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ADVICE ON THE STATUS OF BRITISH GREY SEAL POPULATIONS: 1994

Every year the Sea Mammal Research Unit (SMRU) conducts surveys of the major grey seal breeding sites in Britain in order to estimate the number of pups born there. During 1993 aerial surveys were flown of all the major sites in the Hebrides and Orkney, and of the Isle of May. Trial aerial surveys of Loch Eriboll and Shetland were also conducted. Ground counts of the numbers of pups born at the Farne Islands were carried out by staff from the National Trust; similar counts were carried out by members of the Lincolnshire Trust for Nature Conservation at Donna Nook on the Humber estuary, by members of the Dyfed Wildlife Trust in Wales, and by staff of Scottish Natural Heritage on South Ronaldsay, Orkney.

Hiby *et al.* (*in prep*, attached) presents estimates of pup production based on surveys of grey seal breeding sites carried out since the 1950s. It also describes the methods used to calculate these estimates and the size of the total seal population associated with a group of sites. It includes maps of the British and world distribution of the grey seal, and of the location of sites on Scotland where grey seals have been observed in summer during surveys for common seals.

Until this year, pup production at grey seal colonies which have been surveyed each year from the air has been estimated using a computer model of the growth and decline of the number of pups present on those sites, with the assumption that the date of birth of pups is symmetrically distributed through the pupping season. In the advice for 1993, concern was expressed that the results of surveys conducted in 1992 suggested that the distribution of births through the pupping season had changed. In order to check on this, the number of surveys of each colony was increased to six in 1993. Analysis of the results of these surveys confirmed that a skewed distribution of births was a more appropriate model. Key parameters (the length of time which pups spend on the colony, and the age at which they lose their white coats and can be classified as "moulted") were estimated by fitting the model to counts of the numbers of white-coated, moulted and suckling pups at three major groups of colonies (early and late breeding colonies in Orkney, and all colonies in the Outer Hebrides) in 1993. These parameters were then used to estimate a time series of pup production for each site between 1987 and 1993 (pups counted in photographs taken before 1987 had not been classified as white-coated or moulted animals). Pup production in years before 1987 was estimated using a simplified method. This method will be refined over the coming year, but these modifications should not produce any significant change to the trends in pup production estimated for groups of colonies at a particular location.

The method described in Hiby *et al.* provides an estimate of the total seal population associated with all the breeding sites which are surveyed annually. For illustrative purposes the components of this population which are associated with each of the major breeding areas have been calculated. However, it should be recognized that the distribution of seals outside the breeding seasons is unlikely to be the same as the distribution of the breeding sites. Estimates of pup production and population size for the main colonies surveyed in 1993, which account for more than 85% of all pups born each year, are:

Location	Pup production	Change from 1992	Total population (to nearest 100)
Inner Hebrides	3,175	+7%	10,800
Outer Hebrides	12,777	-2%	43,600
Orkney	11,328	+5%	38,700
Isle of May	1,501	+18	5,100
Farne Islands	1,051	+7%	3,600
Donna Nook	205	+2%	700

Ninety-five percent confidence limits on the pup production estimates for each location are within 5% of the point estimate. It is also possible to calculate 95% confidence limits for the estimate of the female component of the population; these are within 23% below and 38% above the point estimates. The size of the male component of this population has been derived in a different way, as a result it is not possible to calculate formal confidence limits for the estimate of total population size. However, if it was possible they would be at least as large as those for the female component.

The other British breeding areas are surveyed less frequently and intensively. Estimates of pup production have been calculated for these, but confidence limits cannot be calculated. The total population associated with these remaining areas has been calculated using the ratio of total population to pup production for the main areas. The resulting figures are:

Location	Date of last survey	Pup production	Total population (to nearest 100)
Mainland Scotland and South Ronaldsay	1992	1,150	3,900
Shetland	1977	1,000	3,400
Southwest Britain	1973/93	1,500	5,100

Taken together, these figures provide an estimate of 115,000 for the size of the British grey seal population at the start of the 1993 pupping season. This is 40-45% of the world population of the species. 105,6000 seals are associated with breeding sites in Scotland and 9,400 with breeding sites in England and Wales. The equivalent estimates for 1992 are 97,600 for Scottish sites and 9,300 for those in England and Wales. The increase in population size between the two years was 7.5%, although pup production increased by only 2.5%.

In 1988, large numbers of common seals died throughout Europe as a result of an epidemic caused by the phocid distemper virus (PDV). Very few grey seal carcasses were found during the epidemic. This suggested that the disease had a lesser impact on this species, although blood tests indicated that almost all adult grey seals had been exposed to the virus. The number of grey seal pups born at many sites in 1988 was substantially lower than expected. Pup production at these sites has since risen, suggesting that infection with PDV in 1988 led to a temporary reduction in the reproductive rate of grey seals. All the above figures have been calculated on this basis.

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**ADVICE ON THE STATUS OF BRITISH COMMON SEAL POPULATIONS: 1994**

Annex II (Duck *et al.*, in prep.) summarizes the methods used to count British common seals. It also contains detailed maps of the distribution of sites in Scotland and on the east coast of England which common seals use for hauling-out in August. Significant changes made to Duck *et al.* since 1993 are shown in bold type.

Until 1984, SMRU estimated the abundance of common seals by counting the number of animals hauled-out in particular regions from boats, in July at the end of the pupping season. However, estimates from such surveys are not sufficiently precise or accurate to provide a useful indication of the status of British common seal populations. Throughout Europe, surveys of common seals are now carried out between late July and mid-August, when the largest number of seals are usually recorded and repeat counts of the same areas give consistent results. Where counts from boats at the end of the pupping season and from aircraft in August have been carried out in the same year, approximately twice as many seals have been counted from the air. Even though counts made in early August are usually higher than those made at any other time, it is still unlikely that all members of the population will be visible. Thus the figures in this advice represent the minimum number of seals in each area surveyed. The relationship between this minimum number and total population size has not been established precisely. However, studies of seals in Orkney fitted with radio transmitters have indicated that almost all males and 42-75% of females are likely to be counted during aerial surveys in August. If the behaviour of seals elsewhere in Britain is similar to that observed in Orkney, total population sizes could be 23-59% higher than these values.

In 1993, SMRU carried out aerial surveys of common seals in Shetland, Orkney, the Helmsdale coast, Skye, Mull and Lismore using a helicopter mounted thermal imager. The east coast of England (Donna Nook, the Wash and Blakeney Point) was surveyed using NERC's fixed-wing aircraft. Based on the results of these and similar surveys conducted since 1988, the minimum size of the British common seal population is estimated to be 28,334. Britain holds nearly 40% of the population of the European subspecies *Phoca vitulina vitulina* and about 5% of the world population of the species.

The current status of most common seal populations in Britain is unclear. Counts made on the east coast of England between late July and early August showed an average increase of 3.5% per annum between 1969 and 1988. The population in this region was reduced by about 50% following the 1988 phocid distemper epizootic. Populations in Scotland which had been surveyed before the epizootic and which were surveyed again in 1989 were apparently little affected. There is some evidence from Britain, the Netherlands and Denmark that a distemper virus is still circulating in the North Sea, but no mortalities which are directly attributable to the virus have been reported amongst wild seals.

The Conservation of Seals Order (England) (No.2) 1990, which provides year round protection for common and grey seals on the east coast of England, was introduced to promote the recovery of the common seal population there. Counts of common seals in the Wash in 1989, 1990 and 1991 were virtually identical, leading to fears that the population was not

recovering. However, the mean of the two counts made in 1992 was 8% higher than the mean of the counts made in the previous three years. Mean counts increased by 5% between 1992 and 1993, and 13% between 1993 and 1994.

In January 1993, the tanker MV BRAER was wrecked on the south tip of Mainland, spilling its entire load of 80,000 tonnes of light crude oil. Shetland was surveyed in August 1993 in order to assess the effects of this spillage on common seals. 6227 common seals were counted; an increase of 26% over the number counted in an identical survey in 1991. There is clearly no evidence that common seals in Shetland were adversely affected by the oil spill, but longer term effect on pregnancy rates, pup production and survival, or on potential prey species such as sandeels (*Ammodytidae*) would not have been detected by this survey.

The Table below shows the numbers of common seals counted around Britain between 1988 and August 1993. As noted above, these data represent the minimum number of seals in each area surveyed.

Location	Date of Survey	Number counted	Survey Method	Status
NE, N & W coast Scotland & Inner Hebrides	1988-1993	8,331	Helicopter with Thermal Imager (TI)	Unknown
Dumfries & Galloway	1992	8	Helicopter with TI	Unknown
Outer Hebrides	1992	2,278	Helicopter with TI	Unknown
Shetland	1993	6,227	Helicopter with TI	Unknown
Orkney	1993	7,873	Helicopter with TI	Unknown
East coast Scotland	1992	1,730	Fixed-wing aircraft	Unknown
East coast England	1993	1,887	Fixed-wing aircraft	Increasing until 1988
<b>TOTAL</b>		<b>28,334</b>		Unknown

The Department of the Environment Northern Ireland and the National Trust (Strangford Lough Wildlife Scheme) jointly count common seals in Strangford Lough, which holds most of the Northern Ireland population. As the Table below shows, counts made in early July since 1988 declined steadily until 1991 and have remained at around the same level since then. Pups of the year are given in parentheses.

COMMON SEALS IN STRANGFORD LOUGH, NORTHERN IRELAND							
		YEAR					
SITE	DATE	1988	1989	1990	1991	1992	1993
Strangford Lough	1-7 July	184 (34)	129 (25)	139 (39)	87 (31)		
Strangford Narrows	1-7 July	379 (68)	265 (50)	299 (60)	248 (52)		
TOTAL	adults pups	563 (102)	394 (75)	438 (99)	335 (83)	345 (52)	329 (52)

THE STATUS OF BRITISH COMMON SEAL POPULATIONS

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1. BASIC BIOLOGY

Common seals (*Phoca vitulina*) are considerably smaller than grey seals; adults may be up to 1.8m and weigh 80-150kg. They are more often associated with sheltered coastal sites, including estuaries, than are grey seals. Pups are born in June and early July on rocky islets or inter-tidal sandbanks. They weigh about 10kg at birth and grow to 20kg over a 6 week period. Although common seals are gregarious and habitually use specific haul-out sites, they do not breed in colonies. Females in late pregnancy tend to leave or move to the edges of groups and give birth to their pups in the inter-tidal zone. Newborn pups must swim with their mothers at the next high tide. Moulting occurs between mid-June and early September with young animals and females moulting earlier than males. During the moulting periods, especially males, haul-out more consistently and for longer periods than at any other time of year.

2. NORTH ATLANTIC POPULATION

The common seal has a circumpolar distribution with four well-recognized sub-species. In the North Atlantic *P.v.vitulina* is found as far north as Svalbard and as far west as Iceland (Figure 1); *P.v.concolor* is found on the north-east coast of the USA and throughout eastern Canada as far north as Baffin Island. Following the large scale mortality of European seals caused by phocid distemper virus in 1988, Britain now holds nearly 40% of the world's population of *P.v.vitulina*. It holds about 5% of the world population of the species.

3. SURVEY TECHNIQUES

Until 1984, SMRU estimated the abundance of common seals by counting the number of animals hauled-out in particular regions from boats, in July at the end of the pupping season. It was believed that such counts gave some indication of the productivity and minimum size of the local population. However, it is now known that the haul-out behaviour of common seals at this time is not consistent and that some pups have already dispersed widely by mid-July and are unlikely to be counted. Thus estimates from such surveys are not sufficiently precise or accurate to provide a useful indication of the status of British common seal populations.

Throughout Europe, surveys of common seals are now carried out between late July and mid-August, when most animals are moulting and the largest number of seals are usually recorded. Repeat counts of the same areas at this time of year give consistent results. Published estimates of the relationship between the number of seals counted in late July and August and total population size are available for only two European populations.

Telemetry studies in Orkney (Thompson and Harwood 1990) have indicated that males spend almost all their time hauled-out at this time of year while individual females spend 59% of their time hauled-out (95% confidence limits 42-75%). This result suggests that total population size in Orkney may be 23-59% higher than the peak count obtained from surveys in late July and August. Härkönen and Heide-Jørgensen (1990) estimated that total population size for common seals in the Kattegat/Skagerrak was 30% higher than the count obtained from aerial surveys, based on the number of seals found dead during the 1988 phocid distemper epizootic and the mortality rate estimated from aerial surveys in 1987 and 1989.

On the east coast of England and Scotland most common seals haul-out on sandbanks. Groups of seals are easily located and can be counted from conventional vertical aerial photographs. Elsewhere in Scotland, most haul-out sites are on seaweed covered rocks. In this type of terrain, groups of seals can be difficult to locate and count accurately. However, seals hauled-out are readily detected and counted using an infra-red sensitive thermal imaging camera, a device which is now used by SMRU for all rocky coastline surveys.

### 3.1 Thermal image surveys 1988-1993

Surveys are carried out using a thermal imaging camera mounted in a helicopter, a technique which allows a large section of coastline to be surveyed quickly and efficiently. Surveys are restricted to within two hours of low tide because studies of haul-out behaviour have shown that in certain areas, numbers of seals hauled out can decline considerably outwith this period.

During a survey, the thermal image of the coast is recorded onto video tape. The size and location (within a 100m square) of every group of seals (including grey seals) are marked on 1:50,000 Ordnance Survey maps together with the date and time of the sighting. This information is entered into a computer database at the end of each survey flight.

The entire north-east, north and west coasts of Scotland (from Dornoch in the Moray Firth to the Cumbrian border, including the south shore of the Solway Firth as far as Silloth), plus all islands in Shetland, Orkney, the Outer and Inner Hebrides, have been surveyed between August 1988 and August 1993. Large sections of the west coast which had been surveyed in 1988 were resurveyed in 1989 to assess the effects of the phocid distemper epizootic. Other sites (Mull, Lismore, the Ascrib Islands and Loch Dunvegan in Skye) have been surveyed every year. Two sections of the east coast of Scotland (from Findhorn Bay to Carnoustie and from St. Andrews to Berwick) and the more distant offshore islands (St. Kilda, the Flannans, Sule Skerry, Sula Sgeir, North Rona, Sule Stack and Fair Isle) have not been surveyed. In the latter case, this was due to Civil Aviation Authority restrictions on the use of the survey helicopter over open water.

The distribution and numbers of common seals in Scotland during early August are shown in Figure 2. Circles represent the total number of seals observed in each 10km square, centred on the midpoint of that square. Where there are replicate counts (Lismore, Mull, Shetland, Skye and the west coast from Kyle of Lochalsh to Moidart), the mean of these has been



used. During these surveys, a total of 26,447 common seals and 13,992 grey seals have been counted.

Table 1 shows the numbers of seals in areas which have been surveyed repeatedly. In general there appears to be only limited variation in the number of seals counted from day to day and from year to year within a particular locality, although their distribution may vary from year to year. For example, the whole of Skye was resurveyed in 1992 in order to investigate whether the decline in numbers in Loch Dunvegan and on the Ascrib Islands between 1989 and 1991 was representative of the area as a whole. The 1992 total was very similar to those obtained in 1988 and 1989 (Table 1), implying a redistribution of animals. However, in 1993 numbers in Loch Dunvegan and the Ascribs were the highest recorded since 1989, 93% greater than in 1992 (Table 1, Figure 3).

Similarly in Orkney, although the total numbers of common seals counted in the 1989 (visual) and 1993 (thermal) surveys differed by only 10% (Table 2), their distribution had changed. Numbers of seals in the Eynhallow, east Rousay, Egilsay, Wyre, Sweynholm and Gairsay area declined substantially while numbers on Westray, North Ronaldsay, Sanday and Stronsay all increased (Figure 4 (a) and (b); Table 2. Subregion locations are shown in Figure 4(c)).

### 3.2 Effects of the 1993 Shetland oil spill

In early January 1993, the MV BRAER released 80,000 tonnes of light crude oil into the sea around the southern tip of Shetland. Exceptionally severe and prolonged gales smashed the wreck and prevented salvage operations. Oil spread around the south and south-west coasts of Mainland but was dispersed very rapidly throughout the water column. The initial impact on seals appeared to be slight with 22 dead grey seals either seen or recovered. All of these seals were considered to have died either before the spill or for reasons unconnected with it. Three common seals and 30 grey seals were taken into the seal rescue centre at Hillswick. One common and two grey seals died while in care, the remainder were released.

Shetland had been surveyed in August 1991 when 4874 common seals were counted. To assess the impact of the BRAER oilspill, the islands were resurveyed in August 1993 when 6227 common seals were counted (Figure 5; Tables 1 and 3). Excluding the Ve Skerries, which were omitted in 1991, this represents an increase of 26%. The change in numbers was not spread uniformly throughout Shetland. The biggest increases were along the south-east coast between Lerwick and Sumburgh Head, in The Deeps (the embayment to the north and west of Scalloway) and between Fetlar and Unst (Figure 5 (a) and (b); Table 3). Subregions towards the north of Shetland averaged an increase of 12% while those towards the south averaged 39%.

These results indicate that, at least initially, common seals in Shetland were not adversely affected by the oil spill. However, longer term effects on, for example, pregnant females, subsequent pup production or potential prey species such as sandeels, would not have been detected.

The increase in Shetland common seal numbers is in contrast to the results of studies following the 1989 EXXON VALDEZ oil spill in Alaska. Although few oil-affected seals were recovered during the immediate aftermath of this spill, by 1992 harbour seal populations in oil-affected areas had declined by 35% while those in oil-unaffected areas had declined by 18% (Frost and Lowry 1992). The next survey of Shetland is scheduled to be conducted in August of either 1996 or 1997.

### 3.3 Aerial surveys of the east coast

Surveys of the common seal population in the Wash were carried out regularly by SMRU between 1969 and 1982 but were discontinued in 1983 following the death of the survey team in a helicopter accident. Surveying recommenced in 1988 and the survey area was extended to include the north Norfolk coast and the Humber estuary. Sandbank haul-out sites in the Firth of Tay (from 1990 to 1992) and the Moray Firth (in 1992) have also been surveyed and both these areas will be surveyed in August 1994.

Counts made in the Wash between late July and early August showed an average increase of 3.5% per annum between 1969 and 1988 (Figure 5). The population in the Wash and the surrounding area was reduced by about 50% following the 1988 phocid distemper epizootic. Counts from the Wash in 1989, 1990 and 1991 were all around 1,550 individuals. In 1992 the mean count was 1,673, about 8% higher than previously. In 1993 the count was 1759, a further increase of 5% (Figure 6, Table 4). The mean numbers of seals counted per 1km square on the east coast of England, from the Humber estuary to Blakeney Point, between 1989 and 1993 are shown in Figure 7 with the August 1993 survey results shown in Figure 8.

## 4. EFFECTS OF PHOCID DISTEMPER VIRUS (PDV)

The common seal population in the Wash was seriously depleted as a result of the 1988 epizootic. However, other British populations were apparently little affected, even though relatively large numbers of dead seals were found in the Firth of Clyde and in Orkney. Mortality was undetectable in sections of the Scottish west coast which were surveyed immediately before the PDV outbreak and in the year following. It is not possible to estimate the overall mortality in Britain, because surveys in other areas had not been carried out for a number of years prior to 1988. Elsewhere in Europe, many common seal populations were reduced in size by up to 60%. Some of these increased substantially from 1990 to 1992 (ICES, 1992). Heide-Jørgensen *et al.* (1992) predict that the population in Denmark and Sweden will recover to its pre-epizootic level by 1995-96 because of the skewed age and sex ratio created by the epizootic.

Simple epidemiological models (Grenfell *et al.*, 1992) suggest that PDV should have disappeared from North Sea seal populations by 1990. However, up to 50% of grey and common seals born since 1988 which have been examined in the UK, The Netherlands and Sweden had significant levels of actively-acquired (ie non-maternal) antibodies to morbillivirus (ICES 1993). This, together with the fact that there was a small scale mortality attributed to PDV in a Dutch seal rescue and breeding centre in 1990 (Visser *et al.*, 1993) implies that the virus is still circulating in North Sea seal

populations. Seals from elsewhere in the North Atlantic and Arctic Ocean are also known to carry the virus (Henderson *et al.*, 1992; Markussen & Have, 1992). Thus there is a risk of a recurrent epizootic which could be initiated from within the North Sea populations or by an influx of infective individuals from outside the North Sea. This risk, and the magnitude of the effect of an epizootic, will increase with time as the proportion of unexposed individuals in the North Sea populations rises.

#### 5. EXPLOITATION AND DELIBERATE KILLING

Common seal pups were exploited in considerable numbers in the Wash and Shetland until the passing of the Conservation of Seals Act, 1970. Hunting in Shetland was halted by the Conservation of Seals (Scotland) Order, 1973b when it was demonstrated that hunting was removing a very high proportion of the annual pup production. Hunting continued in the Wash until 1973, in Orkney and the east coast of Scotland until 1977, and on the west coast of Scotland until 1981. Since these times licences have been issued only for protection of fisheries. The numbers of common seals taken under licence between 1970 and 1993 (no licences were issued in 1989 or 1990) are shown in Table 3.

An unknown number of common seals are killed legitimately each year by fishermen and the owners of marine fish farms. Figures provided to SOAFD by the Scottish Salmon Growers' Association indicate that at least 215 common seals were killed by its members during 1989 and 1990. In addition, members of the Shetland Salmon Farmers' Association reported that they shot 68 seals (species unknown) in 1989. Most of these were probably common seals because no licence holders in Shetland reported killing any grey seals between 1985 and 1988.

6. REFERENCES

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7. FIGURE LEGENDS

- Figure 1. Distribution of common seals in the North Atlantic.
- Figure 2. Distribution of common seals around the coast of Scotland as revealed by aerial surveys carried out in August between 1988 and 1993. Circles are centred on the mid-point of 10km squares and their size is proportional to the number of seals in each square.
- Figure 3. Numbers and distribution of common seals in north-west Skye in August of each year between 1988 and 1993. Circles represent the numbers of common seals counted in each 1km square.
- Figure 4. Numbers and distribution of common seals in Orkney in August 1989 (a) and August 1993 (b). Circles represent the numbers of seals counted in each 1km square. In 1989 conventional photography was used and in 1993 a thermal imaging camera. The locations of subregions used in Table 2 are shown in Figure 4(c)
- Figure 5. The distribution of common seals in Shetland in August 1991 (a) and August 1993 (b). Circles represent the number of common seals counted in each 1km square. The locations of subregions used in Table 3 are shown in Figure 5(c).
- Figure 6. Numbers of common seals in the Wash in August, from aerial surveys carried out between 1968 and 1993.
- Figure 7. The mean distribution of common seals on the east coast of England from aerial surveys carried out between 1989 and 1993. The size of each circle is proportional to the number of seals counted in 1km squares.
- Figure 8. The numbers and distribution of common seals between the Humber Estuary and Blakeney Point in August 1993. Circles represent the number of seals in 1km squares.

**TABLE 1**

Numbers of common seals in areas around Scotland which have been surveyed more than once between 1988 and 1993.

NUMBERS OF COMMON SEALS IN AREAS SURVEYED MORE THAN ONCE USING A HELICOPTER-MOUNTED THERMAL IMAGER							
		YEAR					
LOCATION	DATE	1988	1989	1990	1991	1992	1993
Applecross	7 Aug	48	26				
Plockton	6-7 Aug	282	158				
Skye, total	4-6 Aug	1233	1269			1296	
Skye, part. L Dunvegan Ascrib Is.	4-8 Aug	621	598	395	342	321	
	10 Aug						619
Kyle	4-7 Aug	43	15				
Sleat	7-8 Aug	43	53				
Loch Nevis	7-8 Aug	30	68				
Arisaig	7-8 Aug	456	499				
Mull	2-3 Aug	607					
	8-9 Aug		940	1008	883	825	946
Lismore	2-3 Aug	535		491			
	7-8 Aug		369	425	405	340	
	10 Aug		398				597
Orkney	5-6 Aug						7873
	13-14 Aug		7137*				
Shetland	2-6 Aug				4797		6227

\* Visual helicopter survey carried out jointly by the University of Aberdeen and SMRU.

**TABLE 2**

A comparison of the numbers of common and grey seals seen in subregions of Orkney in August 1989 and August 1993. In 1989 the helicopter survey used conventional 35mm photography to confirm numbers of seals hauled-out while in 1993 a helicopter-mounted thermal imager was used. The locations of subregions are shown in Figure 4(c).

Subregion	Common seals			Grey seals	
	13-14 Aug 1989	5-6 Aug 1993	% Diffe- rence	13-14 Aug 1991	5-6 Aug 1993
1 N& E Mainland	686	950	+39	37	218
2 S & W Mainland	273	131	-52	2	58
3 Burray and S Ronaldsay	275	377	+37	43	99
4 Hoy & S Walls	304	341	+12	41	248
5 Cava, Flotta, Rysa	690	801	+16	73	14
6 Shapinsay	308	287	-7	4	41
7 Rousay, Egilsay, Wyre, Eynhallow	1087	185	-83	175	93
8 Graemsay	0	8		2	0
9 Stronsay	487	659	+35	131	550
10 Eday & Calf	43	55	+28	51	236
11 Sanday	1108	1661	+50	255	1182
12 Westray & Papa Westray	586	776	+32	122	374
13 Auskerry	13	75	+477	20	79
14 N Ronaldsay	264	417	+58	148	637
15 Greenholms	0	1		40	27
16 Sweynholm etc	421	180	-57	282	13
17 Linga, Lingaholm, Huip, Spurness	63	47	-25	158	285
18 Faray, Faraholm, Ruskholm	3	6	+100	81	129
19 Copinsay	0	1		15	98
20 Swona, Switha, Stroma	526	914	+74	1029	1438
21 Pentland Skerries	0	1		520	972
<b>TOTAL</b>	<b>7137</b>	<b>7873</b>	<b>+10</b>	<b>3259</b>	<b>6821</b>

**TABLE 3**

A comparison of the numbers of seals seen in subregions of Shetland in early August 1991 and 1993. The locations of subregions are shown in Figure 8(c). Ve Skerries, off Papa Stour in subregion 12, were omitted in 1991. The percentage difference in the numbers of common seals is presented.

Area	Common seals			Grey seals	
	3-6 Aug 1991	2-4 Aug 1993	% Diffe- rence	3-6 Aug 1991	2-4 Aug 1993
1 SE Mainland	342	807	+136	16	9
2 Yell	352	353	0	7	15
3 Unst	346	288	-17	43	85
4 Fetlar & Hascosay	354	568	+60	102	14
5 Whalsay	416	512	+23	0	0
6 Out Skerries	280	326	+16	10	0
7 Mousa	388	455	+17	0	23
8 East Mainland	286	335	+17	0	0
9 Bressay	116	83	-28	1	0
10 Yell Sound	861	929	+8	5	7
11 NW Mainland	119	65	-5	56	99
12 St Magnus Bay (excl Ve Skerries)	343	660 456	+33	49	316 67
13 West Mainland	130	185	+42	0	35
15 SW Mainland	339	385	+14	32	621
16 Foula	0	3		37	38
17 The Deeps	125	273	+118	19	8
<b>TOTAL</b> <b>(excl Ve Skerries)</b>	<b>4797</b>	<b>6227</b> <b>6023</b>	<b>+30</b> <b>+26</b>	<b>377</b>	<b>1290</b> <b>1041</b>



**TABLE 4**

Numbers of common seals at sites on the east coast of Britain which have been surveyed more than once between 1988 and 1993. The absence of seals at both Donna Nook and Blakeney Point in 1991 was probably due to disturbance by visitors.

REPEAT SURVEYS OF COMMON SEALS BY FIXED-WING AIRCRAFT							
		YEAR					
SITE	DATE	1988	1989	1990	1991	1992	1993
Firth of Tay	7-13 August	-	-	467	670	773	-
Donna Nook, Lincolnshire	1-16 August	173	126	57	0	180	88
The Wash	1-16 August	3035	1580	1532	1551	1728 1618	1759
Blakeney Point	1-16 August	701	307	73	0	84 217	267

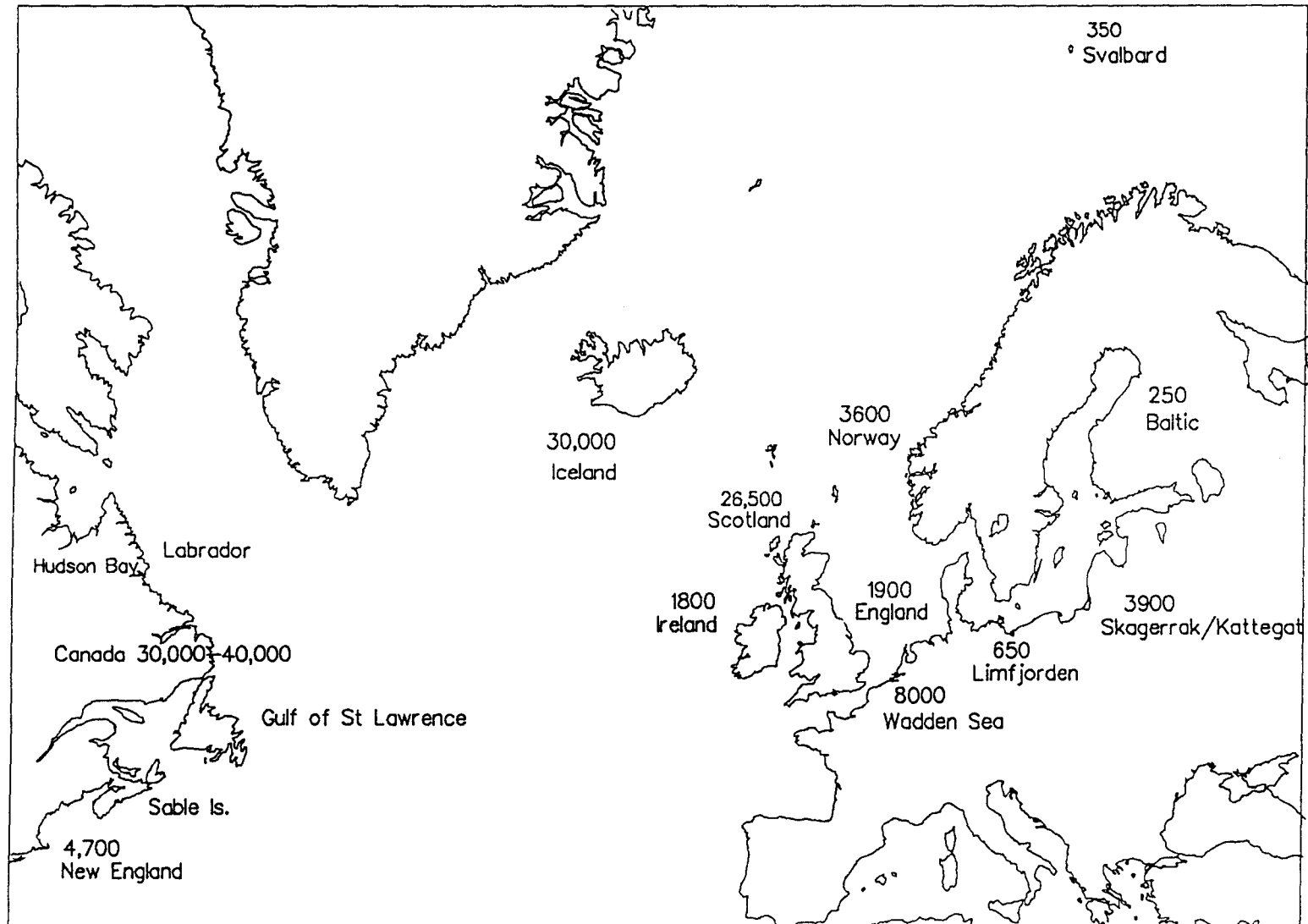
**TABLE 5**

Numbers of common seals killed under licence in Great Britain since 1971, including those taken under scientific permit. All figures refer to pups unless otherwise indicated.

Year	Outer Hebs	W. coast Scotland	E. coast Scotland	Orkney	Wash	Shetland
1971		250 + 17 ad	58 + 8 ad	12	303 + 12 ad	
1972		200 + 30 ad	61 + 9 ad	116	380 + 5 ad	
1973		250	59	198	382 + 13 ad	
1974	15	235	87 + 18 ad	198	1 adult	
1975	50	190	50	86	1 adult	
1976	42	208	104 + 17	96		
1977	39	211	ad	17		
1978		340	34 + 6 ad	-		
1979		350	-	-		
1980		350	-	28		
1981		350	5	-		
1982		3 adults	3 adults*	2		
1983		-	-	-		
1984		-	-	-		4 ad*
1985		1 adult*	-	-		3 ad*
1986		22 adults*	-	-		10 ad*
1987		-	-	-		12 ad*
1988		44 adults*	-	-		23 ad*
1989		-	30 adults*	-		
1990		-	-	-		
1991		-	-	-		
1992		-	5 adults*	-		
1993	-	-	2 adults	-		

\* Taken around salmon nets or at fish farms.

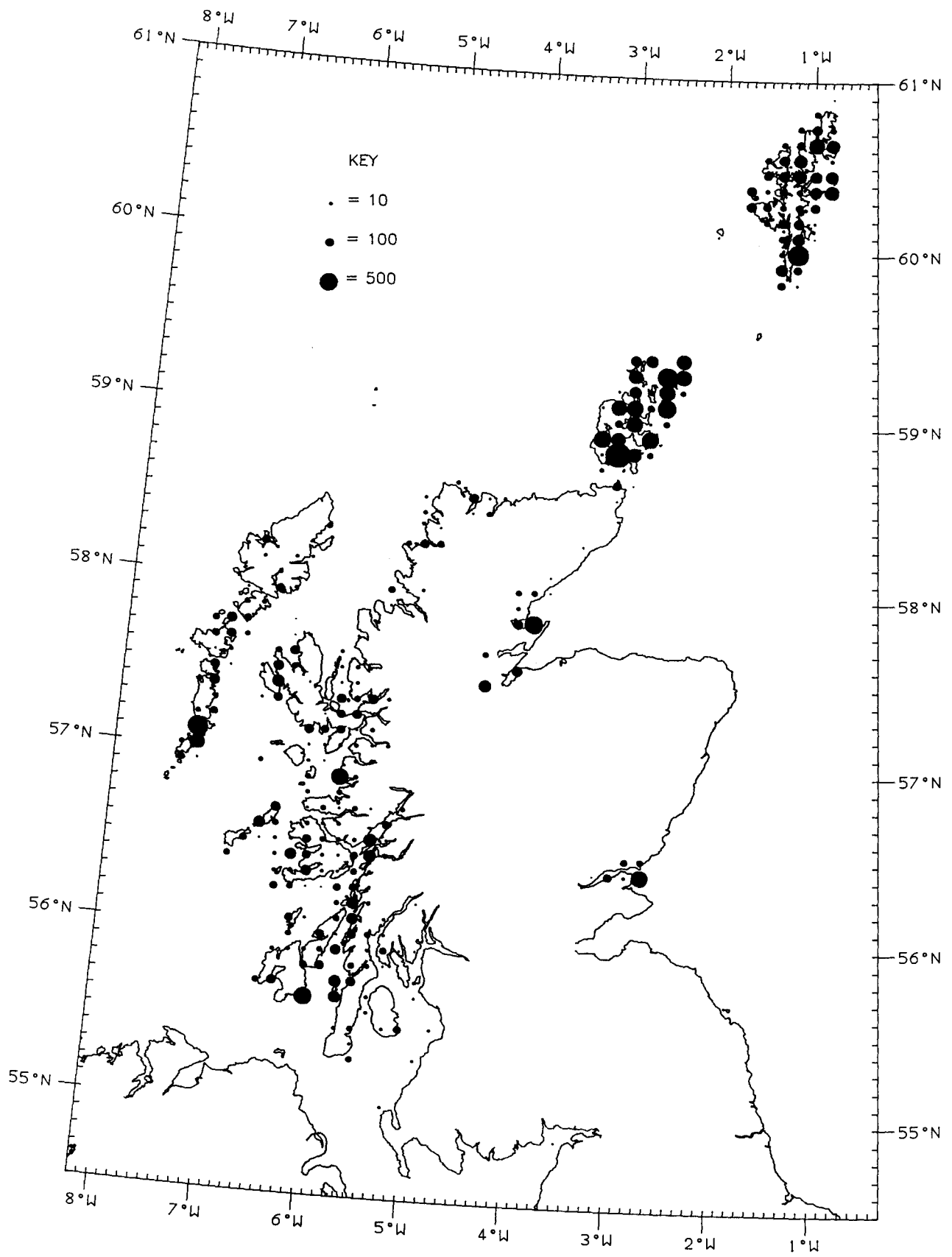
Figure 1



Distribution and Abundance of Common Seals in the North Atlantic

Figure 2.

Common seals in August: 1988 - 1993



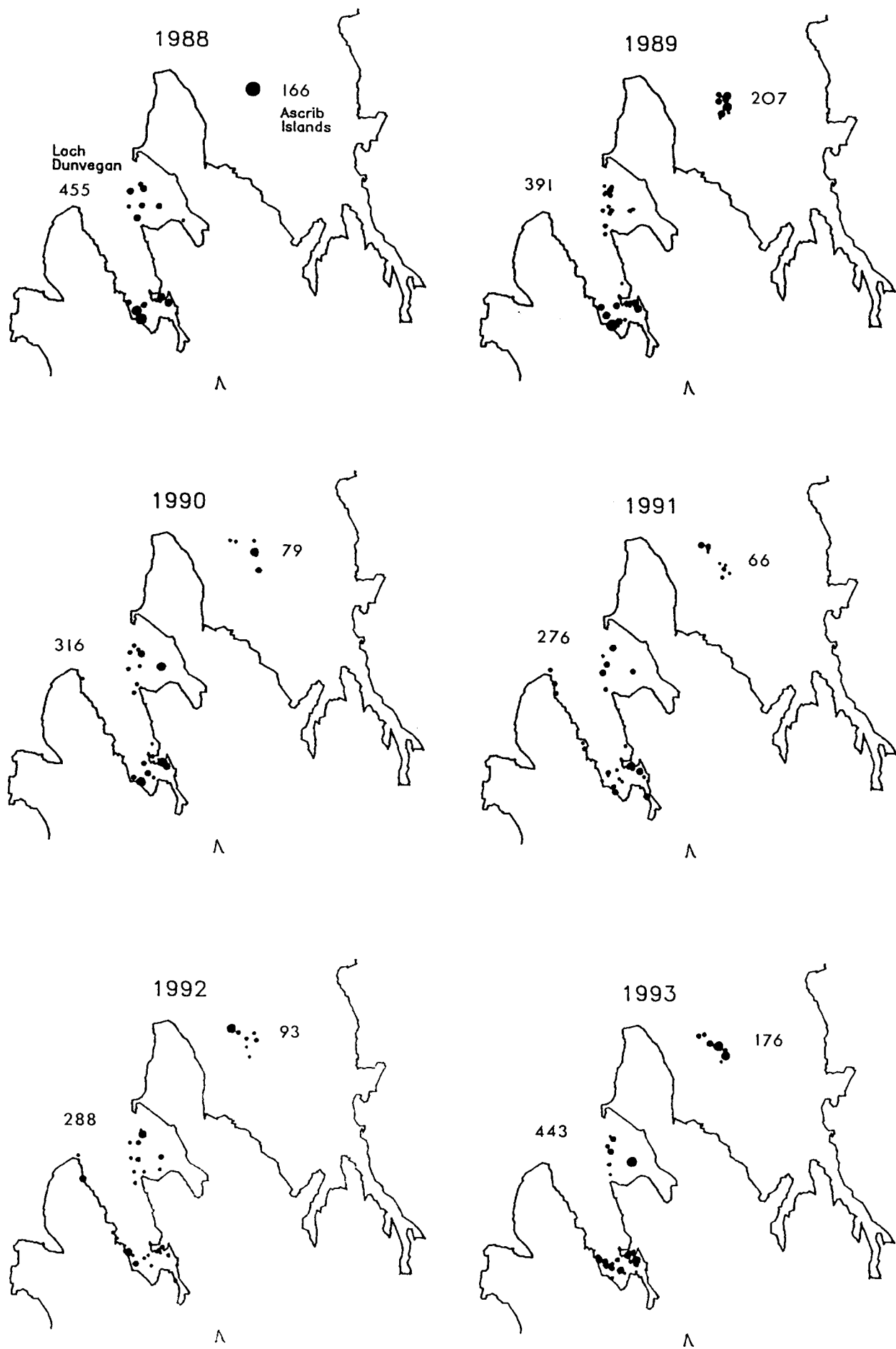
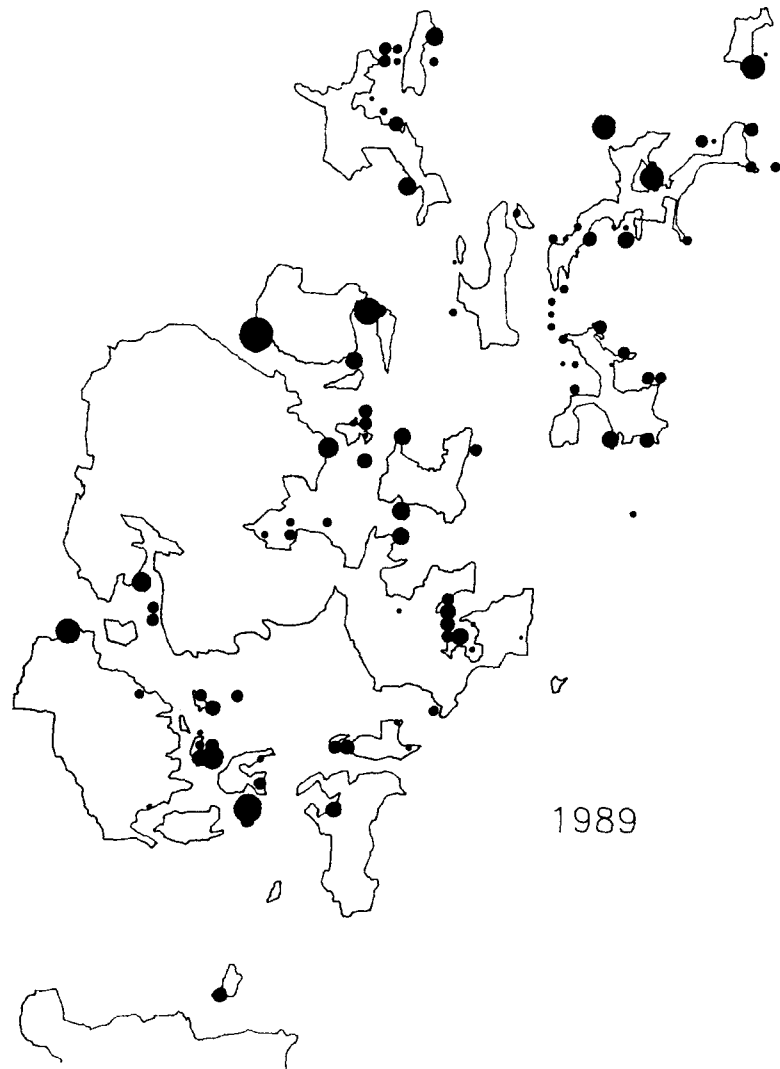


Figure 3.

Figure 4. (a)



(b)

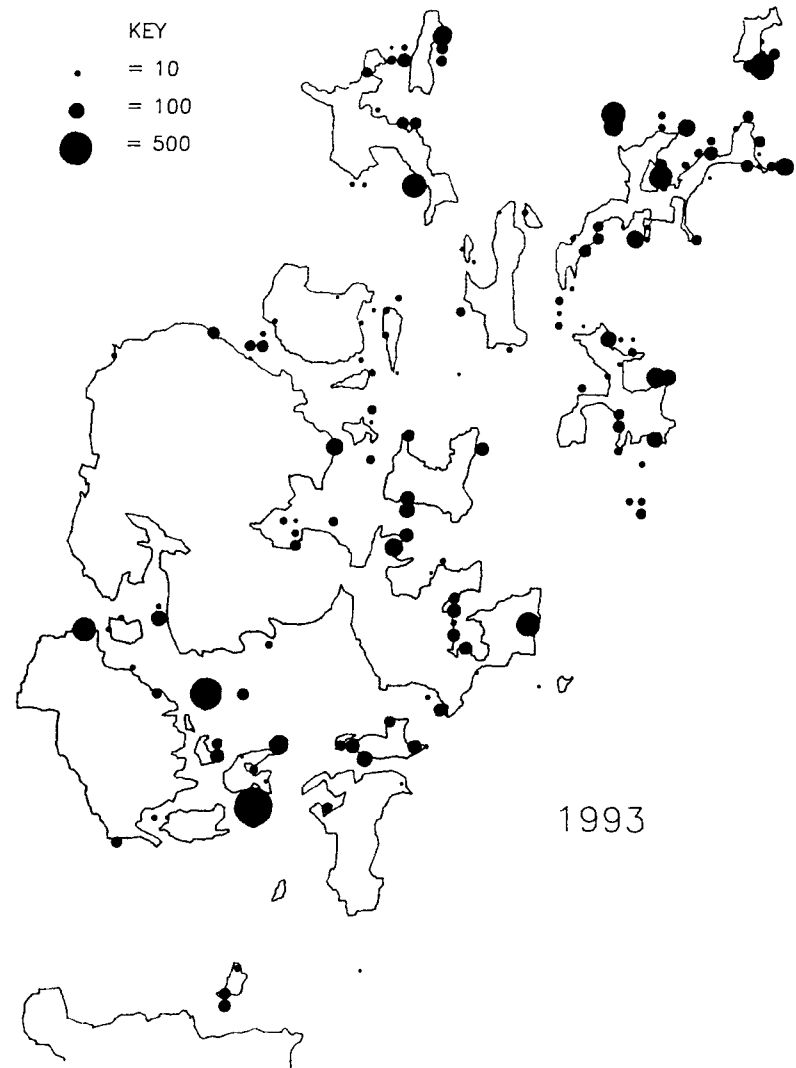


Figure 4 (c)

Subregions of Orkney

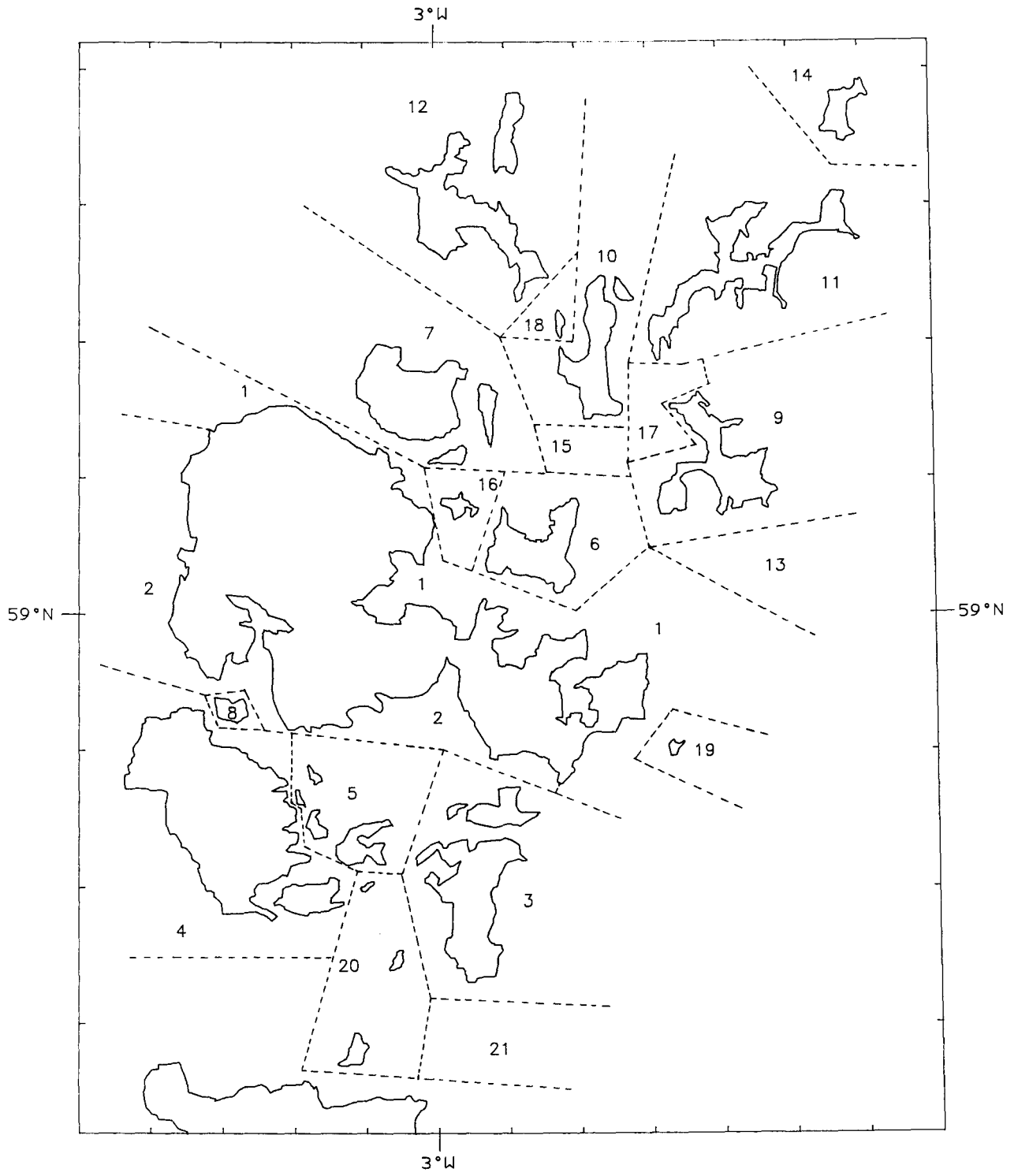
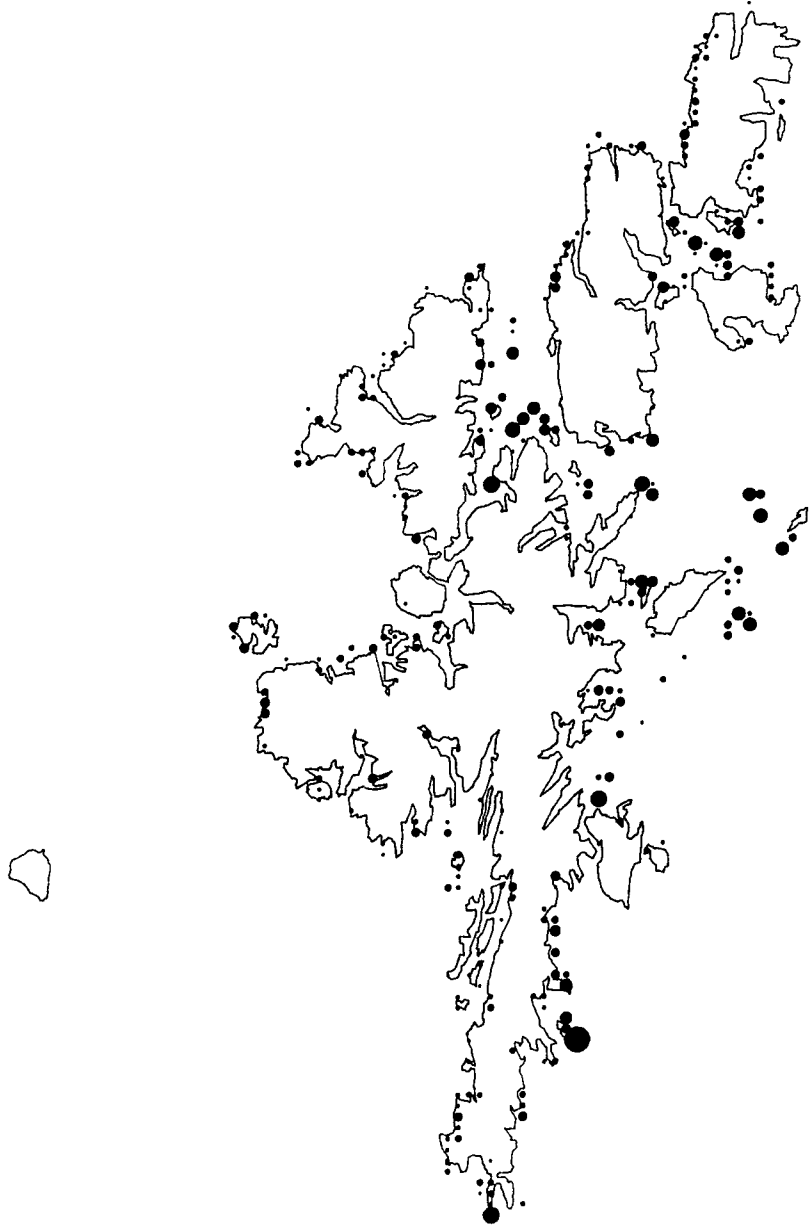


Figure 5 (a)

1991



(b)

1993

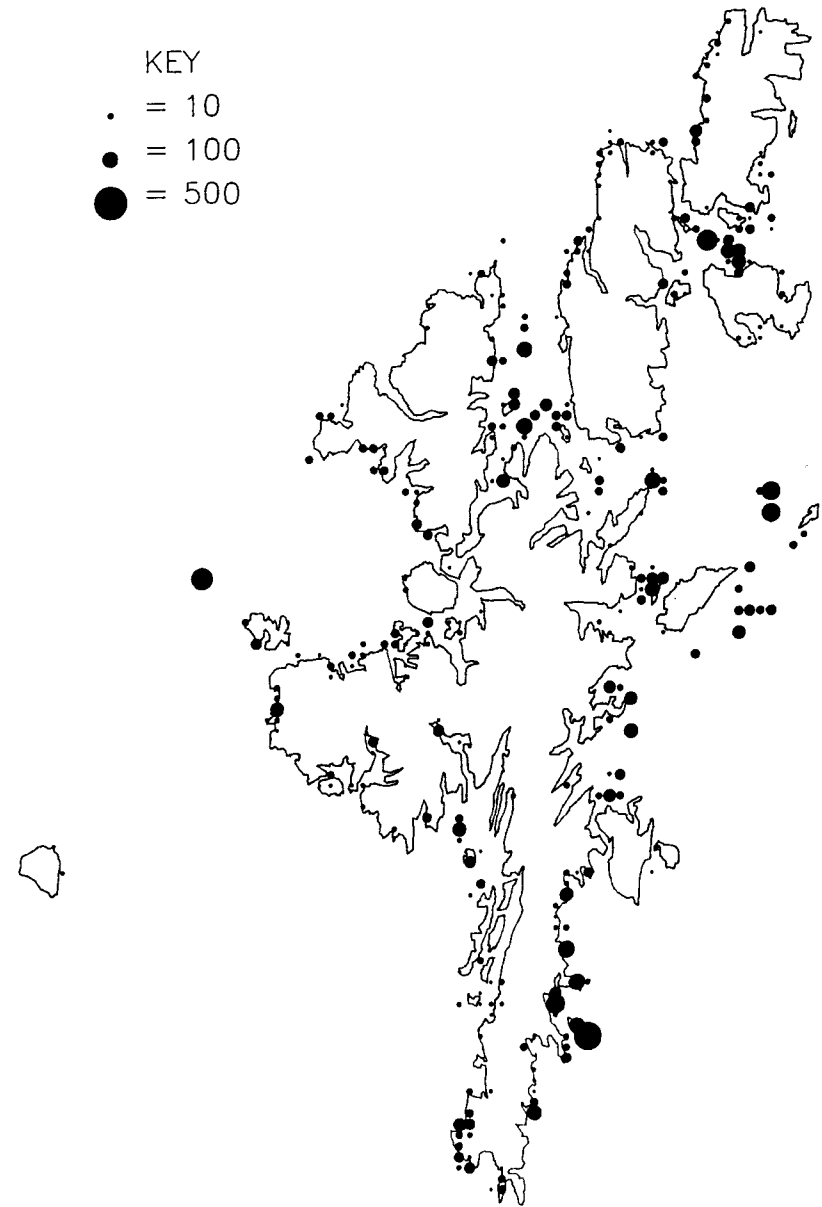




Figure 5 (c)

Shetland subregions

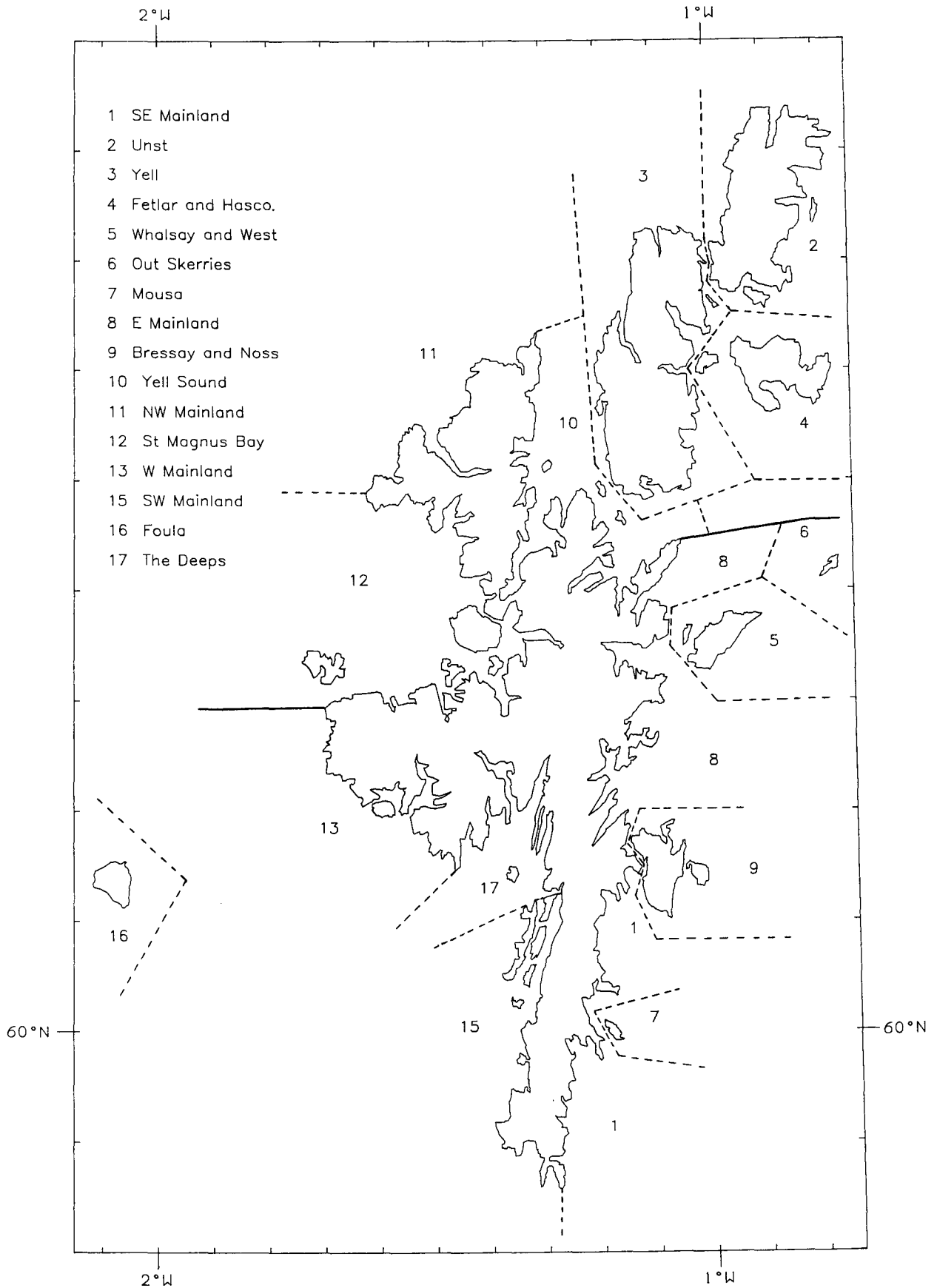


Figure 6.

### COMMON SEALS IN THE WASH IN AUGUST

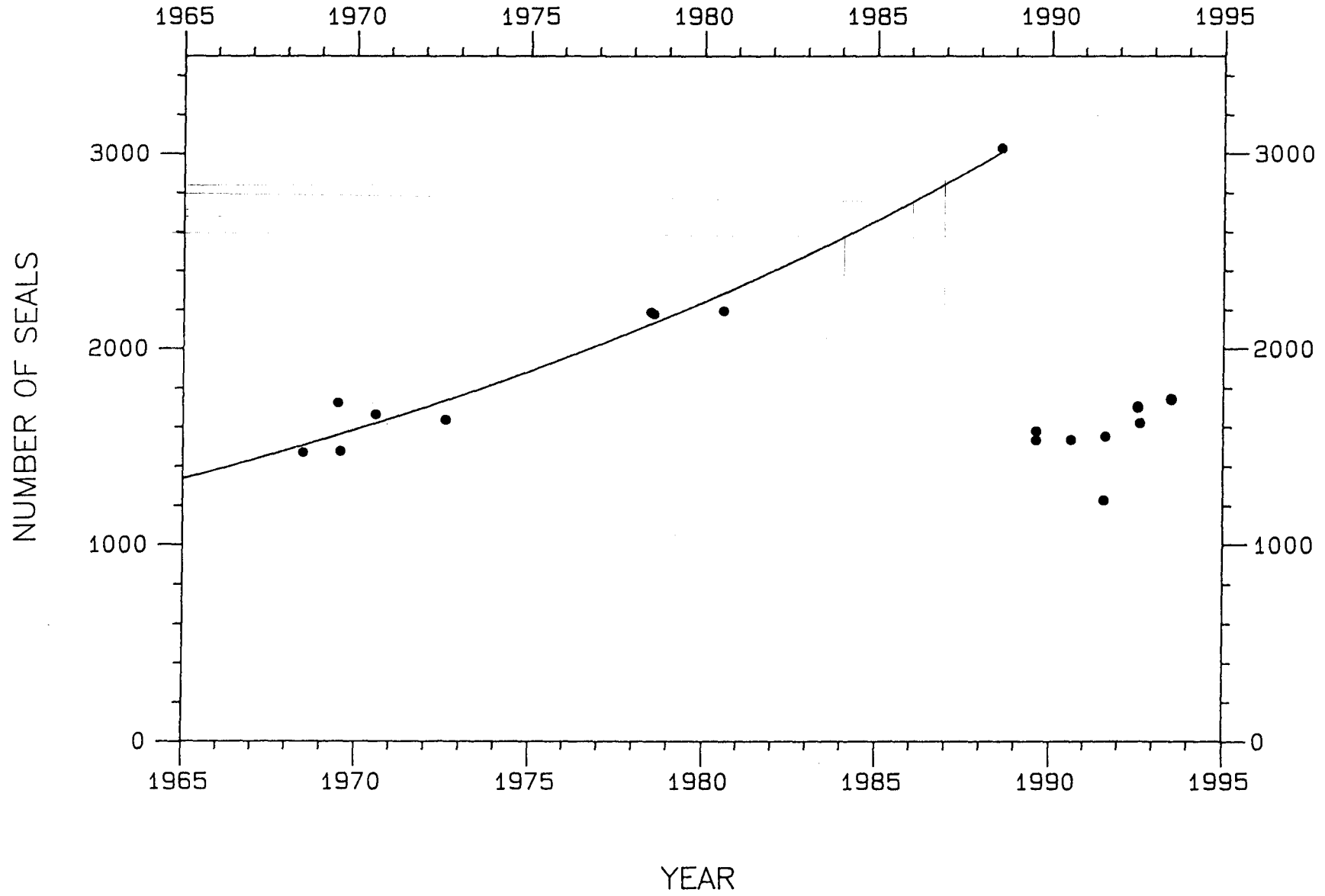


Figure 7.

Common seals in the Wash - 1989 to 1993

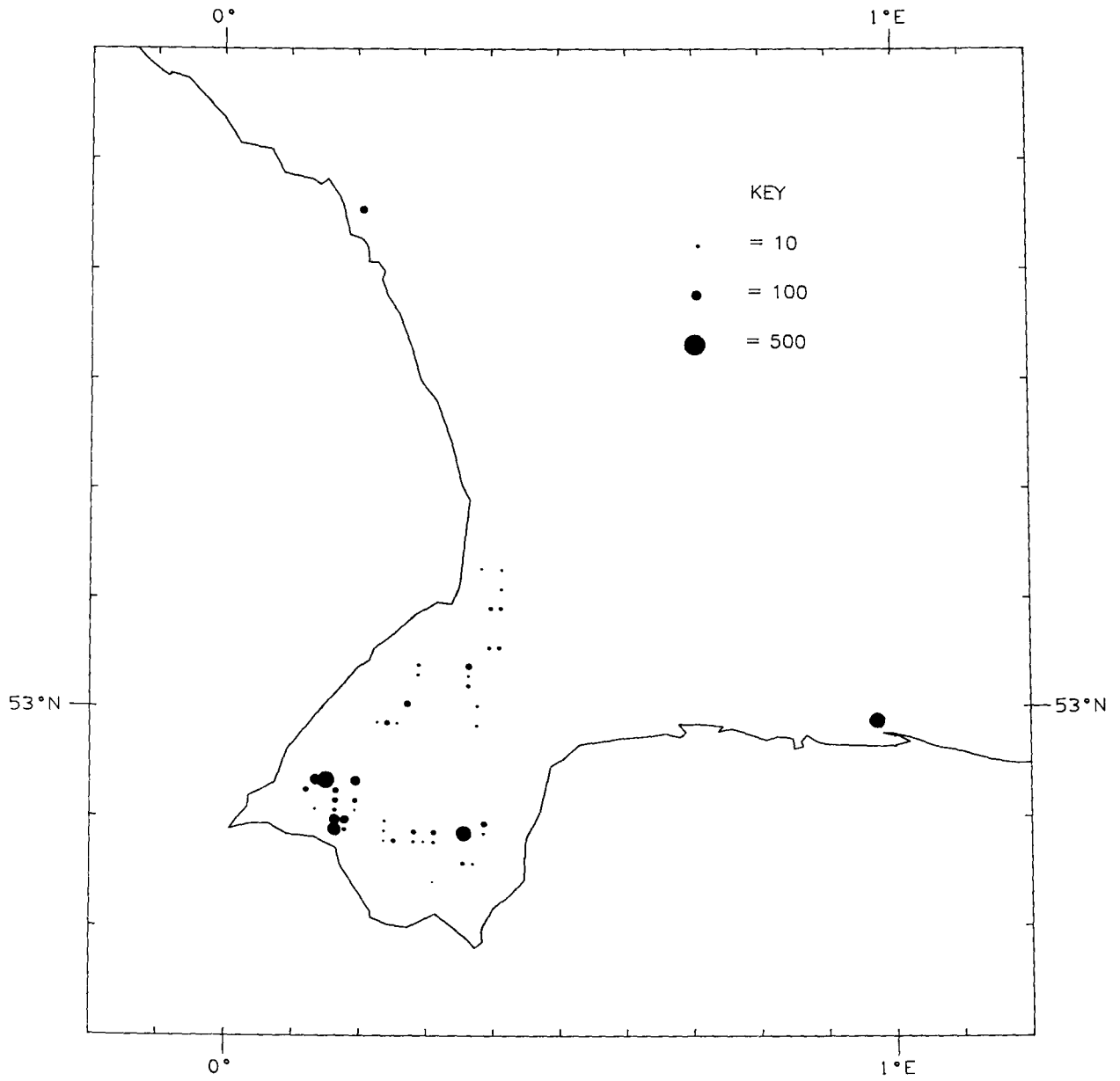


Figure 8.

Common seals in the Wash in August 1993

