infection in the skin, subcuticular tissues and draining lymph nodes. Rope remaining attached to the pectoral region was 9-12mm in diameter and had cut deep into the blubber layer, notably around the left scapulo-humeral joint. Rope of a different colour encircled the head and lower jaw, likely restricting the animal's ability to fully open its mouth. The animal was in poor nutritional condition, with little free lipid in the blubber layer. There was a high parasite burden noted, in specific a large burden of *Bolbosoma* sp. worms throughout the proximal intestine. There was limited intestinal contents, largely fluid and no indication of recent successful feeding. Large volumes of fluid in the lungs and respiratory tree would be consistent with seawater aspiration and drowning as the proximal cause of death. This was an unfortunate example of the impact of chronic

entanglement, with evidence for infection, impaired feeding and poor body condition, likely contributing to generalised debilitation and increasing susceptibility to the effects of infection and parasitism. A systemic, heavy, pure growth of *Streptococcus agalactiae* was recovered from all organs subjected to culture, the significance of this remains uncertain. Histology showed a severe, chronic-active, locally extensive, mixed inflammatory cell, full-thickness dermatitis with granulation tissue formation. There were no significant histological lesions in the internal visceral tissue samples. This was obviously compromised by the degree of autolysis present but this does suggest there was no obvious underlying disease process. The skin lesions are consistent with chronic entanglement (weeks) due to the presence of granulation tissue and mineralised foci.



Figure 23: M245/19 humpback whale (*Megaptera novaeangliae*) from Tynninghame, East Lothian.

5.1.2 M297/19– humpback whale (*Megaptera novaeangliae*)

This juvenile male humpback whale was first reported dead at sea trailing a length of rope and a buoy on the 29th of May. It made landfall at Scrabster beach on the 30th of May and was examined on site the same day. The animal was in moderate body condition although a combination of autolysis of the visceral organs and lack of time or plant machinery limited to extent of internal examination possible at necropsy. This case stranded entangled in creel rope still attached to a buoy, with this rope encircling the pectoral fins with evidence the left pectoral fin had become tied to the body wall with significant rope lacerations into both pectoral fin margins. The rope had cut into the leading edge of the shoulder joint, with evidence of early remodelling to the wound margins. The wound extended full thickness through the epidermis 3-4cm into the subcutis but the absence of significant tissue remodelling suggests this was not a chronic process, likely a week maximum. It should be noted however that there was no capacity to examine the right pectoral fin or flank so assessment of the total extent of entanglement damage to this animal could not be assessed. The body condition of this animal was however inconsistent with a long term, debilitating entanglement. Aside from the single thoracic entanglement, there was no other material affixed to the whale, although from the pattern of skin abrasions around the tailstock and fluke suggests the animal had also been acutely entangled around the tailstock and fluke. This suggests a possible two-stage entanglement process and it is plausible the animal had been entangled in additional gear, which had detached or been cut off prior to the stranding.

Histology revealed a severe, chronic-active, locally extensive, granulo-suppurative, dermatitis in some of the skin lesions, which are consistent with long-term rope injury resulting in necrosis of tissues and an extremely florid inflammatory cell response. There was also a severe, per-acute, multifocal, epidermal ulceration, which are suggestive of very recent trauma (less than a few days). Unusually, the buoy was marked with name of the owner, boat and phone number; *108226 Ch 74 Fishin Tradition Chad Drake 521-6222*. This was traced to a Nova Scotia lobster fishery, over 2500 miles away. The attached line could not be recovered but there was little evidence for biofouling on the rope or the buoy, so it is unclear the order of events which led to this stranding in the Pentland Firth. It is more likely however that this gear either drifted or was dragged by vessel across the Atlantic, possibly wrapped in the drive mechanism and was cut free close to Scotland. The lesion pattern is not consistent with the animal becoming entrained in the the buoy and line at source and crossing the Atlantic dragging this gear. The reasonable body condition of the animal, evidence of past, but not recent feeding and evidence of a predominantly acute entanglement injuries suggest the terminal entanglement event occurred within 48 hours of death, putting it most likely in waters closer to the stranding site in the Pentland Firth. Other organs, although autolysed also did not show any indication of chronic disease or debilitation.



Figure 24: M297/19 humpback whale (*Megaptera novaeangliae*) from Scrabster, Highland.

5.1.3 M509/19– Minke whale (*Balaenoptera acutorostrata*)

This adult female minke whale dolphin was found dead stranded on Sanday, Orkney on the 29th of September. It was one of five minke whales reported as entangled during this period. Of the other four, three were reported at sea and one in advanced decomposition on Shetland. Due to the remoteness of the location, it was not possible for SMASS to attend this stranding in the time available, however a limited examination was undertaken by trained volunteers under Andrew's supervision through the WhatsApp service. The animal was in excellent body condition and pregnant with a mid-term foetus. It looked like it had become recently entangled in a section of discarded or lost fishing net- this had become jammed in the baleen and then dragged behind the animal. This would have hugely impaired the animal from feeding or swimming normally and likely led to an exhausting last few hours of life. Based on the flank bruising and lungs, it seems like this creature live stranded and drowned in the surf line.



Figure 25: M509/19 minke whale (*Balaenoptera acutorostrata*) from Sanday, Orkney showing section of net lodged in the baleen.

5.1.4 M539/19– Sowerby’s beaked whale (*Mesoplodon bidens*)

An adult female Sowerby’s beaked whale was found stranded on Gullane beach, East Lothian on 12th October. The main finding was an entanglement lesion in the form of a circumferential loop of thin, green cord embedded in the cervical/ thoracic region behind the head. In most of the dorsal aspect, the cord had worked its way through the skin and blubber and was lying on the top of the underlying muscle fascia, with granulation and remodelling of the skin over the top of the rope. The welfare implications of this entanglement were likely severe. Over the left occipital region, there was deep tissue infection and an associated abscess, likely a foreign body reaction. Goose barnacles were attached to the rope, indicating that the entanglement had compromised swimming capabilities. Based on the depth of the tissue trauma and the damage to the flank, it was considered likely that this loop behind the head may at some point have been attached to longer and heavier material. The whale was in thin body condition, there was lung asymmetry, and fluid present in both lungs, consistent with live stranded. There was perimortem trauma to the right pectoral fin, which had been almost entirely severed with associated haemorrhage into the humero-scapula joint. In combination with the presence of chronic excoriations around the flank, this was possibly indicative of trauma resulting from material attached to the neck entanglement. There were 50-100 otoliths in the stomach but no evidence of recent successful feeding. Bacteriology revealed a pure growth of a *Pasteurella* sp. from the abscess associated with the entanglement lesion. This organism was not found in any of the other organs cultured suggesting that it was a

localised infection. All other sites either proved sterile or produced organisms not thought significant. Histology showed a moderate, chronic-active, multifocal, verminous cholangitis. Moderate to severe, sub-acute to chronic, generalised, hepatopathy. Severe, chronic-active, generalised, lymphoid hyperplasia with a notable plasma cell response. Severe, sub-acute to chronic, generalised, adrenocortical hyperplasia. Severe, chronic-active, multifocal coalescing, necro-suppurative, primarily deep dermatitis. There were no significant disease process that was unrelated to the entanglement. This chronic entanglement case was likely debilitating, and whilst feeding was possible, a combination of the physical nature of the entanglement and the associated infection as a result of foreign body reactions would explain the thin condition of this case. The pectoral trauma showed haemorrhage but no granulation, indicative this trauma may be the catalyst for the live stranding.



Figure 26: M539/19 Sowerby's beaked whale (*Mesoplodon bidens*) Gullane East Lothian, showing embedded rope encircling the region behind the head.

5.2 Pinniped entanglement cases

Three grey seals were reported as either entangled or have lesions suggestive of previous entanglement. None was subjected to necropsy due to logistical reasons of getting to or recovering the carcass. One animal was shot on welfare grounds following entanglement on Tiree. The two remaining cases were found dead with encircling lesions around their neck suggestive of previous entanglement. One on the Isle of Lewis and another from Boddam Aberdeenshire. This latter animal was sampled by volunteers.

5.2.1 M644/19 – Grey seal (*Halichoerus grypus*)

This juvenile grey seal was found alive at Gott bay, Tiree on the 16th of November with an encircling monofilament net around its neck. The animal was taken was euthanased on welfare grounds. This type of entanglement is not uncommon in this species, and animals can remain entangled for many years before succumbing to the physical effects of the constriction or secondary infection.



Figure 27: M644/19 grey seal (*Halichoerus grypus*) from Gott bay, Tiree with net entanglement around neck.

Section 6: Grey seal predation (cetaceans).

This recently described phenomenon has so far only been seen on harbour porpoise from regions with sympatric grey seal populations. It is characterised by extensive trauma to blubber and underlying musculature, tissue loss and puncture marks around the head and around wound margins. Often large sections of tissue (both blubber and muscle) are removed, assumed predated, particularly the back muscle either side of the spine. Puncture marks through blubber often around the head and throat area. Blubber and skin commonly stripped resulting in missing tissue and flaps of blubber. Internal organs and skeleton are

normally intact in very fresh cases. In some situations, the porpoise initially escapes the seal only to die of bacterial sepsis arising from bite wounds. There were nine animals suspected as seal predation cases, of these 11 were classified as possible or probably primary trauma cases. There was a single possible case due to secondary infection originating from a seal bite in this reporting period. Primary trauma cases are given an adjectival score based on pathological assessment of lesion patterns and exclusion of other causes of trauma:

- Unlikely: Lesion pattern is inconsistent with cases of seal predation or other causes of death are more likely.
- Possible : Lesion pattern is consistent with cases of seal predation but other causes of death cannot be excluded
- Probable: Lesion pattern is consistent with cases of seal predation and significantly more likely than any other cause of death
- Definite: Cases observed to be victims of conspecific seal predation

6.1 Primary trauma cases suspected to be seal predation on harbour porpoise

1. M130/19, 09/02/2019 near Opinan, Gairloch, Highland. Photographs provided show a large amount of tissue missing from the thoracic and abdominal region of the carcass (Figure 24). **Probable seal predation case.**
2. M146/19, 17/02/2019 North of Montrose, Angus. Photographs provided show a tissue missing from the thoracic and tailstock region of the carcass. **Possible seal predation case.**
3. M275/19, 07/05/2019 Big Strand, Islay, Argyll and Bute. Photographs provided show a stripped carcass. **Possible seal predation case.**
4. M310/19, 06/06/2019 Balmedie, Aberdeenshire. Photographs show a partial carcass. **Possible seal predation case.**
5. M356/19, 10/07/2018 Bay of Newark, Sanday, Orkney. Photographs provided show a partial carcass. **Probable seal predation case.**
6. M469/19, 07/09/2019 Culross, Fife Photographs provided show a partial carcass. **Possible seal predation case.**
7. M558/19, 19/10/2019 Tolsta, Lewis. Photographs provided show damage to the thoracic region of the carcass only. **Unlikely to be a seal predation case.**
8. M608/19, 08/11/2019, Ness, Lewis. Photographs provided show a partial carcass. **Possible seal predation case.**
9. M652/19, 23/11/2019, Glen bay, Loch Fyne, Argyll and Bute. Photographs provided show a stripped carcass. **Possible seal predation case.**



Figure 28: M130/198 harbour porpoise (*Phocoena phocoena*) Opinan, Gairloch, Highland showing lesions typically associated with grey seal predation.

6.2 Secondary infection possibly due to seal bite lesions on harbour porpoise

1. M196/19, 26/02/19, Irvine, South Ayrshire. Photographs would suggest that this was a possible grey seal predation case. This adult female harbour porpoise was found dead stranded. The animal was gravid with a female foetus present in the left horn of the uterus. There were bilateral rake marks/skin lacerations to the tailstock, these were full thickness but did not involve the underlying connective tissue/tendons. The margins had been partially scavenged but were suggestive of a seal attack but BND of avian scavenging are also possible. The animal was otherwise in good nutritional condition. There was some fatty change to the liver and no indication of recent feeding. Bruising around the right temporal and submandibular regions suggest that the animal live stranded. Bacteriology with the exception of the liver revealed pure growths of *Steptococcus phocae* from all sites cultured. This would be most consistent with sepsis and live stranding following a failed seal predation event.

Section 7: Neurobrucellosis cases

A diagnosis of neurobrucellosis made in cases based on gross pathology of the brain, for example a meningoencephalitis and/or isolation of *Brucella sp.* from the central nervous system (CNS). The diagnosis is backed up through histopathology. The condition is often associated with live stranding; these animals often exhibit erratic and unusual swimming

behaviours. The disease seems to affect predominantly the family *Delphinidae*. There were two confirmed cases, both striped dolphins reported during this period.

7.1 M86/19 – striped dolphin (*Stenella coeruleoalba*)

This juvenile female striped dolphin was found dead stranded on the Sands of Wright South Ronaldsay, Orkney on the 25th of January. It was in thin body condition and was moderately autolysed; estimated 5-7 days post mortem. It has not recently fed and was mildly icteric, indicative of a catabolic period prior to death. There was some bruising over the thoracic dorsal region and the lungs were mildly asymmetric, suggestive of live stranding prior to death. The carcass was generally dehydrated, most notably the kidneys. The stomach contained a moderate *Anasakis* nematode burden and a single small fragment of blue plastic. The most notable finding was a significant dilation of cerebral ventricles with associated excess of turbid CSF. The meninges also appeared thickened, most notable around brainstem and occipital region. *Brucella ceti* was isolated from both the brain and CSF of this animal. The isolation of this organism and the clinical profile is highly suggestive of meningoencephalitis, most probably due to neurobrucellosis. Histopathology revealed a moderate, sub-acute to chronic, generalised, lymphoplasmacytic meningitis.



Figure 29: M86/19 striped dolphin (*Stenella coeruleoalba*) South Ronaldsay, Orkney.

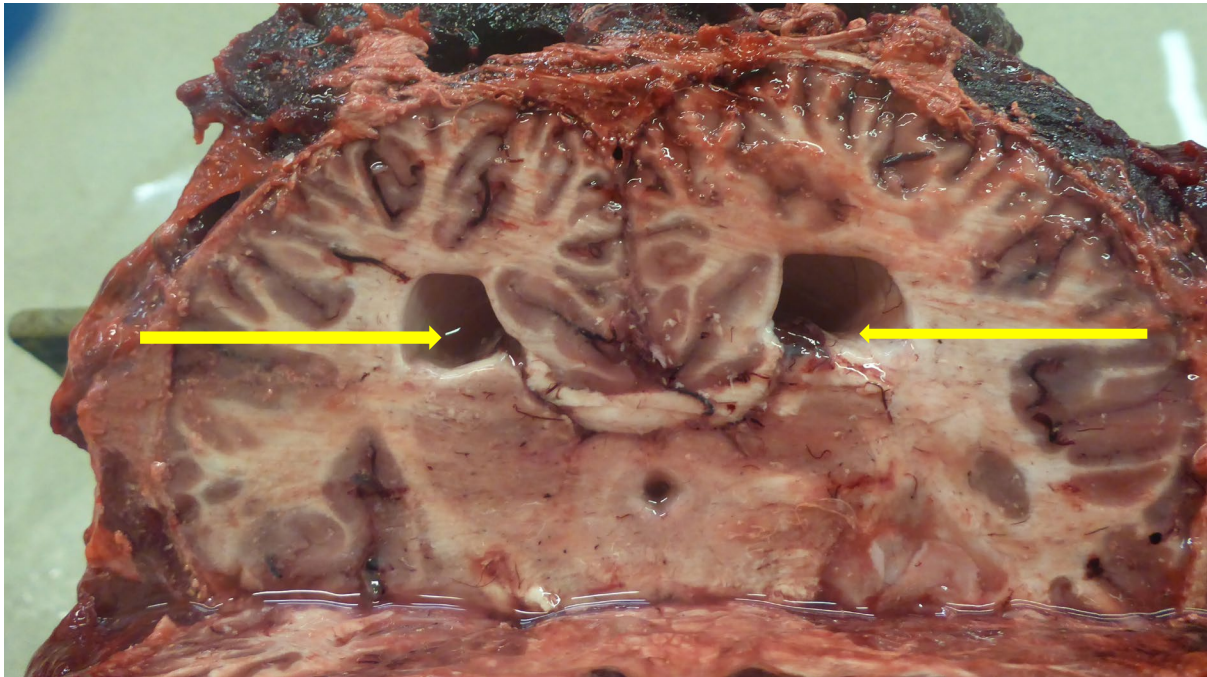


Figure 30: M86/19 striped dolphin (*Stenella coeruleoalba*) showing severe dilation of lateral ventricles (arrows) of the brain.

7.1 M185/19 – striped dolphin (*Stenella coeruleoalba*)

This juvenile male striped dolphin was found dead stranded at Lochinver on the 20th of March. The animal was in moderate nutritional condition with thin blubber deposits and moderate back muscle mass. The animal had not fed recently; there was scant squid beaks present in the cardiac stomach but nothing in the remaining sections of the stomach. The liver was congested and friable. There was evidence that the animal had live stranded at some point with bruising present in the blubber over the sternum and asymmetric lungs with the left hyper inflated. There was a very low nematode present in the bronchi. By far the most significant finding was the much-dilated lateral cerebral ventricles filled with an excess of turbid CSF. The brain itself appeared congested with thickening of the meninges around the medulla, hindbrain and cervical spinal cord. Bacteriology produced pure cultures of *Brucella ceti* from all parts of the central nervous system (CNS) cultured, all visceral sites cultured proved sterile. Histology revealed an extremely severe, chronic, generalised, lymphocytic meningitis affecting all of the meninges overlying the brain and spinal cord. Severe, sub-acute to chronic, peri-ventricular, lymphocytic, encephalitis. Severe, sub-acute to chronic-active, multifocal, broncho-interstitial, mixed inflammatory cell pneumonia. The histopathologist comments, “these findings are consistent with severe and extensive neurobrucellosis. This is probably the most severe case I have seen to date. The lesions in the meninges of the spinal cord peak around the distal cervical region and this may be useful in eventually determining the pathogenesis of this condition.” Further examination of this case by specific IHC failed to find any evidence of morbillivirus; co-infection with this pathogen can potentiate the severity of disease.



Figure 31: M185/19 striped dolphin (*Stenella coeruleoalba*) from Lochinver, Highland.

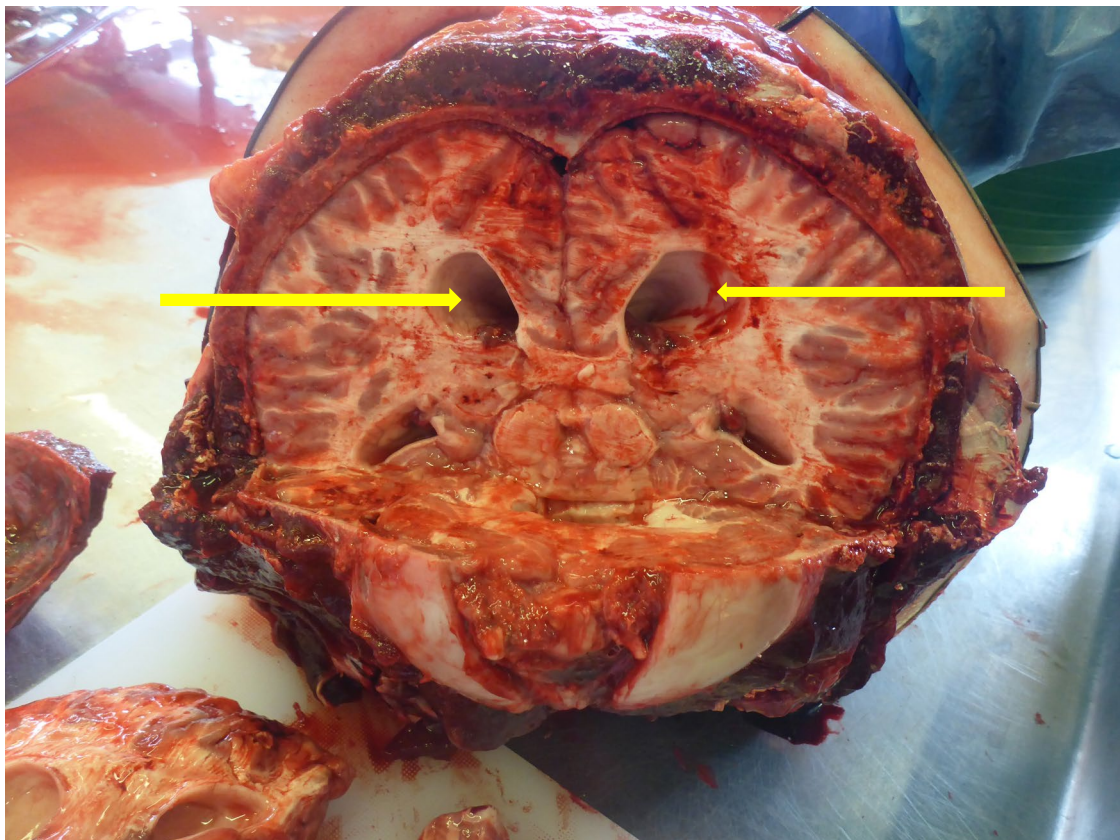


Figure 32: M185/19 striped dolphin (*Stenella coeruleoalba*) brain showing enlarged lateral ventricles (yellow arrows).

Section 8: Other notable single cetacean strandings

8.1 M119/19 – short-beaked common dolphin (*Delphinus delphis*)

This juvenile male common dolphin was found dead stranded on the Braighe, Stornoway, Isle of Lewis on the 12th of February. It was in poor nutritional condition with multiple annular raised plaque-like skin lesions 20-30mm in diameter over much of the epidermis. Some of these were coalescing. The origin of these is at present uncertain however, they are not thought to be traumatic. The most striking finding was a severe and extensive pancreatitis. The spleen was swollen with petechial haemorrhages and a significant volume of sanguineous fluid present in the peritoneal cavity. The liver exhibited fatty change and possibly an ascending hepatitis. This would suggest the animal was suffering from sepsis however; bacteriology did not produce any significant isolates, which raises the possibility of viral involvement. The results of histology showed a severe, acute, generalised, necrotising hepatopathy. Severe, acute, multifocal, pancreatic necrosis and interstitial haemorrhage. The histopathologist comments, “This pattern of necrotising pancreatitis, hepatitis and serosanguinous peritoneal effusion is not infrequent in dogs but I have not seen it in any cetacean before. There was no obvious parasitic involvement suggestive of blockage of the pancreatic duct, which would have been high on my differential diagnosis. The gross mixed flora in the pancreas and peritoneal fluid may have been a bacterial infection from retrograde transport of bacteria from the gut but the lack of inflammatory cells in the pancreas is intriguing.



Figure 33: M119/19 short-beaked common dolphin (*Delphinus delphis*) from the Braighe, Stornoway Isle of Lewis.

8.2 M167/19 – short-beaked common dolphin (*Delphinus delphis*)

This female juvenile live stranded at Balnakeil beach on the 3rd of March. There was an unsuccessful refloat attempt before the animal died on the beach. It was in moderate nutritional condition with thin back muscle mass but reasonable blubber deposits. Apart from dehydration and pathologies normally associated with the live stranding process, the carcass was wholly unremarkable. The GI tract was largely empty with only scant otoliths present in the cardiac stomach indicating no recent feeding. The brain was grossly unremarkable with the exception of some possible mild thickening of the meninges around the brain stem. Bacteriology did not reveal any significant isolates. Histology showed a severe, acute, multi-systemic, generalised congestion. Moderate, acute to sub-acute, multifocal, degenerative hepatopathy. There is no obvious pathology of sufficient severity to cause the death of this animal, but the liver pathology is probably the key aspect. At present, the proximal cause of death is live stranding.



Figure 34: M167/19 short-beaked common dolphin (*Delphinus delphis*) from Balnakeil, Durness.

8.3 M189/19 – Sperm whale (*Physeter macrocephalus*)

This is only the second report of a female sperm whale stranding in the UK (this first was in 2016 in SW England)- it was thought that only male sperm whales ventured this far north.

Whether this is an indication of population recovery, better surveillance or ecological shifts due to climate change is unclear however. This case was reported dead stranded on Bornish beach, South Uist, in a moderately decomposed condition on the 23rd of March. It was examined seven days later. There was obvious advanced autolysis, with most organs gaseous and liquefied. However, some samples were taken and the skull was collected by NMS. The animal was in moderate nutritional condition and appeared to have a prolapsed uterus, although it is not clear if this was a result of decomposition and post mortem change. Remnants of the uterine horn did not indicate any obvious pathology; however, this has low certainty due to autolysis. Colon contents were normal and the stomach was empty of ingesta, squid beaks, or debris. The keratinised epithelium was sloughing and had annular depressions, possibly indicative of squid suckers. The liver was autolytic. The bone plates in the skull had partially though no obvious trauma was noted. Bacterial cultures showed no significant isolates.



Figure 35: M189/19 female sperm whale (*Physeter macrocephalus*) from South Uist.

8.4 M294/19– bottlenose dolphin (*Tursiops truncatus*)

This adult female bottlenose dolphin was found dead stranded at Alturlie, near Inverness on the 27th of May in significant state of autolysis, with complete epidermal loss and blubber liquefaction, likely as a result of the carcass spending at least a week exposed to the sun and tide prior to refloating and re-stranding on the beach at Alturlie. The abdominal and thoracic organs were in better preservation than the external appearance would suggest, however the processes of post mortem autolysis were significant with no evidence of infectious processes. There was no indication of scavenger damage perforating the internal body cavities. In general, this case appeared to have been in good condition, with evidence of significant successful feeding based on salmonid contents in the stomach. There was also indication of asymmetric congestion in the lung fields which could indicate live stranding- a plausible reason for death in an otherwise healthy animal with low parasite burden and recent feeding.

The animal was too decomposed to match to photo ID records, however given the stranding location it is considered likely this was one of the animals from the Moray firth group



Figure 36: M294/19 bottlenose dolphin (*Tursiops truncatus*) from Alturlie, near Inverness.

8.5 M419/19– Minke whale (*Balaenoptera acutorostrata*)

This juvenile male minke whale was found dead stranded on the sand of Cliff beach, Uig, Lewis on the 15/08/19, following a period of rough weather. The animal was necropsied on site. It was in poor nutritional condition, with low blubber reserves and clear indications of live stranding; ventral bruising and water and sand aspiration. The stomach contained a large bolus of fish bones and otoliths, indicating past successful feeding, but no soft material indicative of very recent feeding. The liver was pale, fatty and had a nutmeg appearance, possibly suggestive of a viral hepatitis. The intestines were hyperaemic, but no evidence for peritonitis. The brain was congested and CSF turbid. In addition, the structures of the genitals were unusual, indicating possible ovotestes- normal immature testes led to a bifurcated structure resembling a uterine body. The genital slit continued a 5cm long penis possibly vestigial in structure. Bacterial cultures did not produce any significant isolates. Histology showed a severe, acute, generalised, hepatocellular necrosis. Severe, acute, multifocal, necrotising splenitis. Severe, sub-acute, generalised, mixed inflammatory cell lymphadenitis. These findings are suggestive of a severe but per-acute systemic necrotising process and we will subject the liver and spleen to testing for viral aetiologies.



Figure 37: M419/19 minke whale (*Balaenoptera acutorostrata*), Uig, Lewis.

8.6 M665/19 – Sperm whale (*Physeter macrocephalus*)

This subadult male sperm whale was seen alive but swimming erratically in West Loch Tarbet, Harris on the 27th of November. The animal later live stranded on Luskentyre before dying and washing up on Seilebost beach the following day. Despite the cold air temperature autolysis was significant on examination 48 hours days later. The animal was in moderate nutritional condition with moderate blubber thickness but good back muscle mass. Lungs showed evidence of water aspiration as consistent with the live stranding. The heart exhibited were a notably high amount of myocardial associated fat deposits, especially over the ventricles and coronary sinus. Parasite burden was generally low and the liver was congested but did not show indications of fatty change. Most other organs were too autolysed to be diagnostic. The most significant finding was the large volume of marine debris the cardiac stomach. This comprised of around 100kg of plastic material, including one 3x2m sections of black trawl/scallop net, three large bundles of predominantly 6-10 mm fishing rope, balls of monofilament tangle net, a stack of plastic cups, bags, fragments of rubberised glove, sections of flat packing strap and rubber tubing. This material was in a ball in the stomach, with no clear free ends, surrounded, and embedded with squid beaks. Much of this debris looked like it had been in the stomach for some time, although there was little evidence of associated

gastric ulceration and no indication that this foreign body had become impacted. The animal was neither emaciated nor showing evidence of acute intestinal obstruction, and it is assumed the debris had been ingested over some time, and likely from a number of geographical regions, potentially a collateral effect of suction feeding squid in benthic habitats. Whilst there was no definitive evidence that this quantity of ingested plastic had directly caused the stranding, acute colic or similar discomfort from this extraordinary amount of debris remains highly plausible. Given the location of the stranding on the Atlantic coast of the Western Isles, navigational error seems a less plausible reason for the stranding.



Figure 38: M665/19 Sperm whale (*Physeter macrocephalus*), Seilebost, Harris

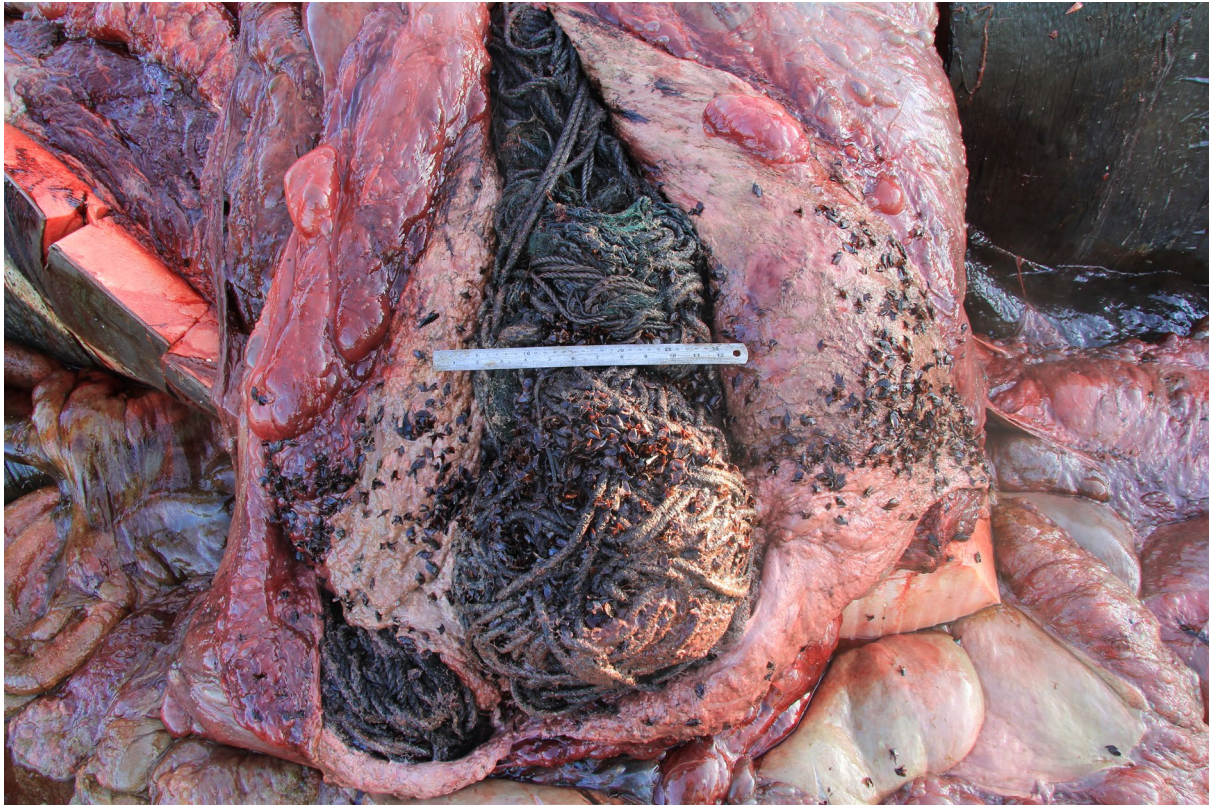


Figure 39: M665/19 Sperm whale (*Physeter macrocephalus*), Seilebost, Harris showing marine debris and squid beaks in the cardiac stomach.



Figure 40: M665/19 Marine debris removed from sperm whale (*Physeter macrocephalus*) cardiac stomach Seilebost, Harris.

Section 9: Spiral “corkscrew” trauma seal cases

Eighty-nine seals were reported as having trauma consistent with spiral or corkscrew injuries. This is an increase in reports compared to 2018. These cases were reported from 12 different regions. Most reports from Orkney with 31 followed by Highland, 17 and Fife 14. There were also reports from other areas including Aberdeenshire (4), Argyll and Bute (9), East Lothian (6) South Ayrshire and Shetland (2), and one each for Moray, North Ayrshire, Scottish Borders and the Western Isles. The majority of these were grey seals (*Halichoerus grypus*) (n=69; 77.5%). Harbour seals (*Phoca vitulina*) (n=14; 14.6%) and those too decomposed or data deficient to be identified (n=7; 7.8%). It is now considered highly plausible that the majority of spiral trauma or “corkscrew” cases can be attributed to grey seal predation, which would make this the most common identifiable reason for seal mortality in Scotland. Research is still ongoing by SMRU in collaboration with SMASS.

Table 6 shows 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. As in section 6 the following criteria were used

- Unlikely: Lesion pattern is inconsistent with cases of seal predation or other causes of death are more likely.
- Possible : Lesion pattern is consistent with cases of seal predation but other causes of death cannot be excluded
- Probable: Lesion pattern is consistent with cases of seal predation and significantly more likely than any other cause of death
- Likely : Lesion pattern is consistent with cases of seal predation and evidence is sufficient to rule out other causes of death
- Definite: Cases observed to be victims of conspecific seal predation



Figure 41: M384/19 harbour seal (*Phoca vitulina*) from Gott bay, Tiree, Argyll and Bute showing typical corkscrew/spiral grey seal predation lesions

Table 6 and Figure 42 below shows the spatial distribution of cases across Scotland.

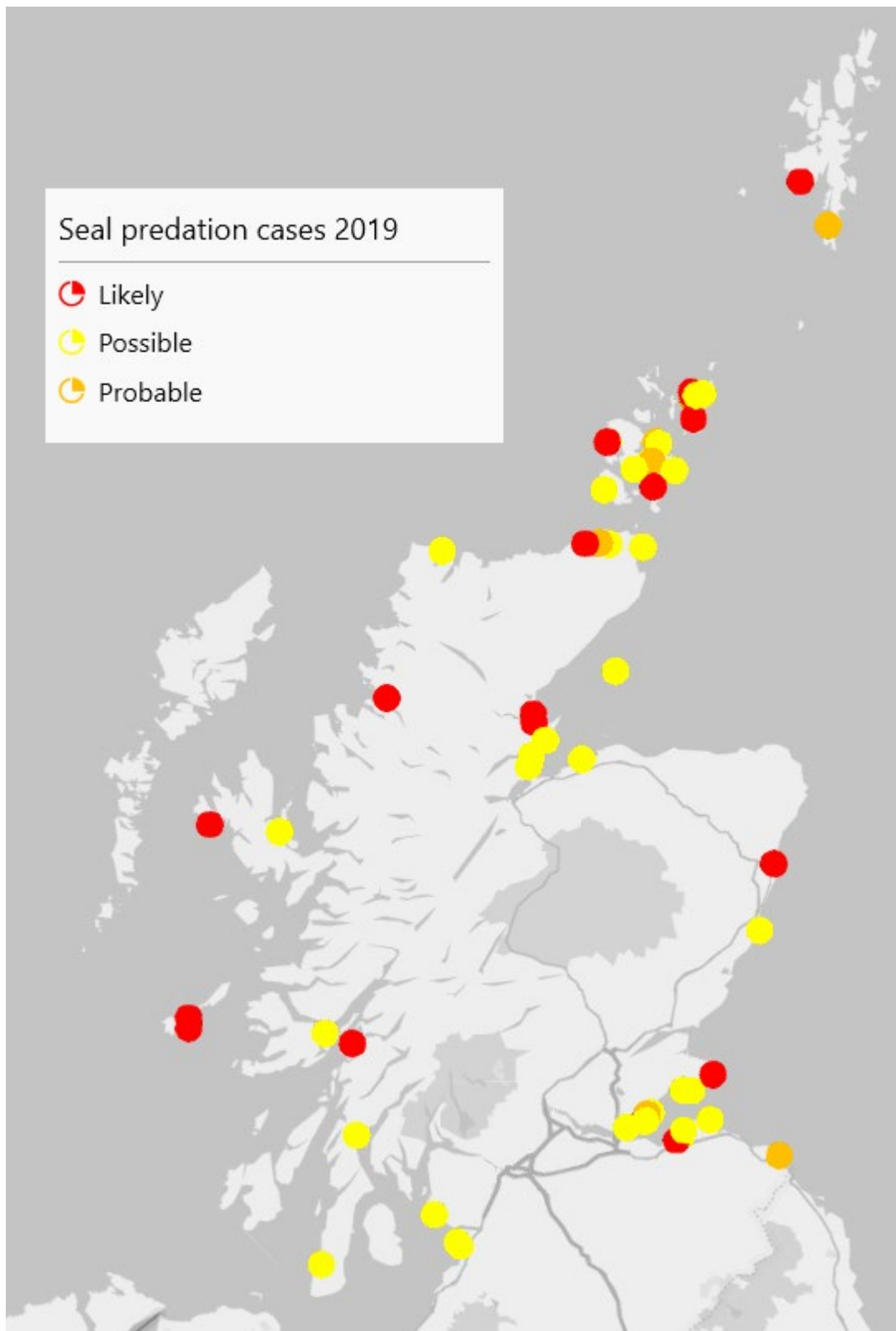


Figure 42:- Distribution of seal predation cases 2019

Table 6: Scoring of suspected spiral trauma cases 2019

SMASS ID	Species	Date found	Region	Sex	Age Group	Likelihood of (grey) seal predation	Would lesions fit with the archetypal 'corkscrew' pattern?
M5/19	Grey seal	04/01/2019	East Lothian	U	Unknown	Possible	Possible
M11/19	Grey seal	06/01/2019	Highland	M	Juvenile	Likely	Likely
M13/19	Grey seal	03/01/2019	Highland	U	Juvenile	Unlikely	Unlikely
M17/19	Seal (indeterminate species)	01/01/2019	Orkney	U	Juvenile	no data	no data
M26/19	Grey seal	05/01/2019	Orkney	U	Unknown	Possible	Unlikely
M38/19	Grey seal	10/01/2019	Shetland	U	Juvenile	Probable	Possible
M42/19	Grey seal	11/01/2019	Highland	U	Unknown	Possible	Unlikely
M57/19	Grey seal	15/01/2019	Orkney	U	Juvenile	Possible	Unlikely
M64/19	Seal (indeterminate species)	17/01/2019	Highland	U	Juvenile	Possible	Possible
M66/19	Seal (indeterminate species)	19/01/2019	East Lothian	U	Juvenile	no data	no data
M77/19	Harbour Seal (Common Seal)	22/01/2019	Moray	U	Juvenile	Possible	Possible
M80/19	Grey seal	22/01/2019	Highland	M	Unknown	Possible	Unlikely
M113/19	Grey seal	08/02/2019	Fife	U	Juvenile	Likely	Probable
M114/19	Grey seal	08/02/2019	Orkney	U	Juvenile	Possible	Unlikely
M116/19	Harbour Seal (Common Seal)	10/02/2019	Highland	U	Unknown	Possible	Possible
M120/19	Seal (indeterminate species)	13/02/2019	Fife	U	Unknown	Possible	Unlikely
M126/19	Grey seal	14/02/2019	Fife	M	Juvenile	Possible	Unlikely
M127/19	Grey seal	14/02/2019	Fife	U	Juvenile	Likely	Possible
M128/19	Grey seal	14/02/2019	Aberdeenshire	U	Pup	Possible	Possible
M139/19	Grey seal	18/02/2019	Highland	U	Juvenile	Possible	Unlikely
M141/19	Grey seal	17/02/2019	Highland	F	Unknown	Possible	Likely
M142/19	Harbour Seal (Common Seal)	18/02/2019	Highland	U	Unknown	Possible	Unlikely
M143/19	Grey seal	15/02/2019	Aberdeenshire	U	Pup	Likely	Likely
M149/19	Seal (indeterminate species)	24/02/2019	East Lothian	U	Unknown	Possible	Possible

SMASS ID	Species	Date found	Region	Sex	Age Group	Likelihood of (grey) seal predation	Would lesions fit with the archetypal 'corkscrew' pattern?
M199/19	Harbour Seal (Common Seal)	17/03/2019	Highland	U	Unknown	Possible	Unlikely
M209/19	Grey seal	31/03/2019	Argyll and Bute	U	Unknown	Possible	Unlikely
M224/19	Grey seal	10/04/2019	Western Isles	U	Unknown	Unlikely	Unlikely
M226/19	Grey seal	11/04/2019	Argyll and Bute	U	Unknown	Unlikely	Unlikely
M227/19	Grey seal	11/04/2019	Fife	U	Unknown	Possible	Unlikely
M242/19	Seal (indeterminate species)	17/04/2019	City of Aberdeen	U	Unknown	no data	no data
M248/19	Grey seal	20/04/2019	East Lothian	U	Unknown	Possible	Unlikely
M280/19	Grey seal	10/05/2019	City of Aberdeen	U	Unknown	Likely	Likely
M286/19	Harbour Seal (Common Seal)	10/06/2019	Argyll and Bute	U	Unknown	Possible	Unlikely
M329/19	Harbour Seal (Common Seal)	21/06/2019	Orkney	M	Pup	Likely	Likely
M353/19	Harbour Seal (Common Seal)	06/07/2019	Argyll and Bute	U	Unknown	likely	Possible
M354/19	Harbour Seal (Common Seal)	06/07/2019	Argyll and Bute	U	Pup	Possible	Unlikely
M357/19	Grey seal	06/07/2019	Aberdeenshire	U	Unknown	no data	no data
M369/19	Harbour Seal (Common Seal)	17/07/2019	Highland	U	Unknown	Likely	Likely
M383/19	Harbour Seal (Common Seal)	27/07/2019	Argyll and Bute	U	Unknown	Likely	Likely
M384/19	Harbour Seal (Common Seal)	27/07/2019	Argyll and Bute	U	Unknown	Likely	Likely
M387/19	Harbour Seal (Common Seal)	26/07/2019	Argyll and Bute	U	Unknown	Likely	Likely
M392/19	Seal (indeterminate species)	27/07/2019	Argyll and Bute	U	Unknown	Likely	Likely
M411/19	Grey seal	10/08/2019	Fife	U	Unknown	Possible	Possible
M412/19	Grey seal	10/08/2019	East Lothian	U	Unknown	Unlikely	Unlikely
M460/19	Harbour Seal (Common Seal)	31/08/2019	North Ayrshire	U	Unknown	Possible	Unlikely
M467/19	Grey seal	08/09/2019	Shetland	U	Unknown	Likely	Likely
M494/19	Grey seal	23/09/2019	Fife	U	Adult	Unlikely	Possible
M587/19	Grey seal	04/11/2019	Highland	U	Pup	Unlikely	Unlikely
M611/19	Grey seal	09/11/2019	Highland	U	Pup	Possible	Unlikely
M614/19	Grey seal	12/11/2019	Highland	U	Pup	Possible	Unlikely

SMASS ID	Species	Date found	Region	Sex	Age Group	Likelihood of (grey) seal predation	Would lesions fit with the archetypal 'corkscrew' pattern?
M621/19	Grey seal	10/11/2019	Highland	U	Pup	Probable	Unlikely
M627/19	Grey seal	15/11/2019	Highland	U	Pup	Likely	Likely
M638/19	Grey seal	16/11/2019	Orkney	U	Pup	Unlikely	Unlikely
M647/19	Grey seal	19/11/2019	Orkney	U	Pup	Likely	Likely
M650/19	Grey seal	21/11/2019	Orkney	U	Unknown	no data	no data
M663/19	Grey seal	25/11/2019	Fife	U	Weaner	Likely	Likely
M666/19	Grey seal	28/11/2019	Highland	U	Juvenile	Likely	Probable
M668/19S	Grey seal	18/12/2018	Highland	U	Pup	Likely	Likely
M670/19	Grey seal	14/12/2018	East Lothian	U	Pup	Likely	Likely
M673/19	Grey seal	14/12/2018	Highland	U	Pup	Possible	Possible
M675/19	Grey seal	20/12/2018	Orkney	U	Unknown	Likely	Likely
M676/19	Grey seal	20/12/2018	Orkney	U	Unknown	Likely	Likely
M677/19	Grey seal	23/12/2018	Orkney	U	Unknown	Possible	Unlikely
M688/19	Grey seal	26/12/2018	Orkney	U	Unknown	Probable	Unlikely
M700/19	Grey seal	26/12/2018	Orkney	U	Pup	Probable	Unlikely
M701/19	Grey seal	26/12/2018	Orkney	U	Pup	Likely	Likely
M702/19	Grey seal	30/12/2018	Orkney	U	Pup	Possible	Unlikely
M703/19	Grey seal	13/12/2019	Orkney	U	Pup	Possible	Unlikely
M704/19	Grey seal	13/12/2019	Orkney	U	Pup	Possible	Unlikely
M709/19	Grey seal	09/12/2019	Orkney	U	Pup	Possible	Possible
M710/19	Grey seal	09/12/2019	Orkney	U	Pup	Possible	Unlikely
M711/19	Grey seal	09/12/2019	Orkney	U	Pup	Likely	Possible
M712/19	Grey seal	14/12/2019	Orkney	U	Pup	Likely	Likely
M714/19	Grey seal	14/12/2019	Orkney	U	Pup	Likely	Unlikely
M718/19	Grey seal	16/12/2019	Scottish Borders	U	Pup	Probable	Possible
M724/19	Grey seal	16/12/2019	Orkney	U	Pup	Probable	Possible

SMASS ID	Species	Date found	Region	Sex	Age Group	Likelihood of (grey) seal predation	Would lesions fit with the archetypal 'corkscrew' pattern?
M725/19	Grey seal	16/12/2019	Orkney	U	Pup	Possible	Unlikely
M726/19	Grey seal	16/12/2019	Orkney	U	Pup	Possible	Unlikely
M728/19	Grey seal	17/12/2019	South Ayrshire	U	Pup	Possible	Unlikely
M732/19	Grey seal	20/12/2019	Orkney	U	Unknown	Possible	Possible
M736/19	Grey seal	21/12/2019	Orkney	U	Pup	Possible	Unlikely
M737/19	Grey seal	21/12/2019	Fife	U	Pup	Unlikely	Unlikely
M738/19	Grey seal	21/12/2019	Fife	U	Pup	Possible	Possible
M739/19	Grey seal	21/12/2019	Orkney	U	Pup	Unlikely	Unlikely
M752/19	Grey seal	28/12/2019	Fife	U	Pup	Probable	Possible
M756/19	Grey seal	29/12/2019	South Ayrshire	U	Pup	Possible	Unlikely
M761/19	Grey seal	31/12/2019	Aberdeenshire	U	Pup	Possible	Unlikely
M762/19	Grey seal	26/01/2019	Orkney	U	Pup	Probable	Possible
M765/19	Grey seal	31/12/2019	Orkney	U	Pup	Possible	Possible

Section 10: Other single pinniped strandings

10.1 M40/19– Harbour seal (*Phoca vitulina vitulina*)

This adult male harbour seal was found dead stranded at Loch Etive on the 11th of January. It was in good body condition. The cause of death appeared to be a strangulation gut torsion, with several loops of intestine becoming entrapped in the cranial hepatic ligament, leading from the caudal edge of the left cranial hepatic lobe. This had led to an acute enteric vascular crisis with dilate and haemorrhagic mesenteric vessels associated with the structure, and clear demarcation between vital and congested gut. There was around 4 – 5 litres of sanguineous, non-clotting fluid in the peritoneal cavity. The liver and kidney parenchyma were jaundiced, and the brain exhibited profound dilation of cerebral vessels with micro-haemorrhage through the white matter. Bacteriology revealed a mix of bacteria most likely post mortem invaders from the intestine. Histology showed a severe, acute, generalised, multi-systemic congestion. Severe, acute, generalised pulmonary congestion and oedema plus locally extensive alveolar emphysema. Severe, per-acute, generalised, small intestinal congestion, oedema and necrosis. The lesions in the intestine are consistent with the torsion present and would have been fatal due to circulatory disturbance and, if the animal survived any length of time with this, toxæmia.



Figure 43: M40/19 harbour seal (*Phoca vitulina vitulina*) from Loch Etive Highland.

10.2 M109/19– Grey seal (*Halichoerus grypus*)

This aged adult male grey seal was found dead stranded at Nairn Highland on the 8th of February. It was in very poor nutritional condition with very poor blubber and muscle deposits. There was a moderate to high nematode burden in stomach and a number of *Acanthocephalan* worms present in the intestine. There was notable lymphadenopathy especially the parotid and retropharyngeal, mesenteric and bronchial LN's. No nematodes were noted in the lungs. The stomach contained a shark/ray egg case and the remains of langoustines in the pyloric sphincter. There was no impaction but some mild ulceration around the sphincter possibly associated with this material. Bacteriological examination did not reveal any significant isolates. Histology showed a moderate, chronic-active, multifocal, granulomatous pneumonia. Moderate, sub-acute, multifocal, necrotising, mixed inflammatory cell hepatitis. Moderate, chronic-active, multifocal to locally extensive, verminous gastritis. Moderate, chronic-active, multifocal, mixed inflammatory cell, lymphadenitis. There is an ongoing chronic active inflammatory response to parasitism in this animal and considering the small number of parasites and that they all appeared to be dead at the time of the animal's death, this is surprising. One possible explanation may be immunosuppression due to protein/calorie malnutrition but with no live parasites present, this seems unlikely. The case of death would appear to be starvation.



Figure 44: M109/19 grey seal (*Halichoerus grypus*) from Nairn, Highland.

10.3 M154/19– Grey seal (*Halichoerus grypus*)

This juvenile grey seal was found alive in severe respiratory distress at Dale of Walls, Shetland on the 24th of February and taken into rehabilitation but died soon after. The animal was in moderate to thin body condition with profound respiratory pathology, characterised by

extensive interstitial emphysema throughout the lung and extending through the thoracic mesenteric tissue planes. This is likely a result of severe verminous pneumonia, as evidenced by the gross evidence for lungworm, although a concurrent viral challenge cannot be ruled out. In addition, the brain was congested and it is possible there was indicative of agonal sepsis. This case was likely moribund on admission and, given the degree of respiratory pathology, it is unlikely it would have survived to successful rehabilitation. Bacteriology produced a pure growth of *Bordetella bronchiseptica* from the lungs, spleen and kidney. The isolation of this organism would suggest a terminal *Bordetella* sepsis and histology supports this with a severe, chronic-active, primarily granulomatous, broncho-interstitial pneumonia. There was also a severe, chronic-active, generalised, primarily granulomatous, lymphadenitis and severe, acute, generalised, necrotising, glomerulotubular nephropathy. *Bordetella bronchiseptica* is not usually fatal in dogs unless the animal is immuno-compromised and although this is a grey seal, IHC for phocine distemper virus proved negative.



Figure 45: M154/19 grey seal (*Halichoerus grypus*) from Dale of Walls, Shetland.

10.4 M175/19– Harbour seal (*Phoca vitulina vitulina*)

This freshly dead pregnant female harbour seal was dead at Achnacloich, Oban on the 3rd of March. The animal appears to have been shot once in the head using a high calibre projectile. It is not clear, if this animal was shot under licence, or if there is, a licence to shoot harbour seals in this region. The cranial vault was destroyed and it was most likely was killed outright. The animal was otherwise in excellent body condition, with a stomach full of pink ingesta, likely salmonid fish. No fish heads or large bones were noted in the 850g ingesta, possibly

indicating the animal had been targeting just the back muscle from prey. The left horn contained an end-mid trimester pup in otherwise apparently healthy condition. The liver in this case was tan, fatty and exhibited pitting oedema and it will be interesting to assess the degree of hepatic pathology from what is assumed a physiologically normal animal undergoing intense lipogenesis in advance of parturition. Bacteriological examination proved sterile and histology did not reveal any underlying disease.



Figure 46: M175/19 harbour seal (*Phoca vitulina vitulina*) from Achnacloch, Oban, Argyll and Bute.

10.5 M186/19– Harbour seal (*Phoca vitulina vitulina*)

This adult male harbour seal was found dead at Gruniard bay on the 20th of March. It showed indications of ballistic trauma- two puncture wounds through blubber and soft tissue of the neck region with associated subcutaneous and blubber haemorrhage. The bullet appeared to have passed through soft tissue causing little skeletal trauma although there was significant cerebral haemorrhage likely associated with the pressure wave from the bullet. There were no skeletal fractures nor metal fragments detectable on gross examination. The stomach contained a large volume of fish tissue and a partially digested octopus. The fish tissue did not resemble salmonid fish on gross examination. The significance of the *Pasteurella* sp. isolated from the lung and brain is uncertain. Histology revealed a severe, acute, locally extensive, meningeal haemorrhage. Severe, acute, generalised haemorrhage in the sub-cutaneous blubber. These findings are consistent with trauma. The congestion present in some of the organs suggests the animal did not die instantly, and therefore a potential welfare issue.



Figure 47: M186/19 harbour seal (*Phoca vitulina vitulina*) from Gruniard bay, Highland.

10.6 M187/19– Harbour seal (*Phoca vitulina vitulina*)

This thin female juvenile common seal was found dead close to the mouth of the Spey on the 21st of March. It was moderately autolysed, with skin sloughing but intact, apart from the eyes which were scavenged. There was no indication of fractures or ballistic trauma. The animal was in thin body condition but had recently fed with numerous otoliths in the stomach. The lungs were very congested, but there was no indication of consolidation or excess fluid indicative of pneumonia. No gross nematode burden was detected. The brain was slightly congested, but no gross evidence of trauma/haemorrhage was present. Other organs were unremarkable. Bacterial examination showed post mortem contaminants only. Histology showed a moderate, acute, focal, necrotising hepatitis. Moderate, chronic-active, multifocal, eosinophilic, lymphadenitis. There is an active response to parasitism on going in this animal but if the lung sample is representative of the whole lung field it does not seem to be due to verminous pneumonia, probably more hepatic/ gastro-intestinal. The focus of hepatic necrosis is interesting and this case will be tested for phocine herpesvirus.



Figure 48: M187/19 harbour seal (*Phoca vitulina vitulina*) from the mouth of the River Spey, Moray.

Section 11: Sharks and marine turtles

11.1 Basking sharks (*Cetorhinus maximus*)

There were six reports of a basking sharks in 2019, all but one significantly autolysed. Two decomposed sharks were spotted floating at sea, one of Greenock, Inverclyde in May the other entangled in creel lines of the Isle of Barra in July. Three other decomposed sharks made land fall, two at Applecross Highland and one at West Kilbride North Ayrshire. All these animals were reported in September. The last shark was found in near Brora, Highland and although moderately decomposed was sampled by volunteers.



Figure 49: M508/19 Basking shark (*Cetorhinus maximus*) from near Brora, Highland.

11.2 Other sharks

Although not officially part of the stranding scheme, SMASS log reports of other species of large sharks. There was one such report in 2019 a porbeagle shark (*Lamna nasus*) in August at Westport, Arbroath. It was thought a likely discard from a fishing vessel. This animal was collected by the National Museum of Scotland.



Figure 50: M508/19 Porbeagle shark (*Lamna nasus*) from Westport, Arbroath.

11.3 Marine Turtles

There were three reports of a marine turtles during in 2019. A single loggerhead turtle (*Caretta caretta*) (M181/19), live stranded at Hosta Beach North Uist and was refloated by members of the public in March. The turtle was later found dead and recovered for necropsy. There was no significant pathology detected and as is usually the case in hardshell turtles in northern UK waters, the cause death of this animal was likely hypothermia or ‘cold stunning’



Figure 51: M181/19 Loggerhead turtle (*Caretta caretta*) North Uist.

A single green turtle (*Chelonia mydas*) (M692/19) was reported from Cleat beach on the Isle of Barra on the 6th of December, the animal appeared to be in fresh condition but the carcass disappeared before recovery could take place. The last report was of the much-decomposed remains of a leatherback turtle (*Demochelys coriacea*) from Calgary beach on the Isle of Mull on the 26th of December.



Figure 52: M692/19 Green turtle (*Chelonia mydas*) Barra.

Section 12: Bacteriology

12.1 *Brucella* sp.

Brucella ceti was isolated three times during this period in pure culture from the cerebrospinal fluid (CSF) and brains of two striped dolphins both are neurobrucellosis cases (see above). The remaining isolate was from the spleen of a harbour porpoise this not thought to be a significant finding. There were a single of *B. pinnipedialis* during this period from the lung of a harbour seal this was an incidental finding.

12.2 *Streptococcus* sp.

Streptococcus phocae was isolated in pure growth from all sites cultured in two harbour porpoises suggesting a sepsis in both animals. The same organism was isolated in mixed culture from a harbour seal; this was thought to be an incidental finding. It was also isolated from a harbour porpoise in septicaemic distribution following a possible grey seal attack.

A β Haemolytic *Streptococcus* sp. was isolated in mixed culture from most sites cultured from a harbour porpoise with peritonitis. The significance of this isolate is at present uncertain.

Streptococcus agalactiae was isolated in pure and heavy from all sites cultured of a juvenile humpback whale with chronic entanglement lesions, suggesting a terminal sepsis.

12.3 *Pasteurella sp.*

Actinobacillus delphinicola was isolated from two sites in a juvenile minke and the liver spleen and kidney of a juvenile Sowerby's beaked whale and the lung of a striped dolphin. These isolates are not thought to be significant in either case.

Haemophilus sp. was isolated in light pure growth from the lung of a common dolphin the significance of this isolate is unknown.

Pasteurella sp. was isolated from the brain and lung of a harbour seal. The significance of this isolate is at present uncertain.

12.4 *Vibrio sp.*

Vibrio alginolyticus was isolated in mixed culture from several sites in a harbour seal; this was an incidental finding.

Photobacterium damsela was isolated in pure culture from the lung and spleen of a short-beaked common dolphin. This same organism was isolated in mixed culture from most sites cultured from a harbour porpoise with peritonitis and in mixed culture from the lung of a Sowerby's beaked whale. The significance of these isolates are uncertain.

12.5 *Yersinia sp.*

Yersinia fredreksenii was isolated in mixed culture from lung and spleen of a harbour seal. The significance of this isolate is uncertain.

Yersinia enterocolitica was isolated in mixed culture from the lung of a harbour porpoise.

12.1 *Bordetella bronchiseptica*

Bordetella bronchiseptica recovered from the lung, spleen and kidney of a grey seal with severe pneumonia.

12.1 *Clostridium sp.*

Clostridium sordellii was isolated in mixed culture from the intestine of a harbour seal, the significance of this isolate is uncertain.

12.2 *Fungal isolates*

A Yeast sp. was isolated in mixed culture from the liver and kidney of a loggerhead turtle.

Section 13: Outreach and Volunteers

13.1 SMASS Forum

On the 2ND of March, SMASS in conjunction with Whale and Dolphin Conservation (WDC) held the second annual marine forum at the Centre for Health Studies. It was well attended with over 120 volunteers and public listening to talks in the morning and taking part in workshops in the afternoon. A beta version of the Beach Track app was released to volunteers for testing at the forum.

Share knowledge - Take action - Sea change

#MarineForum2019

9.30am - Registration and tea/coffee

10am - Key note and host presentations

Learning from whales and dolphins – trying to save the world through a culture of partnerships

Chris Butler-Stroud - CEO, Whale and Dolphin Conservation (whales.org)

Just as we are beginning to understand the importance of culture, social learning and cooperation in dolphins and whales, their example is also teaching us that to achieve anything in this complex, interconnected world, we need to be working together with those who share our views, and sometimes even with those who don't quite yet

<https://youtu.be/nIYUXFjIShQ>

SMASS 2018: an extraordinary year

Dr Andrew Brownlow - Scottish Marine Animal Stranding Scheme (strandings.org)

More strandings were reported to SMASS during 2018 than any other year in the scheme's 25 year life - over 930 animals. These ranged from a seal pup weighing only a few kg, to the largest mortality event of beaked whales ever seen. We discuss these cases and the key role played by citizen scientists to identify and understand marine strandings

<https://youtu.be/j6ZwJwunvWg>

Citizen science and cetaceans: Shorewatch

Dr Graham Pierce - CSIC/IIM

What can we learn from Shorewatch data?

https://youtu.be/f4s7e_1BPG8

How we use Shorewatch data to protect cetaceans

Sarah Dolman - Whale and Dolphin Conservation (whales.org/Shorewatch)

Exploring the last 10 years of Shorewatching to see how we are helping to protect Scotland's cetaceans

<https://youtu.be/9m3rVZaBFDY>

Tea/coffee break

11.15am - Guest speakers

The use of NGO and Citizen Science Data in Marine Development

Pete Watson - SSEN (ssen.co.uk)

Looking at how data can be used to inform subsea cable development, route selection and protection

<https://youtu.be/OnNwtVME-HQ>

Songs from the deep: a Scottish underwater listening network

Dr Denise Risch - SAMS (sams.ac.uk/denise-risch)

The COMPASS project is developing a network of underwater listening stations along the UK west coast waters. As well as detailing the challenges of maintaining these new networks, in this talk we will feature some of the first recordings of the loud and distinctive calls of three large whale species detected singing off western Scotland

When the brain goes diving

Dr Chris McKnight - SMRU

A better understanding of physiology is essential to questioning how robust marine mammals are to growing anthropogenic encroachment in the seas. How is the brain protected during diving? How is oxygen delivery to the brain maintained and how this might interact with an animal's need to sense and perceive its environment?

https://youtu.be/D_SSQPprv50

25 years and 250 minke whales

Dr Lauren Hartny-Mills - HWDT (hwdt.org)

Celebrating 25 years of citizen science at HWDT & its contribution to our understanding of Hebridean minke whales

<https://youtu.be/q-Hd9aRxKjQ>

BDMLR 2018 Summary

Dan Jarvis – BDMLR (bdmlr.org.uk)

A review of BDMLR's callouts during 2018

<https://youtu.be/ePeafYt9XhU>

BeachTrack - what's 'app-ening here?

Ellie MacLennan – SMASS (strandings.org) An introduction to the new SMASS reporting app

<https://youtu.be/3vsWtkK-yYg>

Lunch

1.30pm - Workshop sessions

Please attend your assigned workshop for each session as designated by the order of the coloured dots on your name tag. Tea / coffee will be available on a rolling basis throughout the 10-minute changeovers.

1.30-2.10pm - Workshop session 1

2.20-3.00pm - Workshop session 2

3.10-3.50pm - Workshop session 3

(Red) Cold cases; identifying cetacean & pinniped bones and the importance of skeleton collection with Georg Hantke, National Museums Scotland

(Blue) Individual Influence; how acting locally is impacting globally with Sorcha Cantwell, the Scottish Coastal Clean-up Project & Sarah Dolman, WDC

(Yellow) To refloat or not to refloat; post mortem data to inform rescue & rehabilitation decisions with Dan Jarvis, BDMLR & Mark Dagleish, Moredun

(Green) Baleen and beaked whales; identify those confusing species with Emma Neave-Webb, Sanday Development Trust Ranger

4.00-4.45pm - Q&A with the presenter panel

https://youtu.be/XM_GhrNJ6rk

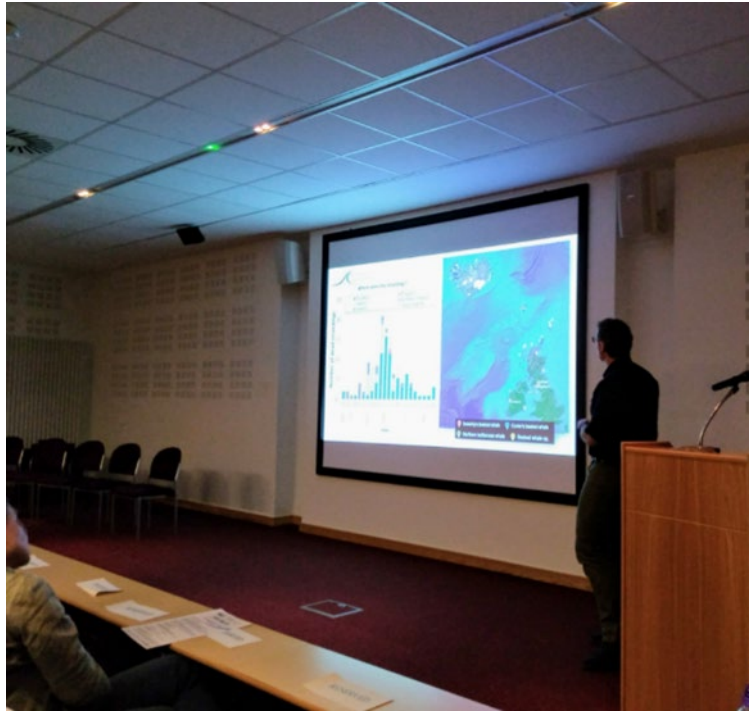


Figure 53: Dr Andrew Brownlow talking about an extraordinary year at the Forum



Figure 54: Delegates enjoying tea and coffee at the SMASS forum



Figure 55: Sarah Dolman WDC Policy Manager talking about 10 years of Shorewatch.



Figure 56: Georg Hantke, National Museums Scotland Cold cases identifying cetacean & pinniped bones and the importance of skeleton collection workshop.



Figure 57: To refloat or not to refloat; post mortem data to inform rescue & rehabilitation decisions workshop with Dan Jarvis, BDMLR & Dr Mark Dagleish, Moredun Research Institute.

13.2 Volunteer training

No formal courses were run during 2019 due to the constraints of moving premises. Nevertheless, several volunteers were trained during beach necropsies

Nick and Mariel trained two volunteers to during the Sowerby's beaked whale necropsies on the 18/09/19. The volunteers will be able to cover Kintyre an area we only have sparse coverage. One new volunteer was trained during the sperm whale necropsy on the 30/11/19. This provides SMASS with a much-needed new volunteer on Lewis and Harris.

13.3 Other outreach

On the 5th and 6th of May Ellie and Mariel held a volunteer engagement session and launch of beach tracker app in Shetland.

Section 14: Outputs

14.1 Overview

In 2019, staff at the Scottish Marine Animal Strandings Scheme published nine peer-reviewed papers and submitted three more. There were nine conference presentations and seven posters.

14.2 Publications

- S. E. Nelms, J. Barnett, **A. Brownlow**, **N. J. Davison**, R. Deaville, T. S. Galloway, P. K. Lindeque, D. Santillo & B. J. Godley (2019) Microplastics in marine mammals stranded around the British coast: ubiquitous but transitory? *Nature Scientific Reports* <https://www.nature.com/articles/s41598-018-37428-3>
- Joe Onoufriou, **Andrew Brownlow**, Simon Moss, Gordon Hastie, David Thompson. Empirical determination of severe trauma in seals from collisions with tidal turbine blades. *Journal of Applied Ecology*. 03/2019; DOI:10.1111/1365-2664.13388
- Joanna L. Kershaw, **Andrew Brownlow**, Christian A. Ramp, Patrick J. O. Miller, Ailsa J. Hall. Assessing cetacean body condition: Is total lipid content in blubber biopsies a useful monitoring tool? *Aquatic Conservation: Marine and Freshwater Ecosystems*
- Andrew D Foote, Michael Martin, Marie Louis, George Pacheco, Kelly Robertson, Mikkel-Holger Sinding, Ana Amaral, Robin Baird, Scott Baker, Lisa Ballance, Jay Barlow, **Andrew Brownlow**, Tim Collins, Rochelle Constantine, Willy Dabin, Luciano Dalla Rosa, **Nicholas J Davison**, John Durban, Ruth Esteban, Steven Ferguson, Tim Gerodette, Christophe Guinet, Bradley Hanson, Wayne Hoggard, Cory Matthews, Filipa Samarra, Renaud de Stephanis, Sara Tavares, Paul Tixier, John Totterdell, Paul Wade, Thomas Gilbert, Jochen Wolf, Phillip Morin. Killer whale genomes reveal a complex history of recurrent admixture and vicariance. *Molecular Ecology* 05/2019; DOI:10.1111/mec.15099
- Milaja Nykänen, Kristin Kaschner, Willy Dabin, **Andrew Brownlow**, **Nicholas J. Davison**, Rob Deaville, Cristina Garilao, M. Thomas P. Gilbert, Rod Penrose, Valentina Islas-Villanueva, Nathan Wales, Simon N. Ingram, Emer Rogan, Marie Louis, and Andrew D. Foote, Post-glacial colonization of northern coastal habitat by bottlenose dolphins: A marine leading-edge expansion? *Journal of Heredity*. 06/2019; DOI:10.1093/jhered/esz039
- Jean-Pierre Desforges, Ailsa Hall, Bernie McConnell, Aqquale Rosing Asvid, Jonathan L. Barber, **Andrew Brownlow**, Sylvain De Guise, Igor Eulaers, Paul D. Jepson, Robert J. Letcher, Milton Levin, Peter S. Ross, Christian Sonne, Rune Dietz: Response to L. Witting: PCBs still a major risk for global killer whale populations. *Marine Mammal Science* 07/2019; 35(3):1201-1206., DOI:10.1111/mms.12615

- Ellen J. Coombs, Rob Deaville, Richard C. Sabin, Louise Allan, Mick O'Connell, Simon Berrow, Brian Smith, **Andrew Brownlow**, **Mariel Ten Doeschate**, Rod Penrose, Ruth Williams, Matthew W. Perkins, Paul D. Jepson, Natalie Cooper: *What can cetacean stranding records tell us? A study of UK and Irish cetacean diversity over the past 100 years*. Marine Mammal Science 04/2019;; DOI:10.1111/mms.12610
- Rosie S. Williams, David J. Curnick, Jonathan L. Barber, **Andrew Brownlow**, **Nicholas J. Davison**, Rob Deaville, Matthew Perkins, Susan Jobling, Paul D. Jepson (2019) Juvenile harbor porpoises in the UK are exposed to a more neurotoxic mixture of polychlorinated biphenyls than adults. Science of the Total Environment <https://doi.org/10.1016/j.scitotenv.2019.134835>
- **Geoffrey Foster**, Adrian M. Whatmore, Mark P. Dagleish, Henry Malnick, Maarten J. Gilbert, Lineke Begeman, Shaheed K. Macgregor, **Nicholas J. Davison**, Hendrik Jan Roest, Paul Jepson, Fiona Howie, Jakub Muchowski, **Andrew C. Brownlow**, Jaap A. Wagenaar, Marja J. L. Kik, Rob Deaville, **Mariel T. I ten Doeschate**, Jason Barley, Laura Hunter & Lonneke L. IJsseldijk (2019). Forensic microbiology reveals that Neisseria animaloris infections in harbour porpoises follow traumatic injuries by grey seals. Nature Scientific Reports 9:14338 <https://doi.org/10.1038/s41598-019-50979-3>

14.3 Publications (Submitted)

- Rosie Williams, **Mariel ten Doeschate**, David Curnick, **Andrew Brownlow**, Jonathan Barber, **Nicholas Davison**, Robert Deaville, Matthew Perkins, Paul Jepson, Susan Jobling: Levels of polychlorinated biphenyls are still associated with toxic effects in harbour porpoises (*Phocoena phocoena*) despite having fallen below proposed toxicity thresholds. Environmental Science & Technology.
- Lonneke L. IJsseldijk, **Mariel T.I. ten Doeschate**, **Andrew Brownlow**, **Nicholas J. Davison**, Rob Deaville, Anders Galatius, Anita Gilles, Jan Haelters, Paul D. Jepson, Guido O. Keijl, Carl Chr. Kinze, Morten Tange Olsen, Ursula Siebert, Charlotte Bie Thøstesen, Jan van den Broek, Andrea Gröne, Hans Heesterbeek. Spatiotemporal mortality and demographic trends in a small cetacean: Using strandings to inform conservation management.
- Sinéad Murphy, Marie A. C. Petitguyot, Paul D. Jepson, Rob Deaville, Christina Lockyer, James Barnett, Matthew Perkins, Rod Penrose, **Nicholas J. Davison** and Cóilín Minto. Spatio-temporal variability of harbour porpoise life history parameters in English and Welsh waters. Frontiers in Marine Science.

14.4 Non Peer reviewed publications

- **Ellie MacLennan**, Russell Leaper and Sarah Dolman

Interim report from the Scottish Entanglement Alliance (SEA) on previously undocumented fatal entanglements of minke whales (*Balaenoptera acutorostrata*) in Scottish inshore waters. International Whaling Commission (IWC) report.

14.5 Conference Talks

- **Mariel T.I. ten Doeschate**, Ceri Wyn Morris, James Barnett, **Nicholas J Davison**, Robert Deaville, Paul Jepson, Charles Lindenbaum, Rod Penrose, Matthew Perkins, Tom Stringell, **Andrew Brownlow**. Insights into long term harbour porpoise strandings monitoring on the west coast UK. MASTS conference, Glasgow. 2nd October 2019.
- **Andrew Brownlow**, **Nick Davison**, Mariel ten Doeschate, Georg Hantke, Aubrie Onoufriou, Simon Berrow, Mark Dagleish, Mara Rocchi, Denise Risch, Nienke van Geel and Andrew Dale (2019). Deep trouble: Investigation into an unprecedented number of beaked whale strandings, eastern Atlantic, July-October 2018. Presentation. World Marine Mammal Conference, Barcelona, Spain, 9th to 12th December 2019.
- Andrew Foote, Michael Martin, Marie Louis, George Pacheco, Kelly Robertson, Mikkel Sinding, Ana Amaral, Robin Baird, C. Scott Baker, Lisa Balance, Jay Barlow, **Andrew Brownlow**, Tim Collins, Rochelle Constantine, Willy Dabin, Luciano Dalla Rosa, **Nick Davison**, John Durban, Ruth Esteban, Steven Ferguson, Tim Gerrodette, Christophe Guinet, Wayne Hoggard, Cory Matthews, Filipa Samarra, Renaud de Stephanis, Sara B. Tavares, Paul Tixier, John Totterdell, Paul Wade, Laurent Excoffier, Thomas Gilbert, Jochen Wolf, Phillip Morin. (2019) Global dataset of killer whale genomes reveal a complex history of recurrent admixture and vicariance. Presentation World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.
- Aubrie Onoufriou, Oscar Gaggiotti, Natacha Aguilar de Soto, Morten Tange Olsen, Phillip Morin, Massimiliano Rosso, Merel Dalebout, **Nick Davison**, Megan Anderson, Robin Baird, C. Scott Baker, Simon Berrow, Daniel Burns, Diane Claridge, Rochelle Constantine, Covelo Pablo, Fabien Demaret, Jim Dines, Martina Duras, John Durban, Alexandros Frantzis, Luis Freitas, Gabrielle Genty, Ana Galov, Nan Hauser, Paul Jepson, Dan Kerem, Zoe Lucas, Vidal Martin, James G. Mead, Kathryn Medlock, Antonio Mignucci, Aurélie Moulins, Carlos Olavarria, Marc Oremus, M. Michael Poole, Charles Potter, Emer Rogan, Conor Ryan, Paola Tepsich, Jorge Urbán, Devi Veytia, Emma Carroll (2019). Hide and RADseq: Revealing Global Population Structure and Genetic Diversity in Two Enigmatic Beaked Whale Species. Presentation. World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019
- Ceri Morris, **Mariel ten Doeschate**, James Barnett, **Nick Davison**, Robert Deaville Paul Jepson, Charles Lindenbaum, Rod Penrose, Matthew Perkins, Tom Stringell, **Andrew Brownlow** (2019). Insights into long term harbour porpoise (*Phocoena phocoena*) strandings monitoring on the west coast UK. Presentation World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.

14.6 SMM workshop presentations

- **Nicholas J. Davison, Andrew Brownlow, Mariel ten Doeschate**, Lorraine Perrett, Emma-Jane Dale, Jakub Muchowski, **Geoff Foster**, Barry McGovern, Adrian Whatmore, Mark Dagleish (2019). The lesion profile of cetaceans diagnosed with neurobrucellosis in Scottish waters 1991 to March 2019. Presentation in “What is new in cetacean pathology 3” workshop. World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.
- **Mariel T.I. ten Doeschate, A. Brownlow, N. Davison**, G. Hantke, S. Berrow, and A. Dale. UK and Irish Beaked Whale Unusual Mortality Event- Case example. Presentation in “Management of Marine Mammal Morbidity and Mortality Events - Emergency Response and Preparedness” workshop. World Marine Mammal Conference- Together for Science and Conservation. Barcelona, Spain. 7th to 12th December 2019.

14.7 Conference Posters

- **Nicholas J. Davison, Andrew Brownlow, Mariel ten Doeschate**, Lorraine Perrett, Emma-Jane Dale, Jakub Muchowski, **Geoff Foster**, Barry McGovern, Adrian Whatmore, Mark Dagleish (2019). The lesion profile of cetaceans diagnosed with neurobrucellosis in Scottish waters 1991 to March 2019. World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.
- Kristina Steinmetz, Sinead Murphy, Oliver Ó Cadhla, **Andrew Brownlow, Nick Davison**, Luca Mirimin, (2019) Population genetic structure of harbour seals in Ireland – filling a knowledge gap to evaluate and monitor Good Environmental Status. World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.
- **Mariel T.I. ten Doeschate, Andrew Brownlow, Nicholas J. Davison**, Rob Deaville, Anders Galatius, Andrea Gröne¹, Jan Haelters, Paul D. Jepson, Guido Keijl, Carl Chr. Kinze, Morten Tange Olsen, Ursula Siebert, Charlotte Bie Thøstesen, Hans Heesterbeek, and Lonneke L. Ijseldijk. (2019) SCANS of the beach; International assessment of harbour porpoise strandings along the North Sea coastline. World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.
- Robert Deaville, **Andrew Brownlow**, James Barnett, **Nick Davison**, Rod Penrose, Matthew Perkins, Brian Smith, **Mariel ten Doeschate**, Ruth Williams and Paul D. Jepson. (2019) Oh what a tangled web we weave- bycatch in UK stranded cetaceans. World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.

- Rosie Williams, Susan Jobling, **Andrew Brownlow**, David Curnick, Jonathan Barber, **Nick Davison**, Robert Deaville, Matthew Perkins, Paul Jepson (2019) Juvenile Harbour Porpoises in the UK are exposed to a More Neurotoxic Mixture of Polychlorinated Biphenyls than Adults. World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.
- **Ellie MacLennan, Andrew Brownlow**, Kirstie Dearing, Sarah J. Dolman, Fiona Read, Lauren Hartny-Mills, Bally Philp, Noel Hawkins. Understanding marine animal entanglement in Scottish waters”, World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.
- L. L. IJsseldijk, M. Kik, J. van den Broek, **M.T.I. ten Doeschate**, H. Heesterbeek, A. Gröne. Age- and sex-specific causes of mortality in stranded harbour porpoises from the southern North Sea: evidence for temporal trends? World Marine Mammal Conference, Barcelona, Spain, 7th to 12th December 2019.

14.8 Media

A Record year for marine strandings in 2018 received a bit of media interest in January.

https://www.bbc.co.uk/news/uk-scotland-highlands-islands-46822658?ns_linkname=scotland&ns_campaign=bbc_scotland_news&ns_mchannel=social&ns_source=twitter

In January, Sarah Nelms paper on micro plastics attracted quite a bit of media interest.

https://www.standard.co.uk/futurelondon/theplasticfreeproject/plastic-pollution-single-use-plastic-a4053361.html?fbclid=IwAR3MQPeZTVy-w-G_tsVlp4nVa6XxzMJkOLMThjcECf3_ES6khvDME5M4QEE

<https://www.theguardian.com/environment/2019/jan/31/microplastics-found-every-marine-mammal-uk-study>

<https://www.bbc.co.uk/news/uk-scotland-highlands-islands-47078733>

<https://www.telegraph.co.uk/news/2019/01/31/100-polluted-plastic-found-british-whales-dolphins-seals/>

<https://www.thenational.scot/news/17400031.microplastics-found-in-guts-of-100-of-marine-mammals-in-new-study/>

<https://news.sky.com/story/plastics-found-in-the-guts-of-uks-seals-dolphins-and-whales-11623649>

In February, several dead seals on the Briaghe, near Stornoway, Lewis made the local Stornoway news.

http://www.welovestornoway.com/index.php/news-list/12808-seal-deaths-at-braighe-natural?fbclid=IwAR0YN2UFx3zEWeUfGvividlixX5doCAPLxPqbxPPjQglBZ7xf7JEm_zmEg

The second SMASS forum, this time co-hosted with WDC attracted quite a bit of media attention.

https://www.scottishfield.co.uk/outdoors/wildlifeandconservation/event-will-thank-the-public-over-stranded-marine-life/?fbclid=IwAR37FxyPsOj4h_Ojzrlko68149tOJeDc67Rp9NRhWez_Pd9dRgw2XwhV-E

https://www.pressandjournal.co.uk/fp/news/highlands/1682537/citizen-science-forum-to-be-held-in-inverness-after-record-year-of-stranded-marine-animal-sightings/?utm_source=facebook&fbclid=IwAR3DMZxKrr7y9P06n-b36885lbn6xW-VUjwUDJWaXyOPL6V-tFRfGgBO-s4

Entanglements in mysticetes were the focus of media attention during this period. A humpback whale that came ashore East Lothian 23/04/19 after been seen entangled in in lines in the Firth of Forth attracted some attention

<https://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-48022781?fbclid=IwAR1YIlzRy6VQzuKUYafbaBCIJ-VIK169pUPjVMDjV41xRnC1uHc9WuD4aA8>

There was a minke spotted entangled off the coast of Barra

<https://www.pressandjournal.co.uk/fp/news/islands/1752894/kayak-team-attempt-dramatic-rescue-of-mink-whale-entangled-in-rope-in-outer-hebrides/>

In addition, another entangled minke whale spotted floating off Mull in May.

https://www.pressandjournal.co.uk/fp/news/highlands/1747458/minke-whale-dies-off-scottish-coast-after-suspected-fishing-gear-entanglement/?fbclid=IwAR12MAM8QEY8zfYU6iA_zjRARqwuMbbfrfmH2X9P9KxiNJ9wjuEpiOZnA2Vw

However, by far the most attention from the press was the entangled humpback that came ashore at Scrabster Highland on the 30th of May with lines and a buoy that could be traced to a creel fisherman in Nova Scotia.

https://www.pressandjournal.co.uk/fp/news/highlands/1761044/witnesses-urged-to-report-sea-life-caught-in-fishing-gear-after-whale-stranding-in-caithness/?fbclid=IwAR2LQeGL2DYDwcjO1ry7k10BsNEW-rny_xfr1ZV70uTwHlx25qytf7QC8yg

https://www.bbc.co.uk/news/uk-scotland-highlands-islands-48458440?fbclid=IwAR1HoG8tBmppFYTnmNII-shAxlr06H8P0erzLEfDk_-smDW11ZvTazDtE

<https://www.thetimes.co.uk/article/whale-found-dead-in-scrabster-caithness-was-caught-in-fishing-line-w9m2fn8wd>

<https://stv.tv/news/highlands-islands/1438143-humpback-whale-washes-ashore-tangled-in-fishing-gear/>

<https://www.dailymail.co.uk/news/article-7087299/Grey-seal-decapitated-abandoned-ghost-fishing-net.html>

<https://www.thelondoneconomic.com/news/heartbreaking-pics-of-whale-washed-up-tangled-in-fishing-gear/30/05/>

<https://theworldnews.net/uk-news/dead-humpback-whale-washes-up-on-a-scottish-beach-after-becoming-tangled-in-rope>

The official launch of SMASS's beach track app allowing the public to report strandings to the Scheme was launched in July and this attracted quite a bit of media interest.

https://www.bbc.co.uk/news/uk-scotland-highlands-islands-49131967?fbclid=IwAR0kT4G9j-7g2YUEXP1TvlSGBcNq_GXFV4v-ZUtBhOZZIPsdZkbl1MuFoE

<https://stv.tv/news/highlands-islands/1439570-marine-strandings-app-will-build-health-map-of-beaches/>

<https://www.inverness-courier.co.uk/news/sea-change-in-scottish-beach-surveillance-new-app-developed-in-inverness-to-help-marine-scientists-monitor-strandings-and-pollution-180921/>

A small mass stranding event (MSE) involving three porpoises in the Solway Firth was picked up by the BBC. BDMLR refloated two animals but the third died and was recovered for necropsy.

https://www.bbc.co.uk/news/uk-scotland-south-scotland-49481841?fbclid=IwAR2xg095WELxzaI4CGzYQxC_yNjV2MXovbc7hT-HFDbjNsCRxp-qJh6uves

There was a second small MSE involving two juvenile Sowerby's beaked whales at Tighnabruich, Argyll and Bute which was picked up by the TIMES

<https://www.thetimes.co.uk/edition/scotland/sowerby-s-beaked-whales-at-kames-beach-died-together-after-refusing-to-be-separated-k3tq2cxxl>

An adult female Sowerby's beaked whale that stranded in East Lothian on the 12/10/19 with a chronic encircling entanglement lesion around its body attracted quite a bit of media attention.

<https://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-50081836>

<https://news.stv.tv/east-central/1441663-whale-found-on-scots-beach-with-most-severe-wounds?top>

<https://www.thescottishsun.co.uk/news/4848592/whale-east-lothian-beach-severe-wounds-scotland/>

<https://metro.co.uk/2019/10/18/dead-whale-found-severe-wounds-ever-recorded-uk-beach-10941423/>

<https://www.sundaypost.com/fp/tangled-whale-found-dead-on-east-lothian-beach-suffered-some-of-worst-wounds-ever-recorded/>

<https://www.heraldscotland.com/news/17976792.whale-washed-beach-suffered-agonising-death/>

<https://www.edinburghlive.co.uk/news/edinburgh-news/tangled-whale-died-east-lothian-17099851>

<https://uk.whales.org/2019/10/17/lost-sowerbys-beaked-whale-suffered-slow-and-painful-death/>

We saw the most intense worldwide media interest in any stranding report by SMASS at the end of November when a sperm whale live stranded at Seilebost, Harris on the 30/11/19 with

large amounts of marine litter in its stomach, mainly rope but also net, packing straps and disposable plastic cups. We had media interest from 14 countries including the UK.

Austria

<https://www.krone.at/2054029?fbclid=IwAR1yo5udOqbGzeeXPPIS77StXtLICKYdHF06yh9xbvMaTacdWSn9CVYwEeQ>

<https://apps.derstandard.at/privacywall/story/2000111763055/toter-pottwal-in-schottland-mit-100-kilogramm-muell-im-magen?fbclid=IwAR3eC82ASr6JvKdQfB30kJP-0mld9IntjnNxclFzq5HxEhtBMNwV5FgOwg>

[file:///C:/Users/ndavison/Downloads/Leben-12-03-19-TT-191203_TT_Lebenzweispalter%20\(1\).pdf](file:///C:/Users/ndavison/Downloads/Leben-12-03-19-TT-191203_TT_Lebenzweispalter%20(1).pdf)

Australia

<https://7news.com.au/news/animals/dead-sperm-whale-found-to-have-100kg-of-rubbish-including-fish-nets-in-its-stomach-c-586543>

<https://www.news.com.au/technology/science/animals/26000-kilogram-beached-sperm-whale-buried-in-beach-after-shock-stomach-find/news-story/c32dcc8e17e3baf3bb106e09f44d1e7>

<https://www.abc.net.au/news/2019-12-03/sperm-whale-found-with-100kg-of-garbage-and-plastic-in-stomach/11759544>

<https://news.theceomagazine.com/environment/sperm-whale-scotland/>

Brazil

<https://riotimesonline.com/brazil-news/miscellaneous/whale-found-dead-with-100-kg-of-garbage-in-stomach/>

Canada

https://www.ctvnews.ca/sci-tech/sperm-whale-found-dead-with-100-kilos-of-trash-in-its-stomach-1.4710995?fbclid=IwAR1XUvn32xPAOxpJPGXRvTCptFaPTOSgJfB1DCa_voKpu8UA_ccPUUPrUZU

<https://globalnews.ca/news/6243060/whale-stranded-plastic-stomach-scotland/>

Denmark

<https://nyheder.tv2.dk/udland/2019-12-03-doed-hval-eksploderede-paa-stranden-med-100-kiloskrald-i-maven?fbclid=IwAR2wvvlFpKb2mn9VtF5-LzZYtrwBBQnnUzriC-9suRAGAAKpKoQHw08lkw>

France

<https://www.geo.fr/environnement/un-cachalot-echoue-avec-100-kilos-de-dechets-dans-le-ventre-198889?fbclid=IwAR2MXMJO4DYvSwXuI9apzH94uh8nlkKADf5QHCx7bveYX03S13fP9Xre5qs>

Germany

<https://www.bild.de/news/ausland/news-ausland/schottland-wal-verendet-mit-100-kilo-plastikmuell-im-bauch-66419212.bild.html>

https://www.mdr.de/wissen/pottwal-einhundert-kilo-muell-magen-110.html?fbclid=IwAR34fdnVyG1cMwvqRYxN6mwNReIS2AtM6N1hU3ZA_nvC062LvbYb_KL2Ncc

<https://de.euronews.com/2019/12/02/wal-strandet-in-schottland?fbclid=IwAR2k8EPCpPWpQP4YjNAuZ3jRN6W17XA7jOIZ0FuKw0C48ED6rlch9iLhIjU>

http://scienceblogs.de/meertext/2019/12/03/plastik-und-giftstoffe-belasten-wale-im-nordatlantik/?fbclid=IwAR1VbnpZc9lsqmtPwBYHwdoKjmSzRUr9IndfQPcg3fe4jkUuveSjERp_-w

https://www.focus.de/wissen/natur/tiere-und-pflanzen/menge-an-plastik-im-magen-ist-erschreckend-seile-tueten-handschuhen-toter-pottwal-mit-100-kilogramm-muell-ball-im-magen-entdeckt_id_11415622.html?fbclid=IwAR1qngU1rkfR2Vke3mlkx0EEWUNellT12wDqg0oICs3Cg3tqatYVKPLLHE

<https://weather.com/de-DE/wissen/umwelt/news/2019-12-03-pottwal-strandet-in-schottland-mit-riesiger-plastikmull-kugel-im?fbclid=IwAR0heeRgcJvTFvdF1kD1NpPKb8oYmFlvNWN57V67q7oZiWWQj-yGWsOnDjk>

Ireland

<https://www.rte.ie/news/2019/1202/1096518-sperm-whale-dies-with-100kg-of-plastic-in-its-stomach/>

https://m.facebook.com/story.php?story_fbid=3094183547277293&id=257558294273180

Netherlands

https://l.facebook.com/l.php?u=https%3A%2F%2Ftheanimalreader.com%2F2019%2F12%2F05%2Fstranded-whale-dies-with-a-stomach-full-of-plastic%2F%3Ffbclid%3DIwAR2d2j8VCluIB1hwPHts2_do5zemjzcvBreXDZvLCOLO05QEI68PS1Vok0&h=AT3kP5NJ-vaEit8zFg5qDeXcsyaClrV6RFDVEHq4GKhDCA12fN5_mwEX-83MScy3jIJuOwKQdAEHsmDIZg7VTJjtc2FvGC98erJGxcQ1eE19KTG1Q3JOPC847U3K5rlzgK6TJg

Poland

<https://kopalniawiedzy.pl/kaszalot-spermacetowy-Harris-Hebrydy-Zewnetrzne-stranding-plaza-smiecie-odpady-sieci-widmo-SMASS,31116?fbclid=IwAR2RbzEd9OxXyP6SCxekrvgbt4c7tPGZAFnsJb6dxsXktOg2EAJOEwjvrJc>

Spain

<https://es.euronews.com/2019/12/02/encuentran-una-ballena-muerta-con-100-kg-de-basura-en-el-estomago?fbclid=IwAR2k8EPCpPWpQP4YjNAuZ3jRN6W17XA7jOIZ0FuKw0C48ED6rlch9iLhIjU>

Turkey

<https://www.dailysabah.com/environment/2019/12/02/100-kilos-of-garbage-found-in-dead-sperm-whales-stomach>

UK

<https://www.bbc.co.uk/news/uk-scotland-highlands-islands-50621304>

<https://stv.tv/news/highlands-islands/1442829-sperm-whale-dies-with-huge-ball-of-litter-in-stomach/>

<https://www.independent.co.uk/environment/whale-dead-100kg-litter-ball-stomach-scotland-a9229111.html>

<https://news.sky.com/video/guts-explode-out-of-dead-whale-11876517>

<https://www.telegraph.co.uk/news/2019/11/30/pictures-day-30-november-2019/14-metre-sperm-whale-washed-seilebost-beach-isle-harris-outer/>

https://consent.yahoo.com/collectConsent?sessionId=3_cc-session_0dabe296-04b8-48cc-8c3e-a7a9005436f7&lang=en-gb&inline=false

https://uk.news.yahoo.com/sperm-whale-dead-plastic-litter-ball-141053177.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLnNvbS8&guce_referrer_sig=AQAAAH5HDchrE9aEOAHb602zdWVE3FCv2QCtMgbhb6fYvh0-OhGb9fsjfa0F8FPlwNgGrvG_LvWrMIZE94p8eZjk4dWIYTrWW1NGZq0B5sAHcp_S7YaCo_b-djG9CY9sb9v8wA4dLVsnmofMDnmLUnZf023pqMRTEGNks6S5vHa7a-r7

<https://www.dailymail.co.uk/sciencetech/article-7746663/Sperm-whale-220lb-huge-ball-litter-stomach.html>

<https://www.standard.co.uk/news/uk/sperm-whale-dead-scottish-island-100kg-litter-ball-a4301971.html>

<https://metro.co.uk/2019/12/02/sperm-whale-dies-220lb-litter-ball-stomach-11257794/>

<https://inews.co.uk/news/uk/whale-litter-ball-dead-isle-of-harris-scotland-plastic-waste-1329756>

<https://www.itv.com/news/2019-12-02/washed-up-whale-had-more-than-100kg-of-litter-in-its-stomach/>

<https://www.thescottishsun.co.uk/news/5017515/sperm-whale-dead-harris-luskentyre-beach-plastic/>

<https://www.scotsman.com/heritage/horrific-case-of-sperm-whale-washed-up-in-outer-hebrides-with-100kg-of-rubbish-in-stomach-1-5055469>

https://www.heraldscotland.com/news/18074096.sperm-whale-washed-scottish-beach-100kg-litter-ball-stomach/?fbclid=IwAR2LnXbEo_Wpkq38QRU0q2_SYdQOyEhtN_COGJXvrtsCOV8PhXojqN9-C8s

https://www.dailyrecord.co.uk/news/scottish-news/shocking-pictures-show-whale-starved-21003939?fbclid=IwAR18SKfdnrSKk6vQqvHHRKc_gTUabe-a8w0l_OIWfegQl0FtiWxEviQrAYE

<https://www.pressandjournal.co.uk/fp/news/highlands/1900985/sperm-whale-washed-up-in-the-western-isles-dies/>

<https://www.carvemag.com/2019/12/sperm-whale-dies-with-100kg-of-plastics-a-litter-in-stomach/>

USA

<https://edition.cnn.com/2019/12/02/world/dead-sperm-whale-ball-of-debris-scli-intl-gbr/index.html>

<https://www.nytimes.com/2019/12/02/world/europe/harris-beached-whale.html>

<https://www.washingtonpost.com/science/2019/12/02/dead-sperm-whale-had-pounds-garbage-its-stomach-including-rope-plastic-gloves/>

<https://www.newsweek.com/dead-sperm-whale-220-pounds-plastic-stomach-beach-1475007>

<https://nypost.com/2019/12/02/sperm-whale-found-dead-with-220-pound-litter-ball-in-its-belly/>

<https://abcnews.go.com/International/sperm-whale-found-dead-scotland-beach-220-pounds/story?id=67437630>

<https://people.com/pets/sperm-whale-found-dead-200-pounds-litter-in-stomach/>

<https://eu.usatoday.com/story/news/world/2019/12/02/scottish-whale-found-dead-220-pound-ball-garbage-stomach/4350303002/>

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<https://www.livescience.com/dead-sperm-whale-trash-belly.html?fbclid=IwAR0JNpXPw1XgGN9ibglRpkuyETX-9P6mcXwL9eqlSGIXgpGhPMurItEYXQ>

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<https://www.ibtimes.com/sperm-whale-dead-scotland-beach-220-pounds-trash-stomach-2877570>

14.9 Conferences/meetings

- 2nd of February, Andrew attended the Marc meeting by phone
- 20th to 21st February, Ellie gave a presentation on SMASS and the SEA project in the Citizen Science session at Scotland's International Marine Conference in Glasgow.
- 6th to 7th of March Andrew attended the Marine Mammal Symposium organised by Marine Scotland, Victoria Quay, Edinburgh.
- 12th to 13th March, Ellie also attended the Cefas/Defra bycatch workshop last month ('Hauling up solutions') ZSL, London and presented on the SEA project.
- 8th to 11th April and 24th to 26th June Andrew Brownlow, Lonneke IJsseldijk and Sandro Mazzariol organised two ASCOBANS/ACCOBAMS meetings in Padua veterinary school to harmonise necropsy sampling protocols between member states.
- 16th April and 17th June, Andrew and Ellie attended an EMFF progress meeting in Glasgow
- 27th May Andrew taught a module on Marine Strandings for the Applied Epidemiology and Surveillance section of the Edinburgh University online Conservation Medicine MSc programme.
- 24th July Andrew attended the Scottish Marine Working Group Meeting at SNH Battleby.
- 8th of August Andrew and Ellie meeting at SMRU for MASTS Super DTP PhD proposal (which was submitted successfully).
- 13th of August, Andrew attended meeting at SAMS on beaked whale investigation and MASTS Super DTP PhD proposal (which was also submitted successfully).
- 15th to 16th of August Andrew, Nick, Mariel and Geoff met with Sam Holland to discuss MVetSci Project with Edinburgh University and ourselves on bacterial isolate data from marine mammals.
- 28th of August Andrew had a meeting at Stirling with Epi Unit for Sandy Carmichaels Data mining PhD) (Running Oct 2019-2021).
- 12th of September Andrew meeting at ZSL with CSIP.
- 17th to 19th of September Andrew was an 'Invited expert' at ASCOBANS.

- 24th September Andrew, Nick and Mariel held a meeting with David Lusseau Professor of Behavioural Biology University of Aberdeen, with visiting PhD student Mingming Liu from the Institute of Deep-sea Science and Engineering, Chinese Academy of Sciences. To discuss setting up a stranding network for China's south coast. In addition, Davina Derous Post Doc Researcher on potential collaborations related to population consequence of disturbance COD (Davina developing single-cell transcriptomics for adipocytes).
- 2nd of October Andrew and Mariel attended the MASTS conference in Glasgow.
- 25th to 27th October Ellie was involved in a disentanglement training event with David Mattila.
- 28th to 29th October Ellie was involved in a UAV/drone surveillance training event with Oceans Unmanned.
- 29th to 30th October Mariel gave a talk entitled “Dead useful?!” The challenges and pathology of marine mammal population monitoring through surveillance of stranded animals. To the Spatial and Population Ecology Working Group, Institute of Biodiversity Animal Health & Comparative Medicine. Glasgow University.
- 11th to 14th November Geoff Foster gave a talk on zoonotic hazards from man’s evolving relationship with marine mammals at the Federation of Infection Societies Conference in Edinburgh.
- 20th of November, Andrew attended the Underwater Sound Forum, VQ, Edinburgh.
- 22nd of November Ellie gave a SEA project update presentation given at the Bycatch Focus Group meeting, Newcastle.
- 27th of November, Ellie gave an Entanglement lecture at SAMS, Oban.
- 3rd of December Andrew was Invited participant to the Marine mammal Welfare workshop, London.
- 7th to -12th Nick, Andrew, Mariel and Ellie all attended and presented at the World Marine Mammal Conference, Barcelona, Spain.

14.10 Other collaborations

- Marie Petitguyot a Masters’ graduate from the Université Pierre et Marie Curie - UPMC Paris had an internship with the SMASS from the 11th of February to the 9th of May.
- Sam Holland a vet from APHA started an MVetSci Project with Edinburgh University and ourselves on bacterial isolate data from marine mammals.
- Nick submitted his Master’s thesis “ The lesion profile of cetaceans diagnosed with neurobrucellosis in Scottish waters 1990 to March 2019” to The University of Edinburgh in October.



Figure 58: Marie Petitguyot from Université Pierre et Marie Curie - UPMC Paris, examining a harbour porpoise in February 2019

- Mariel and Andrew completed a commissioned report for Natural Resources Wales analysing UK West Coast Harbour Porpoise (*Phocoena phocoena*) strandings (in publication)
- SCOS report on Pinniped strandings in Scotland 2009-2018 for SMRU

14.11 Website and digital media

Facebook and Twitter pages were set up in October 2012. We post regular stranding reports, selected photos and requests for information on strandings on both. Feedback has generally been good, at the end of February 2020 Facebook has nearly 18000 likes, and Twitter has over 1400 followers. Facebook is still a valuable resource for the reporting of strandings to the scheme and both are useful for the disseminating information.

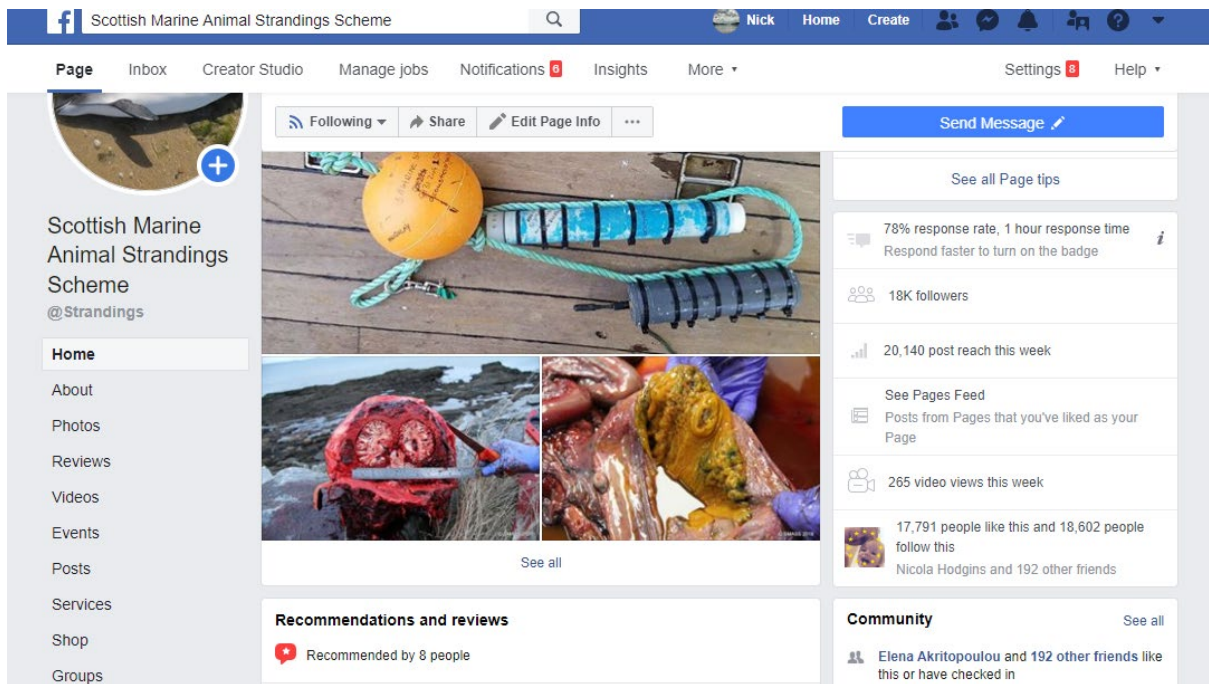


Figure 59: Facebook front page, Feb 2020.

14.12 Data and sample requests

These are either part of on-going collaborations or one off requests for data and or samples.

14.12.1 *Samples sent*

- 04/04/19 samples sent for morbillivirus and herpesvirus as part of Nick's Msc to Dr Mara Rocchi Moredun Institute.
- 04/04/19 M919/18 Cuvier's beaked whale sample for genetic analysis, Emma Carroll and Aubrie Onoufriou, SMRU.
- 14/05/19 turtle skin samples Rod Penrose Marine Environmental Monitoring, Wales.
- 21/05/19 skin sample from Lulu M4/16 killer whale for stable isotope analysis, Roisin Pinfield, School of Biological, Earth and Environmental Sciences, University College Cork, Ireland.
- 20/06/19 samples of beaked whale tissues for stable isotope & Genetic analysis Kerri Smith Smithsonian Institution Predoctoral Fellow Wildlife Ecology and Conservation Lab Environmental Science and Engineering Program University of Texas at El Paso.
- 17/09/19 Mysticete skin and muscle samples for genetic analysis. Per Palsbøll Professor of Marine Evolution and Conservation Groningen Institute of Evolutionary Life Sciences University of Groningen. The Netherlands.

14.12.2 *Data sent*

- 11/01/2019 data on beaked whale strandings in December. Wojtek Bachara, Independent beaked whale specialist, Poland.

- 07/01/2019 Data on harbour seal strandings Skye, Kintyre, Orkney. Monica Arso/ Ailsa Hall SMRU
- 01/03/2019 Data on harbour porpoise strandings east coast (BND attack vs non BND attack for presentation Marine symposium) Ewan Edwards/Pablo Chevallard, Marine Scotland.
- 04/03/2019 data on Orkney seal strandings, Brian Ribbands Orkney Field Club.
- 04/04/19 data on samples sent for morbillivirus and herpesvirus as part of Nick's Msc to Dr Mara Rocchi Moredun Institute.
- 04/04/19 M919/18 data on Cuvier's beaked whale sample for genetic analysis, Emma Carroll and Aubrie Onoufriou, SMRU.
- 17/04/19 data on COD in cetaceans and seals Nikki Taylor JNCC.
- 25/04/2019 Data on harbour seal strandings Skye, Kintyre, Orkney. Monica Arso/ Ailsa Hall SMRU.
- 13/05/2019 PM report on M195/19 live stranded dolphin Quensdale Karen Hall, SNH.
- 06/06/2019 data on specimens sent to Zena Timmons NMS.
- 16/07/19 data on specimens sent the National Museum of Scotland to Georg Hantke National Museum of Scotland.
- 17/07/19 data on seal strandings Skye, Kintyre, Orkney, Monica Arso / Ailsa Hall SMRU.
- 23/07/19 data on seal strandings other locations March 2018 - March 2019 Monica Arso / Ailsa Hall SMRU.
- 23/07/19 Location of strandings Islay for collection trip. Georg Hantke National Museum of Scotland.
- 25/07/19 Metadata 8 cetacean species on cases from which SMRU have blubber. Joanna Kershaw SMRU.
- 06/09/2019 data on recent Sowerby's beaked whale strandings. Wojtek Bachara Independent beaked whale specialist.
- 16/09/2019 Marine mammal isolate data Sam Holland MVetSci Project with Edinburgh University.
- 24/09/19 data on mysticete skin and muscle samples for genetic analysis. Per Palsbøll Professor of Marine Evolution and Conservation Groningen Institute of Evolutionary Life Sciences University of Groningen. The Netherlands.
- 02/10/19 data on seal strandings, Monica Arso / Ailsa Hall SMRU.
- 28/10/19 data on data on Sowerby's beaked whale strandings, Georg Hantke National Museum of Scotland.

14.13 Collaborators

- Dr Mark Dagleish 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.
- Professor 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.
- Mycoplasma dept., Animal and Plant Health Agency, New Haw, Addlestone, Surrey, KT15 3NB. Identification of *Mycoplasma sp.* isolates from marine mammals.
- Emma-Jane Dale 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 Institute for Terrestrial and Aquatic Wildlife Research (ITAW)
- University of Veterinary Medicine Hannover, Germany. Examination of ear bones using scanning and transmission electron microscopy for indirect quantification of hearing ability in mass stranded pilot whale.
- Scottish Salmonella Reference Laboratory – perform typing of *Salmonella* isolates
- Milaja Nykanen, PhD Candidate School of BEES University College Cork Ireland for bottlenose dolphin mitogenome work.
- Eileen Harris Senior Curator Parasites & Vectors Division Department of Life Sciences Natural History Museum Cromwell Road London SW7 5BD
- Natalia Fraija-Fernandez Cetacean helminth post doc research Parasites & Vectors Division Department of Life Sciences Natural History Museum Cromwell Road London SW7 5BD
- Kristina Steinmetz student grey and harbour seals for genetic analysis GMIT Galway Ireland.
- Kerri Smith Smithsonian Institution Predoctoral Fellow Wildlife Ecology and Conservation Lab Environmental Science and Engineering Program University of Texas at El Paso Sowerby's beaked whale tissues for stable isotope analysis
- Monica Arso/ Ailsa Hall SMRU harbour seal declines.
- Lonneke L. Ijsseldijk, BSc Project coordinator Cetaceans Faculty of Veterinary Medicine, Department of Pathobiology Utrecht University Yalelaan Utrecht The Netherlands. Bacteriology
- Emma Carroll / Aubrie Onoufriou / Morten Olsen SMRU beaked whale genetic analysis.

Section 15: Staff and facilities

SMASS currently has four members of staff. Andrew Brownlow the veterinary pathologist and has managed the project since 2009. Nick Davison is the stranding coordinator and undertakes the microbiology for the scheme. He joined the team in October 2012 and has been involved with marine mammal pathological investigation for 33 years. Mariel ten Doeschate joined as a marine strandings administration assistant in September 2014. Ellie MacLennan Harrison joined in April 2018 to run the Scottish Entanglement Alliance (SEA) project.

Closure of Disease Surveillance Centre (DSC) at Drummondhill, Inverness caused a significant constraint to the operational capacity of the programme. The DSC facility had provided a base of operations, including necropsy, laboratory and sample archive storage capacity to the

SMASS programme since inception, however following a review of veterinary surveillance provision by SRUC the facility was closed in May 2019. The SMASS team were provided with alternative offices at An Lochran, on the University of the Highlands and Islands campus. This site also provided access to a Cat 3 laboratory which enabled microbiological components of the work to continue. Marine Scotland also provided funding for a mobile investigation unit—a bespoke conversion of a covered trailer (Figure 60 & Figure 61) which provides a degree of necropsy capability for smaller cetaceans and pinnipeds, operational support for field post mortems, and a base for volunteer training. Unfortunately, completion of the replacement site which would serve as a base for the mobile unit, and offer some necropsy and tissue storage capability and was significantly delayed, resulting in a significant limit to necropsy capacity for the remaining eight months of the year. The site, at Alcaig near Conan Bridge site, finally became operational in February 2020, however there remains a number of cases from 2019 frozen awaiting necropsy.



Figure 60: Mobile necropsy trailer, funded by Marine Scotland



Figure 61 Inside of trailer, showing necropsy table, sink and lab area

Section 16: Acknowledgments

The successful operation of a strandings project over the 10,000 miles comprising Scotland's coastline is only possible with assistance from a large number of individuals and organisations. These volunteers assist SMASS staff in the identification, recovery, storage and transport of stranded animals. We are immensely grateful to all who helped us out in 2019, however particular thanks are due to the Hesselhead Wildlife Rescue Trust, Karen Hall and the Scottish Natural Heritage team on Shetland, Georg Hantke of the National Museums of Scotland, British Divers Marine Life Rescue medics, the Hebridean Whale and Dolphin Trust and Mark Dagleish at the Moredun Research Institute.

We are also grateful to all our trained stranding volunteers who have ventured out in all weathers to collect photographs, data and samples from some much-decomposed animals.

Thanks also to Kelly Macleod, James McKenzie, Helene Gray, Pippa Garrard, Richard Riddell, Malcolm Ogilvie, Brian Ribbands, David Nairn, Walter Innes, Monika Carrie, Mary Harman, Jenny Grant, Val Gall, Lee Watson, Corrine Gordon, Imogen Sawyer, Catrin and Dan Fowden, Stephen Littlewood, Robert Eisler, Mark Fuller, Karen Hall, Russel Neave, Emma Neave-Webb, Elizabeth Moutr, Kate Duffus, Monica Arso Civil, Stephanie Cope, Janet Marshall, Stephen

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END