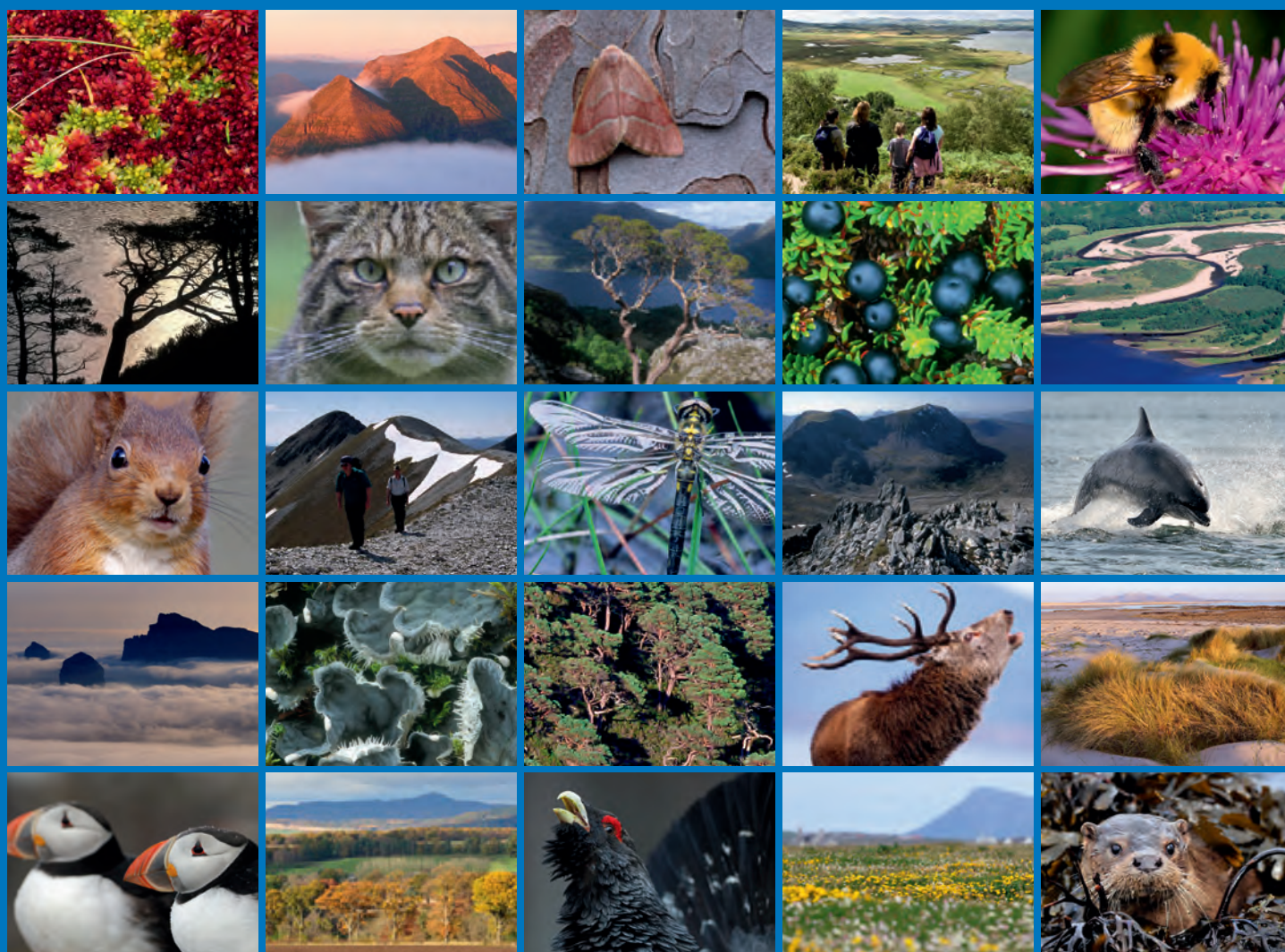


# Surveys of harbour (common) and grey seals in the Outer Hebrides and the Moray Firth in August 2011



# COMMISSIONED REPORT

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**Commissioned Report No. 518**

**Surveys of harbour (common) and grey  
seals in the Outer Hebrides and the Moray  
Firth in August 2011**

For further information on this report please contact:

Dr John M Baxter  
Scottish Natural Heritage  
Silvan House  
231 Corstorphine Road  
Edinburgh  
EH12 7AT  
Telephone: 0131 316 2610  
E-mail: [john.baxter@snh.gov.uk](mailto:john.baxter@snh.gov.uk)

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# COMMISSIONED REPORT

# Summary

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## Surveys of harbour (common) and grey seals in the Outer Hebrides and the Moray Firth in August 2011

**Commissioned Report No. 518, Project No. 12526**

**Contractor: NERC Sea Mammal Research Unit**

**Year of publication: 2012**

### Background

Harbour seal surveys by SMRU in recent years have documented a continuing decline in the numbers of harbour seals, especially in the Northern Isles and the east coast of Scotland. The previous survey of harbour seals in the Outer Hebrides was carried out in 2008 which showed a small but continuing decline from the previous counts in 2006 and 2003. Numbers in the Moray Firth in 2010 were significantly higher than in the previous three surveys in 2007-2009. The purpose of this survey was to determine if the decline in the Outer Hebrides was continuing and if the recovery in the Moray Firth was being maintained.

### Main findings

- In the Outer Hebrides 2739 harbour seals were counted in 2011, compared with 1804 in August 2008, an increase of 51.8%.
- The 2011 count was the second highest since the current series of surveys started in 1992 and was only very slightly lower (by 2.9%) than the 1996 highest count of 2820.
- In the Moray Firth 561 harbour seals were counted between Nairn and Dornoch, compared with 861 in 2010, a decline of 34.8%. Along the Helmsdale coast between Dornoch and Wick (including Loch Fleet) 200 harbour seals were counted compared to 190 in 2008. Along the Moray coast between Nairn and Rattray Head 192 harbour seals were counted compared to 67 in 2007. Overall 924 harbour seals were counted in 2011 compared with 1199 in 2010.
- In the Firth of Tay only 77 harbour seals were counted in August 2011 compared with 124 in August 2010, a decline of 37.9%. This is the lowest count for the Firth of Tay and represents only 11.5% of the mean count of 670 between 1991 and 2002.
- The updated estimate of the minimum size of the harbour seal population in Scotland is 21291. This estimate is based on counts from this survey and surveys carried out in 2007 (west Scotland, part of the Inner Hebrides, Firth of Clyde, Solway Firth, Border to Fife Ness, Carnoustie to Fraserburgh), 2008 (north and north-west Scotland, Small Isles), 2009 (Shetland and part of Argyll), 2010 (Orkney).

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*For further information on this project contact:*

Dr John M Baxter

Tel: 0131 316 2610

*For further information on the SNH Research & Technical Support Programme contact:*

Knowledge & Information Unit, Scottish Natural Heritage, Great Glen House, Inverness, IV3 8NW.

Tel: 01463 725000 or [research@snh.gov.uk](mailto:research@snh.gov.uk)

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## SUMMARY

In August 2011, the Sea Mammal Research Unit, University of St Andrews, carried out aerial surveys of moulting harbour seals in the Outer Hebrides, in the Moray Firth and in the Firth of Tay. Surveys of Northern Ireland and part of the Irish Republic were also completed but are not reported here.

In the Outer Hebrides, **2,739** harbour seals were counted compared with 1,804 in August 2008, an increase of 51.8%. The 2011 count was the second highest since the current survey series started in 1992, and was only slightly lower (by 2.9%) than the 1996 highest count of 2,820.

In the Inner Moray Firth, **561** harbour seals were counted between Nairn and Dornoch, compared with 861 in 2010, a decline of 34.8%. Along the Helmsdale coast, between Dornoch and Wick (including Loch Fleet), **200** harbour seals were counted, compared with 190 in 2008. Along the north coast of Moray, between Rattray Head and Nairn, **192** harbour seals were counted compared with 63 in 2007. A large group of harbour seals was found in 2011 on Culbin Sands, between Nairn and Findhorn, where only small groups have been previously recorded. Also in the Moray Firth, there were many fewer harbour seals in the Beaully Firth in 2011 than in previous years.

In the Firth of Tay, only **77** harbour seals were counted in August 2011 compared with 124 in August 2010, a decline of 37.9%. This is a new lowest count for the Firth of Tay and represents only 11.5% of the mean count (670) between 1991 and 2002.

Using data from the 2011 surveys, the updated estimate of the minimum size of the harbour seal population in Scotland is **21,291**. This is the number of harbour seals counted during surveys carried out in 2007 (west Scotland, part of Inner Hebrides, Firth of Clyde, Solway Firth, Border to Fife Ness, Carnoustie to Fraserburgh), 2008 (north and north-west Scotland, Small Isles), 2009 (Shetland and part of Argyll), 2010 (Orkney) and 2011 (Outer Hebrides, outer Moray Firth from Fraserburgh to Wick, Firth of Tay).



## INTRODUCTION

This report summarises the results from surveys of harbour seals in the Outer Hebrides, in the Moray Firth between Rattray Head and Wick and in the Firth of Tay. The surveys were carried out to obtain updated estimates of the numbers of harbour seals in the three areas.

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) of harbour seals, with selection based largely on information collected by the Sea Mammal Research Unit (SMRU) since 1988.

SMRU 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 to the Department of the Environment, Food and Rural Affairs (Defra) under the Marine (Scotland) Act 2010 and 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/documents/389.pdf>. 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 within SACs and 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. Since the first survey in 1992, harbour seal numbers in the Outer Hebrides have slowly declined. 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 in Scotland from the most recent surveys between 2007 and 2011 is shown in Figure 1 (a and b) with grey seal distribution in Figure 2 (a and b).

Figure 1a shows harbour seal distribution aggregated into 1km squares. Many points overlap as harbour seal haulout sites in some areas are close together. Zoom in to Figure 1a to see haulout sites in more detail (click on the map, hold down the <control> key while scrolling with your mouse). Figure 1b shows the same data aggregated by 10km squares. This coarser resolution map shows the large-scale August distribution of harbour seals around Scotland more clearly but at a more coarse resolution. Seal Management Areas are marked with solid lines while Sub-Areas are marked with dotted lines.

Similarly, Figure 2a shows grey seal distribution aggregated into 1km squares. Again, many points overlap and you can zoom in to see haulout sites in more detail. Figure 2b shows the same data aggregated by 10km squares. This coarser resolution map shows the large-scale August distribution of grey seals around Scotland more clearly.

Figure 3 shows the trends in numbers of harbour seals counted in Scottish harbour seal Management Areas since 1990.

Figure 4 shows the distribution of harbour seals in the Outer Hebrides in August 2011.

Figure 5 shows in more detail, harbour seal distribution in the Sound of Barra as well as the revised subsections of the Sound of Barra that provide better cover of the area currently under consideration for the proposed harbour seal SAC.

Figure 6 shows the distribution of grey seals in the Outer Hebrides in August 2011, with a more detailed map of their distribution in the Sound of Barra in Figure 7.

Figure 8 shows harbour seal distribution around the Moray Firth. Figure 9 shows the trajectories of counts of harbour seals in different parts of the Moray Firth.

Figure 10 shows the trajectory of the continued decline of harbour seals in the Firth of Tay harbour seal SAC.

The numbers of harbour seals counted within the areas of Scotland surveyed in 2011 are as follows:

- Table 1 shows counts of harbour seals in subregions of the Outer Hebrides (see Figure 4) surveyed in 2011 and from all previous surveys. The 2011 Outer Hebrides harbour seal count of 2,739 was 51.8% greater than the previous (2008) count and was the second highest count of harbour seals in the Outer Hebrides, only marginally lower than the 1996 highest count of 2,820.
- Table 2 shows counts of grey seals in the Outer Hebrides. Figure 6 shows their distribution. There were surprisingly limited numbers of grey seals on haulout sites in the Monach Isles compared with previous years (Table 2). There were large numbers in the water, particularly around Stockay, Ceann Ear, Ceann Iar and Shillay. It is possible that high ambient temperatures and prolonged sunshine forced greys to move off land into the water. Seals can overheat and the easiest way for them to cool off is by returning into the water.
- Counts of harbour seals in different subsections of the Sound of Barra are in Table 3 (see Figure 5) with grey seal numbers in Table 4 (see Figure 7). In 2011, 116

harbour seals were counted in the Sound of Barra, representing 0.5% of the Scottish harbour seal count and 0.4% of the UK harbour seal count (using the 2010 count for east England and the 2002 count for Northern Ireland).

- Counts of harbour seals in the Moray Firth are in Table 5 with grey seal numbers in Table 6. The grid references defining the different areas within the Moray Firth are in Table 7. The distribution of harbour seals in the Moray Firth is shown in Figure 8 with the trajectory of harbour seal counts in the Moray Firth (using mean values if more than one count in any year) in Figure 9. The increase in 2010 is obvious but did not continue into 2011. In the Inner Moray Firth, 561 harbour seals were counted compared with 861 in 2010. The main differences in 2011 compared with 2010 were reduced numbers at Ardersier and in the Beauly Firth but increased numbers at Culbin Sands. In August 2011, 208 harbour seals were counted within the Dornoch Firth SAC representing 1.0% of the Scottish harbour seal count and 0.8% of the UK harbour seal count (using the 2010 count for east England).
- Counts of harbour seals in the Firth of Tay are in Table 8 with grey seal numbers in Table 9. Grid references of the different subsections of the Firth of Tay are in Table 10. Figure 10 shows the continued decline in the counts of harbour seals in the Firth of Tay. In 2011, 77 harbour seals were counted within the SAC, representing 0.4% of the Scottish harbour seal count and 0.3% of the UK harbour seal count (using the 2010 count for east England). The August 2011 count in the Firth of Tay was the lowest ever. A relatively large number of dead, 'corkscrewed' pregnant harbour seal females have been found in the past three years around the Firth of Tay (6 in 2009, 5 in 2010 and 4 in 2011). The cause of these mortalities is under investigation.

## OVERVIEW

### 1.1.1 Outer Hebrides

The number of harbour seals counted in the Outer Hebrides (2,738) in August 2011 was 51.8% higher than the last count (1,804) in August 2008 (Table 1) and only slightly lower than the highest recorded count from August 1996 (2,820). The count of grey seals was lower than in previous years, with numbers in the Monach Isles particularly low. Most seals at the Monach Isles were in the water and therefore not counted, possibly on account of high ambient temperatures and prolonged sunshine.

### 1.1.2 Moray Firth

Numbers of harbour seals in all parts of the Moray Firth in August 2011 (924 in Outer Moray Firth, 561 in Inner Moray Firth) were lower than counts in 2010 but higher than counts from other recent years (Table 5, Figure 9). Increased numbers of harbour seals were seen at Culbin Sands, possibly reflecting reduced numbers in the Beauly Firth. Two 'new' haulout sites were seen on the north Moray coast, one between Portsoy and Whitehills and one at Portgordon (Figure 8).

### 1.1.3 Firth of Tay

In the Firth of Tay, only 77 harbour seals were counted in August 2011 (Table 8, Figure 10). This is a new lowest count for the Firth of Tay following the previous lowest count of 111 in August 2009. There is no apparent recovery of the dramatic decline in numbers in this harbour seal SAC.



## **SURVEYS PLANNED FOR 2012**

In August 2012 we intend to survey harbour seals in Orkney, the north coast of Scotland and possibly part of the east coast of Scotland. The Orkney survey will inform on whether the decline detected in 2006 continues. These surveys have been made possible with funding provided by SNH.

**Table 1. Counts of harbour seals in the Outer Hebrides.** Data from aerial surveys by the Sea Mammal Research Unit, University of St Andrews. See Figure 4.

Island	<i>Harbour seals</i>						
	Aug 1992	Aug 1996	Aug 2000*	Aug 2003*	Aug 2006*	Aug 2008*	Aug 2011*
<b>Lewis &amp; Harris</b>	517	926	600	529	522	532	<b>700</b>
<b>North Uist</b>	357	724	745	651	(299 <sup>1</sup> )	561	<b>602</b>
<b>Benbecula</b>	212	249	267	200	(157 <sup>1</sup> )	217	<b>386</b>
<b>Monach Isles</b>	0	0	0	0	3	0	<b>0</b>
<b>South Uist</b>	785	666	551	434	389	311	<b>769</b>
<b>Barra</b>	458	255	250	284	216	183	<b>282</b>
<b>TOTAL</b>	<b>2329</b>	<b>2820</b>	<b>2413</b>	<b>2098</b>	1586 <sup>1</sup> 1981 <sup>2</sup>	<b>1804</b>	<b>2739</b>

\*Survey funded or part funded by Scottish Natural Heritage

<sup>1</sup>Survey incomplete due to equipment malfunction

<sup>2</sup>Composite total using 2003 numbers for N Uist and Benbecula

**Table 2. Counts of grey seals in the Outer Hebrides.** Data from aerial surveys by the Sea Mammal Research Unit, University of St Andrews. See Figure 6.

Island	<i>Grey seals</i>						
	Aug 1992	Aug 1996	Aug 2000*	Aug 2003*	Aug 2006*	Aug 2008*	Aug 2011*
<b>Lewis &amp; Harris</b>	431	609	1194	547	545	989	<b>547</b>
<b>North Uist</b>	477	615	878	421	(163 <sup>1</sup> )	255	<b>401</b>
<b>Benbecula</b>	0	0	12	0	(0 <sup>1</sup> )	11	<b>27</b>
<b>Monach Isles</b>	1520	1537	1921	1261	2057	1421	<b>196</b>
<b>South Uist</b>	120	287	309	146	119	235	<b>301</b>
<b>Barra</b>	278	1014	865	659	416	496	<b>1046</b>
<b>TOTAL</b>	<b>2826</b>	<b>4062</b>	<b>5179</b>	<b>3034</b>	3300 <sup>1</sup> 3558 <sup>2</sup>	<b>3407</b>	<b>2518</b>

\*Survey funded or part funded by Scottish Natural Heritage

<sup>1</sup>Survey incomplete due to equipment malfunction

<sup>2</sup>Composite total using 2003 numbers for North Uist and Benbecula

**Table 3. Numbers of harbour seals counted in the Sound of Barra.**

August surveys since 1996 were either fully or partly funded by Scottish Natural Heritage. Sub-sections 1-8 form the proposed harbour seal SAC, subsections 9 to 11 are immediately adjacent to the pSAC. Note these are a revised suite of sub-sections compared with those used in previous reports to accommodate the change in the area covered by the currently proposed SAC (see Figure 5).

<b>Location</b>	<b>Sub-section</b>	<b>Aug 1992</b>	<b>Aug 1996</b>	<b>Aug 2000</b>	<b>Aug 2002</b>	<b>Aug 2003</b>	<b>Aug 2006</b>	<b>Aug 2008</b>	<b>Aug 2011</b>
Bruairnis	1	0	53	30	18	6	12	4	6
NE Barra	2	173	125	10	8	17	1	0	4
Hellisay, Gighay	3	80	58	7	42	31	47	14	42
N Barra, Fiaray, Fuday	4	115	9	135	112	110	69	57	46
South Eriskay	5	1	38	5	10	1	21	9	13
NW Sound of Barra	6	0	161	30	9	5	0	0	2
S S Uist, NW Eriskay	7	242	63	24	16	18	5	2	1
Sound of Eriskay, Thairteamul	8	267	69	35	34	13	24	6	2
SE S Uist	9	6	26	28	1	2	0	0	1
SW S Uist	10	0	100	0	28	1	5	8	0
Earsairidh	11	1	5	2	5	14	5	5	20
<b>Total Sound of Barra pSAC (1 to 8)</b>		<b>878</b>	<b>576</b>	<b>276</b>	<b>249</b>	<b>201</b>	<b>179</b>	<b>92</b>	<b>116</b>
<b>Total Sound of Barra (1 to 11)</b>		<b>885</b>	<b>707</b>	<b>306</b>	<b>283</b>	<b>218</b>	<b>189</b>	<b>105</b>	<b>137</b>
<b>Outer Hebrides Total</b>		<b>2329</b>	<b>2820</b>	<b>2413</b>		<b>2067</b>		<b>1804</b>	<b>2739</b>

**Table 4. Numbers of grey seals counted in the Sound of Barra.** July counts of grey seals are included as, unlike harbour seals, grey seals show no behavioural difference between July and August. Sub-sections 1 to 8 form the proposed harbour seal SAC, subsections 9 to 11 are immediately adjacent to the pSAC (see Figure 7).

<b>Location</b>	<b>Sub-section</b>	<b>Aug 1992</b>	<b>July 1996</b>	<b>Aug 1996</b>	<b>July 2000</b>	<b>Aug 2000</b>	<b>Aug 2002</b>	<b>Aug 2003</b>	<b>Aug 2006</b>	<b>Aug 2008</b>	<b>Aug 2011</b>
Bruairnis	1	25	62	5	16	21	107	20	46	13	27
NE Barra	2	53	225	58	64	258	86	104	54	107	170
Hellisay, Gighay	3	0	0	0	0	0	0	0	0	0	17
N Barra, Fiaray, Fuday	4	76	53	47	10	188	80	204	29	40	73
South Eriskay	5	10	18	31	19	2	12	3	2	2	5
NW Sound of Barra	6	21	0	17	1	36	16	31	13	26	16
S S Uist, NW Eriskay	7	35	1	5	9	0	19	3	8	22	9
Sound of Eriskay, Thairteamul	8	3	0	2	4	18	21	7	2	10	12
SE S Uist	9	0	0	0	0	0	0	1	0	0	2
SW S Uist	10	0	0	1	0	29	12	8	0	5	0
Earsairidh	11	0	1	0	0	7	1	0	0	0	0
<b>Sound of Barra pSAC Total (1-8)</b>		<b>223</b>	<b>359</b>	<b>165</b>	<b>123</b>	<b>523</b>	<b>341</b>	<b>372</b>	<b>154</b>	<b>220</b>	<b>329</b>
<b>Sound of Barra Total (1-11)</b>		<b>223</b>	<b>360</b>	<b>166</b>	<b>123</b>	<b>559</b>	<b>354</b>	<b>381</b>	<b>154</b>	<b>225</b>	<b>331</b>
<b>Outer Hebrides Total</b>		<b>2826</b>		<b>4062</b>		<b>5179</b>		<b>3064</b>		<b>3407</b>	<b>2518</b>

**Table 5.** Counts of harbour seals in the Moray Firth (see Figures 8 and 9). Mean value if there was more than one count in any year. Data are from August aerial surveys by the Sea Mammal Research Unit. Since 2006, all surveys incorporated hand-held oblique digital photography. fw = fixed-wing aircraft; ti = helicopter thermal image survey. See Figure 7.

<b>LOCATION</b>	<b>Aug 1992</b>	<b>end July 1993</b>	<b>Aug 1994</b>	<b>Aug 1997</b>	<b>Aug 2000</b>	<b>Aug 2002</b>	<b>Aug 2003</b>	<b>Aug 2004</b>	<b>Aug 2005</b>	<b>Aug 2006</b>	<b>Aug 2007</b>	<b>Aug 2008</b>	<b>Aug 2009</b>	<b>Aug 2010</b>	<b>Aug 2011</b>
<b>Survey Method(n)</b>	fw	fw	fw	ti	fw	fw ti	fw	2 fw	2 fw 1 ti	ti fw	ti	ti fw	fw	fw	ti
<b>Ardersier</b>	154		221	234	191	110	205	202	206	197	154	145	277	362	195
<b>Beaully Firth</b>	220		203	219	204	66	151	178	127	176	146	150	85	140	57
<b>Cromarty Firth</b>	41		95	95	38	42	113	88	106	106	102	90	90	140	101
<b>Dornoch Firth (SAC)</b>	662		542	593	405	220	290	230	191	256	144	145	166	219	208
<b>Inner Moray Firth Total</b>	<b>1077</b>		<b>1061</b>	<b>1141</b>	<b>838</b>	<b>438</b>	<b>759</b>	<b>698</b>	<b>630</b>	<b>736</b>	<b>544</b>	<b>530</b>	<b>618</b>	<b>861</b>	<b>561</b>
<i>Loch Fleet</i>		16		27	33	62	56	64	71	80	82	82	65	114	113
<b>Inner Moray Firth + L Fleet</b>		<b>1093</b>	<b>1077</b>	<b>1168</b>	<b>871</b>	<b>500</b>	<b>815</b>	<b>762</b>	<b>701</b>	<b>815</b>	<b>627</b>	<b>612</b>	<b>683</b>	<b>975</b>	<b>674</b>
<i>Findhorn &amp; Culbin</i>			58	46	111	144	167	49	92	58	78.5	92	73	123	163
<b>I M F + L Fleet + Findhorn</b>			<b>1135</b>	<b>1214</b>	<b>982</b>	<b>644</b>	<b>982</b>	<b>811</b>	<b>793</b>	<b>873</b>	<b>706</b>	<b>704</b>	<b>756</b>	<b>1098</b>	<b>837</b>
<i>Loch Fleet to Dunbeath</i>		92		214		188			38	150	54	72	19	101	87
<b>Outer Moray Firth Total</b>		<b>1185*</b>	<b>1227*</b>	<b>1428</b>		<b>832</b>			<b>831</b>	<b>1023</b>	<b>760</b>	<b>776</b>	<b>775</b>	<b>1199</b>	<b>924</b>

\*Note that the Total counts for 1993 and 1994 both include Loch Fleet data from 1993.

**Table 6.** Counts of grey seals in the Moray Firth (mean value if more than 1 count in any year). Data from August aerial surveys by the Sea Mammal Research Unit. Since 2006, all surveys incorporated hand-held oblique digital photography. fw = fixed-wing aircraft; ti = helicopter thermal image survey.

LOCATION	Aug 1992	end July 1993	Aug 1994	Aug 1997	Aug 2000	Aug 2002	Aug 2003	Aug 2004	Aug 2006	Aug 2007	Aug 2008	Aug 2009	Aug 2010	Aug 2011
Survey Method	fw	fw	fw	ti	fw	fw ti	fw	2 fw	2 fw 1 ti	ti fw	ti	ti fw	fw	fw
<b>Ardersier</b>	0		36	24	85	0	0	62	138	74	117	94	297	74
<b>Beaully Firth</b>	8		2	3	8	0	0	2	3	4	0	0	2	3
<b>Cromarty Firth</b>	9		0	0	0	0	0	0	1	0	0	0	1	2
<b>Dornoch Firth (SAC)</b>	233		903	456	121	321	79	569	748	516	569	819	717	679
<b>Inner Moray Firth Total (IMF)</b>	<b>250</b>		<b>941</b>	<b>483</b>	<b>214</b>	<b>321</b>	<b>79</b>	<b>631</b>	<b>890</b>	<b>594</b>	<b>686</b>	<b>913</b>	<b>1017</b>	<b>758</b>
<i>Loch Fleet</i>					0	0	0	0	1	2	2	0	7	7
<b>IMF + L Fleet</b>					<b>214</b>	<b>321</b>	<b>79</b>	<b>631</b>	<b>891</b>	<b>596</b>	<b>688</b>	<b>913</b>	<b>1024</b>	<b>765</b>
<i>Findhorn &amp; Culbin</i>					0	0	10	20	10	28	67	58	58	179
<b>Inner M F + L Fleet + Findhorn</b>						<b>321</b>	<b>89</b>	<b>651</b>	<b>902</b>	<b>624</b>	<b>754</b>	<b>971</b>	<b>1082</b>	<b>944</b>
<i>Loch Fleet to Dunbeath</i>				3		6			102	52	499	72	635	160
<b>Outer Moray Firth Total</b>						<b>327</b>			<b>1003</b>	<b>676</b>	<b>1254</b>	<b>1043</b>	<b>1717</b>	<b>1104</b>



**Table 7.** Ordnance Survey grid references for boundaries of subsections of the Moray Firth.

<b>Location</b>	<b>Subsection number</b>	<b>OS Eastings</b>	<b>OS Northings</b>
<b>DORNOCH TO DUNBEATH</b>	<b>1</b>	2770-3170	8900-9300
<b>OUTER DORNOCH</b> (Dornoch Bridge to Tarbat Ness)	<b>2<sup>1</sup></b>	2748-2950	8810-8899
<b>UPPER DORNOCH</b> (Inveran to Dornoch Bridge)	<b>3<sup>1</sup></b>	2570-2747	8840-8980
<b>CROMARTY FIRTH A</b> (Dingwall to Invergordon)	<b>4</b>	2550-2709	8560-8700
<b>CROMARTY FIRTH B</b> (Invergordon to Sutors)	<b>5</b>	2710-2820	8650-8750
<b>BEAULY FIRTH</b> (Beauly to Kessock Bridge)	<b>6</b>	2530-2664	8450-8500
<b>INVERNESS FIRTH A</b> (Kessock Bridge to Barmac)	<b>7</b>	2665-2819	8460-8599
<b>INVERNESS FIRTH B</b> (Rosemarkie to Sutors)	<b>8</b>	2730-2819	8600-8649
<b>NAIRN COAST</b> (Barmac to Lossiemouth)	<b>9</b>	2820-3250	8560-8730
<b>Moray Firth Total Area</b>		2530-3250	8450-9300

<sup>1</sup>Subsections 2 and 3 comprise the Dornoch Firth SAC

**Table 8.** Counts of harbour seals in the Firth of Tay harbour seal SAC (see Figure 10).

Data from aerial surveys by the Sea Mammal Research Unit. Since 2006, all surveys incorporated hand-held oblique digital photography. fw = fixed-wing aircraft; ti = helicopter thermal image survey. See Figure 10.

LOCATION	Aug 1990	Aug 1991	Aug 1992	Aug 1994	Aug 1997	Aug 2000	Aug 2002	Aug 2003	Aug 2004	Aug 2005	Aug 2006	Aug 2007	Aug 2008	Aug 2009	Aug 2010	Aug 2011
SURVEY METHOD	fw	fw	fw	fw	ti	fw	fw	fw	fw	fw,ti	fw	fw, ti	fw	fw	fw	fw
Eden Estuary	31	0	0	80	223	267	341	93	78	105	90	89	83	22	36	32
Abertay & Tentsmuir	409	428	456	289	262	153	167	53	126	63	34	31	50	8	9	0
Upper Tay	27	73	148	89	113	115	51	83	134	91	91	63	49	45	41	16
Broughty Ferry		83	97	64	35	52		90	55	51	127	24	13	28	15	18
Buddon Ness		86	72	53	0	113	109	142	66	25	0	67	27	8	23	11
Firth of Tay																
SAC Total	467	670	773	575	633	700	668	461*	459	335	342	274	222	111	124	77

\*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.

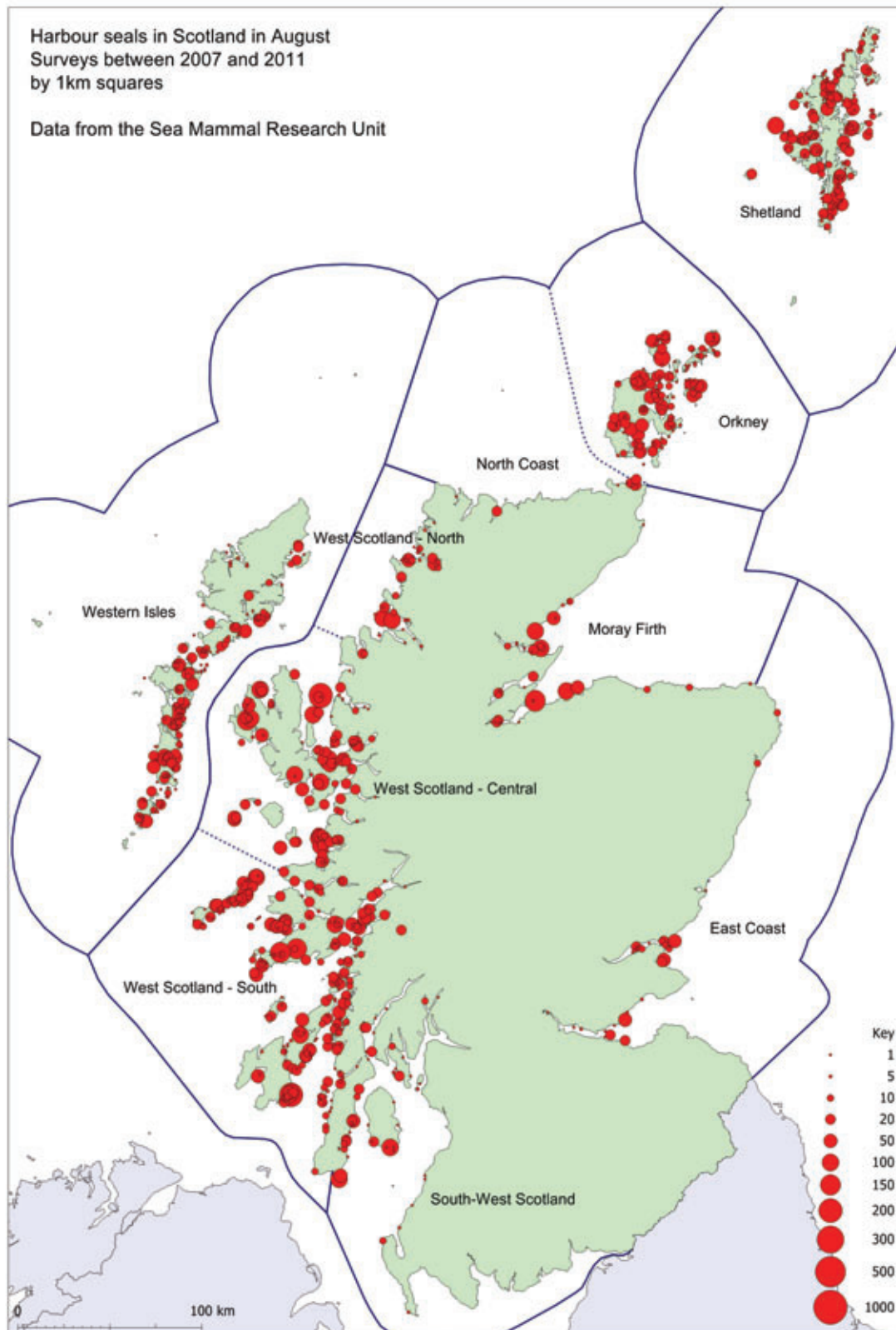
**Table 9.** Counts of grey seals in the Firth of Tay harbour seal SAC. Data from aerial surveys by the Sea Mammal Research Unit.  
fw = fixed-wing aircraft; ti = helicopter thermal image survey.

<b>LOCATION</b>	<b>Aug 1990</b>	<b>Aug 1991</b>	<b>Aug 1992</b>	<b>Aug 1994</b>	<b>Aug 1997</b>	<b>Aug 2000</b>	<b>Aug 2002</b>	<b>Aug 2003</b>	<b>Aug 2004</b>	<b>Aug 2005</b>	<b>Aug 2006</b>	<b>Aug 2007</b>	<b>Aug 2008</b>	<b>Aug 2009</b>	<b>Aug 2010</b>	<b>Aug 2011</b>
<b>SURVEY METHOD</b>	fw	fw	fw	fw	ti	fw	fw	fw	fw	fw, ti	fw	ti	fw	fw	fw	fw
<b>Eden Estuary</b>	0	0	16	0	10	0	25	4		27.3	57	14	33	0	39	17
<b>Abertay &amp; Tentsmuir</b>	912	1546	1191	1335	1820	2088	1490	1560		763	1267	1437	483	400	1406	1265
<b>Upper Tay</b>	0	0	18	20	61	64	78	50		42	22	29	26	55	98	16
<b>Broughty Ferry</b>	0	3	0	9	0	0	0	0		0	8	1	8	0	0	2
<b>Buddon Ness</b>	0	0	1	104	0	101	0	49		11	25	78	7	0	12	22
<b>Firth of Tay SAC Total</b>	<b>912</b>	<b>1549</b>	<b>1226</b>	<b>1468</b>	<b>1891</b>	<b>2253</b>	<b>1593</b>	<b>1614</b>		<b>843</b>	<b>1379</b>	<b>1559</b>	<b>557</b>	<b>455</b>	<b>1555</b>	<b>1322</b>

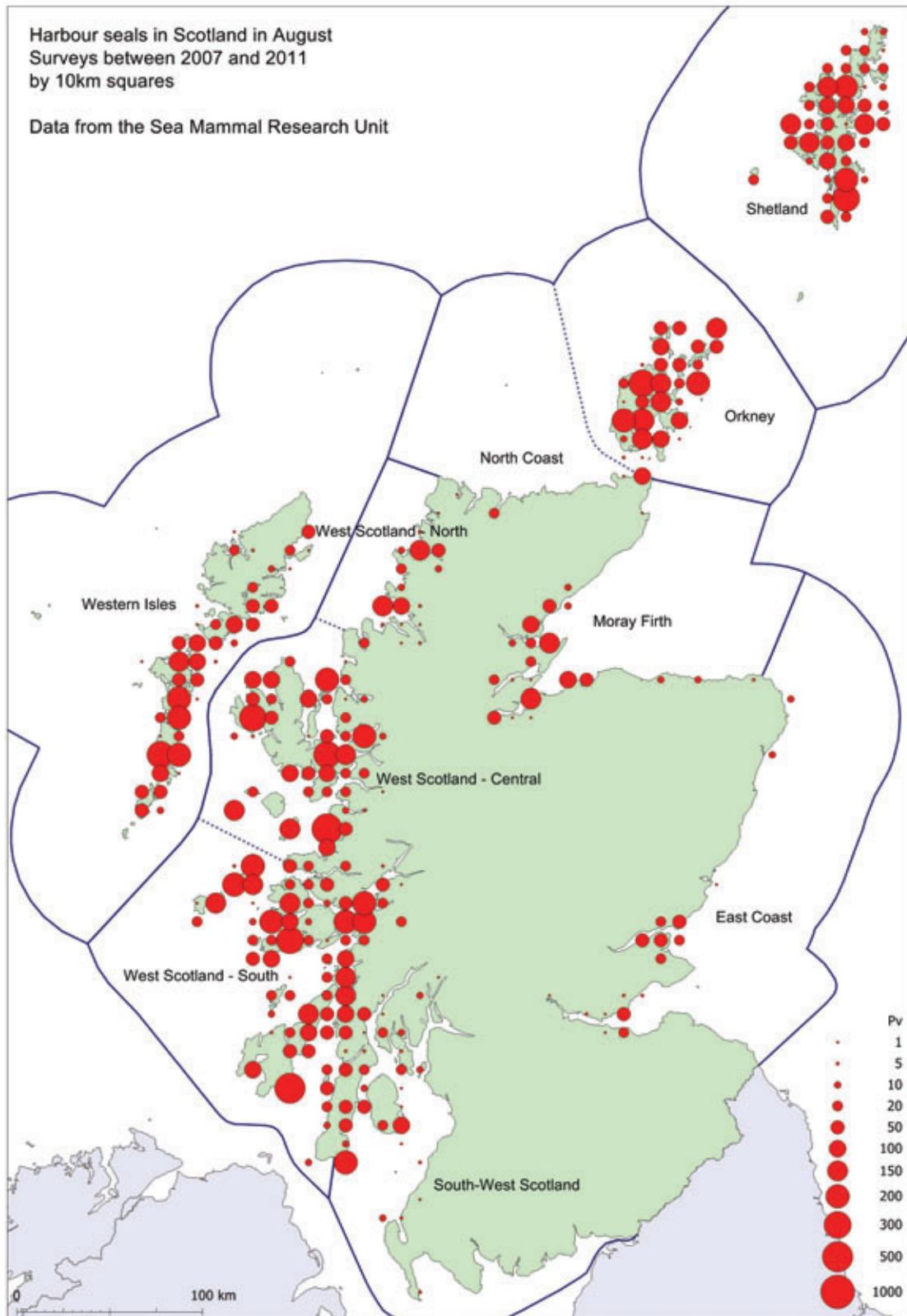
**Table 10.** Grid References for areas in the Firth of Tay.

<b>Location</b>	<b>OS eastings</b>	<b>OS northings</b>
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
<b>Firth of Tay total</b>	3180-3570	7180-7340

**Figure 1a.** The number and distribution of harbour seals in Scotland within 1km squares. Seal management areas are outlined. In some areas there are large numbers of groups in close proximity (zoom in to see detail). Figure 1b shows harbour seal distribution at 10km resolution. Data are from August surveys between 2007 and 2011, from the Sea Mammal Research Unit.

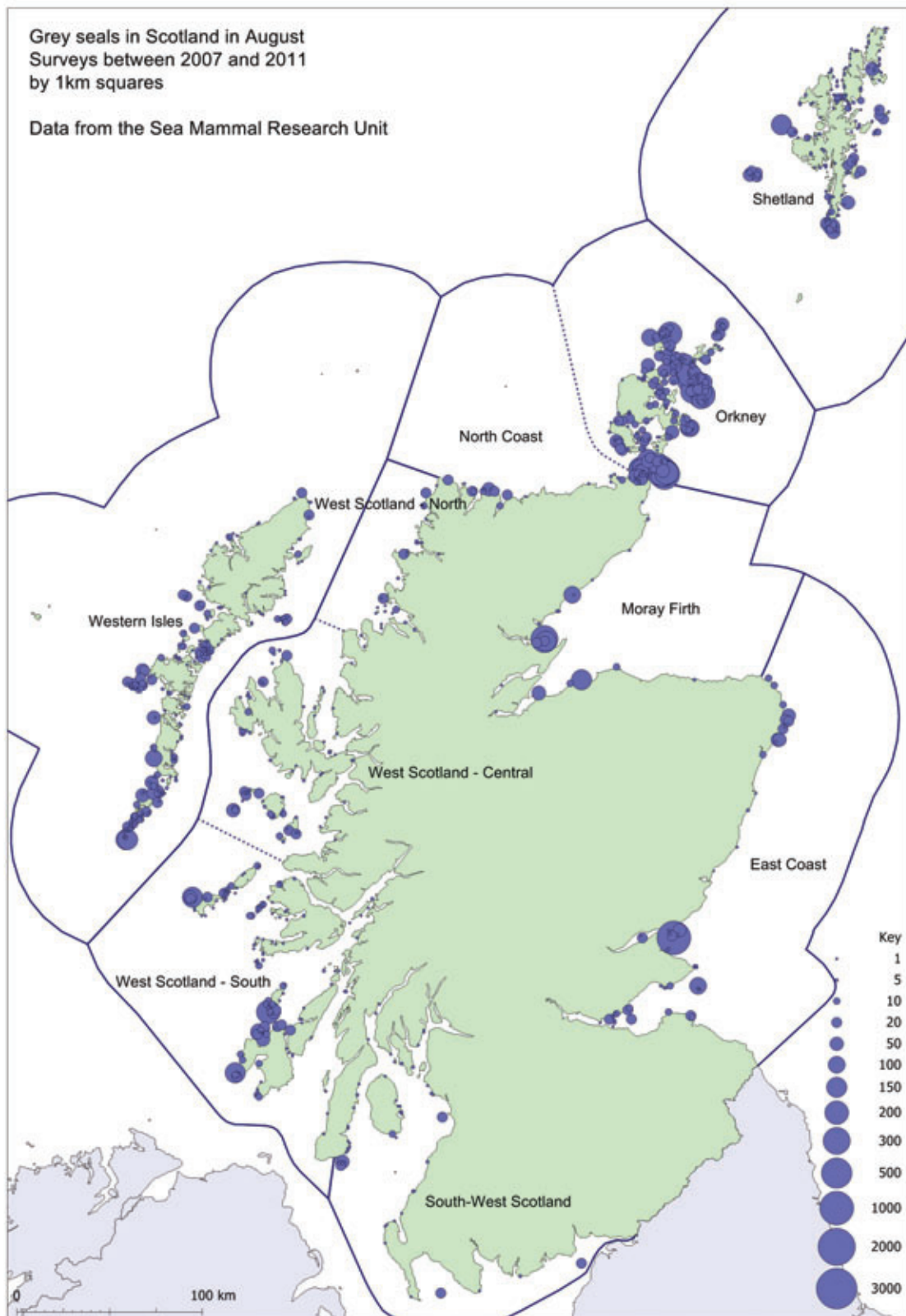


**Figure 1b.** This map shows the same data for harbour seals in Scotland as Figure 1a but aggregated by 10km squares, removing many overlapped locations. Data are from August surveys between 2007 and 2011, from the Sea Mammal Research Unit.

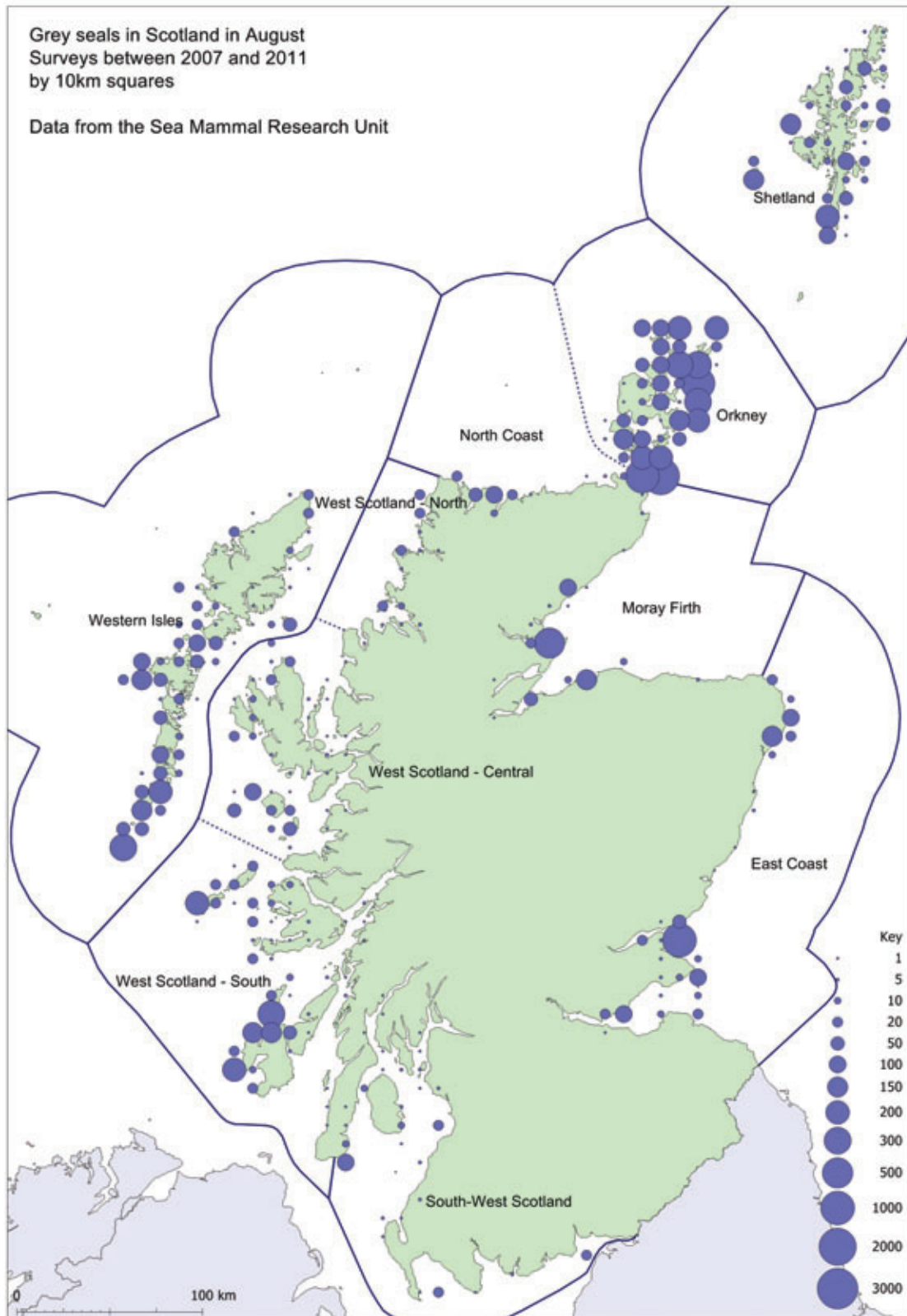




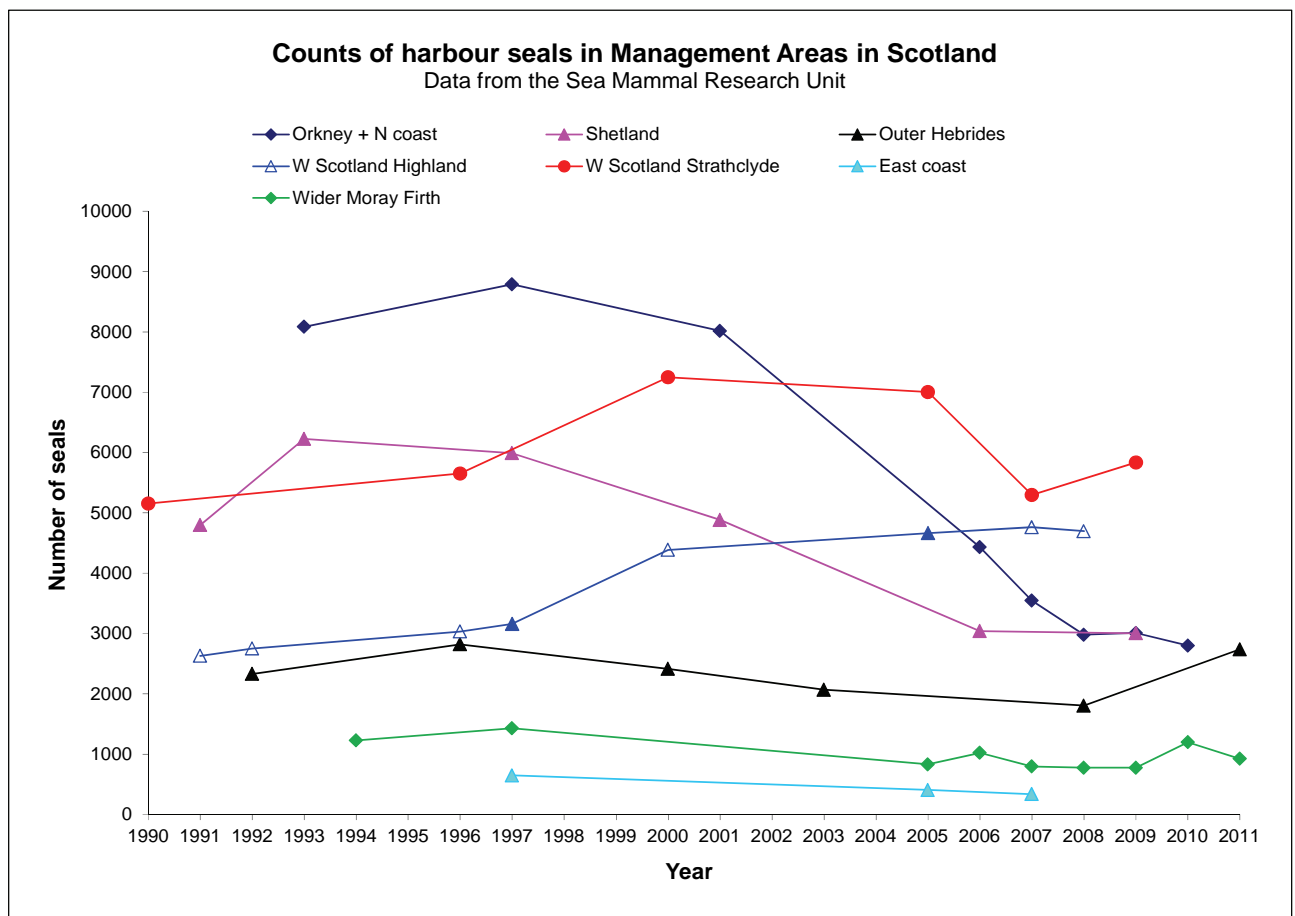
**Figure 2a.** The number and distribution of grey seals in Scotland within 1km squares. Seal management areas are outlined. Data are from August surveys between 2007 and 2011, from the Sea Mammal Research Unit.



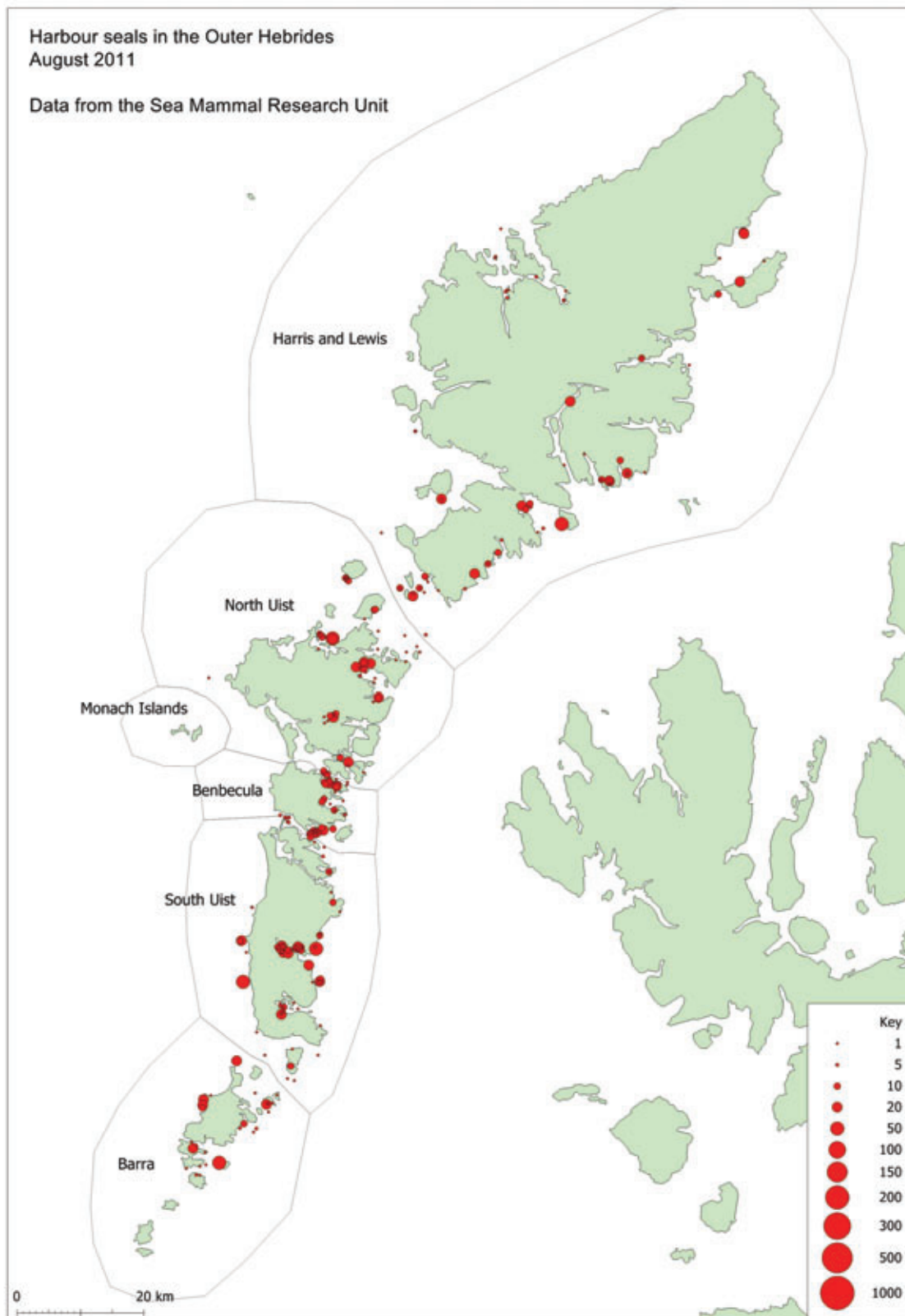
**Figure 2b.** This map shows the same data for grey seals in Scotland as Figure 2a but aggregated by 10km squares, removing many overlapped locations. Data are from August surveys between 2007 and 2011, from the Sea Mammal Research Unit.



**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. The North Coast extends from Cape Wrath to Duncansby Head and is included with Orkney. The Wider Moray Firth extends from Findhorn to Helmsdale. The East Coast extends from Fraserburgh to the Border by Berwick upon Tweed and has only been surveyed in its entirety three times. Note that because these data points represent counts of harbour seals distributed over large areas, individual data points may not be from surveys from only one year. This applies particularly to West Scotland (Highland and Strathclyde).

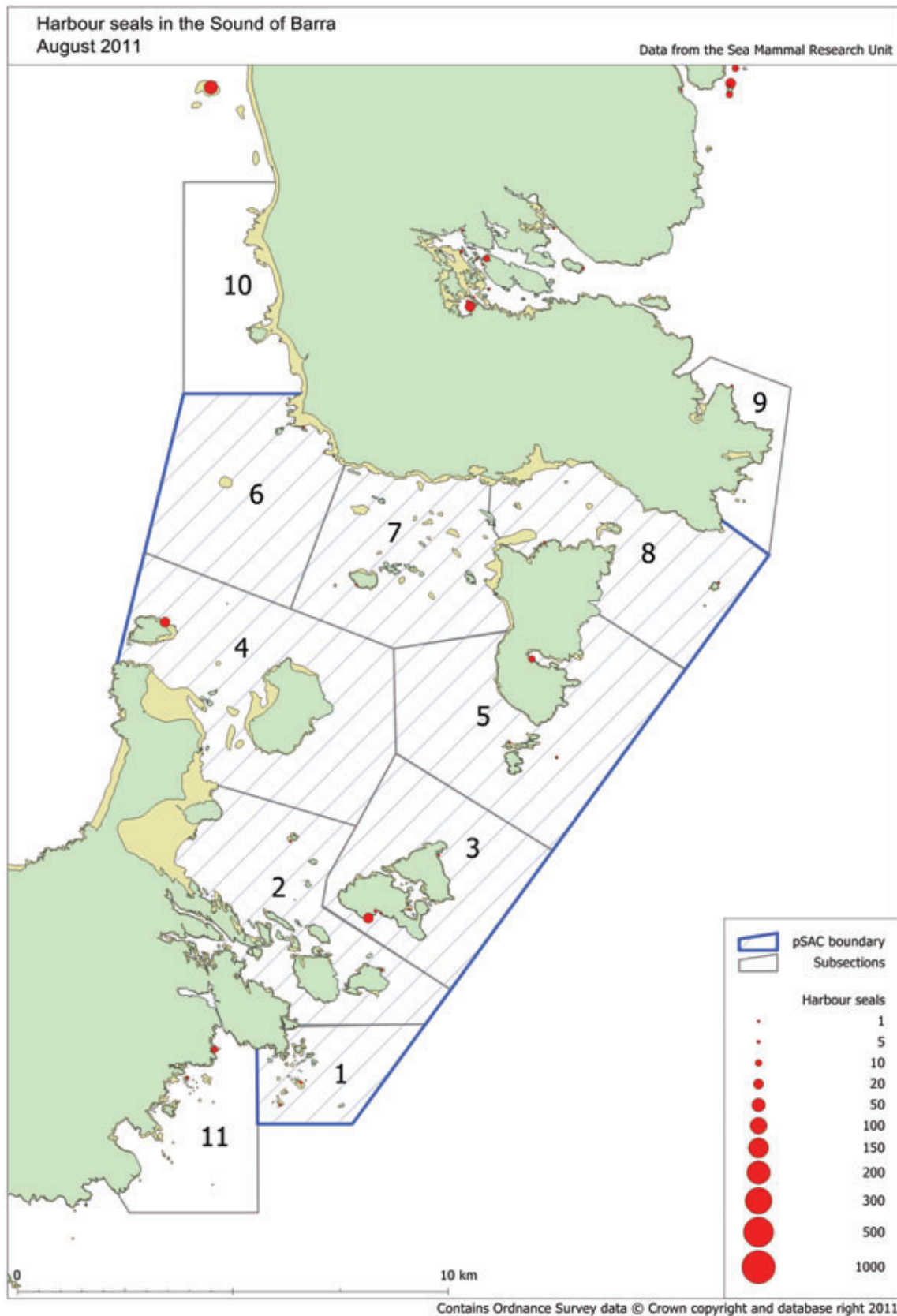


**Figure 4.** Harbour seal distribution in the Outer Hebrides in August 2011. Numbers of seals in each subregion are in Table 1.

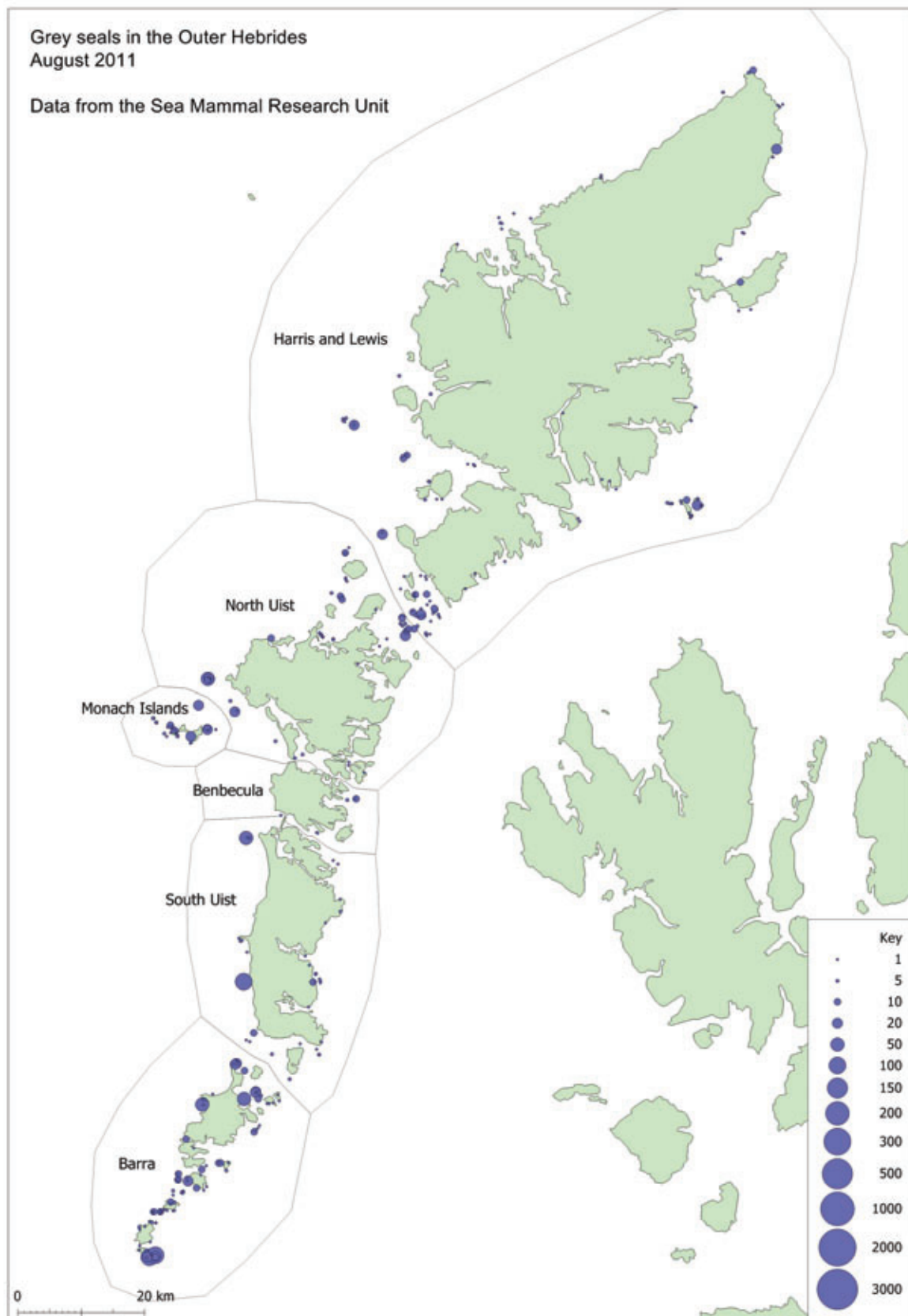




**Figure 5.** Harbour seals in the Sound of Barra. Numbers of seals in each subsection are in Table 3.

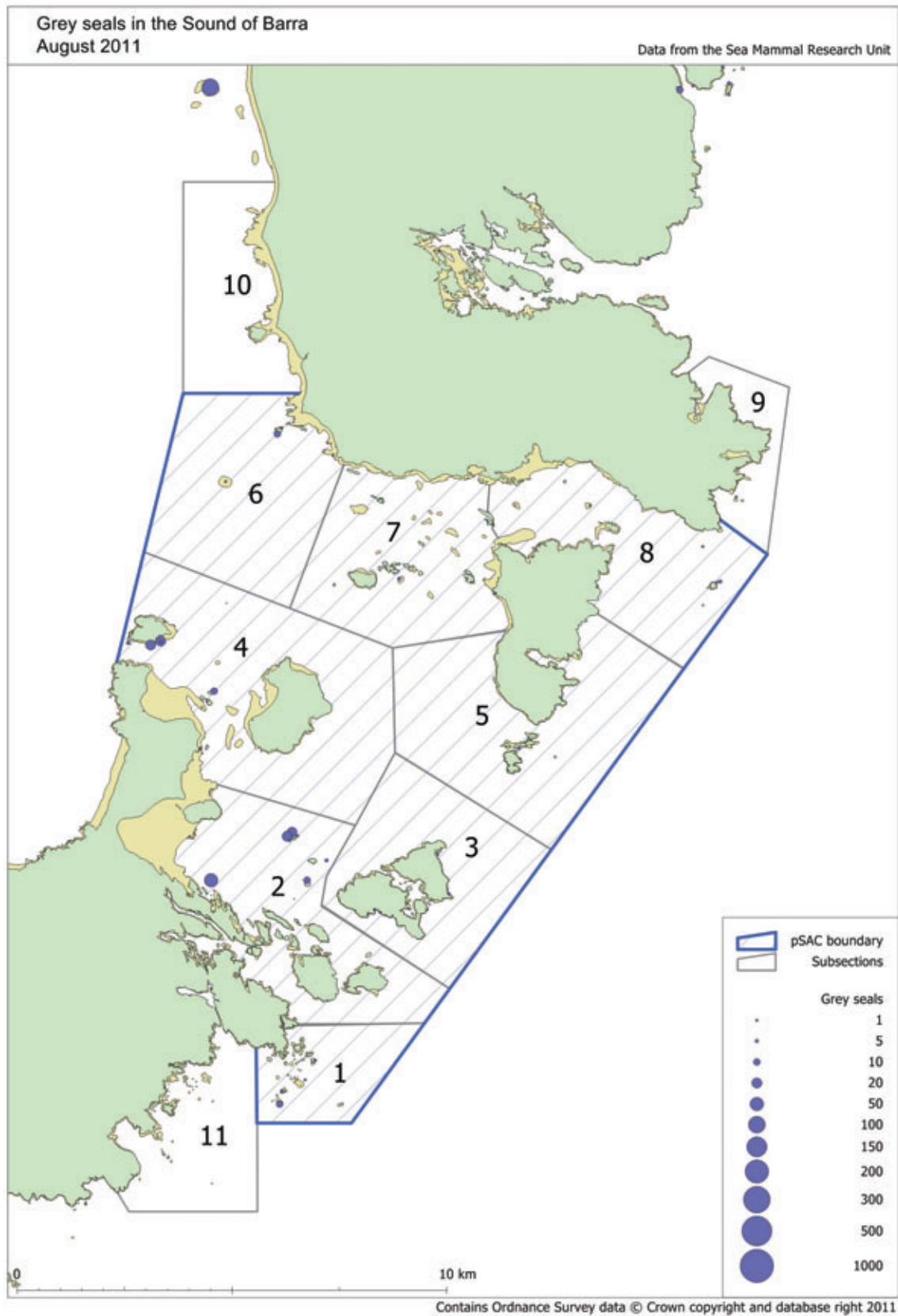


**Figure 6.** Grey seal distribution in the Outer Hebrides in August 2011. Numbers of seals in each subregion are in Table 2.

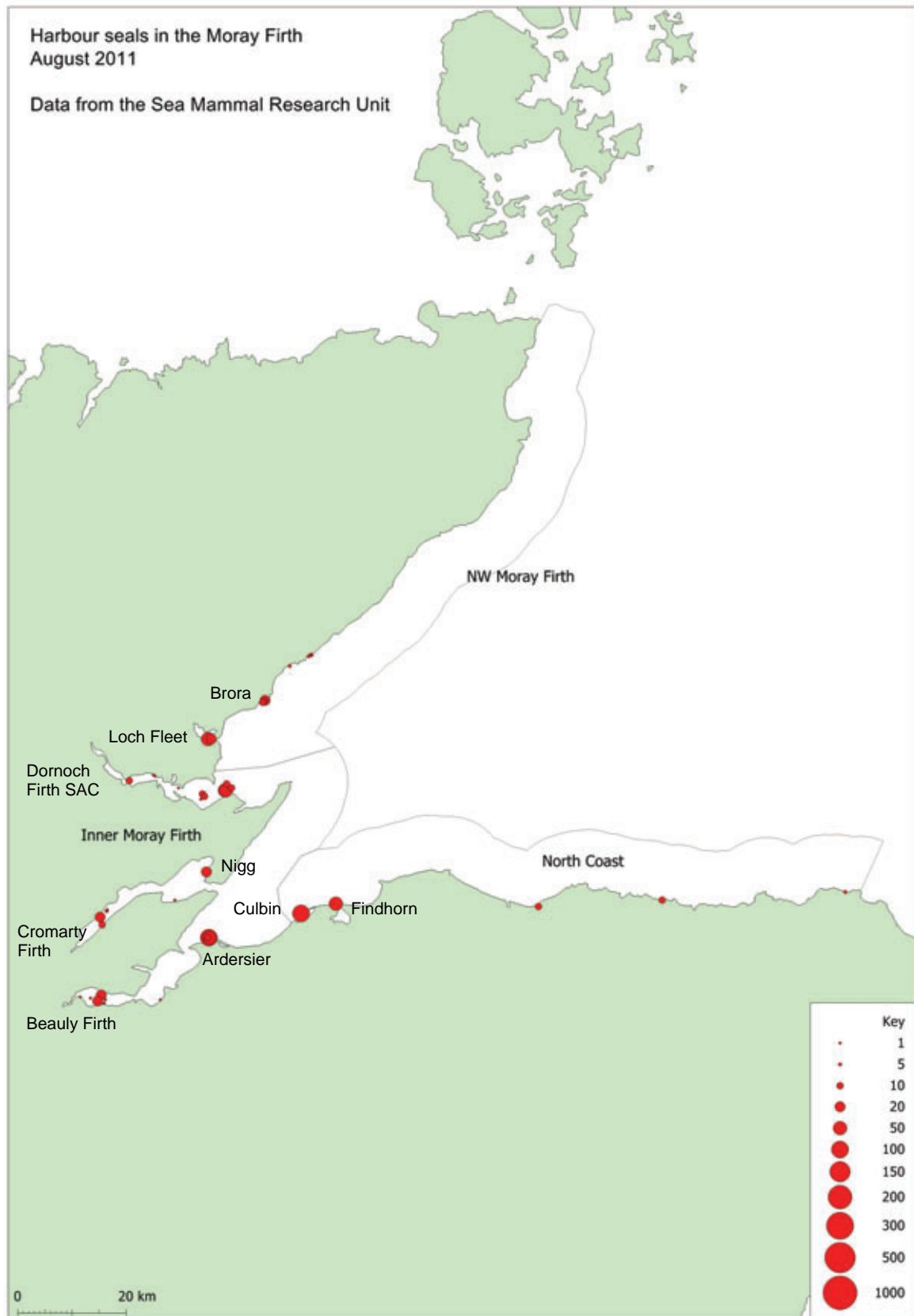




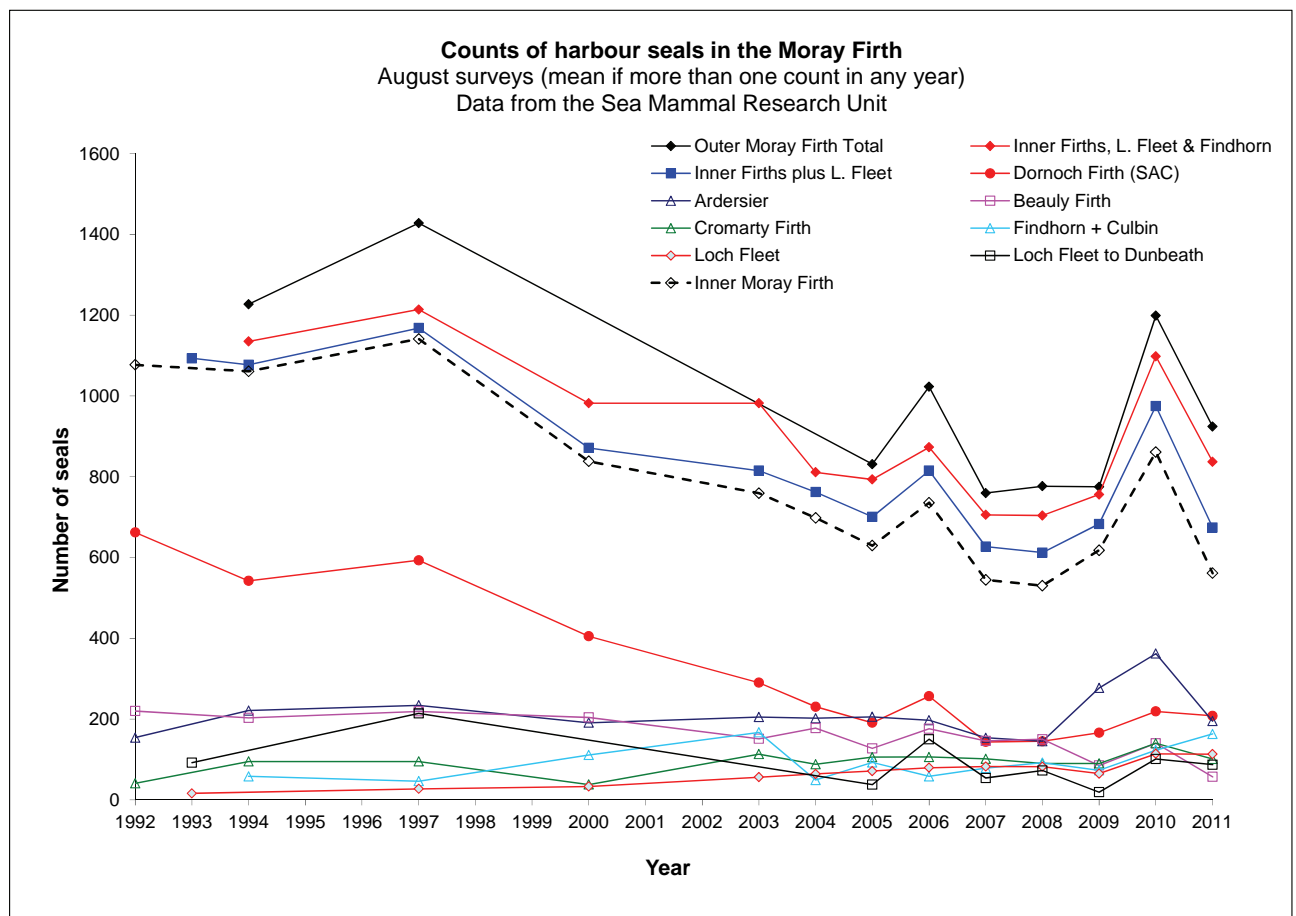
**Figure 7.** Grey seals in the Sound of Barra. Numbers of seals in each subsection are in Table 4.



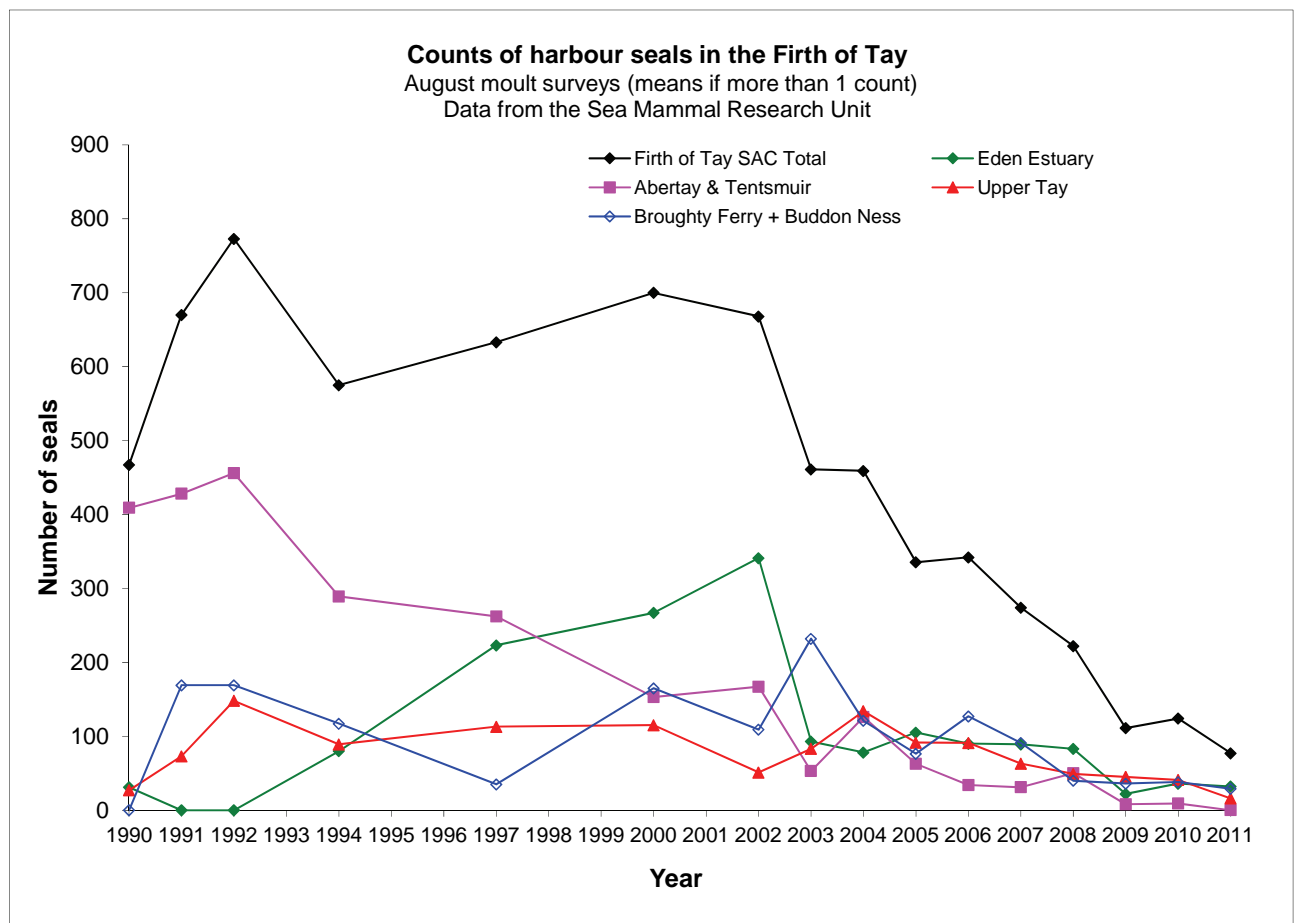
**Figure 8.** Harbour seal distribution in the Moray Firth in August 2011. Numbers of seals in the labelled sections of the Moray Firth, between Findhorn and Helmsdale, are in Table 5.



**Figure 9.** Numbers of harbour seals in the Moray Firth in August (see Table 5). If more than one count in any year, the mean value was used. Data from the Sea Mammal Research Unit.



**Figure 10.** Numbers of harbour seals in the Firth of Tay SAC in August (see Table 8). If more than one count in any year, the mean value was used. Data from the Sea Mammal Research Unit.



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Policy and Advice Directorate, Great Glen House,  
Leachkin Road, Inverness IV3 8NW  
T: 01463 725000

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