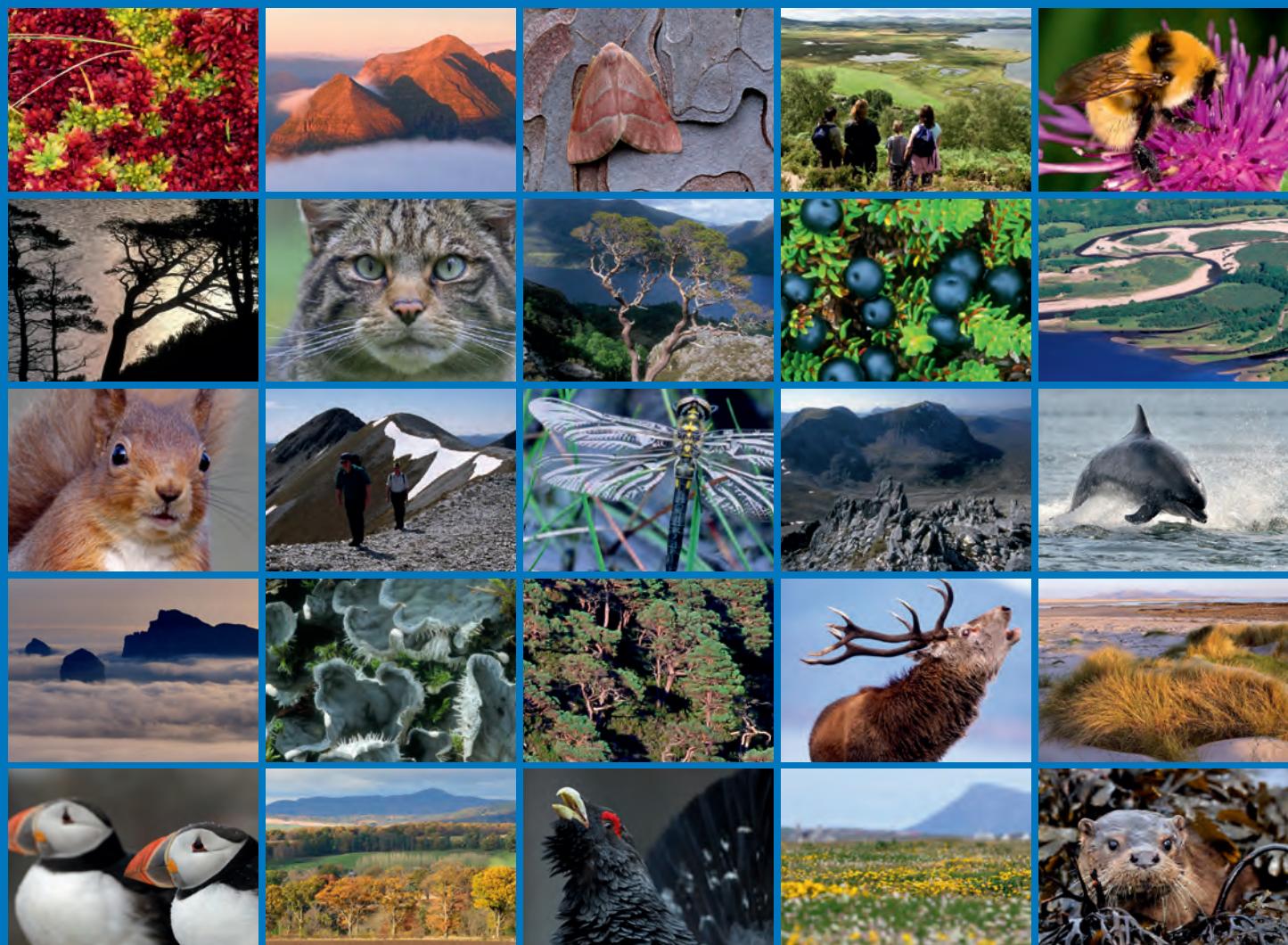


Surveys of harbour (common) seals in Orkney in August 2010





Scottish Natural Heritage
All of nature for all of Scotland

COMMISSIONED REPORT

Commissioned Report No. 439

Surveys of harbour (common) seals in Orkney in August 2010

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COMMISSIONED REPORT Summary

Surveys of harbour (common) seals in Orkney in August 2010

Commissioned Report No. 439

Contractor: St Andrews University Sea Mammal Research Unit

Year of publication: 2011

Background

Recent surveys carried out by SMRU have documented a continuing decline of more than 60% in the number of harbour seals in Orkney. A survey of Orkney harbour seals was planned for 2009 but it was not completed due to adverse weather conditions. The part of the survey that was completed indicated that harbour seal numbers were continuing to decline. In order to establish the final scale of the decline a further survey was undertaken in 2010 that covered the whole of the Orkney archipelago.

Main findings

- In Orkney in August 2010, 2,688 harbour seals were counted compared with 2,867 in August 2008, a reduction of 6.2%. In August 2009, only some of the northern isles of Orkney were surveyed, including Rousay and surrounding islands, Westray, part of Eday, Sanday, North Ronaldsay, Faray, Fara Holm, Rusk Holm, the Green Holms, Shapinsay and part of Stronsay. In August 2010, 1,119 harbour seals were counted in these areas compared to 1,384 in 2009, 1,354 in 2008, 1,538 in 2007, 1,859 in 2006 and 3,824 in 2001.
- The harbour seal numbers in Orkney continue to decline but it appears that the rate of decline is slowing.

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SUMMARY

In August 2010, the Sea Mammal Research Unit, University of St Andrews, carried out a survey of harbour seals around Orkney. This survey was to confirm the numbers of harbour seals in Orkney, to ascertain whether or not the previously recorded decline in numbers was continuing and if so, to determine the rate of decline. A small section of the north coast of Scotland, between Duncansby Head and just west of Dunnet Head, was also surveyed. This survey was in place of the incomplete survey of Orkney in August 2009.

In Orkney in August 2010, **2,688** harbour seals were counted compared with **2,867** in August 2008, a reduction of 6.2%. In August 2009, only some of the Northern Isles were surveyed, including: Rousay and surrounding islands, Westray, part of Eday, Sanday, North Ronaldsay, Faray, Fara Holm, Rusk Holm, the Green Holms, Shapinsay and part of Stronsay. In August 2010, 1,119, harbour seals were counted in these north Orkney areas compared with 1,384 in 2009, 1,354 in 2008, 1,538 in 2007, 1,859 in 2006 and 3,824 in 2001.

These results imply that harbour seal numbers in Orkney continue to decline but at a slower rate than in previous years.

Weather again interrupted the 2010 Orkney survey. All of the 9th was lost to poor weather and surveying on the 11th had to be curtailed early as rain set in.

INTRODUCTION

This report summarises the results from a survey of harbour seals in Orkney and on the north coast of Scotland between Duncansby Head and Dunnet Head. The survey was to determine whether or not the decline in harbour seal numbers in Orkney continued and was in place of the previous, incomplete, survey in August 2009.

Harbour (or common) seals are included in Annex II of the European Union's Directive 92/43/EEC, commonly known as the Habitats Directive. The Directive's aim is to encourage the maintenance of biodiversity through the conservation of natural habitats and wild fauna and flora in the territories of Member European States. A number of sites around the Scottish coast have been selected as Special Areas of Conservation (SAC) for harbour seals, with selection based largely on information collected by the Sea Mammal Research Unit (SMRU) since 1988.

The Sea Mammal Research Unit undertakes routine surveys of harbour and grey seals around Scotland and part of England. These surveys provide the basis of the information the Natural Environment Research Council is obliged to submit to the Scottish Government and the Department of the Environment, Food and Rural Affairs under the terms of the Conservation of Seals Act 1970 on the size, distribution and status of UK seal populations. The most recent advice can be found at: <http://www.smru.st-andrews.ac.uk/pageset.aspx?psr=411>. The surveys also provide information to Scottish Natural Heritage that is used to satisfy Scottish obligations under the EU's Habitats Directive on reporting the conservation status of seals in SACs in Scotland.

In the UK, harbour seal population surveys are carried out during their annual moult, in August. In Scotland, the entire coast is surveyed approximately on a four to five year cycle, although annual surveys are carried out in the Moray Firth and the Firth of Tay. Due to the declines in harbour seal numbers in Orkney and Shetland, surveys in Orkney have been carried out annually since 2006. Harbour seals in the Inner Moray Firth are also surveyed during their breeding season, between mid June and mid July. Grey seals hauled ashore are also counted during all these surveys, providing additional information on their summer distribution. Grey seal numbers can be highly variable from day to day during the summer months.

Since 2007, high resolution digital still photographs were taken of most groups of harbour and grey seals and were used to correct numbers and species identity of seals in the haulout groups. The data provided in this report are obtained from a combination of counts from the thermal images and from digital still images.

METHODS

The Sea Mammal Research Unit (SMRU) carried out surveys of harbour seals by helicopter using a thermal imaging camera, following the standard SMRU survey protocol:

- Surveys were restricted to within two hours either side of low tides occurring between 12:30 and 19:30 (approximately).
- Surveys were restricted to the August moult.
- There was no surveying on rainy days.
- High resolution digital photographs were taken of most groups of harbour seals on shore and of almost all groups of grey seals.

RESULTS

The distribution of harbour seals (at 1km resolution) in Scotland from the most recent surveys between 2007 and 2010 is shown in Figure 1 with grey seal distribution in Figure 2. Figure 3 shows the trends in numbers of harbour seals counted in Scottish seal management areas since the late 1980s.

The numbers of harbour seals counted within the areas of Scotland surveyed in 2010 are as follows:

- Table 1 shows counts of harbour seals in the subregions of Orkney surveyed in 2010 with counts of grey seals in Table 2. Figure 4 shows the distribution of harbour seals in subregions of Orkney with grey seals in Figure 5. The 2010 harbour seal count in Orkney was 2,688, 6.2% lower than the last complete count in 2008.
- Counts of harbour seals on Sanday are in Table 3 with grey seal numbers in Table 4. The grid references defining different areas on Sanday are in Table 5. In 2010, only 116 harbour seals were counted within the Sanday SAC representing 0.6% of the Scottish harbour seal count and 0.5% of the UK harbour seal count (using the 2009 count for east England). The 2010 harbour seal count for the whole of Sanday (131) was only 8% of the highest count of 1,670 in 1997.
- Counts of harbour seals in the Moray Firth are in Table 6 with grey seal numbers in Table 7. The grid references defining the different areas within the Moray Firth are in Table 8. The trajectory of harbour seal counts (using mean values if more than one count in any year) in the Moray Firth, with the conspicuous increase in 2010, is shown in Figure 6. In August 2010, 219 harbour seals were counted within the Dornoch Firth SAC representing 1.1% of the Scottish harbour seal count and 0.9% of the UK harbour seal count (using the 2009 count for east England).
- Counts of harbour seals in the Firth of Tay are in Table 9 with grey seal numbers in Table 10. The grid references defining areas within the Firth of Tay are in Table 11. The trajectory of harbour seal counts in the Firth of Tay is shown in Figure 11. In 2010, 124 harbour seals were counted within the SAC representing 0.6% of the Scottish harbour seal count and 0.5% of the UK harbour seal count (using the 2009 count for east England). The August 2010 count in the Firth of Tay was marginally higher than the lowest ever count from 2009.

OVERVIEW

Orkney

The number of harbour seals counted in Orkney in 2010 (2,688) was 6.2% lower than the last complete count in August 2008 (Table 1) and 7.2% lower than the aggregate count from August 2009 (using values from 2008 for missing subregions).

The 2010 survey of Orkney was complete. The number of harbour seals in the subregions surveyed (Rousay and islands, Westray, Sanday, North Ronaldsay, Faray, Fara Holm, Rusk Holm, the Green Holms) in 2010 was 1,119 compared with 1,384 in 2009 ,1,354 in 2008, 1,538 in 2007, 1,859 in 2006 and 3,824 in 2001 (Table 3).

Moray Firth

Numbers of harbour seals in all parts of the Moray Firth in August 2010 were considerably greater than counts from recent previous years (Table 6, Figure 6), possibly indicating the beginning of a recovery. The last time numbers were greater than the August 2010 count was in August 1997, just after the decline commenced.

Firth of Tay

In the Firth of Tay, only 124 harbour seals were counted in August 2010 (Table 9). This is the second lowest count for the Firth of Tay following the lowest 2009 count of 111. There is no apparent recovery of the dramatic decline in this harbour seal SAC (Figure 7).

SURVEYS PLANNED FOR 2011

In August 2011 we intend to survey harbour seals on the east coast of Scotland, from the Farne Islands to Cape Wrath and in the Outer Hebrides. The east coast survey will provide an update to 2007 numbers, particularly in areas being considered for renewable energy production (wind, tidal and wave). The Outer Hebrides survey is to provide an update to the 2008 survey, particularly in relation to the potential selection of a Special Area of Conservation in the island group and the Seal Conservation Area (harbour seals) recently invoked. These surveys will have been made possible with additional funding provided by SNH.

TABLES

Table 1. The number of harbour seals counted in subregions of Orkney. Subregions are numbered in Figure 3, showing harbour seal distribution in Orkney. All surveys were carried out in August, during the harbour seal annual moult. Surveys from 1991 onwards were by helicopter using a thermal imaging camera. These later surveys covered the entire coastline and were restricted to within two hours of low tide. In 2006 and 2008, some of the Northern Isles were resurveyed, including the SAC on Sanday. Numbers for subregions surveyed twice in one year are in brackets. Numbers in red italics are for subregions which were at least partly surveyed in sub-optimal conditions. The 2009 total is a combined count from 2008 and 2009.

Orkney Subregion	Aug 1985*	Aug 1989*	Aug 1993	Aug 1997	Aug 2001	Aug 2006	Aug 2007	Aug 2008	Aug 2009	Aug 2010
1 Mainland, N & E	558	686	950	592	349	435	310	314	<i>124</i>	255
2 Mainland, S & W	131	273	131	708	384	387	286	186		281
3 S Ronaldsay & Burray	212	275	377	390	511	132	100	62		104
4 Hoy	227	304	341	530	419	204	178	158		114
5 Cava, Flotta, Rysa, Fara, Barrel of Butter	855	690	801	575	596	359	258	164		180
6 Shapinsay	204	308	287	185	125	118	83	89	114	93
7 Rousay, Wyre, Egilsay, Eynhallow, Scokness	1098	1087	185	853	769	393	356	323	390	377
8 Graemsay	3	-	8	17	13	33	13	0		0
9 Stronsay	426	487	659	658	657	399	333	<i>271</i> (294)	<i>204</i>	257
10 Eday & Calf	44	43	55	76	184	59	66	65	<i>44</i>	62
11 Sanday	762	1108	1661	1670	1247	519 (303)	470	312 (316)	349	131
12 Westray & Papa	597	586	776	825	1326	487 (529)	385	339 (261)	312	304
13 Auskerry	271	13	75	271	75	3	2	0		0
14 North Ronaldsay	244	264	417	478	341	246	205	<i>275</i> (239)	204	195
15 M & L Green Holms	0	-	1	2	2	49	30	15	12	19
16 Sweyn Holm, Gairsay	317	421	180	105	37	156	89	108		187
17 Lingas, Huip, Spurness	48	63	47	35	12	9	0	1		0
18 Faray, Fara Holm, Rusk Holm	6	3	6	9	14	10	9	1	3	0
19 Copinsay	0	-	1	9	8	0	0	0	<i>0</i>	0
20 Switha, Swona, Stroma	704	526	914	535	683	240	206	184		129
21 Pentland Skerries	0	-	1	0	0	0	0	0		0
Total	6427	7137	7873	8523	7752	4256	3379	2867	(2897)	2688

*In 1985 and 1989, surveys carried out jointly between the University of Aberdeen and the Sea Mammal Research Unit. These were visual surveys by helicopter, using conventional hand-held photography. These two surveys did not cover the entire coast of Orkney and were not restricted to within two hours before and after low tide.

Numbers in brackets are repeat counts of Westray and of the SAC on Sanday in 2006 and of Sanday, Stronsay, Westray and North Ronaldsay in 2008. Only the first count is included in the total. Numbers in red are incomplete totals for the subregion.

Table 2. Grey seals counted in Orkney during the August surveys of harbour seals (in Table 1). Subregion numbers refer to the areas in Figure 4. Note that grey seal numbers can be highly variable during the summer months. Surveys from 1991 onwards were by helicopter using a thermal imaging camera they covered the entire coastline and were restricted to within two hours of low tide. Repeat counts for subregions are in brackets. Numbers in red italics are for subregions which were at least partly surveyed in sub-optimal conditions. The 2009 total is a combined count from 2008 and 2009.

Orkney Subregion	Aug 1985*	Aug 1989*	Aug 1993	Aug 1997	Aug 2001	Aug 2006	Aug 2007	Aug 2008	Aug 2009	Aug 2010
1 Mainland, N & E	5	37	218	772	122	447	168	261	<i>91</i>	223
2 Mainland, S & W	1	2	58	165	41	10	36	53		76
3 S Ronaldsay & Burray	2	73	99	124	0	58	39	38		231
4 Hoy	55	41	248	214	143	307	218	365		264
5 Cava, Flotta, Rysa, Fara, Barrel of Butter	31	73	14	146	1	263	165	111		105
6 Shapinsay	2	4	41	204	45	250	30	88	78	43
7 Rousay, Wyre, Egilsay, Eynhallow, Scockness	37	175	93	298	94	393	386	437	314	253
8 Graemsay	0	2	0	3	14	16	3	0		0
9 Stronsay	150	131	550	1788	563	1336	936	<i>1665 (404)</i>	<i>1018</i>	1430
10 Eday & Calf	20	51	236	223	132	70	255	558	<i>61</i>	111
11 Sanday	84	255	1182	1888	88	<i>462 (323)</i>	646	<i>452 (340)</i>	393	107
12 Westray & Papa	104	122	374	764	347	<i>419 (339)</i>	879	<i>1057 (1030)</i>	681	704
13 Auskerry	25	20	79	99	20	133	100	69		188
14 North Ronaldsay	0	148	637	474	397	1076	1028	<i>385 (793)</i>	556	235
15 M & L Green Holms	50	40	27	23	67	21	95	23	64	32
16 Sweyn Holm, Gairsay	15	282	13	30	5	13	20	168		83
17 Lingas, Huip, Spurness	5	158	315	743	111	220	224	290		647
18 Faray, Fara Holm, Rusk Holm	33	81	129	165	520	529	486	506	654	283
19 Copinsay	-	15	98	244	11	160	151	208	<i>277</i>	390
20 Switha, Swona, Stroma	0	1029	1438	29	117	2216	554	705		1268
21 Pentland Skerries	-	520	972	434	75	1180	937	910		2410
Total	619	3259	6821	8840	2913	9579	7356	8021	(7644)	9083

*In 1985 and 1989, surveys were carried out jointly between the University of Aberdeen and the Sea Mammal Research Unit. These were visual surveys by helicopter, using conventional hand-held photography. The surveys did not cover the entire coast of Orkney and were not restricted to within two hours before and after low tide.

Numbers in brackets are repeat counts of Westray and of the SAC on Sanday in 2006 and of Sanday, Stronsay, Westray and North Ronaldsay in 2008. Only the first count is included in the total. Numbers in red are incomplete totals for the subregion.

Table 3. Counts of harbour seals on Sanday, Orkney. The areas making up the East Sanday SAC are within the bold lines. Visual helicopter surveys in 1985 and 1989 were in collaboration with the University of Aberdeen. Numbers from breeding season surveys are of adults only. 1979 survey by boat all others by helicopter. TI = Thermal image count; vis = visual; br= breeding; mo= moult. Repeat counts are in brackets. Data are from the Sea Mammal Research Unit.

Section of Sanday coast	Date and type of survey												
	*11 July 79	10 Jun 85	6 Aug 85	14 Aug 89	5 Aug 93	3 Aug 97	24 Jun 98	18 Aug 01	5 Aug 06	10 Aug 07	14 Aug 08	22 Aug 09	10 Aug 10
	br vis	br vis	mo vis	mo vis	mo TI	mo TI	br TI	mo TI	mo TI	mo TI	mo TI	mo TI	mo TI
Lamba Ness North Mire to Strangquoy Taing	22	24	32	54	10	68	18	71	12	14	30	21	4
Spur Ness Strangquoy Taing to Stove	0	0	0	0	0	0	0	0	3	5	0	0	0
Quoy Ness Stove to Backaskaill	19	9	60	113	147	121	107	13	24	16	22	13	11
Kettletoft Church to Pier	7	22	0	5	2	1	98	30	0	0	0	0	1
Els Ness Kettletoft to Lang Taing	50	13	89	126	148	98	60	59	14	31	14	30	13
Tres Ness Lang Taing to Fidge	38	0	26	30	36	31	7	46	10	7	0	0	0
Lopness Fidge to Lopness	2	0	9	0	1	2	0	0	0	0	0	0	1
Start Point Lopness to Saltees	7	4	30	85	217	218	95	113	98	87	43	42	18
Tofts Saltees to Sandquoy	15	15	45	78	96	127	99	78	36	2	12	45	8
Taings Sandquoy to Taing of Crudy	15	76	23	67	118	213	250	194	28	40	45	17	7
Otterswick Taing of Crudy to Helliehow	37	132	131	278	313	314	306	201	26	49	48	82	32
Whitemill Helliehow to Whitemill Bay	0	3	8	0	122	37	10	68	82	66	39	0	16
The Riv Whitemill Bay to Quoy Banks	11	43	0	0	34	0	2	35	6	0	0	0	0
Holms of Ire Quoy Banks to North Bay	0	72	286	272	417	440	131	328	179	153	59	99	20
Brough North Bay to North Mire	0	0	0	0	0	0	0	11	1	0	0	0	0
East Sanday SAC Total	182	380	647	941	1504	1481	1058	1152	479	435	260	315	116
SANDAY TOTAL	223	413	739	1108	1661	1670	1183	1247	519	470	312	349	131

Table 4 Counts of grey seals on Sanday, Orkney. The areas making up the East Sanday SAC are within the bold lines. Data are from the Sea Mammal Research Unit. Helicopter surveys in 1985 and 1989 were in collaboration with the University of Aberdeen. Numbers from breeding season surveys are of adults only. 1979 survey by boat all others by helicopter. TI = Thermal image count; vis = visual; br= breeding; mo= moult. Repeat counts are in brackets.

Section of Sanday coast	Date and type of survey													
	11 July 79	10 Jun 85	6 Aug 85	14 Aug 89	5 Aug 93	3 Aug 97	24 Jun 98	18 Aug 01	5 Aug 06	10 Aug 07	14 Aug 08	22 Aug 09	10 Aug 10	
	br vis	br vis	mo vis	mo vis	mo TI	mo TI	br TI	mo TI	mo TI	mo TI	mo TI	mo TI	mo TI	
Lamba Ness North Mire to Strangquoy Taing	0	0	0	3	0	0	0	0	0	2	0	5	2	
Spur Ness Strangquoy Taing to Stove	0	0	0	0	0	0	0	0	0	0	0	0	0	
Quoy Ness Stove to Backaskail	1		0	18	142	215	45	0	67	19	31	20	28	
Kettletoft Church to Pier	0	0	0	0	0	0	0	0	0	0	0	0	0	
Els Ness Kettletoft to Lang Taing	3	56	0	1	137	171	71	3	9	4	15	14	4	
Tres Ness Lang Taing to Fidge	70	0	50	105	172	481	575	2	127	141	113	57	44	
Lopness Fidge to Lopness	2	0	0	3	10	15	68	0	0	13	22	22	14	
Start Point Lopness to Saltees	26	15	2	1	101	97	177	16	47	139	139	58	6	
Tofts Saltees to Sandquoy	8	23	25	113	393	271	51	5	21	111	42	98	9	
Taings Sandquoy to Taing of Crudy	0	0	0	2	24	80	19	0	47	16	27	3	0	
Otterswick Taing of Crudy to Helliehow	15	5	5	2	0	56	25	0	44	78	7	22	0	
Whitemill Helliehow to Whitemill Bay	0	0	2	2	0	169	75	0	67	0	55	40	0	
The Riv Whitemill Bay to Quoy Banks	45	51	0	4	201	255	200	58	0	31	1	0	0	
Holms of Ire Quoy Banks to North Bay	75	43	0	1	0	76	152	4	33	92	0	54	0	
Brough North Bay to North Mire	0	0	0	0	2	2	0	0	0	0	0	0	0	
East Sanday SAC Total	224	193	84	234	1038	1671	1417	88	395	625	421	368	77	
SANDAY TOTAL	245	193	84	255	1182	1888	1462	88	462	646	452	393	107	

Table 5. Ordnance Survey grid reference co-ordinates for sections of the Sanday coast. Defining areas as rectangular ‘boxes’ facilitates extracting counts from SMRU’s harbour seal database.

Section of Sanday coast	Boundaries	
	OS eastings	OS northings
Lamba Ness North Mire to Strangquoy Taing	3606-3620	10370-10390
Spur Ness Strangquoy Taing to Stove	3595-3605	10330-10380
	3606-3609	10330-10360
Quoy Ness Stove to Backaskaill	3610-3630	10335-10370
	3631-3650	10365-10394
Kettletoft Church to Kettletoft Pier	3651-3660	10380-10395
Els Ness Kettletoft to Lang Taing	3661-3688	10365-10400
Tres Ness Lang Taing to Fidge	3689-3715	10370-10409
Lopness Fidge to Lopness	3710-3730	10410-10430
	3722-3755	10431-10445
Start Point Lopness to Saltees	3756-3795	10428-10446
Tofts Saltees to Sandquoy	3740-3770	10447-10480
Taings Sandquoy to Taing of Crudy	3720-3739	10441-10460
	3707-3719	10430-10450
Otterswick Taing of Crudy to Helliehow	3668-3706	10416-10440
	3681-3706	10441-10457
Whitemill Helliehow to Whitemill Bay	3692-3710	10458-10480
The Riv Whitemill Bay to Quoy Banks	3676-3691	10456-10490
	3666-3675	10450-10460
Holms of Ire Quoy Banks to North Bay	3640-3665	10436-10480
Brough North Bay to North Mire	3630-3664	10396-10435
	3621-3629	10378-10410

Table 6. Numbers of harbour seals in the Moray Firth (see Figure 6). Data from August aerial surveys by the Sea Mammal Research Unit.
 fw = fixed-wing aircraft; ti = helicopter thermal image survey; dig = hand-held oblique digital photography.

Location	07 Aug 1992	30 July 1993	13 Aug 1994	15 Aug 1997	11 Aug 2000	11 Aug 2002	7 Aug 2003	10 Aug 2004	13 Aug 2004	8 Aug 2005	9 Aug 2005	18 Aug 2005	4 Aug 2006	20 Aug 2006	9 Aug 2007	24 Aug 2007	13 Aug 2008	20 Aug 2008	6 Aug 2009	18 Aug 2010
Survey Method	fw	fw	fw	ti	fw	fw	fw	fw	fw	fw	fw	ti	ti	fw dig	ti dig	fw dig	ti dig	fw dig	fw dig	
Ardersier	154		221	234	191	110	205	172	232	260	143	224	210	184	134	173	167	123	277	362
Beaul Firth	220		203	219	204	66	151	175	180	119	169	94	174	178	122	170	165	135	85	140
Cromarty Firth	41		95	95	38	42	113	90	86	98	101	118	119	93	85	118	90	90	90	140
Dornoch Firth (SAC)	662		542	593	405	220	290	199	262	199	118	256	249	264	78	209	160	130	166	219
Inner Moray Firth Total	1077		1061	1141	838	438	759	636	760	676	531	692	752	719	419	670	582	478	618	861
Findhorn			58	46	111	144	167	0	98	90	58	74	63	53	63	94	69	115	73	123
Loch Fleet		16		27	33	62	56	58	70	68	70	76	79	80	78	87	87	77	65	114
Inner MF + L Fleet and Findhorn		1135	1214	982	644	982	694	928	834	659	842	894	852	560	851	738	670	756	1098	
Loch Fleet to Dunbeath		92		214		145					113	163	137	18	90	102	43	19	101	
Outer Moray Firth Total	1185*		1227*	1428		832					955	1057	989	578	941	840	713	775	1199	

*Note that the Total counts for 1992 and 1994 both include the data from 1993.

Table 7. Numbers of grey seals in the Moray Firth. Data from August aerial surveys by the Sea Mammal Research Unit.
fw = fixed-wing aircraft; ti = helicopter thermal image survey; dig = hand-held oblique digital photography.

Location	07 Aug 1992	30 July 1993	13 Aug 1994	15 Aug 1997	11 Aug 2000	11 Aug 2002	7 Aug 2003	10 Aug 2004	13 Aug 2004	8 Aug 2005	9 Aug 2005	18 Aug 2005	4 Aug 2006	20 Aug 2006	9 Aug 2007	24 Aug 2007	20 Aug 2008	6 Aug 2009	18 Aug 2010
Survey Method	fw	fw	fw	ti	fw	fw	fw	fw	fw	fw	fw	ti	ti	fw dig	ti dig	fw dig	fw dig	fw dig	fw dig
Ardersier	0		36	24	85	0	0			69	54	156	121	30	118	117	94	297	
Beaul Firth	8		2	3	8	0	0			0	1	0	6	7	0	0	0	0	2
Cromarty Firth	9		0	0	0	0				0	0	1	0	0	0	0	0	0	1
Dornoch Firth (SAC)	233		903	456	121	321	79			439	699	839	657	598	434	569	819	717	
Inner Moray Firth Total	250		941	483	214	321	79			508	754	996	784	635	552	686	913	1017	
<i>Findhorn</i>							10			0	40	21	0	56	0	67	58	58	
<i>Loch Fleet</i>							0			0	0	1	1	4	1	2	0	7	
<i>Inner MF + L Fleet and Findhorn</i>							89			508	794	1018	785	695	553	754	971	1082	
<i>Loch Fleet to Dunbeath</i>			3		6					111	60	143	42	62	499	72	635		
Outer Moray Firth Total										905	1078	928	737	615	1254	1043	1717		

Table 8. Ordnance Survey grid references for boundaries of subsections of the Moray Firth.

Location	Subsection number	OS Eastings	OS Northings
Dornoch to Dunbeath	1	2770-3170	8900-9300
Outer Dornoch (Dornoch Bridge to Tarbat Ness)	2¹	2748-2950	8810-8899
Upper Dornoch (Inveran to Dornoch Bridge)	3¹	2570-2747	8840-8980
Cromarty Firth a (Dingwall to Invergordon)	4	2550-2709	8560-8700
Cromarty Firth b (Invergordon to Sutors)	5	2710-2820	8650-8750
Beauly Firth (Beauly to Kessock Bridge)	6	2530-2664	8450-8500
Inverness Firth a (Kessock Bridge to Barmac)	7	2665-2819	8460-8599
Inverness Firth b (Rosemarkie to Sutors)	8	2730-2819	8600-8649
Nairn Coast (Barmac to Lossiemouth)	9	2820-3250	8560-8730
Moray Firth Total Area		2530-3250	8450-9300

¹ Subsections 2 and 3 comprise the Dornoch Firth SAC

Table 9. Numbers of harbour seals in the Firth of Tay harbour seal SAC (see Figure 7).

Data from aerial surveys by the Sea Mammal Research Unit.

fw = fixed-wing aircraft; ti = helicopter thermal image survey; dig = hand-held oblique digital photography.

Location	13	11	7	13	13	12	11	7	10	8	9	14	14	4	7	29	7	16
	Aug 1990	Aug 1991	Aug 1992	Aug 1994	Aug 1997	Aug 2000	Aug 2002	Aug 2003	Aug 2004	Aug 2005	Aug 2005	Aug 2005	Aug 2006	Aug 2007	Aug 2007	Aug 2008	Aug 2009	Aug 2010
Survey Method	fw	fw	fw	fw	ti	fw	fw	fw	fw	fw	ti	fw	fw dig	ti dig	fw dig	fw dig	fw dig	
Eden Estuary	31	0	0	80	223	267	341	93	78	81	95	139	90	99	79	83	22	36
Abertay & Tentsmuir	409	428	456	289	262	153	167	53	126	80	26	82	34	32	30	50	8	9
Upper Tay	27	73	148	89	113	115	51	83	134	90	80	104	91	62	64	49	45	41
Broughty Ferry	83	97	64	35	52		90	55	27	91	36	127	0	48	13	28	15	
Buddon Ness	86	72	53	0	113	109	142	66	41	34	0	0	68	66	27	8	23	
Firth of Tay Total	467	670	773	575	633	700	668	461*	459	319	326	361	342	261	287	222	111	124

*In August 2003 low cloud prevented the use of vertical photography; counts were from photographs taken obliquely and from direct counts of small groups of seals.

Table 10. Numbers of grey seals in the Firth of Tay. Data from aerial surveys by the Sea Mammal Research Unit.

fw = fixed-wing aircraft; ti = helicopter thermal image survey; dig = hand-held oblique digital photography.

Location	13	11	7	13	13	12	11	7	10	8	9	14	14	4	7	29	7	16
	Aug 1990	Aug 1991	Aug 1992	Aug 1994	Aug 1997	Aug 2000	Aug 2002	Aug 2003	Aug 2004	Aug 2005	Aug 2005	Aug 2005	Aug 2006	Aug 2007	Aug 2007	Aug 2008	Aug 2009	Aug 2010
Survey Method	fw	fw	fw	fw	ti	fw	fw	fw	fw	fw	ti	fw	fw	ti dig	fw dig	fw dig	fw dig	
Eden Estuary	0	0	16	0	10	0	25	4		11	52	19	57		14	33	0	39
Abertay & Tentsmuir	912	1546	1191	1335	1820	2088	1490	1560		939	843	508	1267		1437	483	400	1406
Upper Tay	0	0	18	20	61	64	78	50		36	46	43	22		29	26	55	98
Broughty Ferry	0	3	0	9	0	0	0	0		0	0	0	8		1	8	0	0
Buddon Ness	0	0	1	104	0	101	0	49		32	0	0	25		78	7	0	12
Firth of Tay Total	912	1549	1226	1468	1891	2253	1593	1614		986	941	570	1379		1559	557	455	1555

Table 11. Grid References for areas in the Firth of Tay.

Location	OS eastings	OS northing
Eden Estuary	3450-3520	7180-7230
Abertay & Tentsmuir Sands	3450-3570	7231-7295
Upper Tay	3180-3449	7180-7320
Broughty Ferry	3450-3519	7296-7330
Buddon Ness	3520-3570	7296-7340
Firth of Tay total	3180-3570	7180-7340

FIGURES

Figure 1. Harbour seals in Scotland by 1km squares with seal management areas. August surveys from 2007 to 2010. Data from the Sea Mammal Research Unit.

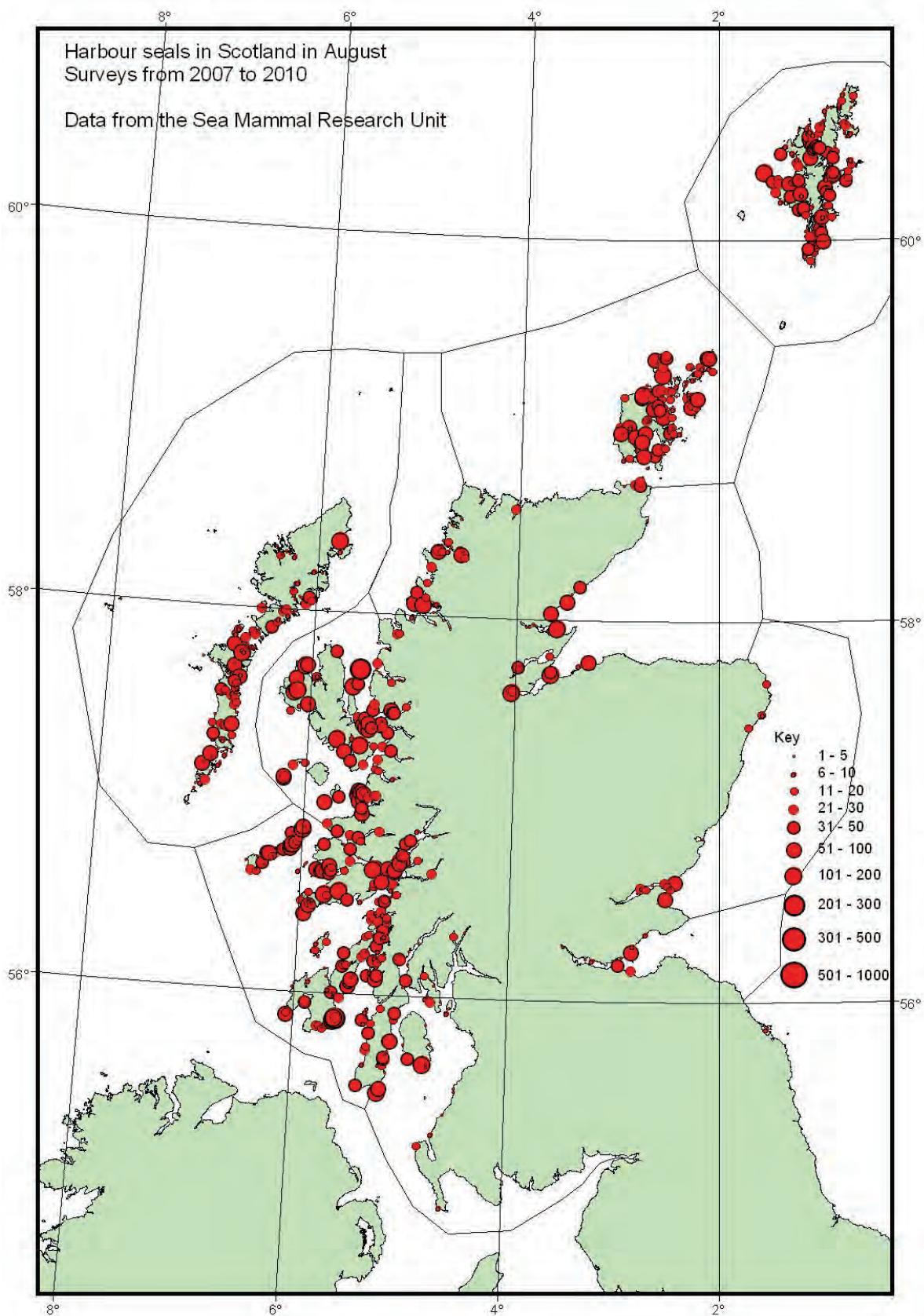


Figure 2. Grey seals in Scotland by 1km squares with seal management areas. August surveys from 2007 to 2010. Data from the Sea Mammal Research Unit.

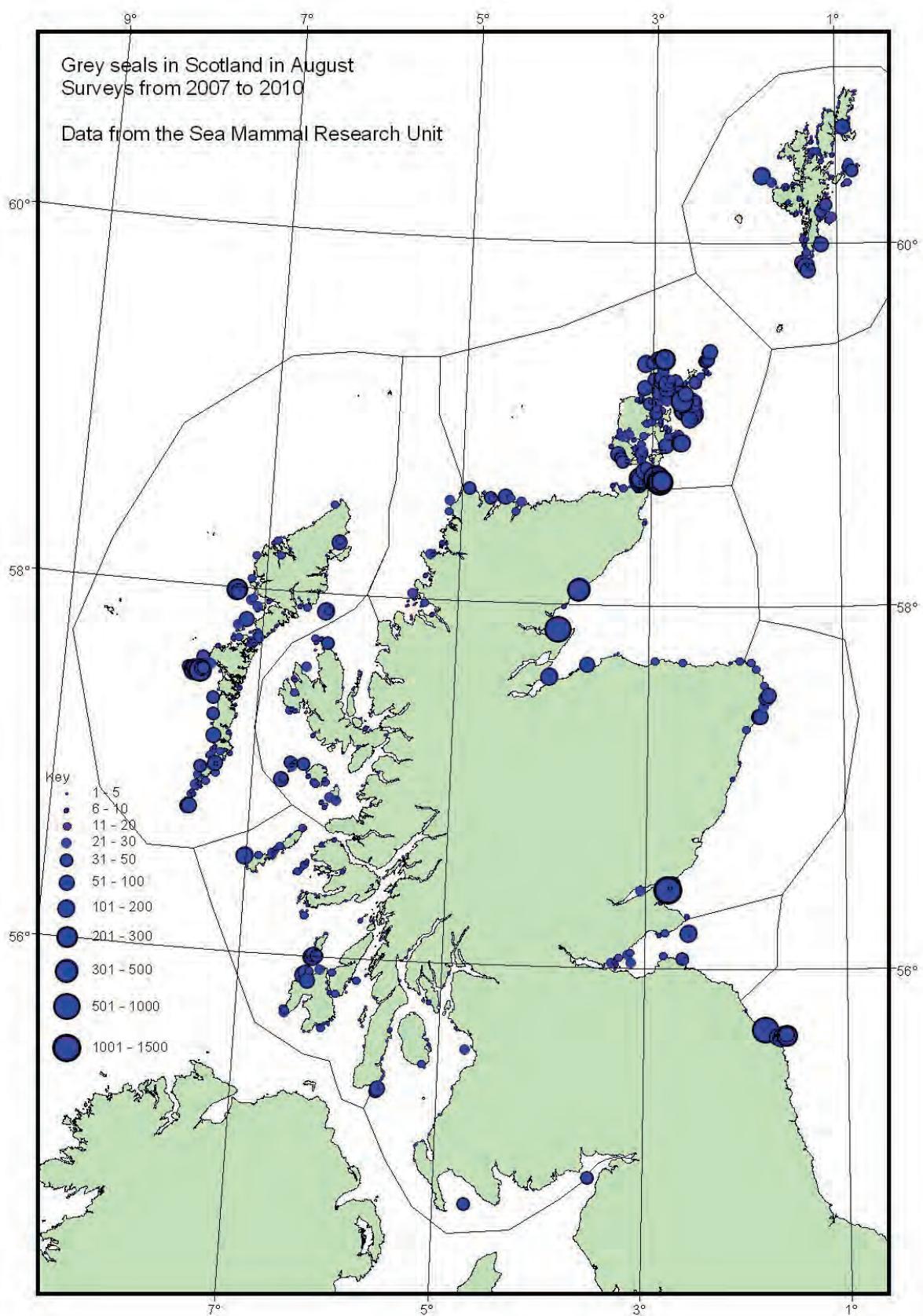


Figure 3. A comparison of counts of harbour seals in different Management Areas of Scotland. All surveys were carried out by the Sea Mammal Research Unit. From 2007, thermal image counts have been verified using digital still images where possible. West Scotland Highland extends from Cape Wrath to Ardnamurchan Point. West Scotland Strathclyde extends from Ardnamurchan Point to the tip of the Mull of Kintyre. North Coast extends from Cape Wrath to Duncansby Head, the Wider Moray Firth from Findhorn to Helmsdale. East Coast extends from Fraserburgh to Fife Ness and Firth of Forth from Fife Ness to the border by Berwick upon Tweed. Note that because these data points represent counts of harbour seals over large areas, individual data points may not be from surveys from only one year. This applies particularly to West Scotland (Highland and Strathclyde) where some counts may include data from the preceding survey.

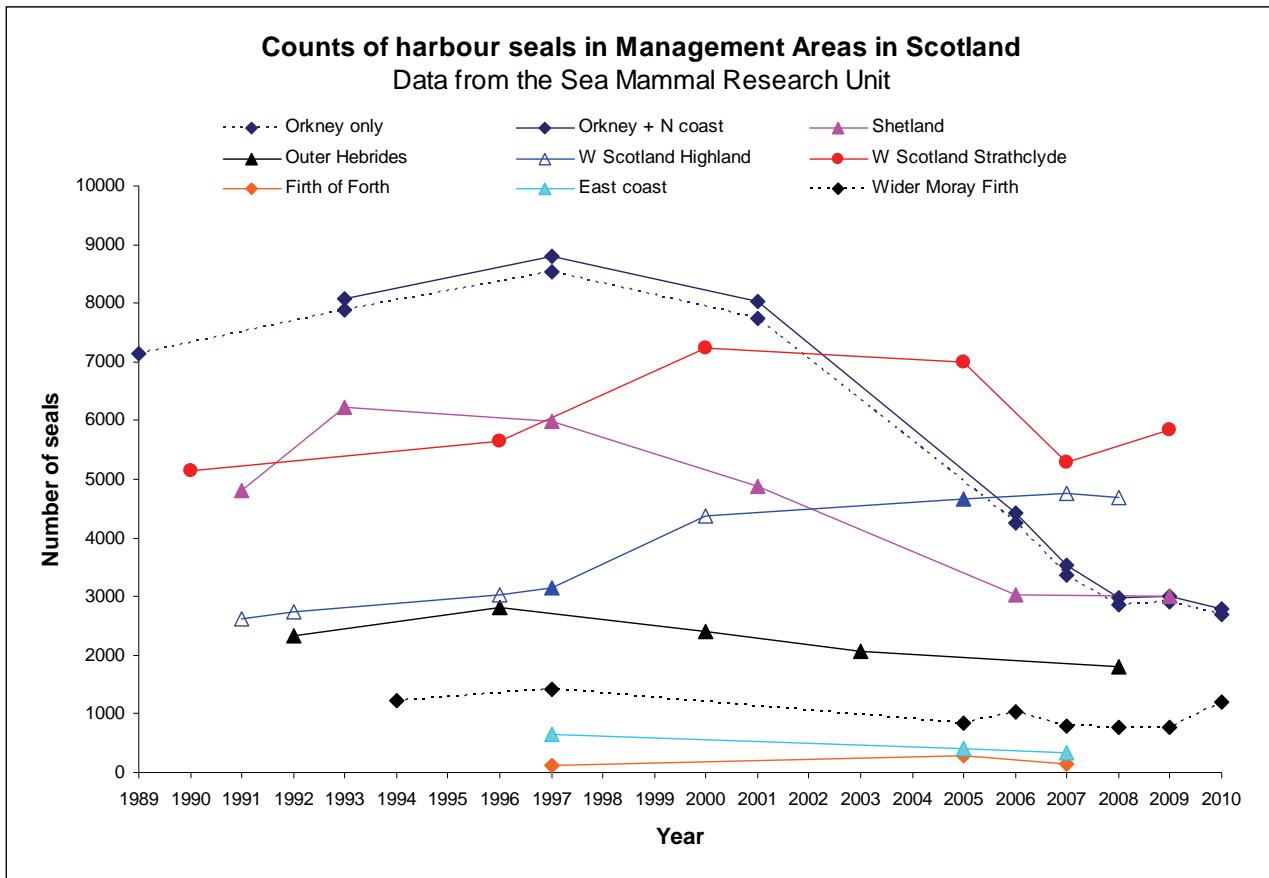


Figure 4. Harbour seal distribution in Orkney in August 2010. Numbers of seals in each subregion are in Table 1.

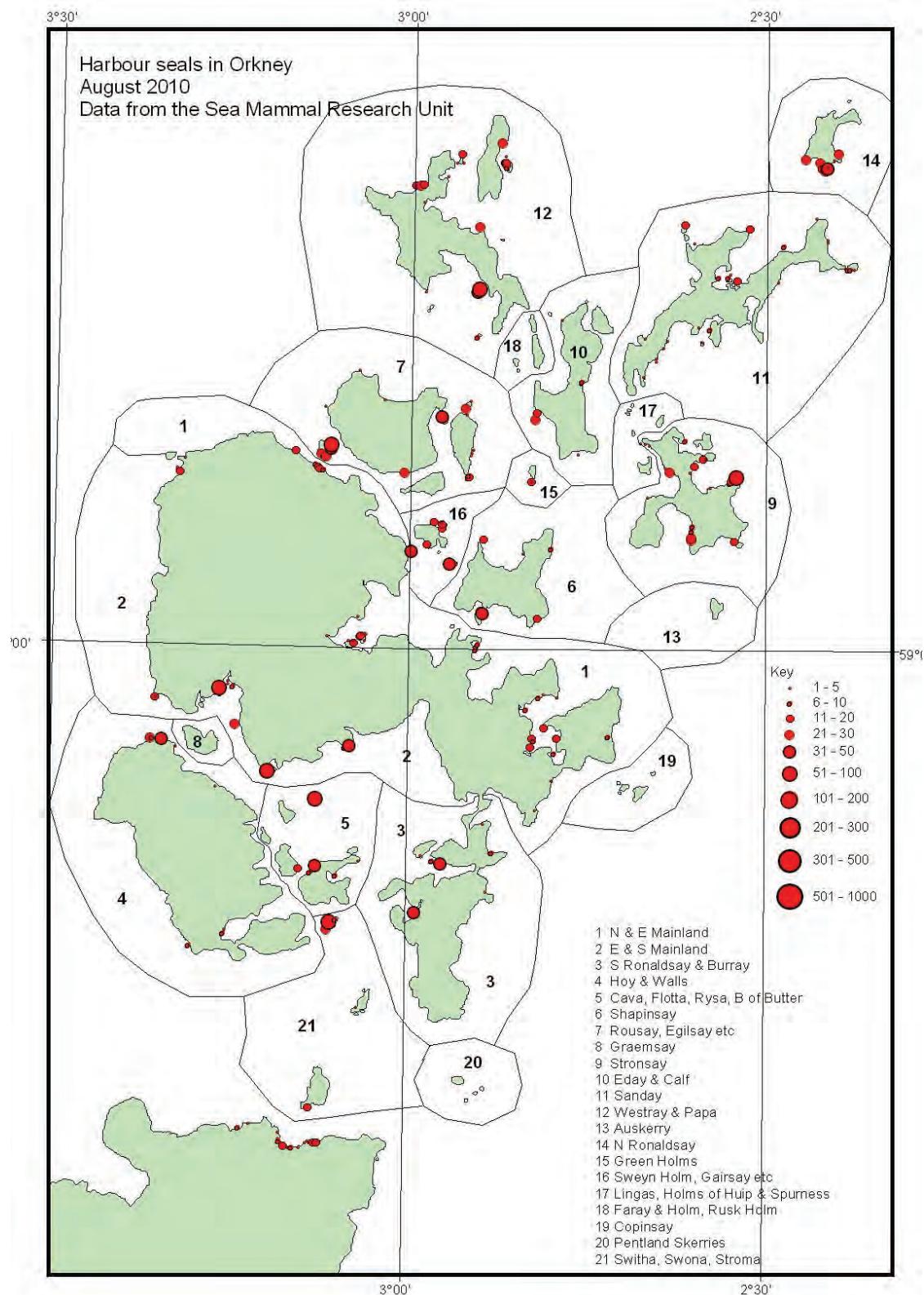


Figure 5. Grey seal distribution in Orkney in August 2010. Numbers of seals in each subregion are in Table 2.

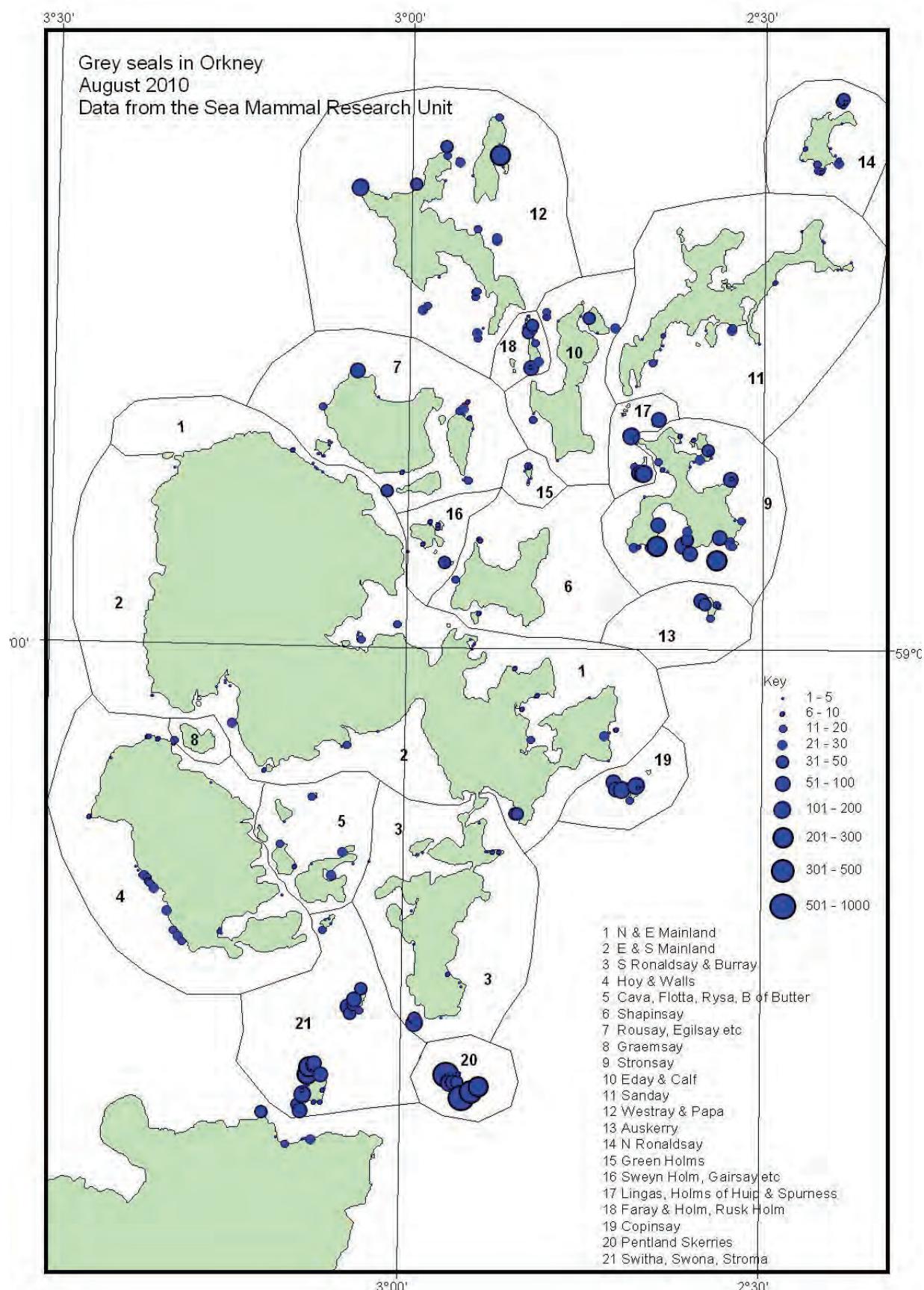


Figure 6. Numbers of harbour seals in the Moray Firth in August. If more than one count in any year, the mean value was used. Data from the Sea Mammal Research Unit.

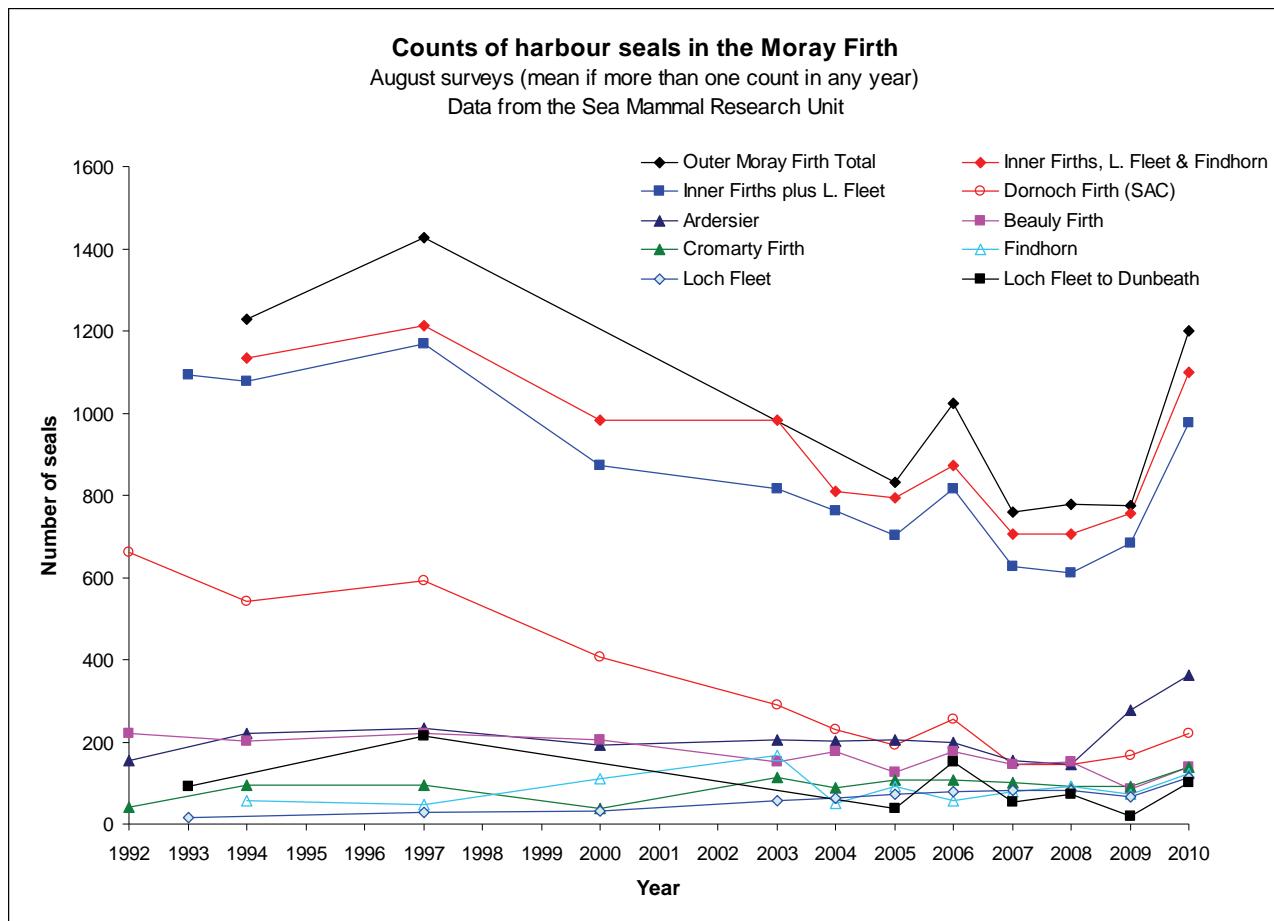
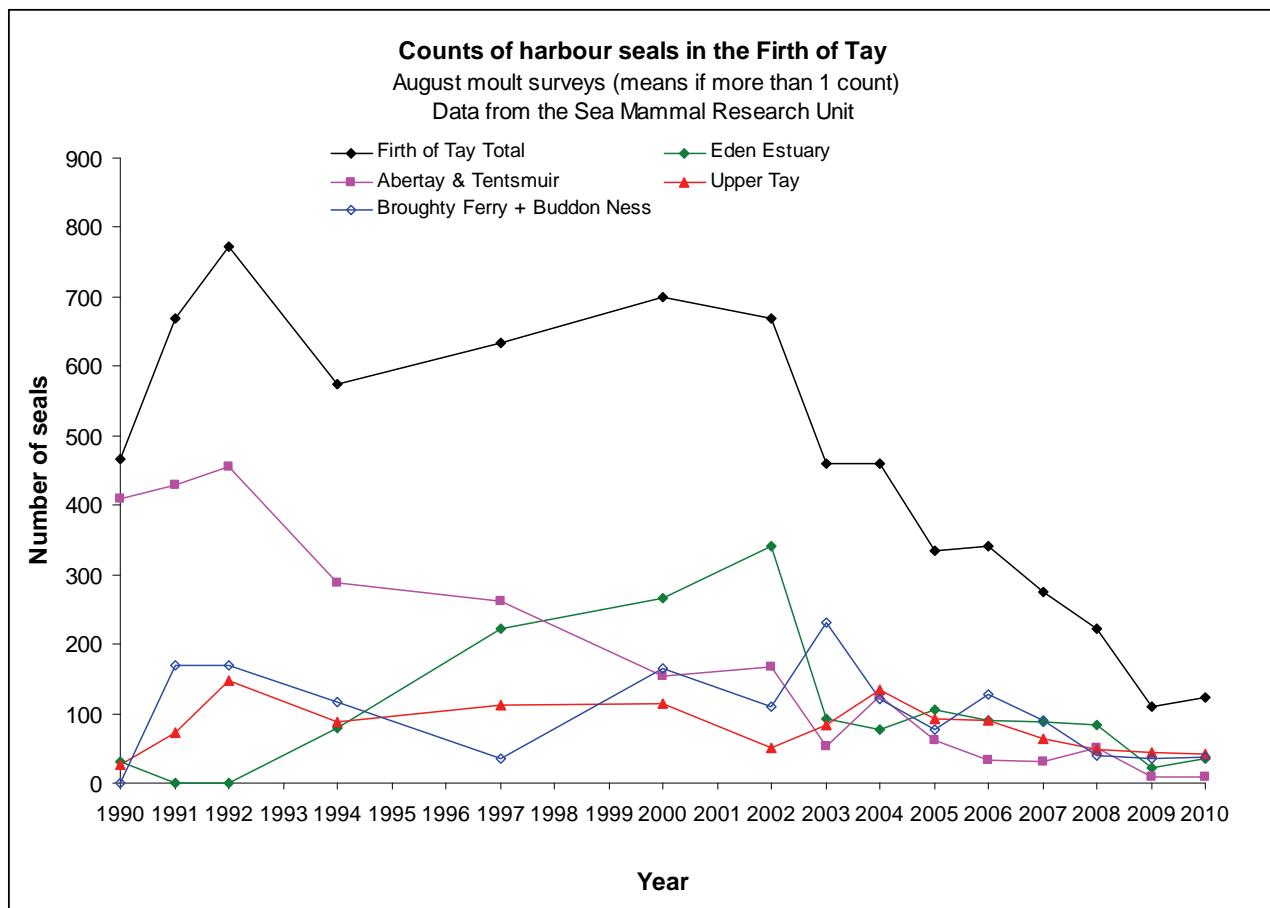


Figure 7. Numbers of harbour seals in the Firth of Tay in August. If more than one count in any year, the mean value was used. Data from the Sea Mammal Research Unit.



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