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**Seabird numbers and breeding success
in Britain and Ireland, 2001**

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Summary

This report presents the results of monitoring of seabird populations and breeding performance throughout Britain and Ireland in 2001 and makes comparisons with previous years. The report is produced annually as part of the JNCC's Seabird Monitoring Programme, in collaboration with the Royal Society for the Protection of Birds (RSPB) and the Shetland Oil Terminal Environmental Advisory Group (SOTEAG). Some findings of particular note in 2001 are summarised below:

- In Orkney, red-throated divers had a successful breeding season fledging 69 chicks from 85 pairs. In Shetland, two pairs successfully nested on artificial sites provided for the first time, fledging three chicks.
- In north-east Scotland, whole-colony counts from Gamrie to Pennan and Buchan Ness to Collieston, previously counted in 1995, revealed large declines for northern fulmars and black-legged kittiwakes along both stretches. Herring gull numbers also decreased between Gamrie and Pennan. European shag numbers increased on both stretches. In study plots, previously counted in 1998, northern fulmars decreased significantly on both coastlines, but significant increases were recorded for razorbills along both stretches and for common guillemots between Buchan Ness to Collieston. At Troup Head, northern gannets increased by 13% since last surveyed in 1998.
- Several Manx shearwater colonies on islands off the west coast of Ireland and in Wales were surveyed as part of Seabird 2000 using tape-playback methodology. Great Blasket, Cruagh and Great Skellig held 5,055, 3,285 and 2,370 pairs respectively. Bardsey held 9,779 pairs.
- Between 1999 and 2001, a census of European storm-petrel in Yell Sound recorded a total of 600 apparently occupied sites (AOS) from 14 colonies. Small colonies were also found on North Rona (414 AOS) and Shillay in the Sound of Harris (328 AOS). In Ireland, a total of over 7,000 AOS was recorded from nine colonies on islands off the west coast. Surveys of Leach's storm-petrel resulted in 1,425 AOS on the Flannan Isles, 2,263 AOS on North Rona and 310 on the Stags of Broadhaven off Ireland.
- Mediterranean gulls totalled 80 pairs with one sub-colony (containing five pairs in 2000) not counted due to access restrictions. Roseate tern numbers decreased to 709 pairs, the lowest figure since 1997.
- Common guillemots had a generally poor breeding season with eight out of ten colonies recording below average productivity.
- A survey of the largest razorbill colony in Britain, on Handa, found 17,042 individuals.
- Surveys of black guillemots in Yell Sound indicated that numbers had decreased by 28% since 1998 to 1,013 individuals although this could be due to low tides during survey periods with birds choosing to feed rather than attend colonies on those days. Declines were also recorded on the northern coasts of Caithness and Sutherland, and the coastline between Oban and Campbeltown and associated islands.
- On Coquet Island, a survey of Atlantic puffins recorded 17,208 apparently occupied burrows (AOB), an increase of 50% since the last full survey in 1998. On Eilean Mor, the largest of the Flannan Isles, survey in 1998 and 2001 a total of 15,632 AOB suggesting numbers had doubled since 1992.
- In Shetland, a shortage of sandeels affected several species. Common guillemot and razorbill numbers in study plots declined significantly possibly because of low attendance by non-breeding and off duty birds due to low food availability. Black-legged kittiwakes suffered almost complete breeding failure with productivity the worst on record and Arctic skuas and Arctic terns had their worst breeding seasons since 1990. On Foula, dozens of emaciated Atlantic puffin chicks were found lying around burrow entrances in July and productivity on Fair Isle was again poor. On Papa Westray, Orkney the food shortage also affected black-legged kittiwakes, Arctic terns and Arctic skuas all of which had very poor breeding seasons.
- Little tern breeding performance was again badly affected by predation at several sites. Kestrels took chicks at Easington Lagoons, Great Yarmouth and at sites in Wales; foxes were also a problem at colonies in Wales and at Hodbarrow. At Kilcoole, Ireland, little tern nests suffered predation by hedgehogs early in the season but productivity was still good.

1 Introduction

This is the thirteenth annual report on the results of seabird monitoring at colonies throughout Britain and Ireland, produced jointly by JNCC, RSPB and SOTEAG, as part of JNCC's Seabird Monitoring Programme. Available data on seabird breeding numbers and breeding success at seabird colonies in 2001 are summarised and compared with results from previous years, primarily 2000.

The information contained in this report has been collated from many sources. These include research staff and wardens from a variety of organisations including RSPB, SOTEAG, JNCC, Scottish Natural Heritage, English Nature, Countryside Council for Wales, Irish National Parks and Wildlife Service, the Wildlife Trusts, bird observatories, National Trust and National Trust for Scotland, the Centre for Ecology and Hydrology and BirdWatch Ireland. Many dedicated fieldwork volunteers also contribute valuable data to the Seabird Monitoring Programme; refer to the Acknowledgements section for details.

One aim of the annual report is to draw attention to notable changes in seabird numbers or breeding performance, which may merit direct conservation action or further research. It is also intended to provide feedback and, we hope, encouragement for future work, to the many individuals and organisations contributing data, by placing results for individual colonies or regions in a wider context. The results presented refer mainly to coastal or island populations of seabirds, but reference is also made to inland populations of great cormorants, gulls and terns where data are available.

Any comments on this report, or offers of help for future seasons, would be greatly appreciated by the authors. We are also keen to receive any existing additional information on numbers or breeding success for any seabird species, whether at coastal or inland colonies, which may not have been previously submitted to the Seabird Monitoring Programme. Any such data will be added to the long-term seabird databases maintained by JNCC and RSPB, including the JNCC/Seabird Group's Seabird Colony Register.

Details of recommended methods for assessing seabird numbers and breeding success are given in the *Seabird monitoring handbook for Britain and Ireland* (Walsh *et al.* 1995). Copies of the *Handbook*, or other advice on seabird monitoring methodology, may be obtained from the Seabirds and Cetaceans Unit of JNCC at the address given on the title page.

1.1 The Seabird Monitoring Programme and Seabird Colony Register

The JNCC's Seabird Monitoring Programme facilitates the co-ordination of seabird monitoring on a UK-wide basis. The aim of the programme is to ensure that sufficient data on breeding numbers and breeding success of seabirds are collected both regionally and nationally to enable their conservation status to be assessed. The programme assists JNCC, RSPB and partner organisations, including the statutory country agencies, to monitor aspects of the health of the wider marine environment and to provide sound advice relevant to the conservation needs of breeding seabirds.

Seabird monitoring directly funded by JNCC focuses particularly on species such as northern fulmar, European shag, black-legged kittiwake and auks, for which changes in breeding populations, breeding success or other parameters may provide evidence of changes in the marine environment as a whole. The most detailed monitoring is undertaken, through external contracts, at several geographically dispersed 'key sites': Isle of May (south-east Scotland), Fair Isle (Shetland), Canna (north-west Scotland) and Skomer (Wales). Triennial monitoring of numbers and breeding success is also undertaken on Orkney Mainland, on St. Kilda (north-west Scotland) and in Grampian (north-east Scotland). Monitoring of breeding success of cliff-breeding species is also encouraged by JNCC at many other colonies, partly by contributing to fieldwork costs of volunteers via the Seabird Group.

The RSPB monitors the numbers and breeding success of a range of seabird species throughout the UK through their network of reserves, and largely co-ordinates the monitoring of terns in Britain. Further RSPB monitoring or survey effort is directed at petrels and skuas.

In Shetland, Aberdeen University, under contract to SOTEAG, carries out extensive population monitoring of cliff-nesting species and black guillemots. This work is funded by the Sullom Voe Association Ltd. and forms part of a wider scheme of biological monitoring in Shetland. For northern fulmar, common guillemot and razorbill, annual counts are carried out in sample plots, and for European shag, black-legged kittiwake and black guillemot, counts are made of longer stretches of coastline at intervals of two or more years. Breeding success has also been assessed annually at many colonies since the mid-1980s.

Available data for Irish colonies are also collated by JNCC and RSPB, helping to place patterns or trends for British colonies in a wider context. Contacts are maintained with a number of bodies, including the National Parks and Wildlife Service and BirdWatch Ireland. Fieldwork at some Irish colonies is grant-aided by the Seabird Group.

The JNCC and Seabird Group also collaborate on the Seabird Colony Register, a database of colony counts for Britain and Ireland for the period 1969 to 1998, which is maintained as part of the Seabird Monitoring Programme. Many observers and organisations (including SOTEAG and RSPB) have contributed to the SCR and data have also been abstracted from sources such as research reports and county bird reports. Nearly all coastal colonies in Britain and Ireland were censused for the SCR in 1985-87, providing a baseline for seabird populations. Population changes since the previous complete survey (the Seabird Group's Operation Seafarer in 1969-70) are summarised in Table 1.1.1. A repeat complete census of British and Irish seabird colonies, Seabird 2000 (running from 1999-2002), is currently under way and a new seabird colony database for the period from 1999 is being developed within the National Biodiversity Network framework.

1.2 Data presentation and methods

Some potential limitations of the information presented are outlined below. Further discussion of methodological considerations and details of analyses are given in Walsh *et al.* (1995) and in previous annual reports.

1.2.1 Population changes: use of regional samples

In order to allow concise and standardised presentation of population data, individual colonies are generally not considered in detail in this report. Details of the original counts used in assessing population changes are held by JNCC, RSPB and SOTEAG.

For most species, with the exception of some terns, it is neither practicable nor valid to assess year-to-year changes for the breeding population as a whole, because such changes may vary markedly between different areas and monitoring effort is uneven. Instead, the coastline has been subdivided into 14 'regions', as defined in Figure 1.2.1 and Table 1.2.1. Within each region, valid counts of whole colonies (excluding very small colonies and colonies where counting error is known or suspected to exceed 5%), or of sample plots within colonies, are summed for year-to-year population comparisons. The aim of this approach is to draw attention to any common patterns shown by a number of regions, as well as to highlight any notable changes shown by colonies in particular regions.

Regional population changes for most species are tabulated for 2000 and 2001. Some of the changes indicated by these counts may be of a short-term nature, not necessarily indicative of longer-term trends, e.g. year-to-year changes in species such as black-legged kittiwake or European shag may in some instances reflect fluctuations in the proportion of the adult population attempting to breed. Movements of breeding birds to or from unmonitored colonies, notably in the case of terns, great cormorants, and black-headed gulls, may also contribute to apparent changes. Even where inter-colony movements do not occur, changes shown by sample populations are not necessarily representative of wider populations.

Table 1.1.1 Counts or estimates of total breeding populations of seabirds in Britain and Ireland. Most figures are for 1985-87 (Lloyd *et al.* 1991) but those for northern gannet, skuas, Mediterranean gull, roseate tern and Arctic tern include more recent updates. Figures for Britain excludes the Isle of Man and the Channel Islands (included under Britain and Ireland). For population estimates for Great Britain (excluding the Isle of Man) and UK (GB plus Northern Ireland) see Stone *et al.* (1997). Units are 'pairs' for most species (apparently occupied nests/sites or, for skuas, territories), with the exception of auks, for which units are individual birds ('i' in table).

	Coastal population ¹		% change ² 1969-87 B and I coast	Total population ³	
	Britain	Britain and Ireland ¹		Britain	Britain and Ireland ¹
Northern fulmar	537,000	571,000	+85%	537,000	571,000
Manx shearwater ⁴	c. 235,000	c. 275,000	?	c. 235,000	c. 275,000
European storm-petrel	41+ colonies	72+ colonies	?	41+ cols.	72+ cols.
Leach's storm-petrel	6+ colonies	7+ colonies	?	6+ cols.	7+ cols.
Northern gannet ⁵	207,100	243,300	+36%	207,100	243,300
Great cormorant	6,000	10,400	+30%	6,800	11,700
European shag	36,400	47,300	+40%	36,400	47,300
Arctic skua ⁶	3,100	3,100	≤ +220%	3,100	3,100
Great skua ⁶	8,800	8,800	≤ +150%	8,800	8,800
Mediterranean gull ⁷	63	64	≥ +200%	64	65
Black-headed gull	77,300	84,200	+13%	167,000	233,000
Mew gull	14,800	15,700	+21%	67,800	71,400
Lesser black-backed gull	62,300	65,700	+31%	82,300	88,700
Herring gull	135,000	191,000	-43%	150,000	206,000
Great black-backed gull	18,300	23,300	+3%	18,400	23,400
Black-legged kittiwake	492,000	544,000	+22%	492,000	544,000
Sandwich tern	14,000	18,400	+53%	14,000	18,600
Roseate tern ⁸	58	709	-80%	58	709
Common tern	11,800	14,700	-1%	12,700	16,000
Arctic tern ⁹	42,400	44,900	-14%	42,900	45,500
Little tern	2,400	2,800	+40%	2,400	2,800
Common guillemot	1,047,000i	1,203,000i	+118%	1,047,000i	1,203,000i
Razorbill	147,000i	182,000i	Probably +	147,000i	182,000i
Black guillemot	37,500i	40,500i	Probably +	37,500i	40,500i
Atlantic puffin ¹⁰	898,000i	940,000i	Slightly +?	898,000i	940,000i

Notes:

1. Irish figures include some estimates (mainly for northern fulmar, European shag and gulls) for coastal sections, which had not been surveyed by 1988.
2. Net change based on comparison with total recorded during the 1969-70 'Operation Seafarer' survey (reanalysis of counts summarised by Cramp *et al.* 1974); differences in count methods prevent direct comparison for some species.
3. British and Irish totals for some species include estimates of inland populations.
4. Manx shearwater figures are very approximate (midpoints of population estimates).
5. Northern gannet figures are from a complete survey of North Atlantic colonies carried out in 1994 and 1995 (Murray and Wanless 1997) with updates for colonies counted subsequently.
6. Skua figures are from the 1992 surveys of Orkney and Shetland (Meek *et al.* 1994; Sears *et al.* 1995), with a 1996 update for Hoy (Furness 1997), otherwise 1985-87 with updates to 1996 for Handa and St. Kilda. Although some nest inland in mainland Scotland, all are treated as coastal here.
7. Mediterranean gull figures are from Ogilvie *et al.* (2000).
8. Roseate tern figures are from 2001 (this report).
9. Arctic tern figures include Shetland and Orkney counts from the 1989 RSPB survey (Avery *et al.* 1993), with counts of individuals divided by 1.5 to give an estimate of pairs.
10. Atlantic puffin figures are very approximate, and include a high proportion of counts of pairs multiplied by 2 to give estimates of numbers of individuals.



Figure 1.2.1 Coastal counties and districts of Britain and Ireland. See Table 1.2.1 for details of the coastal regions (combinations of counties or districts) used in this report. Reproduced, with permission, from Lloyd *et al.* (1991).

Table 1.2.1 Groupings of coastal counties and districts used in assessing regional population changes. These regions are based on Figure 2 of Lloyd *et al.* (1991), except that Shetland and Orkney are each treated separately from 'NE Scotland' and the Inverness to Caithness coastline is treated separately ('N Scotland') from 'NW Scotland'.

County or district name (numbers refer to Figure 1.2.1)	Region
Louth (1), Meath (2), Dublin (3), Wicklow (4), Wexford (5), Waterford (6)	SE Ireland
Cork (7), Kerry (8), Limerick (9), Clare (10)	SW Ireland
Galway (11), Mayo (12), Sligo (13), Leitrim (14), Donegal (15)	NW Ireland
Londonderry (16), Antrim (17), Down (18)	NE Ireland
Annandale and Eskdale (19), Nithsdale (20), Stewartry (21), Wigtown (22), Kyle and Carrick (23), Cunninghame (24), Inverclyde (25), Dunbarton (26), Argyll and Bute (27)	SW Scotland
Lochaber (28), Skye and Lochalsh (29), Western Isles (30), west coast of Ross and Cromarty (31), north-west coast of Sutherland (32)	NW Scotland
Orkney (34)	Orkney
Shetland (35)	Shetland
Caithness (33), east coast of Sutherland (32), east coast of Ross and Cromarty (31), Inverness (32)	N Scotland
Nairn (37), Moray (38), Banff and Buchan (39), Gordon (40), City of Aberdeen (41), Kincardine and Deeside (42)	NE Scotland
Angus (43), City of Dundee (44), north-east Fife (45), Kirkcaldy (46), Dunfermline (47), West Lothian, City of Edinburgh (48), East Lothian (49), Berwickshire (50)	SE Scotland
Northumberland (51), Tyne and Wear (52), Durham (53), Cleveland (54), North Yorkshire (55), Humberside (56), Lincolnshire (57)	NE England
Norfolk (58), Suffolk (59), Essex (60)	E England
Kent (61), East Sussex (62), West Sussex (63), Hampshire (64), Isle of Wight (65)	SE England
Dorset (66), Cornwall and Isles of Scilly (67), Devon (68), Somerset (69), Avon (70), Gloucestershire, Channel Islands (82)	SW England and Channel Islands
Gwent (71), South Glamorgan (72), Mid Glamorgan (73), West Glamorgan (74), Dyfed (75), Gwynedd (76), Clwyd (77)	Wales
Merseyside (78), Lancashire (79), Cumbria (80), Isle of Man (81)	NW England and Isle of Man

1.2.2 Calculation of population trends

Regional population trends are assessed using population indices, rather than sums of actual colony counts, because different combinations of colonies may be counted in different years. The population index in a baseline year (1986 unless otherwise noted), is set at 100, subsequent population changes being expressed relative to this value. Further details of the derivation of these population indices are given in Walsh *et al.* (1990) and in Thompson *et al.* (1997).

Average annual rates of population change are calculated by linear regression of the logarithms of index values on year. The significance of the slope of the regression, equivalent to the average annual rate of increase or decrease in the population, is then assessed using the t-test (Wilkinson 1990). Population trends are not presented in this report for some mobile species, such as gulls, Arctic terns and common terns, for which the numbers of colonies and/or breeding pairs monitored each year are considered too small to enable wider population trends to be confidently assessed.

1.2.3 Accuracy and representativeness of counts

In comprehensive assessments of long-term changes in seabird numbers, e.g. between 1969-70 and 1985-87 (Lloyd *et al.* 1991), there is inevitably some loss of count accuracy at the expense of obtaining complete geographical coverage. However, stricter criteria, covering factors such as census unit, timing, frequency and apparent accuracy of counts, need to be applied when selecting counts for assessment of short-term changes, as in this report. For most species, single, well-timed counts of apparently occupied nests are sufficient. However, the possibility of undetected variations in count accuracy, count coverage or timing of breeding season should be borne in mind.

For northern fulmar, common guillemot and razorbill, numbers of adults attending colonies can fluctuate markedly from day to day. Given this source of variation, assessment of population change for these species ideally requires five to ten counts of adults (auks) or apparently occupied nest-sites (fulmars) in June each year. The statistical significance of changes shown by such counts can be assessed using t-tests. Where such replication of counts is necessary, it is rarely possible to count the whole of a large colony. Therefore, counts are usually of sample plots within a colony, but these plots, even where randomly selected, will not necessarily be representative of the colony as a whole.

The seabird colonies regularly monitored may not be representative of British or Irish populations as a whole. Representativeness is more likely to be achieved within particular regions, but cannot be assumed, especially if few colonies or small population samples are monitored. In particular, if efforts are concentrated on individual colonies, the formation of new colonies elsewhere may go undetected. Coverage of extensive stretches of coastline is a more satisfactory approach for species not requiring replicate counts. This approach is used, for example, in SOTEAG's monitoring of European shags, black-legged kittiwakes and black guillemots in Shetland.

1.2.4 Breeding success: use of 'low-input' methods

For general monitoring purposes, the number of chicks fledged per breeding pair is the most useful parameter for gauging breeding success. Productivity of species other than terns is usually assessed for sample plots, ideally randomly selected, within colonies. For such species, the figures presented here have generally been averaged (rather than combined) across plots. For terns, whole-colony assessments of productivity are usually made. Full details of breeding success monitoring methods are given in Walsh *et al.* (1995). For some species or regions where few colonies are currently monitored, the results presented may not be fully representative. Also, in many cases, 'low-input' methods of assessing breeding success are used and these will tend to overestimate the productivity of breeding pairs slightly (Walsh *et al.* 1995). However, this is considered acceptable, as major geographical or year-to-year changes will still be obvious.

2 General features of the 2001 breeding season

In February 2001, the first outbreak of foot and mouth disease in Britain since 1967 occurred. As part of the process to curb the spread of the disease, legislation was introduced to restrict public access to many parts of the countryside, including coastal sites. As a result of this, risk assessment by the JNCC, which contacted all regular contributors to the Seabird Monitoring Programme, aimed to identify sites where monitoring could still be carried out and encouraged all observers to comply with local regulations on land-access. Fortunately, most observers were able to carry out fieldwork as usual, although some disruption did ensue. The Cormorant Breeding Colony Survey (organised annually by Robin Sellers) was cancelled as access was restricted at many sites, especially in England where birds breed at inland lakes. In north-east Scotland, the triennial programme of study-plot counts carried out by the JNCC was partially disrupted between Boddam and Cruden Bay; access was denied to six (of 13) guillemot and seven (of 17) razorbill plots. In the Northern Isles, restrictions due to foot and mouth resulted in the cancellation of scheduled complete counts and annual monitoring of skuas and necessitated that tystie counts in Yell Sound (Shetland) be carried out from boat only; annual monitoring of red-throated diver productivity on Rousay (Orkney) was also disrupted. Productivity data could not be collected from a few gull and tern colonies throughout the country, although in general, complete counts of adults were still made from suitable vantage points. At very few colonies did access restrictions result in the complete abandonment of data collection, although this did happen at Loch Ryan, St. Bees Head, Ribble Estuary NNR and South Walney. Only in one reported case did access restrictions reduce the breeding performance of a species; little terns at Hodbarrow failed completely due to predation when the electric fence used to exclude foxes could not be erected. Conversely, an increase in herring gull numbers at Durlston Head was possibly due to the lack of human disturbance resulting from restricted access.

Generally, weather conditions in 2001 did not affect seabird breeding performance to the same extent as in 2000. April 2001 was a cold month overall – the coldest in some areas since 1989. An unsettled period of cyclonic southwesterly winds persisted for the first week, followed by a fortnight of mainly northwesterly and northerly winds, with mainly cyclonic wind in the last week. Rainfall was above average in most regions, particularly north-west England, although it was not as wet as April 2000. The north and west of Scotland was both drier and sunnier than average (Eden 2001a). May 2001 was warm, but began with a week of cool northeasterly winds. From 7 May it became warmer and more humid, with a short cyclonic spell from 14-18 May, after which weather was dominated by high pressure. Mean temperatures were between 1 and 2C° above the long-term mean and it was generally dry, especially in south-east Scotland and north-east England. Sunshine levels were also higher than usual across the whole country (Eden 2001b). Overall, timing of breeding was typical, with the odd exception e.g. black-legged kittiwakes and European shags commenced breeding later on the Isle of May and common guillemots were also late at Sumburgh Head in Shetland.

In June 2001, northwesterly winds predominated until 17 June, after which an anticyclonic spell from 18-25 June gave way to a southwesterly airflow for the last few days. Mean maximum temperatures were 1.5C° above the long-term average in southern England, but 2C° below average in western Scotland. It was generally dry, especially in England and Wales where it was the driest June since 1996. Sunshine levels were 20% above normal in southern and eastern areas, but 30% below normal in the north and west (Eden 2001c). July 2001 was dominated by high pressure early and late, but several depressions crossed the country between 5 and 21 July. Mean temperature ranged from 1C° below normal in northern Scotland to 1.5C° above in many parts of England. Southern England had a wet month, but northern England and eastern Scotland were dry. Sunshine levels were 10-30% above average over most of England and Wales, but Scotland had a cloudy month (Eden 2001d).

The most notable feature of the 2001 season was the almost complete breeding failure in Shetland of those species that rely heavily on sandeels *Ammodytes* spp. to feed their chicks (Heubeck 2001). Black-legged kittiwakes, Arctic terns and Arctic skuas all had their worst breeding season since the last sandeel shortage in 1989/90. Breeding failure began to occur in mid-June, following hatching. There were many observations of chicks being left for long periods, starving and eventually dying in

the nest (e.g. Shaw *et al.* 2001). Studies on Foula provided direct evidence of food deprivation - adult black-legged kittiwakes tending chicks had completely empty crops and mean adult body masses were among the lowest since 1986 (Furness 2001). Breeding Arctic skuas and Arctic terns failed also on Orkney, whereas black-legged kittiwakes fared much better although productivity was still below average. This apparent reduced availability of sandeels affected the auks (which also rely on sandeels) much less. Attendance by both common guillemots and razorbills at colonies in Shetland declined around the second week of June. There was also evidence of reduced productivity, plus low pulli weights and some chick neglect but nowhere near the extent observed in the surface feeders.

On the Isle of May, it appeared that sandeel availability did not limit breeding success, certainly not for black-legged kittiwake and European shag. For the second successive year breeding productivity of both species was higher than the long-term average and 2001 was the best year for European shags on the island since monitoring began in 1986. High percentages of sandeels were recorded in the diets of both species, as well as Atlantic puffins, which also had good year (Wilson *et al.* 2001). For the last two years there has been no commercial sandeel fishery on the Wee Bankie c.30 km east of the Isle of May and an important feeding ground for seabirds. It is possible that the suspension of fishing underlies the improved breeding performance of black-legged kittiwakes and European shags during 2000 and 2001, although no causal link has been established. In contrast, species on the Isle of May that do not feed predominantly on sandeels had a poor breeding season. Almost 70% of fish delivered to common guillemot chicks consisted of clupeids and they had their lowest productivity since monitoring began in 1986. Productivity continued to be low for northern fulmars (not known to take sandeels) and was below average for razorbills, which also favoured clupeids. A new EU project, established on the island in 2001, will investigate how climate and hydrography affect sandeel availability and seabird breeding performance (Wilson *et al.* 2001).

3. Species accounts

Nomenclature follows *Checklist of Birds of Britain and Ireland* (British Ornithologists Union 1992) and subsequent relevant BOURC updates published in the journal *Ibis*.

3.1 Red-throated diver *Gavia stellata*

Breeding numbers and breeding success (Figure 3.1.1, Table 3.1.1)

In Shetland, the timing of the breeding season was near normal in 2001 in contrast to the very early seasons of recent years. In the four areas monitored annually by the Shetland Ringing Group (Okill 2001a), there was an increase in the number of successful pairs, from 34 in 2000 to 44, although this was still below average for the period 1980 to 2000 (52.1, s.d. \pm 8.8). The number of pairs that raised two chick broods also increased. Mean brood size at fledging in the study area was 1.27, below the mean for the period 1979 to 2000 (1.36, s.e. \pm 0.02). Included in these figures are two pairs of divers that nested for the first time on artificial sites provided in 2001. One was a specially constructed island, the other a man-made raft, both situated at reservoirs where falling water levels during previous breeding seasons had caused nesting divers to fail. Both of these pairs were successful, fledging a total of three chicks. In the SOTEAG Northmavine study area, a total of 69 lochs and pools were surveyed, of which 23 held divers. Breeding was confirmed at 16 sites, the highest total since 1990 but only slightly higher than the 1989-98 mean (15.1, s.d. \pm 3.2) suggesting that the size of the breeding population has remained fairly stable over the past decade (Heubeck 2001).

Elsewhere in Shetland, the mean breeding success declined between 2000 and 2001 for all study areas except Foula, where breeding success was similar to that in 1999 and 2000. However, productivity on Foula was still well below average, with 11 pairs fledging four young. On Fetlar, 23 pairs fledged 11 chicks, close to the long-term average for the site (Houghton and Smith 2001). On Hermaness, red-throated divers fledged only 0.43 chicks per pair; the lowest recorded at this site (Duffield 2001). Productivity was also low on Yell where eight monitored pairs raised just two chicks.

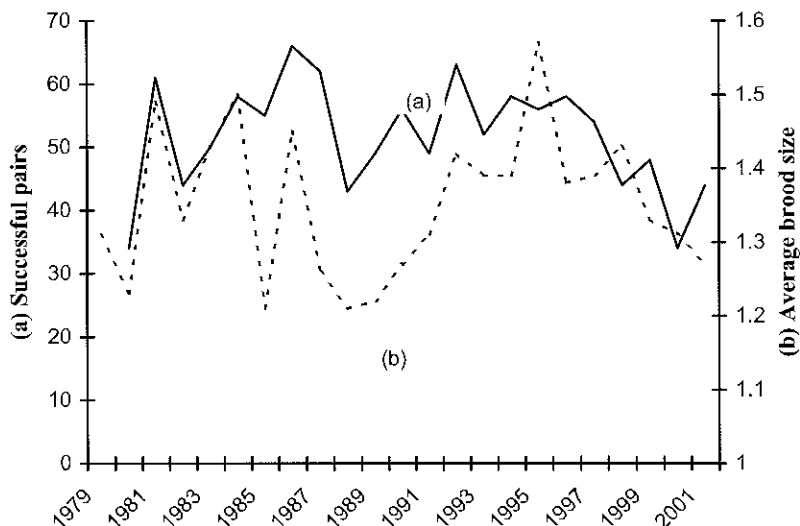


Figure 3.1.1 Annual variation in (a) numbers of 'successful' pairs (with chicks in mid-July) and (b) average brood-size near fledging at red-throated diver study areas in Shetland (parts of Unst, Eshaness, North Roe and Bressay), 1979-2001. Data are from Okill (2001a).

In contrast to Shetland, red-throated divers on Orkney had a successful breeding season. Eighty-five monitored sites fledged an average of 0.81 chicks per site, well above the long-term average of 0.52 (s.e. ± 0.03). On the Orkney Mainland, 19 monitored pairs had a successful season fledging 1.11 chicks per pair (Meek 2001). This was the most successful season on record with productivity well above the 1989-2000 mean of 0.56 (s.e. ± 0.07). On Hoy, breeding success in 2001 was high, with only 1999 being a more productive year (E.J. and S.J. Williams, pers. comm.). In total, 117 known sites were checked, of which 65 were occupied from which a total of 47 young fledged (0.72 young per occupied site). On Rousay, restrictions due to the foot and mouth outbreak meant that only one pair could be monitored. This pair successfully fledged a single chick.

Outside the Northern Isles, few data were available for 2001. On Rum, atypically high rainfall during the first week of June may have affected nesting divers. Only eight nests were found and just two young were seen although it is not known if they fledged. On the neighbouring island of Eigg, three pairs nested but two clutches were depredated and the third was deserted. One adult was also killed on the nest and partly eaten, possibly by an otter *Lutra lutra* (J. Chester, pers. comm.). On Handa, four pairs again nested, three of which hatched two chicks each. Unfortunately, the number of fledged chicks could not be ascertained (Stoneman 2001).

Table 3.1.1 Red-throated diver breeding success, 1986-2000, 2000 and 2001: figures are estimated number of chicks fledged per breeding pair or occupied site (Orkney). Note that numbers of pairs do not necessarily indicate total populations in study areas. Figures for Rousay in 2000 are not included in the Orkney sample total for that year.

	1986-2000 mean		2000		2001	
	No. years	Fldg/pr (\pm s.e.)	Pairs	Fldg/pr	Pairs	Fldg/pr
Hermaness	15	0.99 (± 0.09)	8	0.75	7	0.43
Fetlar	15	0.50 (± 0.05)	23	0.57	23	0.48
Yell	12	0.62 (± 0.09)	-	-	8	0.25
Foula	15	0.45 (± 0.06)	12	0.33	11	0.36
Shetland sample total	13	0.59 (± 0.04)	43	0.53	49	0.41
Hoy	12	0.55 (± 0.03)	66	0.53	65	0.72
Rousay	10	0.25 (± 0.12)	(7	0.00-0.29)	1	1.00
Mainland	12	0.56 (± 0.07)	14	0.86	19	1.11
Orkney sample total	12	0.52 (± 0.03)	80	0.59	85	0.81
Handa	14	1.25 (± 0.11)	4	1.50	4	0.00-1.50
Eigg	15	0.91 (± 0.15)	2	0.00	3	0.00
Rum	14	0.59 (± 0.06)	12	0.42	8	0.00-0.25

3.2 Northern fulmar *Fulmarus glacialis*

Breeding numbers (Table 3.2.1, Figure 3.2.1)

Breeding numbers decreased at the majority of colonies monitored in 2000 and 2001. Large reductions occurred in north-east Scotland and in north-east England, with moderate decreases recorded in Shetland and south-east Scotland. A slight increase was recorded in Wales. In addition, whole-colony and triennial sample plot counts also revealed large decreases in north-east Scotland since 1995 and 1998 respectively.

In Shetland, decreases occurred at all four SOTEAG annual monitoring plots. Significant decreases were recorded at Sumburgh Head (7.2%, $t=2.870$, $d.f.=8$, $P<0.05$) and Burravoe (15.9%, $t=3.245$, $d.f.=8$, $P<0.05$). At Eshaness and Troswick Ness there were non-significant decreases of 8.2% and 6.5% respectively. It was thought that numbers attending cliffs were genuinely low in 2001 and that it was not an effect of the weather during the counts (Heubeck 2001).

In north-east Scotland, a whole colony count along the Grampian coast (Gillon *et al.* 2001) recorded 1,976 apparently occupied sites between Buchan Ness and Collieston and 2,900 AOS between Gamrie and Pennan. Compared to the last counts, made in 1995, these figures represented decreases of 30.0% and 34.4% respectively. Triennial monitoring of numbers attending sample plots within these two stretches also showed significant declines since 1998. Counts of five plots between Boddam and Cruden Bay showed a decrease of 10.4% ($t=4.148$, $d.f.=9$, $P<0.01$), while five plots counted between Troup and Lion's Head revealed a decrease of 23.5% ($t=7.756$, $d.f.=9$, $P<0.001$). Elsewhere, numbers at the Sands of Forvie decreased by 17.5% from 2000, to 297 AOS. In south-east Scotland, a complete census of islands in the Firth of Forth (Inchkeith, Inchgarvie, Inchcolm, Inchmickery, Craigleith, The Lamb and Fidra) revealed numbers had decreased by 7.0% since 2000, to 1,154 AOS (Jones 2001). A decrease was also noted at St. Abb's Head, down 22.6% to 212 AOS. Numbers on the Isle of May remained stable at 369 AOS (367 in 2000). In north-east England, numbers on the Farnes were also found to have declined, by 10.7% to 226 AOS (Rideout and Harris 2001).

On the west coast of Scotland, overall declines from 2000 levels were only slight, although at individual colonies there was again considerable variation. In north-west Scotland, numbers declined by 9.3% on Canna (Swann 2001a), to 402 AOS and a decline was also noted on Colonsay (south-west Scotland), where numbers decreased by 13.8%, from 571 to 492 AOS. In contrast the colony on Lunga increased by 10.8%, to 575 AOS.

Table 3.2.1 Population changes at monitored northern fulmar colonies, 2000-2001 (apparently occupied sites in late May or June). Counts with a reported inaccuracy of $> \pm 5\%$, and regional samples < 100 AOS, are excluded. Except where otherwise indicated, regional totals are derived from single complete counts of the colonies listed below. Statistical significance of trends (t-test) indicated as: n.s. not significant, * $P<0.05$, *** $P<0.001$. Further details of calculation of trends are given in section 1.2.2.

	SW Scotland	NW Scotland	Shetland	NE Scotland	SE Scotland	NE England	Wales
1986-2000 annual % change	-1.2 n.s.	0.0 n.s.	+1.9***	-	+1.6*	+1.9*	+2.1***
2000	1106	725	2,977	360	1,950	451	1,116
2001	1096	696	2,664	297	1,788	379	1,165
2000-2001 % change	-0.9 ^a	-4.0 ^b	-10.5 ^c	-17.5 ^d	-8.3 ^e	-16.0 ^f	+4.4 ^g

Colonies: ^a Mull of Galloway, Lunga (Treshnish Isles), Colonsay (sample areas); ^b Canna, Eigg, Handa (plot counts); ^c Hermaness (productivity plot), Eshaness (plot counts), Burravoe (plot counts), Troswick Ness (plot counts), Sumburgh Head (plot counts), Fair Isle (productivity plots); ^d Sands of Forvie; ^e Isle of May, Inchkeith, Inchgarvie, Craigleith, Fidra, St. Abb's Head, Inchcolm, Inchmickery, The Lamb, Bass Rock; ^f Farnes Islands, Coquet, Huntcliff; ^g Stackpole Head plus Elegug Stacks and adjacent coastline, St. Margaret's Island, Caldey, Skomer, Skokholm, Bardsey, South Stack.

Wales was the only region where an increase was noted between 2000 and 2001. On Skokholm there was a significant increase of 12.6% in the mean number of AOS present in the replicate counts of sample plots between 2000 and 2001 ($t=3.532$, $d.f.=17$, $P<0.01$), whereas single counts of the whole island were similar in both years (152 AOS in 2001 compared to 155 in 2000). On Caldey Island, numbers increased by 14.0% to 113 AOS, and 730 AOS were recorded on Skomer, an increase of 5.6% and the highest figure since 1990.

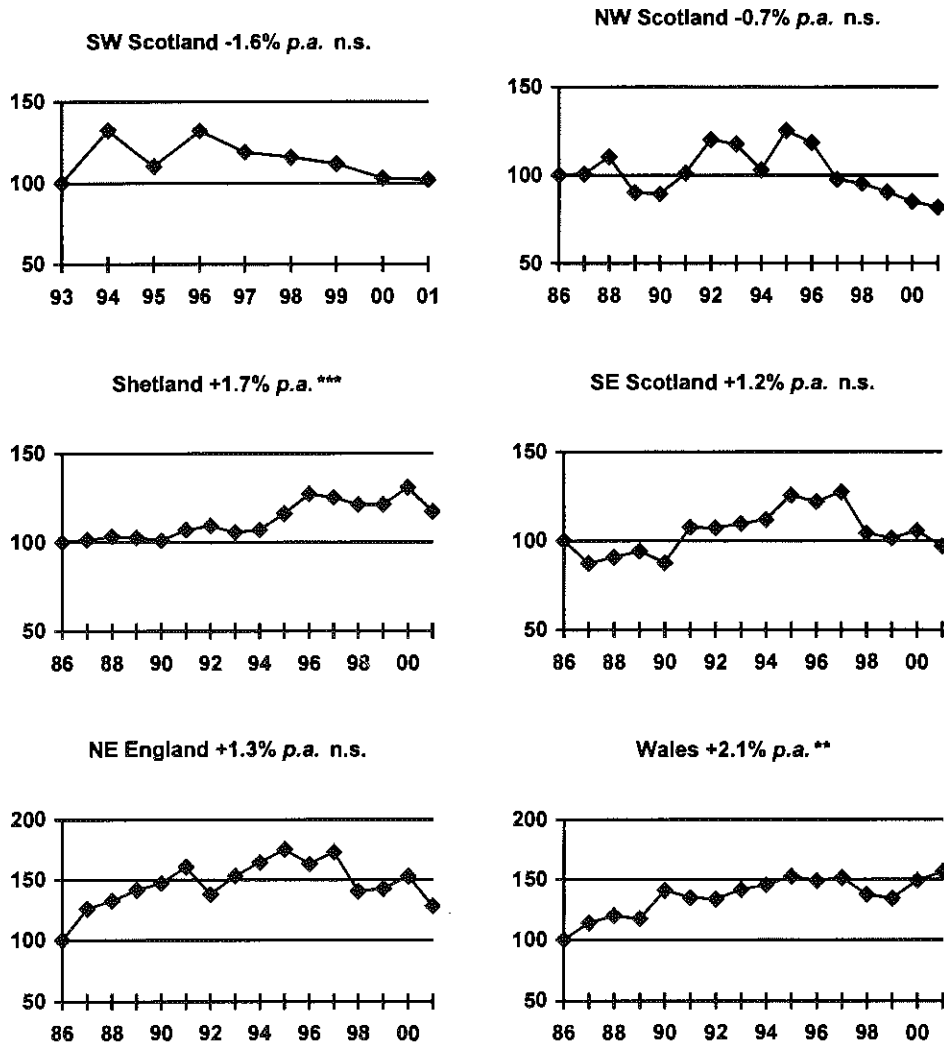


Figure 3.2.1 Regional population indices for breeding northern fulmars, 1986-2001 (apparently occupied sites in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Unless otherwise indicated, three or more colonies were counted in each year. Statistical significance of trends (t-test) indicated as: n.s. not significant, ** $P < 0.01$, *** $P < 0.001$.

Breeding success (Table 3.2.2)

In 2001, overall productivity was lower than that recorded in 2000 averaging 0.41 (s.e. ± 0.03) chicks fledged per AOS across 26 colonies, but only slightly below the 1986-2000 mean of 0.42 (s.e. ± 0.01).

Between 2000 and 2001, productivity declined in most regions except for Orkney and north-east England. However, all regional changes were slight and as always, there was considerable variation between individual colonies. In Orkney, productivity increased at three colonies and decreased at three. The largest increase was on Rousay where breeding performance improved from 0.29 chicks to

0.75 chicks per AOS, well above the colony average (1997-2000 mean 0.38, s.e. \pm 0.08). The largest decline occurred on Papa Westray, where productivity fell from 0.73 chicks per AOS in 2000 to 0.42 chicks (1989-2000 mean 0.52, s.e. \pm 0.04). Productivity on the Farnes (north-east England) increased for the third successive year and was the highest recorded since 1992, with 0.66 chicks fledged per AOS (Walton 2001), well above the 1986-2000 average of 0.53 (s.e. \pm 0.03).

Declines were recorded between 2000 and 2001 at five out of seven monitored colonies in Shetland. Productivity was especially low at Troswick Ness (0.28 chicks per AOS), Sumburgh Head (0.30 chicks per AOS) and Fair Isle (0.28 chicks per AOS) all of which were below the respective colony long-term means (range 0.44-0.48 chicks per AOS). At Westerwick, birds fared better, although productivity of 0.44 chicks per AOS was much lower than 2000 (0.68 chicks per AOS) and well below the 1990-2000 mean (0.56, s.e. \pm 0.04).

At North Sutor (north Scotland), productivity was low but equal to the 1994-2000 colony mean (0.21, s.e. \pm 0.05). In south-east Scotland, productivity was the lowest on record on the Isle of May (0.26 chicks per AOS) and at Tantallon (0.16 chicks per AOS). Elsewhere, productivity at St. Abb's Head (0.28 chicks per AOS) was also low but had improved for the third consecutive year and was above average for the site (1994-2000 mean 0.18, s.e. \pm 0.05).

Table 3.2.2 Northern fulmar breeding success, 2000-2001: estimated number of chicks fledged per apparently occupied site at sample colonies (superscript n = number of colonies). Figures are based on regularly occupied sites or on the average numbers of occupied sites in June, and are presented as the means and standard errors of figures for individual colonies. Changes in breeding success are indicated for colonies where similar methods have been used in both years; none of these is statistically significant.

Region	2000 chicks fledged/site				2001 chicks fledged/site				00-01 change	
	AOS ⁿ	Range	Mean	\pm s.e.	AOS ⁿ	Range	Mean	\pm s.e.	Mean ⁿ	\pm s.e.
SW Scotland ^a	17 ¹	-	0.53	-	16 ¹	-	0.50	-	-0.03 ¹	-
NW Scotland ^b	506 ³	0.24-0.69	0.47	\pm 0.13	536 ³	0.30-0.45	0.40	\pm 0.05	-0.07 ³	\pm 0.09
Shetland ^c	3,165 ⁷	0.30-0.68	0.46	\pm 0.05	2,830 ⁷	0.28-0.47	0.38	\pm 0.03	-0.08 ⁷	\pm 0.06
Orkney ^d	875 ⁶	0.29-0.73	0.44	\pm 0.07	751 ⁶	0.26-0.75	0.47	\pm 0.06	+0.03 ⁶	\pm 0.11
N Scotland ^e	62 ¹	-	0.34	-	57 ¹	-	0.21	-	-0.13 ¹	-
SE Scotland ^f	303 ³	0.20-0.37	0.27	\pm 0.05	274 ³	0.16-0.28	0.23	\pm 0.04	-0.04 ³	\pm 0.06
NE England ^g	153 ¹	-	0.59	-	149 ¹	-	0.66	-	+0.07 ¹	-
SW England ^h	12 ¹	-	0.83	-	-	-	-	-	-	-
Wales ⁱ	308 ³	0.33-0.91	0.57	\pm 0.17	303 ³	0.37-0.91	0.55	\pm 0.18	-0.02 ³	\pm 0.05
Isle of Man ^j	25 ¹	-	0.40	-	44 ¹	-	0.34	-	-0.07 ¹	-
NE Ireland ^k	5 ¹	-	1.00	-	-	-	-	-	-	-
Total	5,431 ²⁸	0.20-0.91	0.48	\pm 0.04	4,960 ²⁶	0.16-0.91	0.41	\pm 0.03	-0.03 ²⁵	\pm 0.03

Colonies: ^a Ailsa Craig; ^b Canna, Handa, St. Kilda; ^c Hermaness, Eshaness, Noss, Westerwick, Troswick Ness, Sumburgh Head, Fair Isle; ^d Costa Head, Mull Head, Gultak, Rousay, North Ronaldsay, Papa Westray; ^e Easter Ross; ^f Isle of May, Tantallon, St. Abb's Head; ^g Farne Islands; ^h West Bay-Burton Bradstock (2000 only); ⁱ Skomer, Skokholm, Bardsey; ^j Glen Maye (2000 only), Bradda (2001 only); ^k Old Lighthouse Island (2000 only).

On Ailsa Craig (south-west Scotland), breeding performance declined slightly between 2000 and 2001, to 0.50 chicks fledged per AOS, so remained well below the 1992-2000 mean (0.73, \pm 0.03). Of the three colonies monitored in north-west Scotland, productivity was lowest on St. Kilda at 0.30 chicks per AOS. This was a slight improvement on 2000 (0.24 chicks per AOS) but it was below the 1989-2000 mean (0.41, s.e. \pm 0.02). Productivity on Handa fell from 0.69 chicks per AOS in 2000 to 0.45 chicks, also below the 1989-2000 mean (0.48, s.e. \pm 0.03). On Canna, breeding success of 0.45 chicks per AOS was similar to that recorded in 2000 (0.48) remaining above the 1986-2000 average of 0.38 (s.e. \pm 0.03).

In Wales, overall productivity at three colonies monitored in 2001 was similar to 2000. Breeding success at Bardsey was again high and equal to that recorded in 2000, with 0.91 chicks fledging per

AOS (Stansfield 2001). However, on Skokholm, productivity of 0.37 chicks fledged per AOS was the lowest on record (1994-2000 mean 0.50, s.e. ± 0.03). On Skomer, breeding performance improved from 0.32 chicks per AOS in 2000 to 0.38 but this was still well below the 1992-2000 average (0.57, s.e. ± 0.05). On the Isle of Man, productivity of 0.34 chicks per AOS at Bradda almost equalled the colony average (0.35, s.e. ± 0.05).

3.3 Manx shearwater *Puffinus puffinus*

In 2001, several surveys of Manx shearwater colonies were carried out for Seabird 2000 along with the annual monitoring of breeding performance at selected sites. In Wales, a complete census of Bardsey using standard tape-playback methodology (Walsh *et al.* 1995) revealed a total of 9,779 pairs (Leaper *et al. in press.*). The most recent previous survey, in 1996, recorded 6,928 pairs (Silcocks 1996), although the results are not directly comparable since tape-playback methodology was not used by Silcocks. It was another productive breeding season on Bardsey, with 0.78 chicks fledged per pair from a sample of 50 occupied burrows. This is just below the 1996-2000 average (0.81, s.e. ± 0.01). On Skomer, productivity was the lowest recorded since 1993. Only 0.43 chicks fledged per pair laying in 98 study burrows, well below the 1991-2000 average (0.56, s.e. ± 0.05). The low productivity was thought to result from unusually high chick losses due to a wet period centred around a heavy thunderstorm on 6 July. This caused extensive flooding of burrows, a number of which were subsequently found to be empty on July 11 (Perrins 2001).

On Lundy (south-west England), survey work using standard tape-playback methods estimated a total population of 166 pairs. Signs of rat *Rattus* sp. predation, including broken eggs, carcasses of adults and scatterings of feathers, were apparent at several of the sub-colonies (Booker and Price 2001).

Several islands off the west coast of Ireland were also surveyed using tape-playback methodology (Newton and Mitchell 2001). A total of 5,055 apparently occupied burrows was recorded on Great Blasket Island (south-west Ireland), which had not previously been thought to hold a Manx shearwater colony of any notable size. Nearby on Great Skellig, 2,370 AOB were found. In north-west Ireland, a long established but previously unvisited colony comprising 3,285 AOB was found on Cruagh in the Connemara Islands. Visits to High Island and Inishshark revealed that each contained fewer than 100 AOB.

On Rum (south-west Scotland), the breeding season was the most successful since 1997 (Ramsay 2002). Occupancy was 74% in a sample of 76 monitored burrows and breeding success was 0.73 chicks fledged per occupied burrow, above the 1994-99 average (0.68, s.e. ± 0.07). Only 186 chicks were ringed on the island in 2001 (469 in 2000, 499 in 1999), largely due to inclement weather that restricted access to the breeding areas. On Sanda, breeding success was estimated at 0.82 chicks fledged from a sample of 61 occupied burrows (Morton 2001). There was once again a disappointing response to tape-playback on Canna (north-west Scotland). From a sample of 100 burrows checked between the Nunnery and Garrisdale there was only one response. This was from a burrow in a gully at Am Beannan where a bird had responded in 2000 (Swann 2001a).

3.4 European storm-petrel *Hydrobates pelagicus*

There are inherent difficulties in censusing petrels accurately, arising from their patchy distribution and nocturnal habits, the presence of non-breeders and the siting of nests deep within burrows, cavities or crevices in remote areas. Because of this, estimates for total breeding numbers of European and Leach's storm-petrels remain uncertain (Lloyd *et al.* 1991). However, more recently, a standardised method for repeatable surveys has been developed, involving the use of diurnal playback of the male's "purr" song (Gilbert *et al.* 1998a and b; Ratcliffe *et al.* 1998). This method, first advocated by James and Robertson (1985), has recently been applied in Seabird 2000. Other methods are also used to monitor populations on an annual basis. The count unit is the apparently occupied site.

Birds on Mousa, Shetland had a late season and wet July weather was thought to have adversely affected breeding; 35 chicks were ringed at the usual sites on 11 September (*cf.* 49 in 2000), none of which was near to fledging. In addition, there were a further three AOS with eggs, nine small chicks, four dead chicks and 16 AOS with addled or abandoned eggs (Okill 2001b). Elsewhere in Shetland, a playback survey of 31 sites in Yell Sound between 1999 and 2001 yielded a total of 600 AOS (95% CL = 575–626) at 14 sites: 113 AOS (108–119) on Samphrey, 107 AOS (102–112) on Copister Broch, 101 AOS (96–106) on Brother, 92 AOS (87–97) on Kay Holm, 59 AOS (56–62) on Linga and 46 AOS (44–48) on Bigga (Fowler 2001).

Tape-playback was used to census birds on North Rona, north-west Scotland for the first time. Between 26 June and 2 July, 147 responses were obtained from all suitable habitat, equating to 414 AOS (95% CL = 379–462) when a correction factor was applied; 75% of the responses were from natural habitat such as storm beach. On nearby Sula Sgeir, there were an estimated eight AOS.

In the Sound of Harris, three islands (Coppay, Shillay and Pabbay) suspected of containing breeding birds were surveyed in mid-July. No birds were found on Coppay or Pabbay. However, on Shillay there were 131 responses to tape playback, confirming previous breeding records. Using the correction factor obtained from surveys on North Rona, this corresponded to 328 AOS (95% CL = 298–368). Comparisons with previous estimates were not possible as census methods differed (Newton and Mitchell 2001).

In the Republic of Ireland, playback surveys were carried out in north-west Mayo and islands off Donegal (Newton and Mitchell 2001). Notable colonies were counted on Inishglora and Inishkeeragh (3,405 AOS), Stags of Broadhaven (1,905 AOS) and Duvillaun Beg (945 AOS). Smaller colonies were located on Roaninish, Donegal (485 AOS), Rathlin O'Birne, Donegal (160 AOS) and Black Rock, Mayo (170 AOS). Two other sites in Mayo, Pig Island and Inishkea North, held a few birds each.

3.5 Leach's storm-petrel *Oceanodroma leucorhoa*

See the preceding chapter for the background to methodology and survey techniques.

No birds were located on Sule Skerry, Orkney using the tape playback method. This was despite birds regularly being caught in mist nets during the breeding season (Newton and Mitchell 2001).

On the Flannans in north-west Scotland, six islands thought to be suitable for petrels were surveyed in July, using the playback method (Eilean Mor, Eilean Tighe, Soray, Sgeir Toman, Roareim, Eilean a' Ghobha). This was the first time an accurate census had been carried out on the islands. A correction factor of 3.39 was applied to the number of responses resulting in an estimate of 1,425 AOS (95% CL = 1,231–1,709), the majority breeding on Eilean Mor (567 AOS, 95% CL = 492–676) and Eilean Tighe (630 AOS, 95% CL = 544–759; Newton and Mitchell 2001). Elsewhere in the region, there were five responses to tape playback on Old Hill, Loch Roag, Lewis on 14 July, compared with 25 AOS found on a nocturnal visit in 1994. An adult mink *Mustela vison* was seen entering a holt on the day of the survey (Newton and Mitchell 2001).

The first accurate census of North Rona revealed 2,263 AOS (95% CL = 1,727–3,402), making this colony the second largest in Great Britain after St. Kilda (Newton and Mitchell 2001). On nearby Sula Sgeir, two responses were elicited from tape playback, equalling nine AOS.

In western Ireland, breeding was confirmed on the Stags of Broadhaven, Mayo - the current estimate is around 310 AOS (Newton and Mitchell 2001).

3.6 Northern gannet *Morus bassanus*

Breeding numbers (Figure 3.6.1)

Few data were received in 2001 although counts still indicate that the overall population in Britain is continuing to increase.

Only the colony on Fair Isle was counted in both 2000 and 2001 and was found to have increased by 21.0% (Shaw *et al.* 2001). At Troup Head (north-east Scotland), 1,228 apparently occupied nests were counted. This represents an increase of 13.2% since the last comparable count in 1998 (1,085 AON). However, between 1995 and 1998 the colony increased by 99.1% suggesting that the actual rate of increase is slowing (Gillon *et al.* 2001).

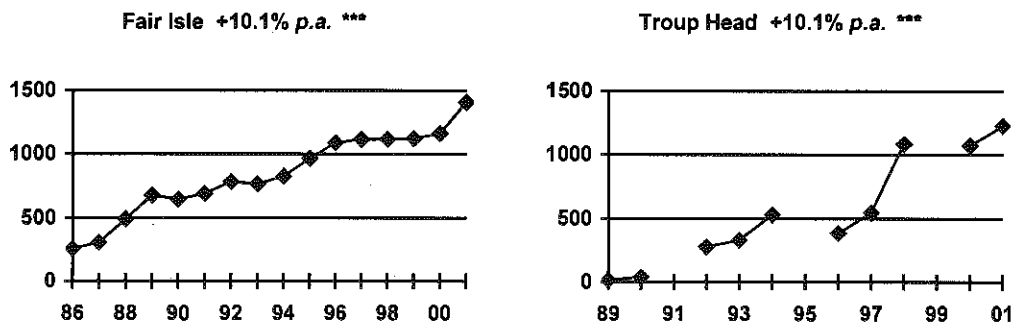


Figure 3.6.1 Colony population indices for northern gannets, 1986-2001 (apparently occupied nests in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends (t-test) indicated as: *** P<0.001.

Breeding success (Table 3.6.1)

The mean breeding success across five colonies monitored in 2001 was 0.71 chicks fledged per occupied nest, just above the 1986-2000 mean of 0.65 (s.e. ± 0.02), based on between three and six colonies annually. Productivity was higher than the colony averages for Fair Isle, Noss and Troup Head. At Hermaness, breeding success improved on the low figure recorded in 2000 and was equal to the long-term average for the colony. On Ailsa Craig, where the breeding season was delayed by three weeks due to persistent cold weather in March and April, breeding performance was below average.

Table 3.6.1 Northern gannet breeding success, 1986-2000, 2000 and 2001: estimated number of chicks fledged per occupied nest. In 1999 and 2000, with the exception of Fair Isle, productivity is shown as the mean and standard error of figures from sample plots (superscript n = number of plots). The 2000 and 2001 figures for Fair Isle are for all nests totalled across sample plots.

Colony	1986-2000 fledged /nest			2000 fledged/nest			2001 fledged/nest		
	Years	Mean	\pm s.e.	AON ⁿ	Mean	\pm s.e.	AON ⁿ	Mean	\pm s.e.
Ailsa Craig (SW Scotland)	10	0.68	± 0.02	215 ²	0.71	± 0.06	245 ²	0.64	± 0.08
Hermaness (Shetland)	12	0.66	± 0.02	699 ³	0.57	± 0.02	688 ³	0.66	± 0.01
Noss (Shetland)	15	0.68	± 0.01	464 ⁴	0.73	± 0.02	469 ⁴	0.84	± 0.08
Fair Isle (Shetland)	15	0.68	± 0.03	195 ¹	0.59	-	173 ³	0.75	-
Troup Head (NE Scotland)	6	0.57	± 0.04	1,071 ¹	≤ 0.70	-	1,227 ¹	≤ 0.67	-
All colonies	-	0.65	± 0.02	2,644	0.66	± 0.03	2,802 ⁵	0.71	± 0.04

3.7 Great cormorant *Phalacrocorax carbo*

Breeding numbers (Table 3.7.1, Figure 3.7.1)

Many fewer data were received in 2001 because the annual Cormorant Breeding Colony Survey was curtailed because of access restrictions imposed due to foot and mouth disease (R.M. Sellers, pers. comm.). Between 2000 and 2001, overall numbers at colonies in the west of Britain generally declined; although declines in Wales and south-west England were slight. Numbers in colonies in the north and east increased. An exception to this geographical split occurred in south-east Scotland, where numbers decreased. However, it should be noted that counts of breeding pairs of cormorants can be difficult to interpret, particularly where regional coverage is incomplete; birds may move between colonies and variable proportions of adults breed each year.

In Shetland, five regularly counted colonies were found to have increased by 26.6% to 243 apparently occupied nests between 1999 and 2001, the highest total since 1991. Only two colonies were counted in 2000 and 2001, the largest of which, Clett Stacks, increased by 47.0% after a decline of 11.7% between 1999 and 2000. Ramna Stacks was deserted for the fourth consecutive year (Okill 2001b).

In northern Scotland, the colony at North Sutor declined from 186 AON to 181 AON, the second lowest figure recorded here since regular counting began in 1991 (Swann 2001b). In south-east Scotland, a complete count of five colonies in the Firth of Forth (Inchkeith, Inchmickery, Carr Craig, Craigleith and The Lamb) revealed 372 AON, a decrease of 15.4% from 2000 (Jones 2001). Numbers declined on four of the five islands, with the largest proportional decreases on Craigleith (32.3% to 90 pairs) and Inchkeith (18.8% to 82 pairs).

In north-east England, a regional increase of 24.9% between 2000 and 2001 was largely accounted for by the Farnes population increasing by 34.2% to 196 pairs (Walton 2001).

Table 3.7.1 Population changes at monitored great cormorant colonies, 2000-2001 (apparently occupied nests in May-June). Regional samples of fewer than 50 AON or of only one colony are excluded. Trends for 1986-2000 are average annual rates of change shown by sample populations. Significance of trends indicated as: n.s. not significant, *** P<0.001). Further details of calculation of trends are given in section 1.2.2.

	SW Scotland	Shetland	SE Scotland	NE England	SW England	Wales
1986-2000 annual % change	+1.1 n.s.	-5.4***	0.1 n.s.	-1.3 n.s.	-1.8 n.s.	+0.6 n.s.
2000	173	87	440	181	124	266
2001	155	129	372	226	125	262
2000-2001 % change	-10.4 ^a	+48.3 ^b	-15.4 ^c	+24.9 ^d	-0.8 ^e	-1.5 ^f

Colonies: ^a Sanda, Ruadh Sgeir, Corr Eilean, Eilean Dubh, Eilean Buidhe (Portavadie), Eilean Buidhe (Black Harbour); ^b Clett Stacks, Heads of Grocken; ^c Carr Craig, The Lamb, Inchkeith, Inchmickery, Craigleith; ^d Farne Islands, Huntcliff; ^e Ballard Cliff, Gad Cliff; ^f Skomer, St. Margaret's Island, Ynys Gwylan, Great Orme.

In south-west Scotland, a decline of 10.4% occurred at monitored colonies (Craik 2001). Some movement between two island colonies, 3 kilometres apart, was evident in the Loch Fyne area. At the first island, Eilean Buidhe (Black Harbour) numbers declined from 65 pairs in 2000 to none in 2001, while at the second island, Eilean Buidhe (Portavadie), numbers increased from 19 to 74 pairs.

In Wales, overall numbers declined only slightly between 2000 and 2001. Numbers at three of the four monitored colonies declined. The greatest proportional decline occurred at Great Orme where numbers decreased by 30.4% to 32 pairs, while on St. Margaret's Island, the largest colony, numbers

fell by 8.0%, from 149 pairs to 137 pairs, the lowest recorded at this site. The only colony to increase was Ynys Gwylan, where a count of 78 pairs represented a rise of 47.2% (Stansfield 2001).

In south-west England, numbers remained stable between 2000 and 2001. As with south-west Scotland, there was some evidence of interchange between two nearby colonies. The colony at Gad Cliff declined by eight pairs to 43 pairs while the colony at Ballard, some 14 km to the east, increased by nine pairs to 82 pairs (Morrison 2001).

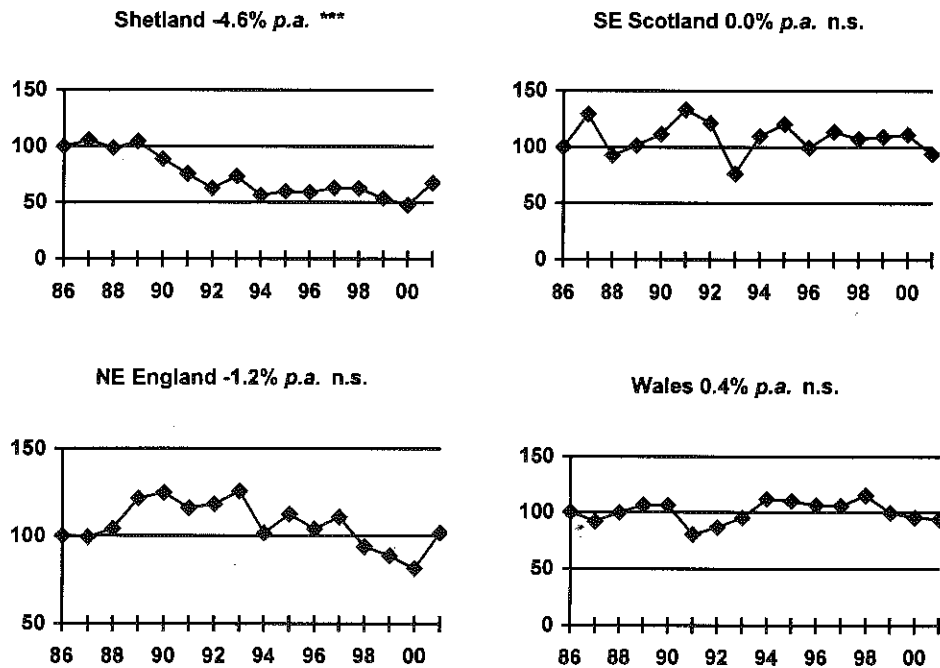


Figure 3.7.1 Regional population indices for breeding great cormorant, 1986-2001 (apparently occupied nests in late May or June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Significance of trends indicated as: n.s. not significant, *** $P < 0.001$.

Breeding success

Few data were received in 2001. Once again, productivity appeared to be close to the norm for this species in Britain, with broods of between two and three chicks fledged per successful nest except in south-west England. In Shetland, it was noted as being another early and successful breeding season (Okill 2001b). Average brood size was measured at 2.8 chicks per brood, identical to the 1990-2000 average. At North Sutor (north Scotland), breeding success was again high. In a sample of 66 nests, productivity was 2.47 chicks per nest, similar to that recorded in 2000 (2.45) but well above the 1991-2000 mean (2.02, s.e. ± 0.16). In western Scotland, a minimum of 158 young fledged from 98 nests at five sites, equivalent to a minimum of 1.61 per pair. At one of these sites, complete breeding failure occurred with very few young hatching and none fledging from 27 nests due to an unidentified predator. This was the first time that a great cormorant colony was known to fail completely in the previous 12 years (Craik 2001). In Wales, the colony on Ynysodd Gwylan fledged an average of 2.96 chicks per pair (*cf.* 3.07 in 2000, and 1.98 in 1999). Productivity at Ballard (south-west England) was estimated at 1.33 chicks per nest from a sample of 42 nests.

3.8 European shag *Phalacrocorax aristotelis*

Breeding numbers (Table 3.8.1, Figure 3.8.1)

There was little change in overall numbers of European shags between 2000 and 2001, with the populations in most regions fluctuating by less than 5%. Larger increases were recorded in north and south-east Scotland. However, populations in both south-east Scotland and north-east England have yet to recover from the 1993-94 winter wreck.

Table 3.8.1 Population changes at monitored European shag colonies, 2000-2001 (apparently occupied nests in May-June). Counts with a reported inaccuracy of $> \pm 5\%$, and regional samples < 100 AON, are excluded. Trends for 1986-2000 are average annual rates of change shown by sample populations. Significance of trends indicated as: n.s. not significant, ** $P < 0.01$, *** $P < 0.001$). Further details of calculation of trends are given in section 1.2.2.

	SW Scotland	NW Scotland	Shetland	N Scotland	SE Scotland	NE England	Wales
% annual change	1994-2000 +2.5 n.s.	1987-2000 -4.5**	1986-2000 -4.6***	-	1994-2000 +2.1 n.s.	1994-2000 +5.2 n.s.	-
2000	1095	965	643	292	1283	1310	237
2001	1048	925	617	322	1682	1373	247
2000-2001% change	-4.3 ^a	-4.1 ^b	-4.0 ^c	+10.3 ^d	+31.1 ^e	+4.8 ^f	+4.2 ^g

Colonies: ^a Mull of Galloway, Colonsay (sample plots), Sanda Island, Lunga, Carraig an Daimh, Eilean Buidhe, Ruadh Sgeir, Eilean na Cille, Eileanan Glasa; ^b Eigg, Canna, An Glas Eilean, Handa (plot); ^c Fair Isle (plots), Noss, Sumburgh Head, Noness (land only); ^d North Sutor; ^e Isle of May, Inchkeith, Fidra, Inchmickery, Inchcolm, Haystack, Carr Craig, Craigleith, The Lamb, Bass Rock, St. Abb's Head; ^f Farne Islands; ^g Ynys Gwylan, Bardsey, St. Margaret's Island, Caldey Island, Skomer, Middleholm, Stackpole Head and nearby coast, Eilegug Stacks.

At North Sutor in northern Scotland, numbers reached a new high, increasing for the fifth successive year, up 10.3% to 322 AON (Swann 2001b). Numbers at monitored colonies in both north-west and south-west Scotland decreased slightly between 2000 and 2001. Whole colony counts along two stretches of coast in north-east Scotland revealed both had increased since 1995. Between Boddam and Collieston, numbers increased by 86.1%, from 223 AON to 415 AON, and numbers had also risen between Gamrie and Pennan, by 18.9%, from 180 to 214 AON. However, numbers at both sites are still lower than the figures recorded in 1992, prior to the 1993/94 winter wreck (Gillon *et al.* 2001). In south-east Scotland, following the 109% increase between 1999 and 2000, the number of apparently occupied nests on the Isle of May increased again, by 35.7% to 734 AON, the highest at this site since 1992 (Wilson 2001). Similarly, numbers on eight islands in the Firth of Forth increased again, up 26.6% to 609 AON (*cf.* increase of 46.2% to 481 AON between 1999 and 2000). An increase was also recorded at St. Abb's Head where numbers rose by 28.8% to 300 AON. In north-east England, 1,373 AON on the Farnes was the highest count there since 1993.

In Shetland, at the four colonies monitored in 2000 and 2001 numbers declined slightly. However, a larger set of 12 colonies counted in both 1999 and 2001 showed an increase of 42.1%, to 1,127 AON (Heubeck 2001). On Fair Isle, a whole-colony count showed an increase of 16.9% to 663 AON since the last comparable count in 1998, but between 2000 and 2001, the total of five monitoring plots remained similar at 155 and 149 AON respectively (Shaw *et al.* 2001). Numbers also increased on Out Skerries between 1995 and 2001, from 146 to 181 AON. This confirms that the very gradual population increase suggested since the mid-1990's continues, although along some stretches of coast numbers remain well below levels recorded in the late 1980's (Heubeck 2001).

In north-west Scotland, numbers were relatively stable on Canna at 844 AON (*cf.* 838 in 2000) although on nearby Eigg, the population fell by 21.9% to 50 AON, the lowest figure recorded there since 1986. On Handa, a low count of 51 AON, down 53.2% from the 2000 figure, was perhaps caused by birds deserting early in the breeding season before the count, rather than a genuine decline

(Stoneman 2001). Numbers on Lunga (south-west Scotland) fell for the second successive season, decreasing by 24.0% to 197 AON.

In Wales, there was a slight overall increase at colonies monitored in 2000 and 2001. Numbers at Ynys Gwylan, the largest colony monitored, were unchanged at 133 AON, although numbers on nearby Bardsey increased from 44 to 61 AON (Stansfield 2001). In south-west England, a count of 198 AON on Annet represented a 28.6% increase since 1998.

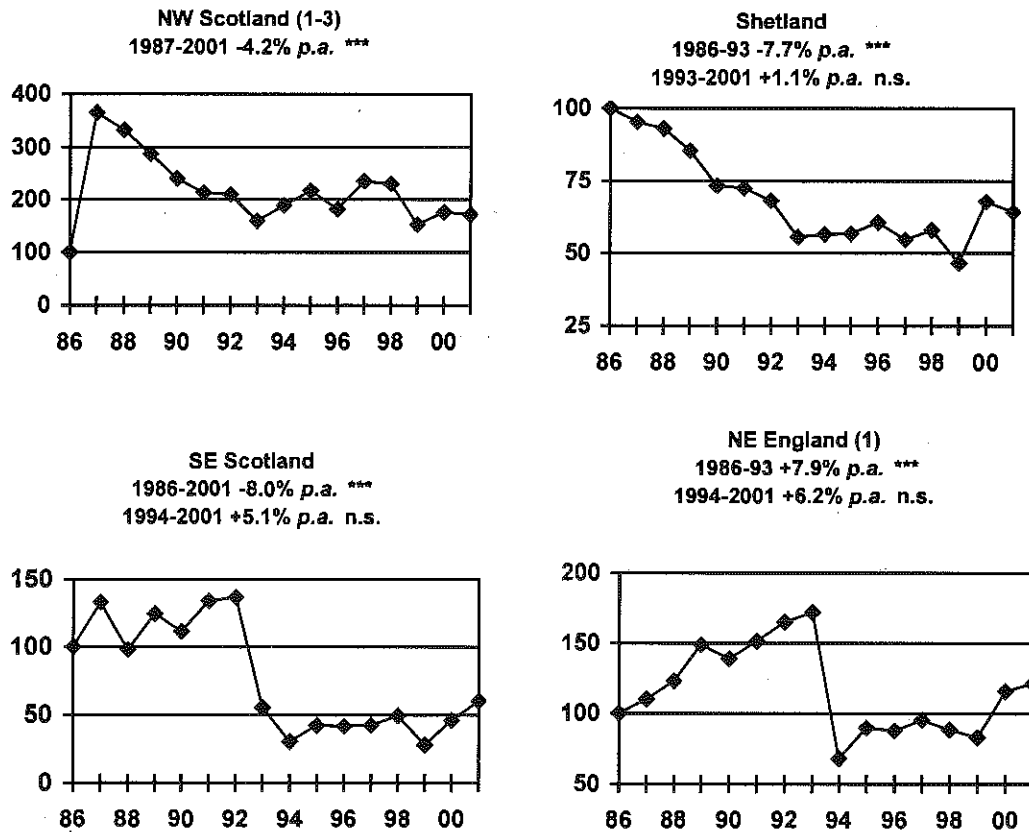


Figure 3.8.1 Population indices for breeding European shags, 1986-2001 (apparently occupied nests in late May or June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Trends are shown for the periods indicated. Three or more colonies are counted in each region in each year unless otherwise indicated. Note: the large increase in index value between 1986-87 for north-west Scotland is due to very few birds breeding on Canna in 1986. Statistical significance of trends (t-test) indicated as: n.s. not significant, *** $P < 0.001$.

Breeding success (Table 3.8.2)

Across 12 colonies where productivity was assessed by monitoring sample nests throughout the breeding season, an average of 1.43 chicks fledged per active nest in 2001, above the 1986-2000 mean of 1.30 (s.e. ± 0.05) averaged over between three and 20 colonies annually. This was higher than the 2000 average of 1.34 chicks fledged per pair, although across the 11 colonies monitored in both years, productivity increased only slightly, by an average of 0.05 chicks per pair.

In Shetland, productivity at Sumburgh Head was 1.20 chicks per pair, much improved on the gale-affected low value recorded in 2000 (0.89) and equal to the 1988-2000 mean (1.20, s.e. ± 0.08). Breeding performance also improved on Foula, doubling between 2000 and 2001 from 0.46 chicks fledged per pair to 0.96. On Fair Isle, productivity fell from 2000 by 0.26, to 1.58 chicks per pair, although this was still well above average (mean 1986-2000 1.42, s.e. ± 0.06).

At North Sutor in northern Scotland, breeding success was again high at 1.74 chicks per pair, well above average for the site (mean 1992-2000 1.52, s.e. \pm 0.12). On the Isle of May (south-east Scotland), breeding success was the highest recorded, with 1.68 chicks fledged per pair overall (1986-2000 average 0.81, s.e. \pm 0.09; Wilson *et al.* 2001). Productivity was also high at St. Abb's Head; although slightly lower than the 1.56 chicks fledged per pair recorded in 2000, the figure of 1.51 chicks fledged per pair was still well above the 1990-2000 mean of 1.26 (s.e. \pm 0.14). In north-east England, productivity on the Farnes was 1.01 chicks per pair, similar to the long-term mean (1987-2000, 1.03, s.e. \pm 0.11).

Table 3.8.2 European shag breeding success, 2000-2001: estimated number of chicks fledged per occupied nest at sample colonies (superscript n = number of colonies). Figures are based on nests where eggs or apparent incubation were recorded, and are presented as the mean and standard error of figures for individual colonies. Only colonies where ten or more nests were monitored are included. The figures used for some colonies in both years in south-west Scotland as well as for An Glas Eilean in north-west Scotland are based on just one or a few visits and are therefore approximate; those for other colonies and regions are based on regular checks of sample nests. Changes in breeding success are indicated for colonies studied in both years; none of these is statistically significant.

Regions	2000 chicks fledged/nest				2001 chicks fledged/nest				2000-2001 change	
	Nests ⁿ	Range	Mean	\pm s.e.	Nests ⁿ	Range	Mean	\pm s.e.	Mean ⁿ	\pm s.e.
SW Scotland ^a	285 ⁶	0.91-2.15	\geq 1.48	\pm 0.24	354 ⁸	0.00-2.31	1.10	\pm 0.27	-0.32 ⁵	\pm 0.16
NW Scotland ^b	82 ²	0.80-0.91	\geq 0.86	\pm 0.06	152 ³	0.10-1.00	0.67	\pm 0.29	-0.30 ²	\pm 0.40
Shetland ^c	305 ³	0.46-1.81	1.04	\pm 0.41	313 ³	0.96-1.58	1.27	\pm 0.18	+0.24 ³	\pm 0.24
N Scotland ^d	74 ¹	-	1.66	-	82 ¹	-	1.74	-	+0.08 ¹	-
SE Scotland ^e	198 ²	1.53-1.56	1.54	\pm 0.02	227 ²	1.51-1.68	1.60	\pm 0.08	+0.05 ²	\pm 0.10
NE England ^f	137 ¹	-	0.65	-	152 ¹	-	1.01	-	+0.36 ¹	-
Wales ^g	177 ²	1.78-2.27	2.03	\pm 0.24	194 ²	1.92-2.03	1.98	\pm 0.06	-0.05 ²	\pm 0.19
Total	1,257 ¹⁷	0.46-2.15	1.36	\pm 0.14	1,474 ²⁰	0.00-2.31	1.23	\pm 0.14	-0.09 ¹⁶	\pm 0.10
Detailed only	940 ¹⁰	0.80-2.27	1.34	0.19	1,103 ¹²	0.10-2.31	1.43	0.17	0.05 ¹¹	\pm 0.10

Colonies: ^aRuadh Sgeir, Eilean Buidhe, Carraig an Daimh (2001 only), Dubh-feith (2001 only), Eilean Dubh, Eilean na Cille, Eileanan Glasa, Craro (2000 only), Sanda (2001 only); ^bCanna, Rum, An Glas Eilean; ^cSumburgh Head, Fair Isle, Foula; ^dNorth Sutor; ^eIsle of May, St. Abb's Head; ^fFarne Islands; ^gBardsey, Ynys Gwylan.

In western Scotland, eight colonies containing 300 nests fledged a minimum of 259 young (0.86 chicks per AON; Craik 2001). Predators reduced productivity at three of these colonies with mink responsible at one and herring gull at another. At the third colony, where no young fledged from 30 nests, the predator responsible was not identified. On Canna, despite site occupancy appearing to be high in late May, productivity was the lowest recorded since 1986 with only 0.1 chicks fledged per study nest (1986-2000 mean 1.35, s.e. \pm 0.10; Wilson *et al.* 2001). Most losses occurred at the egg stage when many eggs were found with a groove along the long axis suggesting predation by gulls. However, remains of eaten chicks were also found, which suggests that a mammalian predator was also involved (Swann 2001a). Breeding success was also measured for the first time at two west coast islands. On Rum, productivity from 81 nests was 0.96 chicks per AON (S. Morris, pers. comm.), and on Sanda breeding success was high with 2.31 chicks per AON from 64 nests (Morton 2001).

Breeding success again continued to be high in Wales: two nearby colonies, Bardsey and Ynys Gwylan, averaged 1.98 chicks per AON (Stansfield 2001).

3.9 Arctic skua *Stercorarius parasiticus*

Breeding numbers (Table 3.9.1)

The foot and mouth outbreak severely restricted monitoring in the Northern Isles in 2001. In Shetland, increases on Foula and Fair Isle signalled partial recoveries from the lows of 1998-2000. A whole island count of Foula revealed 116 apparently occupied territories (AOT), up 8% (Furness 2001) and numbers on Fair Isle increased by 20% to 78 AOT (Shaw *et al.* 2001). Only four of the usual study plots were monitored elsewhere in Shetland in 2001. The overall decline was attributable to a decrease on Mousa, from 19 to nine AOT. This was the lowest recorded for at least 12 years (1991-2000 average = 20, s.d. \pm 3). Numbers on Noss (nine AOT; Maher *et al.* 2001), Hermaness (12 AOT; Duffield 2001) and Fetlar (19 AOT) remained stable. A complete census of Fetlar indicated 96 AOT compared with 198 in 1991, 148 in 1992 and 125 in 1993 (Houghton and Smith 2001).

In Orkney, data were available from only two sites. At North Hill, Papa Westray, numbers declined by 22% to 52 AOT (Meek 2001). This is 59% lower than the ten-year average for the reserve (127, s.d. \pm 24). At The Loons, Mainland, there was one AOT (one AOT in 2000).

In north-west Scotland, the population increased on Handa for the seventh successive year, to 42 AOT (40 AOT in 2000). In addition, there were four pairs at one site in Sutherland (one pair in 2000) and one AOT on St. Kilda (where two pairs held territory in 1999, with one pair returning in 2000).

Table 3.9.1 Population changes at monitored Arctic skua colonies, 1999-2001. Figures are counts of apparently occupied territories. Superscript = number of colonies counted in both years.

	Foula	Fair Isle	Other Shetland	Total Shetland	Orkney	Handa
1999	106	69	61	236	129	35
2000	107	65	57	229	67	40
2001	116	78	49	243	52	42
2000-2001 % change	+8.4	+20.0	-14.0 ⁴	+6.1 ⁶	-22.4 ¹	+5.0

Breeding success (Table 3.9.2)

In Shetland, the shortage of available sandeels from mid-June resulted in the worst breeding season since the sandeel crisis in 1989 and 1990. There were reports of chicks starving and poor attendance on territories rendered nests more susceptible to predation by great skuas. Excluding Foula, overall fledging success at five sites in Shetland was only 0.10 per AOT. There were complete failures at Hermaness (Duffield 2001), Noss (Maher *et al.* 2001), the study plots on Fetlar (Houghton and Smith 2001) and Mousa (P.Ellis, pers. comm.). In addition, no fledged young were seen on south Bressay or in the Dalsetter area, south Mainland (Okill 2001b). Only 13 young fledged from 78 AOT on Fair Isle (0.37 per AOT in 2000; Shaw *et al.* 2001). On Foula, 66 chicks from 116 pairs (0.57 per pair) were raised to ringing age, but great skuas killed many around fledging time (Furness 2001). Only ten fledglings were seen alive on 5 August (S. Gear, pers. comm.).

In Orkney, birds at North Hill, Papa Westray, had their worst year on record with just five chicks fledging from 52 AOT (1990-2000 average = 0.69, s.e. \pm 0.11). Two chicks fledged from one AOT on St. Kilda (north-west Scotland) where two chicks were also raised in 2000.

Table 3.9.2 Arctic skua breeding success in 2000 and 2001: number of chicks fledged per apparently occupied territory. Note that the same colonies have not necessarily been monitored in each region in each year and that the numbers of AOT given here are sample sizes (n) and do not necessarily indicate population changes between years. Superscript indicates number of colonies. (- indicates that no data were available).

Colony	2000		2001	
	n	overall numbers fledged per AOT	n	overall numbers fledged per AOT
<i>Shetland</i>				
Unst	12 ¹	0.50	12 ¹	0.00
Fetlar	17	0.18	19	0.00
Noss	9	0.22	9	0.00
Mousa	-	-	9	0.00
Fair Isle	65	0.37	78	0.17
Shetland total (excl. Foula)	103 ⁴	0.34	127 ⁵	0.10
Foula	107	c. 0.80	116	<0.57
<i>Orkney</i>				
Papa Westray	67 ¹	0.40	52 ¹	0.10
Rousay	3 ¹	0.00	-	-
N Ronaldsay	1 ¹	2.00	-	-
Orkney total	71 ³	0.41	52 ¹	0.10

3.10 Great skua *Catharacta skua*

Breeding numbers (Table 3.10.1)

Table 3.10.1 Population changes at monitored great skua colonies, 1999-2001. Figures are counts of apparently occupied territories. Superscript = number of colonies counted in both years.

	Fair Isle	Other Shetland	Total Shetland	Orkney	Handa
1999	132	-	-	-	168
2000	135	150	285	11	195
2001	143	169	312	10	-
2000-2001 % change	+5.9	+12.7 ⁵	+9.5 ⁶	-9.1 ²	-

The foot and mouth outbreak disrupted monitoring in Shetland and Orkney in 2001, but the available data indicate that overall numbers continue to increase. On Fair Isle, there was a 5.9% increase to 143 AOT (Shaw *et al.* 2001), the second highest total on record. Elsewhere in Shetland, at five of the usual study plots numbers increased by more than 12%. However, this may be misleading as an increase of 64% (from 28 to 46 AOT) at Lambhoga, Fetlar, might have resulted from the 2000 count being an underestimate (Houghton and Smith 2001). In addition, there were 24 AOT on Mousa (18 in 1999). Complete censuses were made of Noss, Fetlar and Hermaness. On Noss, 432 AOT were recorded (*cf.* 414 in 1997 and 423 in 1992; Maher *et al.* 2001). There were 593 AOT on Fetlar, a 26% increase since 1991 (Houghton and Smith 2001) and 726 AOT at Hermaness (748 in 2000, 631 in 1997 and 854 in 1992; Duffield 2001).

Data were available for only two sites in Orkney. Nine pairs held territories at North Hill, Papa Westray (Meek 2001), and one pair bred at Trumland, Rousay. Elsewhere in Scotland, one pair again bred on Canna (a new colonisation in 2000) and were joined by a second pair in late July (Swann 2001a). Two birds were counted on Treshnish Isles in late June. No census was carried out on Handa, north-west Scotland (Stoneman 2001).

Breeding success (Table 3.10.2)

With the exception of 1998, overall productivity at monitored colonies in Shetland was the lowest since 1990. However, low sandeel availability affected great skuas less than Arctic skuas. Birds on Noss fared worst: only nine chicks fledged from 59 AOT (Maher *et al.* 2001), the lowest since 1989. The remains of 20 chicks that had apparently been cannibalised by adults were found in the study area (21 found in 2000) although it is believed that other factors, such as less available prey items from surface feeding species and fewer discards, also combined to lower productivity. Elsewhere, breeding performance was higher. Productivity at Hermaness was close to the ten-year average (Duffield 2001). On Foula, laying dates were slightly later than usual and adult attendance at territories fell to low levels during early July. Regurgitates from chicks during the second week of July were mainly of herring; none contained sandeels. Fledging success was *c.* 0.7 per pair by mid-July, although some of these chicks might have been lost later in the month (Furness 2001). Ringing data from south Bressay indicated an above-average year, and birds on the Scalloway Islands and on the Mainland at Fitful Head were also successful (Okill 2001b).

In Orkney, three chicks fledged from nine AOT at North Hill, Papa Westray (Meek 2001), and two fledged from one pair at Trumland, Rousay. No other data from the archipelago were available.

Table 3.10.2 Great skua breeding success in 2000 and 2001: number of chicks fledged per apparently occupied territory. Note that the same colonies have not necessarily been monitored in each region in each year and that the numbers of AOT given here are sample sizes (*n*) and do not necessarily indicate population changes between years. Superscript indicates number of colonies. (- indicates that no data were available)

Colony	2000		2001	
	<i>n</i>	overall numbers fledged per AOT	<i>n</i>	overall numbers fledged per AOT
<i>Shetland</i>				
Unst	41 ¹	0.85	35 ¹	0.91
Fetlar	52 ³	1.17	75 ³	0.76
Mousa	-	-	24	0.75
Noss	57	0.54	59	0.15
Fair Isle	135	0.74	143	0.66
Shetland total	285	0.80	336	0.62
<i>Orkney</i>				
Mainland	1	0.00	-	-
Rousay	2	1.00	1	2.00
Papa Westray	9	0.78	9	0.33
Orkney total	12	0.75	10	0.50

3.11 Mediterranean gull *Larus melanocephalus*

Breeding numbers and breeding success

Mediterranean gull features in this report for the second year. An extreme rarity in Britain as recently as the 1930s, the numbers seen along our shores have increased substantially in recent decades. Colonies around the Black Sea increased in size, from an estimated 93,500 pairs in 1961 to a minimum of 330,000 pairs in 1982 (Cramp and Simmons 1983; Siokhin *et al.* 1988), and with this increase has come a range expansion westwards. A small breeding population became established in Hungary in the late 1950s, since when breeding has occurred in most west European countries. Breeding in Britain was first recorded in 1968, but it was not until 1979 that this became an annual event. Since then the number of nesting pairs has increased, a trend mirrored in other countries in central and Western Europe (Donald and Bekhuis 1993). It is estimated that the breeding population in the United Kingdom now numbers over 80 pairs.

In 2001, data were received from six sites in east and south-east England and one in Ireland. In south-east England, the largest colony held 46 pairs (*cf.* 38 in 2000) fledging between 20-23 chicks. At four other sites in the south-east a total of 31 pairs were counted (*cf.* 28 pairs in 2000) though one sub-colony could not be visited due to foot and mouth disease restrictions. Breeding performance was reported for three of these sites. One site holding five pairs fledged a single chick and a second site holding two pairs fledged four young. At the remaining site, eight pairs fledged no young. Outside south-east England, only three nesting pairs were reported; two pairs in east England, which fledged three young, and one pair in south-east Ireland.

3.12 Black-headed gull *Larus ridibundus*

Breeding numbers and breeding success (Table 3.12.1)

Black-headed gulls are highly mobile between breeding sites; hence, the changes in numbers at sample colonies shown in Table 3.12.1 are not necessarily representative of broader regional trends.

Table 3.12.1 Population changes at monitored black-headed gull colonies, 2000-2001. Figures are breeding pairs, apparently incubating adults or apparently occupied nests in May-June.

	SW Scotland	NE England	SE England	SW England
2000	183	2,370	6,225	199
2001	176	2,275	8,531	90
2000-2001 % change	-3.8 ^a	-4.0 ^b	+37.0 ^c	-54.8 ^d

Colonies: ^a Eilean Inshaig, Sgeir na Caillich, Eilean an Ruisg, Eilean Fada, Airds Islet, Torinturk, Duncuan; ^b Farnes, Coquet Island; ^c Rye Harbour, North Solent NNR, Dungeness; ^d Brownsea Island.

In south-west Scotland, overall numbers at monitored colonies declined only slightly. At eight sites between Mallaig and Tarbert on the Kintyre peninsula, breeding success of 178 pairs was 0.93 chicks per pair. Although lower than that in 2000 (1.29) it is still far higher than that recorded in most years (0.34 in 1999, 0.24 in 1998, 0.47 in 1997, 0.42 in 1996). All of the young were at four sites where mink are controlled annually. Over 92% of the young were observed again at one site where black-headed gulls had been extirpated after four successive years of mink predation between 1992-1995. Following mink control during 1996-2000, the black-headed gull colony at this site has now almost been restored to its former size (Craik 2001). In north-west Scotland, the black-headed gull is thought

to be close to extinction as a mainland breeding species north of the Great Glen (D. Butterfield, pers. comm.).

In Shetland, numbers remained low on Fetlar at 13 pairs, after the decline between 1999 and 2000. Breeding success was again low with only two young fledged (Houghton and Smith 2001). Once again, colonies in the Tingwall Valley failed, but a colony at South Whiteness holding 53 pairs fledged 'reasonable numbers of chicks' (Okill 2001b). In Orkney, four small colonies were monitored on Egilsay; all four colonies had failed by early June, but subsequently at one colony, pairs relaid and 21 young eventually fledged (Mceek 2001).

In north-east Scotland, there was a large increase in the colony at Forvie National Nature Reserve, (NNR) from 194 pairs in 2000 to 645 pairs in 2001. Breeding success was 0.94 chicks fledged per pair, compared with the 2000 value of 1.19, though well above the 1986-2000 mean of 0.48 (s.e. \pm 0.14).

In north-east England, overall numbers at the two monitored colonies declined slightly. At the largest colony on Coquet Island, breeding numbers remained stable at 2,218 pairs (2,286 pairs in 2000), although productivity increased from 1.10 to 1.70 (1993-2000 mean 1.30, s.e. \pm 0.13; Morrison et al. 2001). Productivity on the Farnes was low due to chick predation by large gulls; only 0.38 chicks per nest fledged from 16 monitored nests, well below the 1996-2000 average of 1.21 (s.e. \pm 0.36).

At Scolt Head (east England), there were an estimated 2,000 nesting pairs (1,035 pairs counted in 2000), fledging a minimum of one young per pair. Nearby at Stiffkey Marshes, a maximum of 2,500 pairs nested, with a further 855 pairs nesting at Holkham NNR. Although no figures are available, productivity was thought to be high at both sites. A further 855 pairs nested at Holkham NNR, where breeding success was also thought to be high. At Havergate, a total of 115 nesting pairs represented a decrease of over 90% from 1,300 pairs counted there in 1990. In south-east England, numbers at North Solent increased for the third successive year, by 32% from 6,125 pairs in 2000 to 8,066 pairs in 2001, the highest count at the site since 1991. Breeding success was thought to be high, with between two and three chicks fledged per pair. At Flander's Mare, foot and mouth disease restricted access to the colony, which was estimated to contain 3,500 pairs (3,155 pairs in 2000). At Rye Harbour, numbers increased from 33 pairs in 2000 to 280 pairs in 2001. Breeding performance was also much improved with a maximum of 450 chicks fledged (between 10-20 chicks fledged in 2000). At Langstone Harbour, 3,179 AON were counted, which was an increase of 17% since 1999, with 1,444 young fledging (0.45 chicks per AON). In south-west England, brown rat *Rattus norvegicus* predation again affected breeding success at Brownsea Island, where a maximum of 90 pairs produced only 10-15 young.

In north-east Ireland, a total of 1,257 pairs nested at Larne Lough, an increase of 11% on 1999. In north-west Ireland, a maximum of 800 nesting pairs was estimated on Inch Islet (627 pairs in 1999). In south-east Ireland, a combination of flush counts and nest counts produced a total of 540-600 nesting pairs at Lady's Island Lake (620 pairs in 1998). Breeding success of all species nesting on the island was low due to predation by brown rats. Average clutch size was 2.45 eggs (n=172), but only 187 chicks were ringed from the whole colony during June.

3.13 Mew gull *Larus canus*

Breeding numbers and breeding success (Table 3.13.1)

In western Scotland, accurate counts have been undertaken annually at 20 breeding sites since 1994. At these there was a 9.6% decrease between 2000 and 2001, with numbers at their lowest since 1997. Mink control efforts again enhanced breeding success. In 2001, at 19 colonies where mink were

removed, 760 chicks fledged from 899 nests (0.84 per pair). This contrasts with another 31 colonies (29 with no mink control, two where mink control failed) where a total of 471 pairs fledged 182 chicks, an average success rate of only 0.39 per pair. This implies that mink are reducing productivity by almost 54% at unprotected colonies. Of these unprotected colonies, 18 contained five or more pairs, nine of which failed completely (Craik 2001). Elsewhere in western Scotland, numbers on Sanda increased from 38 pairs in 2000 to 55 pairs. On Eigg, 71 pairs held territory (60 pairs in 2000) but productivity was low with fewer than ten chicks known to have fledged.

Table 3.13.1 Numbers of mew gulls in study colonies on the west coast of Scotland 1994-2001. Figures are sums of counts of pairs at 20 colonies in Argyll and Bute and southern Lochaber.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2000-2001 % change
No. of pairs	1,081	1,015	821	805	929	913	986	891	-9.6

Colonies: Glas Eileanan, Eilean Inshaig, Tucker's Island, Sgeir na Caillich, Eilean an Ruisg, Eilean Mor, Glas Eilean, Kilmaronag, Aird's Point Islet, Bonaawe Island, McCormaig Island, Eilean Fada, Ardrishaig, Sanda, Eilean Dubh, Eilean Gainimh, Sgeir Sallachain, Eilean Choinneich, Coruanan, Eilean Nan Gall.

In Shetland, visits to colonies to ring chicks indicated that some colonies had a poor breeding season. Pairs in the Tingwall Valley again failed completely. At Hildasay, where the colony has now dwindled to only 11 pairs, breeding appeared to be late as only one chick was caught and ringed on July 1 when all the other nests still contained eggs (Okill 2001b). On Fair Isle, eight pairs again nested, although only two young were seen, both of which were predated (Shaw *et al.* 2001). In Orkney, only 27 pairs were found nesting at North Hill, Papa Westray, a decline of 64% since 1997. The usually large and productive colony at Littlequoy held only *c.* 100 pairs and few chicks fledged.

The colony at Nigg in north Scotland decreased slightly to 110 pairs (117 in 2000). Breeding success from 70 monitored nests was well above average at 1.26 chicks per pair (1996-2000 mean 0.98, *s.e.* \pm 0.10) (Swann 2001b). Elsewhere in the same area, the colony at Alness Point held *c.* 80 pairs though no young fledged from this site due to accidental human disturbance.

In east England, a maximum of five nesting pairs at each site were noted for Scolt Head, Holkham NNR, and Orford Ness. Productivity was estimated at 2.0 chicks per pair and 1.0 chick per pair at Scolt Head and Holkham NNR respectively. In south-east England, 11 pairs nested at Dungeness representing no change from 1999 levels. In north-east Ireland, at Big Copeland (*c.* 100 pairs) and Lighthouse islands (15 pairs), breeding numbers were similar to 2000 levels (N. McKee, pers. comm.). Small numbers also nested at Larne Lough (seven pairs).

3.14 Lesser black-backed gull *Larus fuscus*

Breeding numbers and breeding success (Table 3.14.1)

Overall numbers of lesser black-backed gull declined in most regions between 2000 and 2001. Particularly large declines were evident at colonies in south-east Scotland. The annual census on the Isle of May revealed an estimated 1,203 nests, a decline of 16.6% on the 2000 figure and the sixth consecutive year of decrease (Wilson 2001). From a sample of 264 nests, breeding success was 1.32 chicks per pair, well above the 1989-2000 average (0.82, *s.e.* \pm 0.07). Of four islands surveyed in the Firth of Forth, large declines occurred on Inchmickery (60.4% to 91 pairs) and on Fidra (71.5% to 51 pairs) between 2000 and 2001 (Jones 2001).

In north-east England, numbers on Coquet Island totalled 221 pairs, an increase of 20.1% on 2000 (Morrison *et al.* 2001). In east England, an estimated 23,500-24,000 pairs nested at Orford Ness (D. Cormack, pers. comm.). Elsewhere, 171 pairs nested at Blakeney Point and 290 pairs nested at Havergate Island. Nesting is controlled at both sites, for tern conservation.

Table 3.14.1 Population changes at monitored lesser black-backed gull colonies, 2000-2001. Figures are breeding pairs, apparently incubating adults or apparently occupied nests in May-June.

	SW Scotland ^a	SE Scotland ^b	E England ^c	Wales ^d
1999	863	2,448	22,500	16,023
2000	990	1,854	23,000	16,868
2001	924	1,348	23,500-24,000	16,820
2000-2001 % change	-6.7%	-27.3	+c. 3.7	-0.3

Colonies: ^a Tarbet Island, Reisa Mhic Phaidean, Eilean Gamhna, Bach Island, Eilean Mor, Eilean na Cille, Eilean Eoghainn, Eilean a Bhuic, Burnt Isles, Sanda; ^b Isle of May, The Lamb, Inchmickery, Fidra; ^c Orford Ness; ^d Skomer, Skokholm, Bardsey, Ynys Gwylan, Caldey, Elegug Stacks and nearby coast.

In Wales, the annual census of breeding numbers on Skomer resulted in an estimated 13,019 pairs. It should be noted that the figure of 10,007 pairs, quoted for 2000 (Mavor *et al.* 2001), was wrong; the correct estimate is 13,253 pairs. Thus numbers declined only slightly between 2000 and 2001 (Brown and Boyle 2001). Productivity was estimated at 0.28 chicks per pair, above the 1989-2000 average (0.24, s.e. \pm 0.05), but well below the number needed for the population to maintain itself (about one fledgling per pair; Perrins 2001). On Skokholm, the population was estimated at 2,450 pairs showing little change from 2000 (2,419 pairs; G. Thompson, pers. comm.). Breeding performance was again low, at 0.23 chicks fledged per pair, but still above average for this site (1994-2000 mean 0.19, s.e. \pm 0.02). On Bardsey, numbers increased by 6.7%, to 634 pairs, and productivity averaged 0.71 chicks fledged per pair, well above the 1996-2000 average (0.50, s.e. \pm 0.08). On Caldey Island, numbers increased by 21.8% between 2000 and 2001, from 550 to 670 pairs.

In south-west Scotland, numbers at colonies counted in 2000 and 2001 decreased by 6.7% to 924 pairs. At 11 colonies where breeding numbers and performance were estimated, c. 869 pairs fledged a minimum of 339 young. Mink were removed from one of these colonies but were active at a further three, reducing productivity especially at the largest colony, where only 25 chicks fledged from c. 300 pairs (Craik 2001). In north-west Scotland, numbers on Eigg declined by five pairs to 35 pairs between 2000 and 2001, while on Canna 43 pairs nested, an increase of two pairs over the same period. On Old Lighthouse Island (north-east Ireland), numbers decreased from 200 pairs to 180 pairs between 2000 and 2001 (N. McKee, pers. comm.).

Fortunes of mixed colonies of lesser black-backed and herring gulls also varied between 2000 and 2001. The annual census of the large inland gull colony at Tarnbrook Fell (north-west England) found an estimated 18,080 nests with eggs, compared with 18,993 in 2000, 17,155 in 1999 and 14,129 in 1998, of which c. 97-98% were lesser black-backed gulls and the remainder herring gulls (Sowter 2001). However, these figures should be treated as minimum population estimates. Nests with eggs represented only 50% of the total numbers of nests in sample quadrats. Application of a conversion factor as used between 1990 and 1997 to allow for missed and late nests gives a maximum estimate of 22,007 breeding pairs. After the 2001 census, 10,165 birds were culled as part of a long-term water quality management strategy. Elsewhere in north-west England, the colony at Rockcliffe Marsh was estimated to contain 10,300 pairs, a similar figure to that in 2000. Sample counts indicated a ratio of 3:1 in favour of lesser black-backed gulls (M. Carrier, pers. comm.). In north-east England, the mixed colony on the Farnes declined by 14.2%, to 1,058 pairs between 2000 and 2001 (Walton 2001).

3.15 Herring gull *Larus argentatus*

Breeding numbers and breeding success (Table 3.15.1)

Few colonies are counted regularly, but the limited data available suggest that coastal populations were roughly stable or declining between the mid-1980s and mid-1990s, following major declines from the early 1970s to mid-1980s (Walsh and Gordon 1994; Lloyd *et al.* 1991). However, population trends at individual colonies may vary within regions, so data for small samples of colonies are not necessarily indicative of more widespread changes.

In both north-west and south-west Scotland, overall numbers at regularly monitored colonies decreased from 2000 levels. In study sites between Mallaig to Tarbert on the Kintyre peninsula 8,230 pairs nested at 77 sites (Craik 2001). Colonies holding more than ten pairs (53 colonies) were divided into three groups: i) those with active mink control (n=7); ii) those without mink control, and no observed mink predation (n=32); and iii) those where mink predation was recorded (n=14). Breeding performance was similar in the two groups of colonies that remained free of mink predation (i.e. 0.83 chicks fledged per pair from *c.* 1,386 nests in the controlled colonies and 0.74 fledged per pair from *c.* 5567 nest in the uncontrolled colonies). However, productivity was much less at those colonies suffering mink predation, with only 0.13 chicks fledging on average from *c.* 1224 nests. Furthermore, half of the mink-depredated colonies produced no fledglings (Craik 2001). On Eigg, after a 22% increase between 1999 and 2000, numbers fell by 17.1% to 316 territories in 2001. On Canna, numbers decreased from 2000 levels by 21.5%, to 1,006 territories. Breeding performance was noted as being very poor, with only 10% of 704 nests checked producing chicks. From 90 study nests only nine chicks were caught for ringing (0.1 chicks per nest) indicating one of the worst breeding seasons at this site. The low productivity was possibly related to a large reduction in commercial fishing activity around Canna in the early part of the summer, resulting in a major food shortage for gulls (Swann 2001a).

Table 3.15.1 Population changes at monitored herring gull colonies, 2000-2001. Figures are breeding pairs or apparently occupied nests in May-June. Regional samples < 200 pairs are excluded.

	SW Scotland ^a	NW Scotland ^b	NE Scotland ^c	SE Scotland ^d	E England ^e	Wales ^f
1999	6,979	2,931	445	4,391	6,250	3,417
2000	7,506	3,097	488	5,771	6,750	3,848
2001	7,357	2,705	272	4,800	6,800	4,419
2000-2001 % change	-2.0	-12.7	-44.3	-16.8	+c. 0.7	+14.8

Colonies: ^a Mull of Galloway, Eilean Mor (McCormac Isles), Eilean Glasa, Ban Eileanan, Eilean Dubh Mor, Reisa Mhic Phaidean, Eilean Creagach, Eilean Gamhna, Dubh Sgeir, Bach Island, Sgeir nan Gobhar, Glas Eileanan, Rubha an Ridire, Eilean Mor (Dunstaffnage), Eilean Beag, Glas Eilcan, Eilcan Loch Oiscair, Sgeir nan Tom, Eilean Gainimh, Eilean Dubh, Inn Island, Kilmarnog, Abbot's Isle, Eilean nan Caorach and nearby, Tarbet Island, Ruadh Sgeir, Reisa an t'Struith, Eilean na Cille and islets, Eilean Eoghainn and nearby, Liath Eilean, Eilean a'Bhuic, Sgat Beag, Sgat Mor, Eilean Buidhe, Glas Eilean, Eilcan Aoghainn, Eilean Buidhe, Burnt Isles, Sanda, Lunga; ^b Sligneach Mor, An Glas Eilean (Moidart), An Glas Eilean (Arisaig), An Glas Eilean (Loch nan Uamh), Sgeir Ghlas, Eilean MhicNeill, Sgeir an Eididh, Am Fraoch-eilean, Sgeir an Fheoir, Eilean an t'Snidhe, Eilean an Sgurra, Rubha da Chuain, Eilcan da Chuain, Eilean Dubh, Eilean Balnagowan, Sgeirean Sallachain, Eilean Munde, Eilean Choinneich, Fort William islets, Canna, Eigg, Handa; ^c Sands of Forvie NNR; ^d Isle of May, Inchgarvie, Inchmickery, Eyebroughty, Carr Craig, Fidra, Haystack, The Lamb, St. Abb's Head; ^e Orford Ness; ^f Elegug Stacks and nearby coast, Skomer, Skokholm, Middlholm, Caldey, Bardsey, South Stack, Yny Gwylan Fawr.

In Shetland, the colony on Hildasay, which held *c.* 300 pairs in 1998, was found to contain only two pairs in 2001 (Okill 2001b). Numbers on Noss were little changed at 63 pairs (*cf.* 67 pairs in 2000) but again productivity was low with only 20 chicks fledging. A handful of chicks and adults were depredated by great skuas (Maher *et al.* 2001).

In north Scotland, numbers at Nigg were stable at 209 pairs (208 pairs in 2000). Most herring gulls at this site continued to nest on rooftops. In north-east Scotland, large declines were evident in two areas (Gillon *et al.* 2001). Along the Gamrie to Pennan coast a complete survey revealed 1,951 pairs, a decline of 53.5% on the previous survey in 1995. The Boddam to Collieston coast held a total of 3,126 pairs and sections counted in both 1995 and 2001 had increased by 13.1%, from 1,998 pairs to 2,260 pairs. At Forvie NNR, numbers declined by 44.3% to 272 pairs between 2000 and 2001.

In south-east Scotland, population levels on several closely-grouped islands in the Firth of Forth continued to fluctuate between 2000 and 2001 (Jones 2001). Herring gull numbers on Fidra decreased by 51.0% to 840 pairs, after increasing by 23% the previous year. Numbers also declined on Inchgarvie, by 30.6% to 227 pairs. However, increases were apparent on Inchmickery (up 70.1% to 395 pairs) and the Lamb (up 225.0% to 117 pairs). On the Isle of May, numbers declined by 7.2% from 2000 figures, to 2,845 pairs. Productivity was above average with 0.91 chicks fledged per pair (1997-2000 mean 0.60, *s.e.* \pm 0.02; Wilson 2001).

In north-east England, the colony on Coquet Island declined from 49 to 31 pairs between 2000 and 2001. In east England, the large colony at Orford Ness was estimated to hold 6,800 breeding pairs of herring gulls, similar to 2000 figures. Smaller numbers nested at Blakeney Point (240 pairs), Blakeney Marshes (35 pairs), Havergate Island (125 pairs) and Holkham NNR (90 pairs). At the three former sites, nests were controlled for tern conservation. At Dungeness (south-east England), 51 pairs nested, a 50% decline from 2000 figures, though half the pairs had their eggs destroyed to promote tern conservation.

At Durlston Head in south-west England, numbers increased by 64.2% to 110 pairs, possibly due to the lack of human disturbance as a result of the foot and mouth outbreak (Morrison 2001). However, productivity from a sample of 26 nests was low with only 0.12 chicks fledged per nest. Many medium to large young were found dead in mid-July, but the cause of death was unknown. Nearby at Ballard, 15 nesting pairs was similar to 2000 (17 pairs), and breeding performance from 11 nests was estimated at 1.72 chicks per nest.

In Wales, there were large increases at several colonies between 2000 and 2001: 95.3% at Ynys Gwylan (to 459 pairs), 37.6% at Skomer (to 505 pairs), 33.3% at Stackpole Head (to 124 pairs), 30.1% at Middleholm (to 147 pairs), 24.6% at Skokholm (to 385 pairs) and 24.2% at Bardsey (to 663 pairs). The largest colony, at Caldey, declined slightly from 2,134 pairs to 2,076 pairs (S. Sutcliffe, pers. comm.). Compared to 2000, breeding performance improved at all four islands for which data was recorded. On Skomer, 0.88 chicks fledged per nest from 42 monitored nests (*cf.* 0.59 in 2000), which was just below average for the site (1996-2000 mean 0.92, *s.e.* \pm 0.13; Brown and Boyle 2001). On Skokholm, productivity increased from 0.67 chicks per pair to 0.89, slightly above the 1993-2000 mean (0.86, *s.e.* \pm 0.13). Productivity on Bardsey was 1.28 chicks per nest, the highest recorded since 1996, but only slightly higher than average (1996-2000 mean 1.22, *s.e.* \pm 0.20) and on nearby Ynysodd Gwylan, productivity improved from 0.89 chicks fledged per nest in 2000 to 1.20 in 2001.

In north-east Ireland, 80 pairs nested on Old Lighthouse Island (*cf.* 100 pairs in 2000).

3.16 Great black-backed gull *Larus marinus*

Breeding numbers and breeding success (Table 3.16.1)

A review of the limited available data suggests that coastal populations of great black-backed gulls in the UK generally increased or remained roughly stable between 1986 and 1994 (Walsh and Gordon 1994).

At monitored colonies in south-west and north-west Scotland, there were decreases of 6.6% and 8.0% in breeding numbers respectively between 2000 and 2001 (Table 3.16.1). Within a study area from Mallaig to Tarbert on the Kintyre peninsula, 671 pairs were found at 62 sites, with single pairs at 27 of these. At 58 sites where productivity was monitored, breeding success averaged 0.92 chicks per pair across c. 667 nests. Mink were active at 14 out of 55 sites where no control was carried out, with only seven young fledging from 53 nests at the mink-depredated sites (Craik 2001). On Canna, there was a marked decline to 72 apparently occupied territories, 17 fewer than in 2000, and the lowest count since 1996. Productivity was low: of 32 monitored pairs 25 nests failed completely resulting in only 11 young fledging (0.34 young per pair), by far the lowest breeding performance since monitoring started in 1997 (Swann 2001a). Numbers on Lunga increased from 67 pairs in 2000 to 74 pairs. The population remained stable on Handa at 36 pairs (*cf.* 37 in 2000).

Table 3.16.1 Population changes at monitored great black-backed gull colonies, 2000-2001. Figures are breeding pairs or apparently occupied nests in May-June. Regional samples of < 50 pairs are excluded.

	SW Scotland ^a	NW Scotland ^b	Shetland ^c	N Scotland ^d	Wales ^e
1999	515	218	51	134	219
2000	634	249	56	139	197
2001	592	229	62	164	224
2000-2001 % change	-6.6	-8.0	+10.7	+18.0	+13.7

Colonies: ^a Mull of Galloway, Sanda, Lunga, Eileanan Glasa, An Glas Eilean, Eilean an Sgurra, Liath Sgeir, Eilean Dubh Mor, Reisa Mhic Phaidean, Eilean Gamha, Belnahua, Ormsa, Fladda, Dubh Sgeir (Luing), Bach Island, Eilean Beag, Duhh Sgeir (Lismore), Eilean Dubh, Eilean Glas, Eilean Gainimh, Sgeir nan Tom, Inn Island, Abbot's Isle, Carraig an Daimh, Eilean Mor and islets, Eilean na Cille, Ruadh Sgeir, Eilean Eoghainn, Liath Eilean, Eilean Buidhe, Eilean a'Bhuic, Sgat Mor, Glas Eilean, Eilean Aoghainn, Burnt Isles; ^b Eigg, Canna, Sligneach Mor, Handa, Sgeir an Fheoir, An Glas Eilean, Am Fraoch-eilean, Eilean an t-Snidhe, Eilean MhicNeill, Eilean Balnagowan, Fort William islets, Sgeir nan Torran; ^c Noss; ^d Nigg oil terminal; ^e Skomer, Skokholm, Middleholm, Stackpole Head plus Elegug Stacks, Caldey, South Stack, Bardsey, Ynys Gwylan.

In Shetland, 62 pairs bred on Noss, an increase of six pairs on the previous year, but it was a less successful breeding season with only 0.47 chicks fledged per pair compared with 0.61 in 2000 (Maher *et al.* 2001). Breeding performance in Orkney appeared to be mixed. On Faray, only 90 chicks could be found for ringing on July 1 compared with almost 900 on the same date the previous year (Meek 2001). At the North Hill RSPB reserve on Papa Westray, where numbers had declined from 85 pairs in 1997 to 48 pairs in 2001, chick mortality was noted as being 'high'. However, on Swona, although no figures are available, breeding performance was noted as 'good' on a visit on June 23.

In northern Scotland, the colony at Nigg increased by 10.1%, to 164 pairs. From 143 monitored nests, 110 young fledged - a mean of 0.77 young per nest, well below average for this colony (1991-2000 mean 1.79, s.e. \pm 0.14). Many nests failed at the egg stage, with evidence of clutch depletion between

visits suggesting that mammalian predation may have been partly responsible (Swann 2001b). In south-east Scotland, the population on the Isle of May continued to increase, reaching a new peak of 27 pairs. No data was available on productivity, which was noted as being 'good' (Wilson 2001).

In Wales, overall numbers at monitored colonies increased by 13.7% since 2000. On Skomer, a total of 69 apparently occupied nests were located (61 in 2000), the highest figure since 1981. Productivity from 25 monitored nests was 1.36 young per pair, well above the 1996-2000 mean (1.18, s.e. \pm 0.09) (Brown and Boyle 2001). On nearby Middleholm, after the decline between 1999 and 2000, numbers doubled from 14 to 29 apparently occupied nests, almost returning to 1999 levels. On Skokholm, 53 monitored pairs fledged an average of 1.15 young each, similar to values recorded in 2000. On Ynys Gwylan Fawr, numbers between 2000 and 2001 increased by seven pairs to 61 pairs. Breeding performance also improved - a total of 120 young fledged equating to a productivity of 1.97 young per pair, compared to a figure of 1.80 in 2000 (Stansfield 2001). In north-west England, numbers increased at Rockliffe Marsh from 39 to 55 pairs between 2000 and 2001, with a minimum of 45 young fledged in 2001 (M. Carrier, pers. comm.).

In the Isles of Scilly (south-west England), 168 apparently occupied nests were found on Annet (P. Robinson pers. comm.). Elsewhere in the region, 14 pairs nested at Ballard, fledging a minimum of 13 young.

3.17 Black-legged kittiwake *Rissa tridactyla*

Breeding numbers (Tables 3.17.1 and 3.17.2, Figure 3.17.1)

Black-legged kittiwakes may move between colonies and hence, year to year changes in counts of kittiwakes at sample colonies may not always necessarily reflect larger scale regional population changes. Between 2000 and 2001, overall numbers declined in most regions but only slightly. However, large declines were evident in north-east and south-east Scotland, and in south-east England.

Few breeding stations were surveyed in Shetland in both 2000 and 2001. Data from productivity plots and two (now very small) Mainland colonies counted in both years suggest only a slight decline (Table 3.17.1). Furthermore, a complete re-count of Fair Isle produced 8,204 apparently occupied nests, a very similar figure to that recorded in 2000 (8,175 AON), which was thought to have been low because the count had been conducted late in the season (Shaw *et al.* 2001). However, these figures contrast with 13 colonies that were counted in 1999 and 2001, which showed a decline of 20.3% over that period (Heubeck 2001).

Table 3.17.1 Population changes at monitored black-legged kittiwake colonies, 2000-2001 (apparently occupied nests in late May or June) and 1986-2000 population trends. Trends for north-east Scotland are based on triennial monitoring at Troup\ Lion's Head and Bullers of Buchan. Counts with a reported inaccuracy of > 5% and regional samples <500 AON are excluded. Average annual rates of change for 1986-2000 were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends (t-test) indicated as: n.s. not significant, * P<0.05, ** P<0.01, ***P<0.001.

	SW Scotland	NW Scotland	Shetland	NE Scotland	SE Scotland
% annual change	1986-2000 +3.2**	1986-2000 -1.2 n.s.	1986-1999 -9.7**	1992-2000 -9.0 **	1986-2000 -3.2*
2000	1,279	2,752	1,988	1,494	17,185
2001	1,315	2,657	1,951	1,226	12,818
2000-2001 % change	+2.8 ^a	-3.4 ^b	-1.9 ^c	-17.9 ^d	-25.4 ^e
	NE England	SE England	Wales	SE Ireland	
% annual change	1986-2000 -0.8 n.s.	1986-2000 -2.8*	1986-2000 -2.1***	1986-2000 +0.8 n.s.	
2000	9,155	1,676	2,690	835	
2001	8,522	1,229	2,654	857	
2000-2001 % change	-6.9 ^f	-26.7 ^g	-1.3 ^h	+2.6 ⁱ	

Colonies: ^a Colonsay, Mull of Galloway, Lunga; ^b Canna, Rum SE coast, Handa (productivity plots); ^c Sumburgh, Noness, Ramna Geo, Westerwick, Noss, Hermaness, Fair Isle (all productivity plots), Eshaness mainland and Skerry; ^d Fowlshough (plots), Sands of Forvie NNR, Portknochie, Covesea; ^e Isle of May, Inchkeith, Craigeith, The Lamb, Fidora, Inchcolm, St. Abb's Head; ^f Farne Islands, Coquet, Saltburn; ^g Fan Bay-West Langdon Cliffs; ^h Elegug Stacks, Skomer, St. Margaret's, Bardsey, South Stack; ⁱ Dunmore East, Portally.

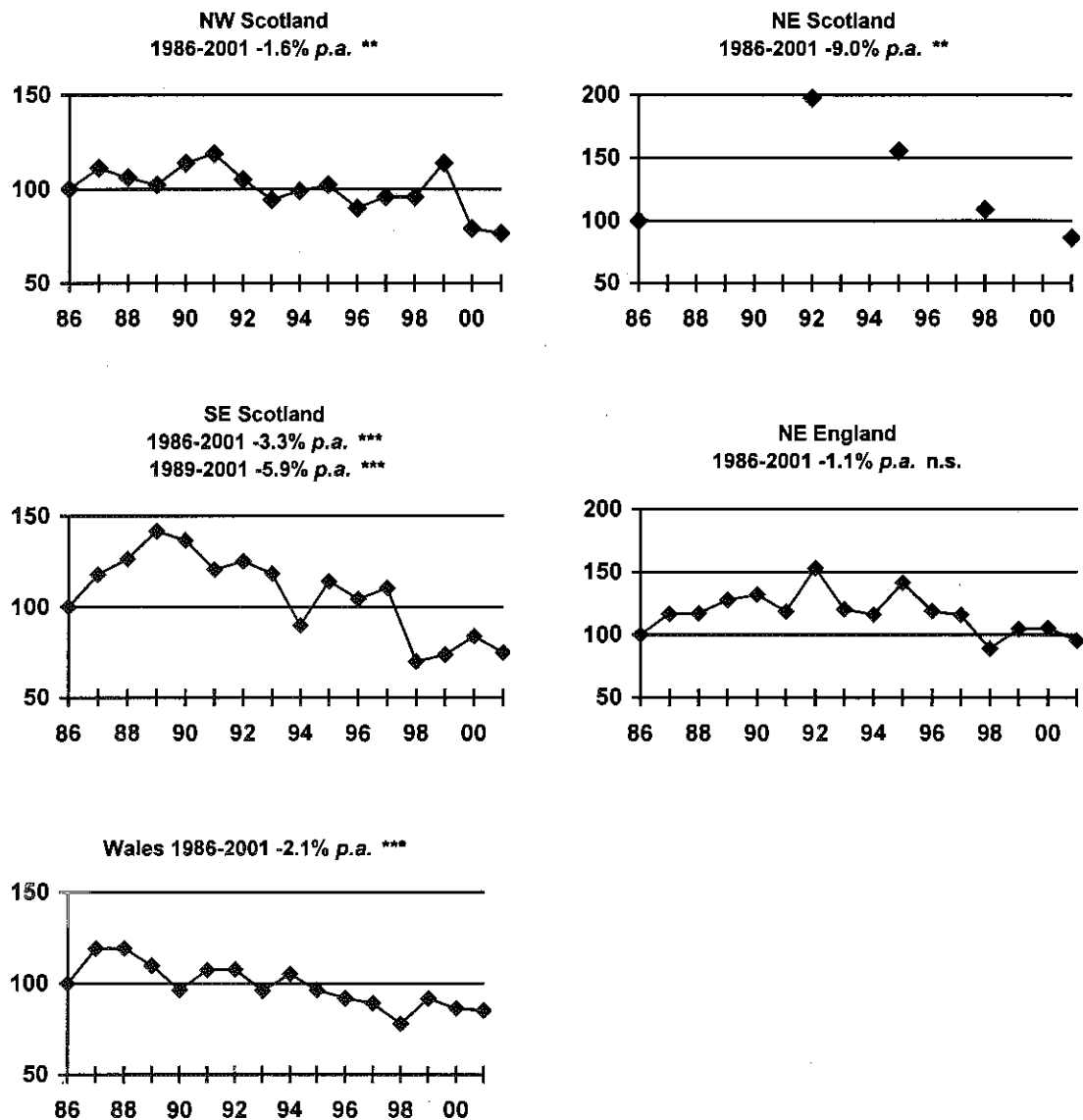


Figure 3.17.1 Regional population indices for breeding black-legged kittiwakes, 1986-2001 (apparently occupied nests in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends (t-test) indicated as: n.s. not significant, ** $P < 0.01$; *** $P < 0.001$.

In north-east Scotland, counts carried out by JNCC along the Aberdeenshire coast from Gamrie to Pennan and from Buchan Ness to Collieston showed declines of 41.6% to 18,482 AON and of 43.5% to 14,091 AON respectively since they were last counted in 1995 (Gillon *et al.* 2001). Within each of these areas, colonies at Troup Head and Lion's Head and between Boddam and Cruden Bay had also been counted in 1998, as well as in 1995. Table 3.17.2 shows that the rate of decline at both colonies was greater during the period 1995-1998 than during 1998-2001.

Table 3.17.2 Population changes at monitored black-legged kittiwake colonies in north-east Scotland, 1995-2001. Figures are apparently occupied nests in late May or June.

	1995	1998	2001	% annual change	
				1995-1998	1998-2001
Troup Head and Lion's Head (Gamrie to Pennan)	21,325	14,933	11,305	-11.2	-8.9
Boddam to Cruden Bay (Buchan Ness to Collieston)	19,646	12,988	10,952	-12.9	-5.5

Numbers also fell at North Sutor (north Scotland) reaching a new low of 367 AON, a decline of 17.9% since 2000. In south-east Scotland, numbers of black-legged kittiwakes continued to fluctuate. Following the major decline between 1997 and 1998 (Thompson *et al.* 1999), numbers then increased between 1998 and 2000 (Upton *et al.* 2000; Mavor *et al.* 2001), only to fall by over 20% between 2000 and 2001. The St. Abb's Head population fell from 11,077 to 8,028 AON (Rideout and Harris 2001). On the Isle of May 3,639 AON represented a decline of 21.2% and was the lowest figure recorded there since 1986 (Wilson 2001), while on the Firth of Forth islands (Craigleith, the Lamb, Fidra, Inchkeith and Inchcolm) numbers decreased by 22.8% to 1,115 AON (Jones 2001).

In south-west Scotland since 2000, numbers at the Mull of Galloway fell by 37.4% to 213 AON but an increase of 23.9% was recorded on Lunga, where 1,010 AON was the highest count for that site. In north-west Scotland, small declines were recorded on Canna (down 7.5% to 1,179 AON) and along the south-east coast of Rum (down -8.1% to 715 AON).

At Huntcliff (north-east England), a count of 2,675 AON was 32.3% less than the count in 2000. Elsewhere in the region, the Farnes population increased by 12.8% to 5,781 AON. In south-east England, the population at South Foreland declined for the second successive year by 26.7% to 1,229 AON. In east England, the small colony at Sizewell increased from 180 AON in 2000 to 219 AON.

In Wales, there was little change at reporting colonies and thus, in overall numbers. However, the colony on St Margaret's Island is close to extinction; just four nests were found in 2001 compared with 379 AON recorded in 1986 (S. Sutcliffe, pers. comm.).

Breeding success (Table 3.17.3, Figure 3.17.2)

It was generally a poor breeding season for black-legged kittiwakes with productivity in most regions lower than in 2000. Productivity in 2001 averaged 0.58 (s.e. \pm 0.06) chicks fledged per breeding pair at 43 colonies, well below the mean for the period 1986-2000 of 0.72 (s.e. \pm 0.03) at 30 to 61 colonies monitored annually. In 38 colonies monitored in both 2000 and 2001, there was a significant decline in mean breeding success of 0.25 (s.e. \pm 0.05) chicks fledged per breeding pair. However, these mean productivity estimates for the UK contain marked regional variation.

In Shetland, there was almost complete breeding failure at eight monitored colonies. Productivity averaged just 0.01 (s.e. \pm 0.01) chicks per AON, far below the 1986-2000 regional mean of 0.49 (s.e. \pm 0.07). In Mainland colonies, it was noted that few nests failed before the first chicks were hatched, towards the end of the second week of June. There then followed a very rapid breeding failure with virtually all nests failing by the end of the second week of July. This failure was undoubtedly caused by food (sandeel) shortage rather than by weather or predation (Heubeck 2001). On Foula, evidence of food shortage was provided by regurgitate samples. Birds caught on nests with chicks provided no samples but birds caught on empty nests provided eight samples, four of which contained only

sandeels with three containing only herring *Clupea harengus*. Mean body weight of captured adults was just 350g, one of the lowest mean weights recorded since 1986, despite that at the time of capture almost all adults had no chicks left to feed (Furness 2001). On Fair Isle productivity was 0.06 chicks fledged per AON, which was the lowest since 1990 when there was complete failure (1986-2000 average 0.82, s.e. ± 0.12). Most broods on Fair Isle in 2001 were left unattended for long periods and many chicks were found dying in the nest right up to fledging time (Shaw *et al.* 2001).

Table 3.17.3 Black-legged kittiwake breeding success, 2000-2001: estimated number of chicks fledged per occupied, well-built nest at sample colonies (superscript n = number of colonies). Figures are presented as the mean and standard error of the average number of chicks fledged per nest for individual colonies. Changes in breeding success are indicated for colonies studied in both years (significant changes, as indicated by t-test: ***P<0.001).

Region	2000 chicks fledged/nest				2001 chicks fledged/nest				2000-2001 change	
	Nests ⁿ	Range	Mean	\pm s.e.	Nests ⁿ	Range	Mean	\pm s.e.	Mean ⁿ	\pm s.e.
SW Scotland ^a	183 ¹	-	0.82	-	191 ¹	-	0.27	-	-0.55 ¹	-
NW Scotland ^b	1,176 ³	0.38-1.10	0.66	± 0.22	1,309 ³	0.25-1.29	0.79	± 0.30	+0.12 ³	± 0.13
Shetland ^c	1,876 ⁸	0.00-1.08	0.48	± 0.12	1,848 ⁸	0.00-0.06	0.01	± 0.01	-0.46 ⁸	± 0.11 ***
Orkney ^d	1,250 ⁷	0.59-1.32	0.89	± 0.10	1,014 ⁷	0.01-1.15	0.74	± 0.16	-0.15 ⁷	± 0.17
N Scotland ^e	139 ¹	-	0.53	-	112 ¹	-	0.73	-	+0.20 ¹	-
NE Scotland ^f	660 ³	0.77-0.98	0.89	± 0.05	647 ³	0.46-0.90	0.64	± 0.13	-0.25 ³	± 0.16
SE Scotland ^g	1,481 ³	0.80-1.14	0.97	± 0.10	1,257 ³	0.40-0.78	0.60	± 0.11	-0.37 ³	± 0.01 ***
NE England ^h	1,025 ³	0.75-1.31	1.04	± 0.16	1,316 ³	0.71-1.30	0.97	± 0.14	-0.21 ³	± 0.13
E England ⁱ	150 ¹	-	0.98	-	157 ¹	-	0.93	-	-0.05 ¹	-
SW England ^j	49 ¹	-	0.99	-	86 ²	0.58-0.65	0.62	± 0.04	-0.34 ¹	-
I. of Man ^k	78 ¹	-	0.75	-	45 ¹	-	0.93	-	+0.18 ¹	-
Wales ^l	1,634 ⁴	0.74-1.12	0.86	± 0.09	1,509 ⁴	0.13-1.13	0.46	± 0.23	-0.40 ⁴	± 0.14
NE Ireland ^m	-	-	-	-	49 ¹	-	1.03	-	-	-
SE Ireland ⁿ	1,281 ³	0.16-1.15	0.71	± 0.29	988 ³	0.53-0.74	0.66	± 0.06	-0.21 ²	± 0.10
Total	10,982 ³⁹	0.00-1.32	0.78	± 0.05	10,528 ⁴³	0.00-1.30	0.58	± 0.06	-0.25 ³⁸	± 0.05 ***

Colonies: ^a Ailsa Craig; ^b Canna, Handa, St. Kilda; ^c Nones, Hermaness, Westerwick, Foula, Noss, Ramna Geo, Sumburgh Head, Fair Isle; ^d Papa Westray, Rousay, Marwick Head, Row Head, Mull Head, Gultak, Costa Head; ^e North Sutor; ^f Bullers of Buchan, Sands of Forvie, Fowlshcugh; ^g Isle of May, Dunbar, St. Abb's Head; ^h Farne Islands, Coquet Island (2001 only), Gateshead-Newcastle, Saltburn, Bempton (2001 only); ⁱ Lowestoft; ^j Durlston Head-St. Albans Head, Samson (2001 only); ^k Contrary Head-Traie Cronkan; ^l Bardsey, Elogug Stacks, Skomer, Great Orme; ^m Isle of Muck; ⁿ Dunmore, Portally (2001 only), Ram Head (2000 only), Rockabill.

Compared with Shetland, black-legged kittiwakes fared better in Orkney with an average of 0.74 chicks fledged per AON, although this was down on the 2000 figure of 0.89 chicks per AON. Breeding performance was below average for all colonies except Mull Head where productivity of 1.15 chicks per AON was less than that recorded in 2000 (1.32), but was still just above the average for the period 1986-2000 (mean 1.10, s.e. ± 0.04). The lowest breeding success on Orkney was recorded on Papa Westray where just one chick fledged from 148 AON (1989-2000 mean 0.90, s.e. ± 0.09). Elsewhere, productivity at Rousay (0.50 chicks fledged per AON), Costa Head (1.08) and Gultak (0.47) were all less than in 2000 (0.55, 1.10 and 0.83 chicks per AON respectively). The only colonies where productivity was higher than in 2000 were Marwick Head (1.02 chicks per AON, *cf.* 0.82 in 2000) and Row Head (0.97 chicks per AON, *cf.* 0.59 last year; Paice 2001).

Throughout other regions of the UK productivity was generally lower than in 2000, except in north-west and north Scotland and on the Isle of Man, where breeding performance improved. In north-west Scotland, productivity was high on Handa with 1.25 chicks fledged per AON, although still below the 1986-2000 mean (1.32, s.e. ± 0.06), and was above average on Canna with 0.82 chicks fledged per AON (1986-2000 mean 0.66, s.e. ± 0.07). At both sites breeding performance improved on 2000 but on St. Kilda productivity fell from 0.38 chicks fledged per AON in 2000 to 0.25. This was the second

lowest value to be recorded at the site since 1986 (1986-2000 mean 0.48, s.e. \pm 0.06). At North Sutor (north Scotland), productivity of 0.73 chicks per AON was an improvement on the previous two years (0.52 in 1999 and 0.53 in 2000) and was almost equal to the long-term mean (1990-2000 mean 0.74, s.e. \pm 0.08). On the Isle of Man, the Peel Hill colony fledged 0.93 chicks per AON, the best year for this site since monitoring started in 1997 (1997-2000 mean 0.36, s.e. \pm 0.17; A. Moore, pers. comm.).

At Ailsa Craig in south-west Scotland, 2001 was the poorest breeding season since 1991 with only 0.27 chicks fledged per AON, well below the 1986-2000 mean (0.51, s.e. \pm 0.09). In north-east Scotland, breeding success at Bullers of Buchan was the highest since 1989 with 0.90 chicks fledged per pair (1989-2000 mean 0.53, s.e. \pm 0.12). This was the only north-east colony to show an improvement in productivity on 2000; breeding performance declined at both Sands of Forvie NNR (from 0.86 chicks fledged per AON to 0.46) and Fowlsheugh (from 0.98 chicks fledged per AON to 0.56), although it was only below average at the latter site (1986-2000 mean 0.72, s.e. \pm 0.10). In south-east Scotland, productivity decreased from 2000 levels at all three colonies monitored. On the Isle of May, 0.61 chicks fledged per AON (0.97 in 2000), only slightly more than the 1986-2000 mean (0.55, s.e. \pm 0.11). At Dunbar and St. Abb's Head, 0.78 (1.14 in 2000) and 0.40 (0.80 in 2000) chicks fledged per AON respectively, below the 1987-2000 means for each site. At the latter site mink were suspected of causing significant chick mortality in one of the study plots (Rideout and Harris 2001).

In north-east England, breeding success on Coquet Island (1.30 chicks fledged per AON) and at Bempton (1.11 chicks fledged per AON) was above the long-term averages (0.99, s.e. \pm 0.08 and 1.05, s.e. \pm 0.09 respectively). Elsewhere, productivity fell from 2000 levels and was below average at the Farnes (from 0.98 to 0.71 chicks fledged per AON) and Gateshead (from 1.31 to 0.92 chicks fledged per AON). At Saltburn, productivity of 0.79 chicks per AON was similar to that recorded in 1999 and 2000 (0.76 and 0.75 respectively), but remained below the 1986-2000 average (0.87, s.e. \pm 0.08). At Lowestoft (east England), productivity of 0.93 chicks fledged per AON was only slightly lower than in 2000 (0.98) but was still below the 1986-2000 mean (1.09, s.e. \pm 0.08). In south-west England, the colony at Durlston Head - St. Albans Head, produced 0.65 chicks per AON, less than that recorded in 2000 (0.99) but only slightly below the 1991-2000 mean (0.69, s.e. \pm 0.12). Elsewhere, in the Isles of Scilly, 0.58 chicks fledged from 31 nests monitored on Samson.

In Wales, productivity declined from 2000 levels at all colonies except Bardsey where 1.13 chicks fledged per AON (1.12 in 2000), which was higher than the site mean (1987-2000, 0.66, s.e. \pm 0.13). Productivity at Elegug Stacks was 0.13 chicks per AON; the lowest number fledged there since 1991 (B. Haycock, pers. comm.), and on Skomer where 0.21 chicks fledged per AON was the lowest value recorded and consequently well below average (1986-2000 mean 0.72, s.e. \pm 0.05). Productivity at Great Ormes Head of 0.38 chicks fledged per AON was below the 1989-2000 average of 0.57 (s.e. \pm 0.07).

In north-east Ireland, monitoring was carried out on the Isle of Muck for the first time (A. Upton, pers. comm.). Average productivity from 49 monitored nests was 1.03 chicks per AON. In south-east Ireland, productivity at Rockabill was the lowest on record at 0.74 chicks per AON. Breeding performance declined at Dunmore from 0.81 chicks per AON in 2000 to 0.70 in 2001, although this was still above the long-term average for the site (1986-2000 mean 0.67, s.e. \pm 0.05). At nearby Portally, productivity was low at 0.53 chicks per AON although this was again higher than the site's long-term average (1986-2000 mean 0.39, s.e. \pm 0.12).

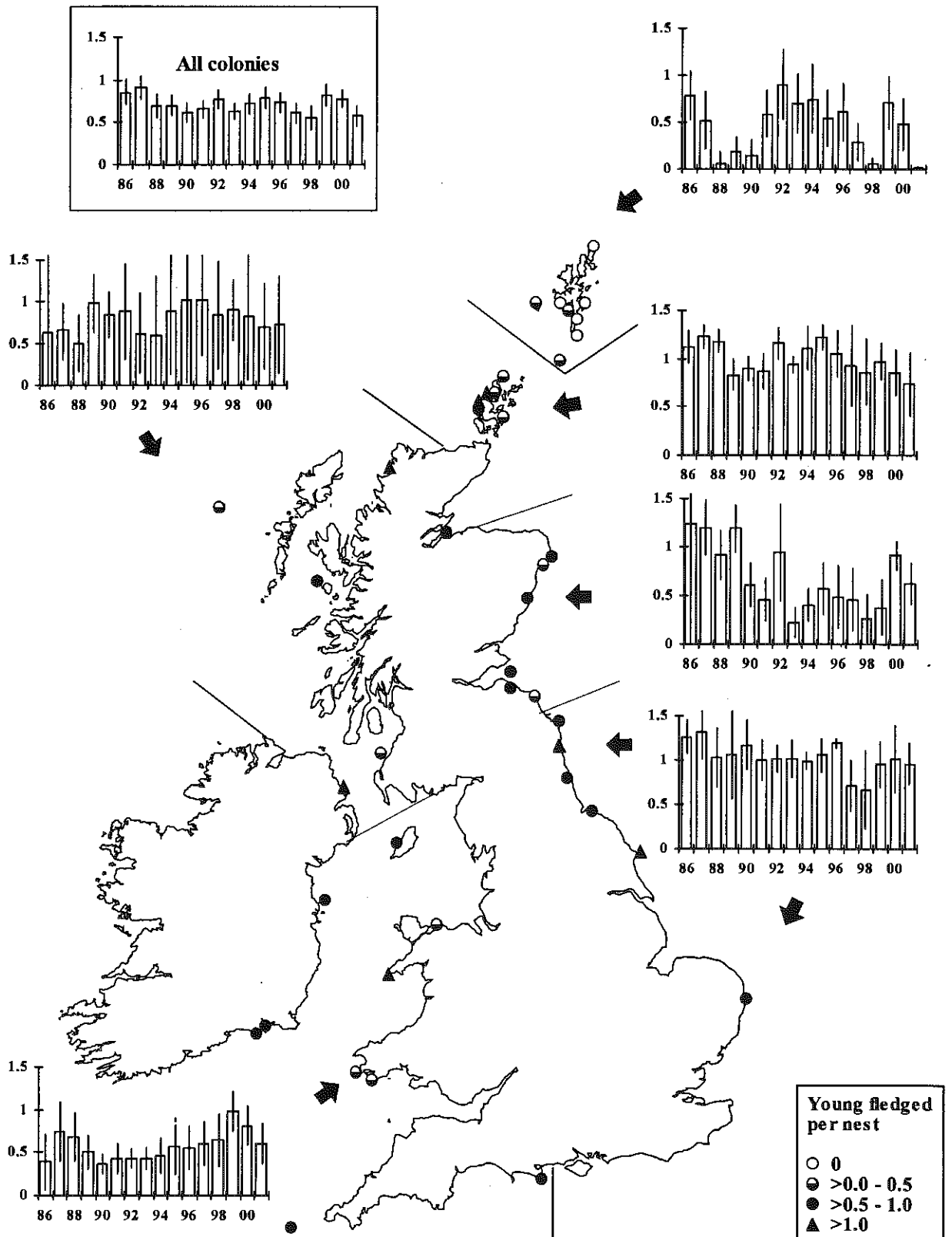


Figure 3.17.2 Breeding performance (chicks fledged per well-built nest) at black-legged kittiwake colonies during 1986-2001, showing regional and annual variation. Symbols on map represent 2001 data for individual colonies; histograms show annual averages (with 95% confidence limits) for the regions indicated.

3.18 Sandwich tern *Sterna sandvicensis*

Breeding numbers (Tables 3.18.1 and 3.18.2)

No data were available for Loch Ryan, south-west Scotland, in 2001 due to foot and mouth disease restrictions. Birds did not breed at the Loch of Strathbeg, north-east Scotland, for the second successive year. However, numbers at the Sands of Forvie were the highest for ten years, increasing by over 50% to 804 pairs. The colony on the Isle of May, south-east Scotland, continued to grow; there were 305 nests on 8 June, but a second wave of nesting towards the end of the month increased the count to an estimated 500 pairs (Wilson 2001).

Although total numbers in north-east England changed relatively little, this masked a decline on Coquet to 1,190 pairs, the lowest level since 1989 (15 year mean = 1,571, s.d. \pm 277; Morrison *et al.* 2001), and an increase on the nearby Farnes, by over 20% to 2,364 pairs (15 year mean = 2,477, s.d. \pm 617; Walton 2001). Numbers increased slightly at four colonies in East Anglia, the majority (4,000 pairs) again breeding at Scolt Head, with a new colony (*c.* 220 pairs) established at Holkham, north Norfolk. In south-east England, numbers fell at Langstone, Burntwick Island and North Solent, but remained within the ranges observed at the sites in recent years. No birds nested on Brownsea Island, south-west England, for the second year running. At Hodbarrow, north-west England, numbers returned to 1999 levels and were the second highest on record. However, numbers continued to fall on Anglesey (Wales), reaching the lowest level recorded since 1985.

In north-west Ireland, numbers declined at both colonies after the increase observed in 2000. There were increases at Larne and Carlingford Loughs (north-east Ireland) with numbers at Larne Lough the highest on record. No data were available for Strangford Lough. At Lady's Island Lake, south-east Ireland, numbers recovered slightly from 2000 levels, to 1,068 pairs, but remained below the ten-year average (1,190, s.d. \pm 179; Merne *et al.* 2001).

Table 3.18.1 Population changes at monitored Sandwich tern colonies, 2000-2001 (breeding pairs).

Trends for 1986-2000 are average annual rates of change shown by sample populations. Significance of trends indicated as: n.s. not significant, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. Further details of calculation of trends are given in section 1.2.2. Superscript = number of colonies counted in both years.

	SW Scotland	NE Scotland	SE Scotland	NE England	E England	SE England	SW England
1986-2000 annual % change	-	-6.9**	-26.5*	-2.0**	+0.5 n.s.	-4.0***	-14.4 n.s.
2000	70	524	<i>c.</i> 300	3,676	4,306	689	0
2001	n/a	804	<i>c.</i> 500	3,554	4,472	536	0
2000-2001 % change	-	+53.4 ²	+66.7 ²	-3.3 ²	+3.9 ⁴	-22.2 ⁴	0 ¹
	NW England	Wales	NE Ireland	NW Ireland	SE Ireland	Britain and Ireland	
1986-2000 annual % change	-6.8**	-2.5 n.s.	-0.2 n.s.	-0.2 n.s.	+3.7 n.s.	-1.0*	
2000	340	450	998	337	1,005	12,625	
2001	380	349	1,369	296	1,068	13,327	
2000-2001 % change	+11.7 ¹	-22.4 ¹	+37.2 ²	-12.2 ²	+6.3 ¹	+5.6 ²¹	

Table 3.18.2 Numbers of Sandwich tern breeding pairs at regularly counted colonies in Britain and Ireland, 1991-2001. (- indicates that no data were available)

Colony	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Loch Ryan	14	13	35	60	80	19	0	120	70	70	-
Loch of Strathbeg	283	304	515	923	481	375	355	523	473	0	0
Sands of Forvie	1115	29	0	0	20	0	4	22	247	524	804
Isle of May	-	0	0	0	0	0	0	2	110	c. 300	c. 500
Long Craig	1	40	200	31	4	2	0	0	16	0	0
Inchmickery	473	112	9	98	1	0	0	0	0	0	0
Coquet Island	1736	2131	1469	1611	1543	1511	1659	1897	1676	1726	c. 1190
Farne Islands	2126	2730	2349	c1750	1837	2179	2484	1785	1946	1950	2364
Scolt Head	320	280	853	2406	1588	450	220	650	1000	4200	4000
Holkham NNR	0	0	0	0	0	0	0	0	0	0	221
Blakeney Point	3000	4000	3000	1000	1450	3500	3000	3000	3200	c. 100	250
Minsmere	20	0	0	0	23	0	0	0	0	0	0
Havergate	84	70	125	300	250	104	0	0	0	6	1
Foulness/Maplin	280	548	275	405	330	53	36	0	0	0	-
Burntwick Island	-	-	-	-	-	-	-	15	155	333	c. 240
Dungeness	250	250	40	0	0	120	110	0	0	0	0
Rye Harbour	2	0	90	c125	c100	12	c30	13	26	0	24
Pagham Harbour	2	0	0	0	0	0	0	0	0	0	0
Chichester Harbour	5	27	45	9	0	0	0	0	0	0	0
Langstone Harbour	0	0	0	0	0	12	91	158	59	88	61
North West Solent	151	150	85	148	233	173	155	92	275	268	210
Pitts Deep - Hurst	0	90	103	150	2	25	0	-	0	0	0
Brownsea Island	75	82	120	70	107	140	165	c155	174	0	0
Anglesey	601	500	564	400	650	650	450	460	604	450	349
South Walney	0	450	0	0	0	0	0	0	0	0	0
Foulney	332	0	253	380	343	0	0	0	0	0	0
Hodbarrow	520	360	100	0	59	360	230	320	380	340	380
Larne Lough	135	132	c64	152	234	255	253	178	450	348	531
Green Is., Carlingford	172	108	c721	449	270	502	935	c1200	582	650	838
Strangford Lough	879	657	587	346	532	711	789	389	782	893	-
Lady's Island Lake	1469	1129	1254	1447	1130	1358	1050	1015	1048	1005	1068
Lough Swilly	99	116	119	220	222	240	149	176	259	286	258
Mulroy Bay	76	107	117	23	0	0	0	0	0	0	0
Lower Lough Erne	42	42	51	40	61	56	39	16	21	51	38
Total	14262	14457	13143	12543	11550	12807	12203	12186	13553	13588	13327

Breeding success (Table 3.18.3)

Overall productivity in Britain and Ireland was slightly below 2000 levels at 11 colonies where data were available, with an average 0.95 chicks fledged per pair. Ten pulli were ringed from 11 nests in Orkney (Meek 2001). In east Scotland, *c.* 1,300 pairs fledged an average of 0.96 young per pair. At the Sands of Forvie, between 949 and 1,063 chicks fledged from 804 pairs, which with the exception of 2000 was the highest productivity on record. At least 250 chicks fledged from *c.* 500 pairs on the Isle of May, south-east Scotland (Wilson 2001).

In north-east England more than 429 chicks hatched from 1,190 pairs on Coquet (an estimated 0.6 chicks fledged per pair in 2000). On the Farnes, breeding performance was not measured, but an estimated 50% of chicks died during poor weather in mid-June, many of the survivors being depredated by gulls (Walton 2001). Birds had another successful year in east England. At Scolt Head (4,000 pairs), Holkham (221) and Blakeney (250) around one chick fledged per pair and two chicks fledged from a single pair on Havergate. Productivity was below 2000 levels in south-east England. Birds at Rye and Langstone Harbours fledged only 0.13 and 0.16 chicks per pair respectively. At North Solent, 210 pairs had produced 233 large chicks by late June, which indicates a substantial decrease in productivity compared with 2000 when on average two chicks fledged per pair. In addition, 160-170 large chicks (from *c.* 240 pairs) were present on Burntwick Island in mid-June. At Hodbarrow, north-west England, fledging success was lower than in recent years, with a minimum estimated fledging rate of 0.53 chicks per pair.

Productivity at the Anglesey colony, where 338 chicks fledged from 349 pairs, equalled the 1995-2000 average for the site (0.97, s.e. \pm 0.11).

In north-west Ireland, at least 21 chicks fledged from 38 pairs at Lower Lough Erne. Elsewhere, 258 pairs produced 335 large chicks at Lough Swilly - a maximum productivity of 1.30 per pair. Productivity was thought to have been moderate to high at Lady's Island Lake, with 954 pulli ringed (Merne *et al.* 2001).

Table 3.18.3 Sandwich tern breeding success, 2000-2001: estimated number of chicks fledged per breeding pair at sample colonies (n = number of colonies). When more than one colony was sampled in a given region, the overall figure given is the total number of fledglings divided by the total number of breeding pairs across all colonies. Note that the same colonies have not necessarily been monitored in each region each year and that the numbers of pairs given here are sample sizes (and do not necessarily indicate population changes between years). (- indicates that no data were available).

Region	2000 fledged/pair			2001 fledged/pair		
	pairs ⁿ	range	overall	pairs ⁿ	range	overall
SW Scotland	70 ¹		0.89	-		-
NE Scotland	524 ¹		1.29	804 ¹		c. 1.25
SE Scotland	c. 300 ¹		0.85	c. 500 ¹		>0.50
NE England	1,950 ¹		c. 0.56	-		-
E England	4,306 ³	0.00-1.19	1.16	4,472 ⁴	1.00-2.00	1.00
SE England	356 ²	0.77-2.00	1.70	85 ²	0.13-0.16	0.15
Wales	450 ¹		0.63	349 ¹		0.97
NW England	340 ¹		1.18	380 ¹		>0.53
NW Ireland	51 ¹		>0.69	38 ¹		>0.55
Total	8,347 ¹²	0.00-2.00	1.01	6,628 ¹¹	0.13-2.00	0.95

3.19 Roseate tern *Sterna dougallii*

Breeding numbers (Table 3.19.1)

A total of 709 pairs of Roseate terns bred in Britain and Ireland in 2001. This was a decline of at least 5% compared with the 750+ pairs in 2000 and the lowest count since 1997.

Fifty-eight pairs bred at six sites in the UK, slightly more pairs than in 2000 (54-55 pairs) but at two fewer sites. A total of only two pairs bred at two sites in east Scotland, the lowest ever recorded for the region. However, in north-east England, the colony on Coquet showed an increase, up 24% to 42 pairs, following the installation of new terraces and nest boxes prior to the breeding season. Rings read in the field revealed that 63% of known birds were recruited from Rockabill, confirming the importance of the Irish colony (Morrison *et al.* 2001). Numbers on the Farnes remained low, with two pairs present, but only one bred. Numbers partly recovered in Anglesey (Wales) and north-east Ireland to seven and six pairs respectively. This was the highest count for Wales since 1995. No birds were reported breeding at any other sites around the country.

Numbers on Rockabill (south-east Ireland) fell slightly, from 618 to 605 pairs. Mean clutch size was 1.78 and of 456 birds of known origin, 91% had returned to their natal site with the remaining individuals recruited from other Irish and British colonies. Three- and six-year-olds comprised the largest cohorts - 15% and 14.5% respectively (Watts *et al.* 2001). Counts continue to fluctuate at Lady's Island Lake. In 2001, 46 nests were recorded; the lowest count since 1988 (Merne *et al.* 2001).

Table 3.19.1 Roseate tern numbers (breeding pairs) at most colonies during 1990-2001, and breeding success (chicks fledged per pair) in 2001. (- indicates that no data were available)

Region: Colony	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Chicks per pair 2001
E Scotland:													
Inchmickery	0	0	0	0	2	0	0	0	0	0	0	0	
Forth B	15	23	17	17	7	11	7	8	8	9	10-11	1	1.00
Forth C	-	-	-	-	-	1	1	0	0	0	1	1	0.00
New colony	0	0	0	0	0	0	0	0	0	0	1	0	
NE England:													
Farne Islands	4	3	4	3	2-3	2	2	3	3	4	1	1	1.00
Coquet Island	23	20	29	c30	c38	38	24	25	29	34	34	42	1.29
New colony	0	0	0	0	0	1	14	2	3	0	0	0	
Wales													
Anglesey A	35	1	0	16	18	10	1	2	3	3	2	7	0.57
Anglesey B	7	0	0	0	0	0	0	1	0	0	0	0	
Anglesey C	3	4	7	5	2	0	0	0	2-3	0	0	0	
NE Ireland:													
Larne Lough	19	4	3	0	4	7	13	7	3	10	4	6	0.83
Carlingford L.	3	0	0	0	0	0	0	2	0	0	0	0	
SE Ireland													
Rockabill	321	366	378	427	394	554	557	602	578	611	618	605	1.50
Lady's Island	60	56	76	76	140	60	120	48	80	116	>78	46	0.00
TOTAL*	490	450	520	578	614	686	744	703	712	788	>750	709	1.37

* includes pairs noted at other sites in the UK and Republic of Ireland.

Breeding success (Table 3.19.1)

The overall productivity for Great Britain and Ireland was 1.37 chicks per pair. This was slightly below the 2000 figure (1.45), but above the nine-year average (1.28, s.e. \pm 0.07). Only one chick fledged in Scotland, from the Forth B site. The pair at Forth C hatched two chicks but both were probably depredated as they were not seen again after day nine. Birds on Coquet had the most successful year since at least 1990 (1991-2000 mean = 0.99, s.e. \pm 0.06): 56 chicks were ringed and 54 fledged (Morrison *et al.* 2001).

Four chicks fledged at the Anglesey colony, the highest number in Wales since 1994. Five young fledged from six pairs in north-east Ireland, the highest recorded productivity since 1991. Birds on Rockabill continued to be very successful with 1.50 chicks fledged per pair (n=105 pairs monitored). Productivity here has fallen below one chick per pair only once in the last 13 years (1998); the survival of A-chicks (those hatching first) was 98.7% and that of B-chicks (those hatching second) 73.4% (Watts *et al.* 2001). A minimum of 33 chicks hatched at Lady's Island Lake. However, brown rat predation devastated the colony later in the season before most of the chicks were able to fledge and subsequently no fledglings were seen (Merne *et al.* 2001).

3.20 Common tern *Sterna hirundo*

Breeding numbers (Table 3.20.1)

Comparable data from 97 colonies in Great Britain showed an overall decline of 4%. Trends varied regionally. Numbers declined by 27% in Scotland, but increased in England and Wales by 15%. In west Scotland, numbers in the mink-seabird study declined by up to 30%, with a minimum of 886 pairs breeding at 20 sites compared to 1,269 pairs at 19 sites in 2000. Within the study area, birds were characteristically mobile. For instance, 500 adults at the established colony near Mull deserted nests early in the season and may have moved to the Sound of Jura where 282 nests were recorded later in the season. The largest colony in the study area in 2001 was in Loch Melfort (442 nests, 278 in 2000; Craik 2001). Numbers returned to 1999 levels on the Treshnish Isles, south-west Scotland, down from 63 pairs in 2000 to just 11 adults.

In north Scotland, numbers declined, mainly due to a decrease at Alness Point, from 210-245 pairs to just 20 adults. However, 125 pairs bred at McDermott's Yard, Ardesier, after their absence in 2000 and numbers increased by 45% at Nigg, to 295 pairs. Numbers in north-east Scotland fell slightly and fewer birds bred at all sites in south-east Scotland. The largest declines were on the Isle of May (down 56% to 132 pairs; Wilson 2001) and at Leith Docks (down 26% to 507 pairs).

Numbers at 11 colonies in north-east England increased by 9%, mainly due to a recovery at Teesmouth, from 200-250 to 394 pairs. In addition, 68 pairs bred on a newly created shingle island in Cleveland. These increases compensated for declines on Coquet by 5% to 977 pairs and on the Farnes by 24% to 114 pairs, the lowest recorded on the Farnes for 25 years (Walton 2001). The largest increases in east England were at Blakeney (a threefold increase to 150 pairs) and at Minsmere, where the creation of new islands accounted for a 132% rise, to c. 102 pairs. Data were received from only one site in central England: 45 pairs bred at Rye Meads, Hertfordshire. Following a decline in 2000, numbers increased at most sites in south-east England, notably between Pitts Deep and Hurst, where numbers rose from 59 to 211 pairs. In addition, a record number bred at Langstone Harbour (148 pairs).

In south-west England, common terns also fared well, with a record 203 pairs nesting on Brownsea. In the Isles of Scilly, 25-36 pairs were counted on Samson, but no data were available for other islands in the archipelago (Robinson and Colombé 2001). Numbers remained stable at three colonies in north-west England. However, no counts were made at Ribble NNR due to foot and mouth disease restrictions (see section 2).

Table 3.20.1 Population changes at monitored common tern colonies, 2000-2001 (breeding pairs). Superscript = number of colonies counted in both years. Regional samples <100 pairs not included.

	NW & SW Scotland	N Scotland	NE Scotland	SE Scotland	NE England	E England	SE England
2000	1,333	<557	358	1,242	1,490	940	538
2001	920	<511	336	776	1,621	1,056	729
2000-2001 % change	-31.0 ³⁰	-8.3 ⁶	-6.1 ⁸	-37.6 ⁶	+8.8 ¹¹	+12.3 ¹⁹	+35.5 ⁸
	SW England	NW England	Wales	Great Britain	NE Ireland	SE Ireland	
2000	c. 210	227	669	7,564	1,042	605	
2001	246	230	812	7,237	1,015	693	
2000-2001 % change	+17.1 ²	+1.3 ³	+21.4 ⁴	-4.3 ⁹⁷	-2.6 ³	+14.5 ¹	

Overall numbers increased in Wales for the fifth year in a row. It was another record year at Shotton (545 pairs) and the Skerries (90 pairs), and 26 pairs nested at Inland Sea following the creation of a new shingle island (<13 in 2000). The 89 pairs recorded at Lough Swilly, north-west Ireland was similar to 2000. A record number (693 pairs) nested on Rockabill, south-east Ireland (Watts *et al.* 2001). But at Lady's Island Lake numbers had declined by 32% since 1999 to *c.* 322 pairs (derived from 484 'commics', assuming the typical common tern:Arctic tern ratio of 2:1; Merne *et al.* 2001).

Breeding success (Table 3.20.2)

Breeding performance in Scotland and England was below 2000 levels but overall productivity in Great Britain remained high, with one chick fledged per pair. This was principally due to high productivity in north-east England and Wales; birds in Wales had their most productive year since 1996. In south-east Ireland, the average fledging was below that in 2000 at Rockabill.

Table 3.20.2 Common tern breeding success, 2000-2001: estimated number of chicks fledged per breeding pair at sample colonies (n = number of colonies). When more than one colony was sampled in a given region, the overall figure given is the total number of fledglings divided by the total number of breeding pairs across all colonies. Note that the same colonies have not necessarily been monitored in each region in each year. Numbers of pairs given here are sample sizes and are not necessarily indicative of population changes between years. (- indicates that no data were available)

Region	2000 fledged per pair			2001 fledged per pair		
	pairs ⁿ	range	overall	pairs ⁿ	range	overall
SW Scotland	1,186 ¹¹	0.00-2.33	0.64	>797 ¹⁰	0.00-2.33	<i>c.</i> 0.60
NW Scotland	79 ⁵	0.00-3.00	1.65	95 ⁸	0.00-3.00	0.72
N Scotland	448 ²	0.18-1.32	0.70	<511 ⁵	0.00-0.95	0.71
NE Scotland	269 ⁶	0.14-1.10	0.36	323 ⁶	0.16-0.64	0.38
SE Scotland	75 ¹		0.99	143 ²	0.21-0.41	>0.33
Total Scotland	2,057 ²⁵	0.00-3.00	0.67	1,869 ³¹	0.00-3.00	0.58
NE England	1,263 ⁶	0.07-2.20	1.99	1,128 ⁵	0.20-1.83	1.64
E England	780 ⁷	0.00-1.50	0.77	1,050 ¹¹	0.44-1.26	0.85
C England	-		-	45 ¹		1.38
SE England	369 ⁵	0.00-1.33	<0.75	191 ³	0.00-1.44	0.54
SW England	<i>c.</i> 210 ²	<i>c.</i> 0.51-1.22	0.60	216 ²	0.66-1.88	<i>c.</i> 0.88
NW England	227 ³	0.23-0.79	0.67	230 ³	0.00-0.35	0.27
Total England	2,849 ²³	0.00-2.20	1.29	2,860 ²⁵	0.00-1.88	1.11
Wales	637 ³	1.16-2.50	1.44	755 ³	1.45-2.08	1.60
Total Great Britain	5,543 ⁵¹	0.00-3.00	1.08	5,484 ⁵⁶	0.00-3.00	1.00
NE Ireland	>12 ¹		1.25	25 ¹		1.80
SE Ireland	605 ¹		1.53	693 ¹		1.05

It was difficult to assess the effectiveness of mink control in west Scotland due to factors such as desertion and otter and peregrine *Falco peregrinus* predation. A minimum of 886 pairs fledged 550 young, a fledging of 0.62 per pair, compared with 0.71 in 2000 (Craik 2001). Elsewhere in north-west Scotland, two young fledged from ten pairs on the Isle of Eigg and 0.85 chicks fledged per

'commic' pair on Handa. Despite predation and disturbance, colonies in north Scotland fledged 0.71 chicks per pair, largely due to another successful year at Nigg (295 pairs fledged 263 young).

Up to 35 young fledged from 55 pairs at Kirkhill, north-east Scotland, the second highest total for the site. But at the Loch of Strathbeg, predation by black-headed gulls reduced productivity to just nine young fledged from 57 pairs. In south-east Scotland, 20-50 chicks fledged from 86 pairs at Grangemouth and at least 12 chicks fledged from 57 pairs (assuming 1.5 birds per pair; Bullock and Gomersall 1981) at Methil Docks. In addition, at least 0.12 chicks fledged per 'commic' pair on the Isle of May, although this was considered an underestimate (Wilson 2001).

Birds on Coquet, north-east England, had their second most successful year on record, with 1.83 chicks fledged per pair (n=36 pairs monitored). However, poor weather and increased gull predation on the Farnes resulted in just 0.30 young per pair (n=30 pairs monitored). At Teesmouth, 213 pulli were ringed. The highest productivity in east England was at two inland sites where 196 pairs at Breydon Water in Norfolk and 45 pairs at Alton Water in Suffolk each fledged on average 1.26 and 1.22 young respectively. Birds at Blakeney produced 160 young from 150 pairs, but only 0.44-0.61 fledged per pair at other north Norfolk sites. In central England, 45 pairs fledged 62 chicks at Rye Meads, Hertfordshire. Despite record breeding numbers, productivity at Langstone Harbour, south-east England was the lowest for seven years, with 148 pairs fledging just 52 young. The 36 pairs at Rye Harbour fared much better and fledged 1.44 chicks per pair. The failure of seven pairs at Newtown, Isle of Wight was attributed to predation by great black-backed gulls.

Productivity in south-west England was the highest since 1987, with 203 pairs on Brownsea fledging 119-150 young and 43 pairs at Lodmoor fledging 78-85 young. In north-west England, predation caused big losses at Hodbarrow, where none of the young from 40 pairs survived and at Rockcliffe Marsh where 18 pairs fledged just three young. At Seaforth, high winds reduced hatching success from nests on rafts and as a result, 172 pairs fledged only 60 young.

Colonies in Wales continued to be successful. Productivity at one colony was again over two chicks per pair, and 90 pairs at the Skerries and 545 pairs at Shotton fledged 1.83 and 1.45 chicks per pair respectively.

Twenty-five pairs at Belfast Lough, north-east Ireland, fledged 45 young. Productivity at Rockabill, south-east Ireland, was below 1999-2000 levels, with 1.05 per pair (n=94) (Watts *et al.* 2001). At Lady's Island Lake, 167 chicks were ringed, indicating productivity of the 322 pairs to be low (Merne *et al.* 2001).

3.21 Arctic tern *Sterna paradisaea*

Breeding numbers (Table 3.21.1)

Indications from the few sites monitored in Shetland and Orkney were that breeding numbers were higher than in 2000. Whole island counts made included *c.* 800 pairs on Foula (similar to 2000) (Furness 2001), 350 pairs on Fetlar (97 pairs in 2000; Houghton and Smith 2001), 206 adults on Mousa (twice that in 2000), a record count of 2,836 pairs on Fair Isle (up 127%; Shaw *et al.* 2001) and 34 pairs on Noss (29 pairs in 2000; Maher *et al.* 2001). In addition, a record 43 pairs bred at Hermaness (Duffield 2001) and over 400 pairs began nesting on the Skerries (Okill 2001b). In Orkney, 1,615 adults were counted at North Hill, Papa Westray (up 58%), 413 adults at ten colonies on North Ronaldsay (256 at six in 2000) and 16 pairs at Onziebust, Egilsay (down from 19 pairs). In addition, 690 adults were recorded elsewhere on Papa Westray and 920 birds were recorded at three colonies on Rousay. On Auskerry, numbers remained low for a second year with only 30 birds attempting to breed (Meek 2001).

Numbers declined in most other regions of Scotland but remained stable in England and increased in Wales. A minimum of 204 (maximum 281) pairs was monitored at 13 sites for the mink-seabird project in west Scotland (361 pairs at 14 colonies in 2000; Craik 2001). As with common terns, there were many desertions with movement between sites. Most birds eventually nested at two sites in the Sound of Jura (Craik 2001). A total of 30 pairs bred at three other sites in south-west Scotland and 174 pairs bred at three other sites in north-west Scotland (298 in 2000).

In north-east Scotland, declines occurred at Kinloss of 57% to 95 pairs and at St. Fergus, where 120 pairs was the lowest total on record (Coleman 2001). These declines were partly offset by increases at the River Spey from 24 to 107 pairs and at the Sands of Forvie from 76 to a record total of 212 pairs. Numbers increased further on the Isle of May, south-east Scotland, from 908 to 916 pairs (Wilson 2001).

Table 3.21.1 Population changes at monitored Arctic tern colonies, 2000-2001 (breeding pairs). Superscript = number of sites counted in both years. Regional samples <100 pairs not included.

	NW & SW Scotland	N Scotland	NE Scotland	SE Scotland	NE England	Wales
2000	659	361	620	909	3,559	1,705
2001	378	263	570	917	3,563	1,762
2000-2001 % change	-42.6 ²⁵	-27.2 ⁸	-8.1 ⁷	+0.9 ²	+0.1 ³	+3.3 ³

Numbers on the Farnes, north-east England, fell by 29% to 1,088 pairs, the lowest total ever recorded. However, following exponential growth since the late 1980s at Long Nanny there was a further 44% increase, to 1,723 pairs. Numbers on Coquet (752 pairs) were below 1998-2000 levels but above the 15-year average (631 pairs, s.d. \pm 158). Twenty-four pairs bred at four sites in east England (ten pairs at three sites in 2000) and numbers on Foulney Island (north-west England) remained stable at 31-38 pairs.

In Wales, following several productive years, numbers on the Skerries reached record levels, up 5% to 1,440 pairs. No data were available for Strangford Lough, north-east Ireland, but 35 pairs bred at Carlingford Lough, the highest total for 13 years. In south-east Ireland, gull disturbance resulted in just 20 nests on Rockabill (88 in 2000). Up to 160 pairs bred at Lady's Island Lake (*c.* 235 in 1999; Merne *et al.* 2001).

Breeding success (Table 3.21.2)

Apparently low availability of sandeels from mid-June led to the worst breeding season in the Northern Isles since 1990. In Shetland, only 14 chicks fledged from a combined total of 4,200 pairs on Foula, Fetlar, Fair Isle, Noss, Hermaness, Mousa and Whalsay. In addition, the colonies at Dalsetter and Eshaness, Mainland, Skerries, West Burra, and Looss Laward, Grutness completely failed. Four fledglings were noted on the Scalloway Islands on 1 July and up to 20 near-fledged chicks were seen near the Sullom Voe Oil Terminal (Okill 2001b). Colonies in Orkney fared little better. Just three young fledged from *c.* 1,536 pairs on Papa Westray and no chicks fledged from over 600 pairs on Rousay (Meek 2001). The most successful colony was recorded at Onziebust, Egilsay, where 16 pairs fledged eight young.

In west Scotland, 88 chicks fledged from 204 pairs in the mink-seabird project study area (0.70 per pair in 2000), the most successful colony being in the Sound of Jura, where 72 pairs fledged 50 young. It was not possible to detect the effect of mink control on productivity due to complicating factors such as desertion and otter predation (Craik 2001). Elsewhere in north-west Scotland, poor weather and predation on the Isle of Eigg resulted in only 30 chicks fledging from 71 pairs, but

productivity of birds on Handa was higher (0.85 chicks per 'commic' pair). Overall productivity in north Scotland was at its highest since 1992; at the most successful site, Brora, ten pairs fledged 17 young, and birds at Nigg were highly productive (169 pairs fledged 135 young). At the Sands of Forvie, north-east Scotland, 130-185 chicks fledged from 212 pairs (26 from 76 pairs in 2000). However, 120 pairs at St. Fergus failed due to suspected gull predation (Coleman 2001). The fledgling count on the Isle of May was thought to be an underestimate due to asynchronous nesting (0.12 'commics' per pair; Wilson 2001).

Table 3.21.2 Arctic tern breeding success, 2000-2001: estimated number of chicks fledged per breeding pair at sample colonies (n = number of colonies). When more than one colony was sampled in a given region, the overall figure given is the total number of fledglings divided by the total number of breeding pairs across all colonies. Note that the same colonies have not necessarily been monitored in each region each year and that numbers of pairs given here are sample sizes (and do not necessarily indicate population change between years). (- indicates no data were available)

Region	2000 chicks fledged/pair			2001 chicks fledged/pair		
	pairs ⁿ	range	overall	pairs ⁿ	range	overall
Shetland	2,259 ⁷	0.00-0.80	>0.52	4,200 ⁶	0.00-0.02	0.00
Orkney	1,161 ⁴	0.16-0.29	0.21	2,181 ⁶	0.00-0.50	0.01
SW Scotland	391 ¹⁰	0.03-1.80	0.65	199 ⁷	0.00-0.69	<0.43
NW Scotland	131 ²	0.12-2.00	0.13	101 ⁵	0.00-1.50	0.33
N Scotland	159 ³	0.00-0.81	0.35	276 ⁷	0.00-1.70	0.68
NE Scotland	484 ⁴	0.04-1.00	0.18	365 ⁴	0.00-0.74	c. 0.44
SE Scotland	1 ¹		0.00	1 ¹		0.00
NE England	2,359 ²	1.02-1.30	1.12	3,563 ³	0.28-1.13	0.86
E England	1 ¹		1.00	24 ⁴	0.67-1.50	1.00
Wales	1,703 ²	1.39-1.49	c. 1.41	1,748 ³	0.00-1.70	c. 1.69
NW England	33 ¹		c. 0.58	34 ¹		c. 0.29
SE Ireland	88 ¹		c. 1.39	20 ¹		<0.50
Total	8,770 ³⁸	0.00-2.00	0.80	12,712 ⁴⁸	0.00-1.70	0.52

Poor weather and gull predation on the Outer Group of the Farnes contributed to the low success for the islands in 2001 (0.28 chicks per pair, n=465 pairs). However, productivity on Coquet and Long Nanny (1.08 and 1.13 chicks per pair respectively) was high. All four colonies in east England were successful - especially at Blakeney (16 pairs fledged 17 young) and Scolt Head (two fledged three young) - but productivity on Foulney Island (north-west England) continued to be low. In Wales, productivity was high: the largest colony (c. 1,440 pairs) fledged c. 1.70 chicks per pair. Just ten chicks were ringed on Rockabill, south-east Ireland and productivity was estimated as 0.50 per pair. At Lady's Island Lake, 57 pulli were ringed - a below-average year.

3.22 Little tern *Sterna albifrons*

Breeding numbers (Table 3.22.1)

Between 2000 and 2001, populations partly recovered in some regions following the widespread decline recorded in 2000. Total numbers at 54 colonies in Great Britain increased by over 6%. Numbers in Orkney were stable (two to three pairs) but they increased at eight other sites in Scotland by over 30%. This was attributable to a recovery at the Sands of Forvie, north-east Scotland, from 51 to 72 pairs, the highest figure since the mid-1970s. However, elsewhere in eastern Scotland numbers

remained very low (four pairs). Few data were available from west Scotland as counts from Tiree were incomplete (53 pairs in 2000).

In north-east England, numbers increased by 14%. A minimum of 31 pairs bred in Cleveland (minimum 19 in 2000) and numbers doubled on Lindisfarne to 14 pairs. In addition, ten pairs bred at Saltfleetby/Theddlethorpe, which was the first record here for five years. The larger colonies at Long Nanny (43 pairs), Gibraltar Point (34) and Easington Lagoons (44) remained stable. The largest decline in east England occurred at Hamford Water, where numbers fell from 113 to just 30 pairs, following the recharge of the main breeding site with more soft silts (L. Woodrow, pers.comm.). The colony at Great Yarmouth remained the largest in the country, increasing by *c.* 11% to 225-265 pairs, and further increases were recorded in the Blackwater Estuary (up 22% to 121 pairs). The most notable increases in south-east England were at Lymington/Hurst (from 20 to 50 pairs) and at Rye Harbour where 26 pairs returned after their absence in 2000. In Langstone Harbour, the enlargement of Hayling Oysterbeds during winter 2000/2001 led to most of the birds (115 out of 129 pairs) moving there from traditional breeding islands elsewhere in the Harbour.

Table 3.22.1 Population changes at monitored little tern colonies, 2000-2001 (breeding pairs). Regional samples < 40 pairs are excluded. Superscript = number of colonies counted in both years (including known colonies not occupied in 2000-2001).

	Scotland	NE England	E England	SE England	SW England	Wales	Great Britain	SE Ireland
2000	88	154	865	154	81	75	1,417	20
2001	116	176	831	238	65	85	1,511	40
2000-2001 % change	+31.8 ⁸	+14.3 ¹⁰	-3.9 ²⁵	+54.5 ⁹	-19.8 ¹	+13.3 ¹	+6.6 ⁵⁴	+100.0 ¹

At Chesil Bank, south-west England, 65 pairs bred, the lowest total for eight years (1991-2000 mean = 77, s.d. \pm 18). Data were available for only two sites in north-west England, at Hodbarrow, where 25 pairs bred and at Haverigg, which held 26 pairs. Numbers at the Welsh colony increased by ten pairs and were close to the 1999 record total. In south-east Ireland, after four years of good productivity, there were signs of a recovery at Kilcoole, with numbers doubling to 40 pairs (Breen *et al.* 2001).

Breeding success (Table 3.22.2)

Overall productivity of 0.49 chicks per pair at 39 sites in Great Britain was higher than 2000 and slightly above the ten-year average (0.45, s.e. \pm 0.05). Generally, birds in eastern England had a more productive year than 2000, but colonies in western England, Wales and Scotland were unproductive. Birds in south-east Ireland were highly productive.

A total of 87 pairs at four sites in Scotland fledged a below-average 0.21 chicks per pair. Seven chicks fledged from 12 pairs in north Scotland, despite disturbance to the colonies. At the largest colony at the Sands of Forvie, north-east Scotland, 11 chicks fledged from 72 pairs - a black-headed gull destroyed 36 nests in one 24-hour period. Birds failed for the fifth successive year in south-east Scotland. Two pairs in Orkney failed at the egg stage (Meek 2001).

In north-east England, 22 pairs (including re-lays) eventually nested at Crimden Dene and fledged 32 young. This highly successful breeding attempt was due at least in part to the low levels of disturbance and predation. At Easington Lagoons, a single female common kestrel *Falco tinnunculus* depredated all but three chicks produced by 44 pairs (Stoyle 2001).

Table 3.22.2 Little tern breeding success, 2000-2001: estimated number of chicks fledged per breeding pair at sample colonies (n = number of colonies). When more than one colony was sampled in a given region, the overall figure given is the total number of fledglings divided by the total number of breeding pairs across all colonies. Note that the same colonies may not necessarily have been counted in each region each year and that numbers of pairs given here are sample sizes (and do not necessarily indicate population changes between years).

Region	2000 chicks fledged/pair			2001 chicks fledged/pair		
	pairs ⁿ	range	overall	pairs ⁿ	range	overall
SW Scotland	33 ¹		>0.30	-		-
N Scotland	8 ²	0.60-0.67	0.62	12 ²	0.55-1.00	0.58
NE Scotland	53 ²	0.37-2.00	0.43	72 ¹		0.15
SE Scotland	2 ¹		0.00	3 ¹		0.00
Scotland	96 ⁶	0.00-2.00	>0.40	87 ⁴	0.00-1.00	0.21
NE England	164 ¹⁰	0.00-0.44	0.24	176 ⁹	0.00-1.45	0.40
E England	c. 748 ¹⁹	0.00-1.67	0.29	720 ¹⁷	0.00-2.00	0.47
SE England	142 ⁷	0.00-0.80	0.25	238 ⁶	0.00-1.56	1.03
SW England	81 ¹		c. 0.27	65 ¹		0.08
Wales	75 ¹		0.76	85 ¹		0.01
NW England	36 ²	0.00-0.08	0.06	20 ¹		0.00
England and Wales	1,246 ⁴⁰	0.00-1.67	0.30	1,304 ³⁵	0.00-2.00	0.51
Total (GB)	1,342 ⁴⁶	0.00-2.00	0.31	1,391 ³⁹	0.00-2.00	0.49
SE Ireland	20 ¹		1.90	40 ¹		2.00

In east England, exceptionally high breeding success was reported from Hamford Water, where 30 pairs fledged 60 young. Elsewhere in the region, 309 pairs at five north Norfolk colonies fledged 0.38 chicks per pair (0.13 in 2000). Common kestrel predation was again a problem at Great Yarmouth, but not as severe as in 2000, with 103 chicks fledged from c. 245 pairs.

The high success rate in south-east England was attributable to one site - at Hayling Oysterbeds, in Langstone Harbour, 115 pairs fledged 179 young. Three other colonies had moderate to high productivity, but the colony in the Medway (23 pairs) was again washed out by high tides. Over 75% of eggs failed to hatch at Chesil Bank, south-west England resulting in only five chicks fledging from 65 pairs. An ongoing project hopes to establish the cause of the repeatedly low hatching rate. One possibility is that disturbance during incubation is causing the eggs to irrevocably chill. All 20 pairs at Hodbarrow (north-west England) failed - probably because access restrictions due to the foot and mouth outbreak prevented erection of the electrified fence normally used to exclude foxes *Vulpes vulpes* from the colony.

Little terns in Wales were extremely unproductive, with only one chick fledging from 85 pairs due to predation by foxes and common kestrels (10-year mean = 0.98; s.e. \pm 0.18). Despite hedgehog *Erinaceus europaeus* predation of nests at the start of the season, productivity at Kilcoole, south-east Ireland, was again exceptionally high, with 40 pairs fledging 80 young (Breen *et al.* 2001).

3.23 Common guillemot *Uria aalge*

Breeding numbers (Table 3.23.1, Figure 3.23.1)

For most regions, numbers of adult common guillemots attending breeding ledges in study plots and at whole colonies changed little between 2000 and 2001. The exceptions were a large decrease in study plots in Shetland, and in study plots in north-east Scotland where a large increase occurred. However, it is possible that the large number of common guillemots killed in the oil-spill resulting from the *Erika* in December 1999, which were mostly young birds from colonies around the Irish Sea and in west Scotland (Mead and Wernham 2000), may yet have an affect on the UK and Ireland breeding population.

Table 3.23.1 Population changes at monitored common guillemot colonies, 2000-2001 (adults attending colony in first three weeks of June). Trends for 1986-2000 are average annual rates of change observed in sample populations. Significance of trends (t-test) indicated as: n.s. not significant, * $P < 0.05$, *** $P < 0.001$). Further details of the calculation of trends are given in section 1.2.2.

3.23.1a Counts of adult guillemots in study plots. Figures are summed means of 5-10, or exceptionally [4], replicate counts of each of the study plots.

	NW Scotland ^a	Shetland ^b	NE Scotland ^c	SE Scotland ^d	Wales ^e
1986-2000 annual % change 2000	+1.1*	+0.3 n.s.	+4.7***	+3.5***	+5.6***
2001	3,506	12,235	3,372	7,264	10,338
2000-2001 % change	+3.9	-16.3	+15.5	-6.6	+5.9

Colonies: ^a Handa; ^b Hermaness, Burra, Eshaness, Noss, Troswick Ness, Sumburgh Head, Fair Isle; ^c Fowlsheugh; ^d Isle of May, St. Abb's Head; ^e South Stack, Skomer, Skokholm, Stackpole Head NNR, Elegug Stacks.

3.23.1b Whole-colony counts of common guillemots. Note that whole-colony counts should be treated with some caution as the numbers of birds attending colonies may vary markedly from day to day. Replicate study plot counts are better indicators of population change. Trends given for south-east Scotland are derived from whole-colony counts on the Isle of May only, those for north-east England are from whole-colony counts on the Farne Islands only, those for Wales are from whole-colony counts at Skomer, Skokholm, Stackpole and Elegug Stacks.

	SE Scotland ^a	NE England ^b	Wales ^c	SW England ^d
1986-2000 annual % change 2000	+3.5***	+4.6***	+5.3***	-
2001	36,732	33,038	24,599	1,679
2000-2001 % change	+3.1	+7.3	+7.7	-6.1

Colonies: ^a Isle of May, Inchkeith, Craigleith, Fidra, The Lamb, Bass Rock; ^b Farne Islands; ^c Stackpole Head plus Elegug Stacks and nearby coast, Skokholm, Skomer, St. Margaret's Island; ^d St. Aldhelm's - Durlston, Berry Head (peak June count).

In Wales, numbers of birds in study plots increased at all five monitored colonies although the only significant increase was at Stackpole Head NNR (36.4%, $t=3.515$, $d.f.=8$, $P<0.01$), where the whole colony count also increased between 2000 and 2001 by 10.7% to 1,074 individuals. For whole colony counts in Wales, the largest proportional increase was recorded at Elegug Stacks where numbers totalled 8,023 individuals, an increase of 17.7% between 2000 and 2001. Numbers on Skomer, the largest colony in Wales, remained stable at 14,281 individuals (*cf.* 13,852 in 2000). In south-west England, a whole colony count at Berry Head totalled 953 birds, a decrease of 7.4% between 2000 and 2001 (S. Ayres, pers. comm.).

In Shetland, significant declines occurred in sample plots at Sumburgh Head (16.5%, $t=6.276$, $d.f.=8$, $P<0.001$), Eshaness (23.1%, $t=2.392$, $d.f.=8$, $P<0.05$), Troswick Ness (11.3%, $t=1.884$, $d.f.=8$, $P<0.05$), Fair Isle (25.3%, $t=6.541$, $d.f.=13$, $P<0.001$) and Hermaness (14.1%, $t=3.986$, $d.f.=8$, $P<0.01$). Particularly low counts were recorded at plots during the second week of June, which was possibly caused by low attendance of non-breeding and off-duty birds responding to low food availability (Heubeck 2001). Elsewhere in Shetland, non-significant decreases occurred in study plots on Noss and at Burravoe, although a whole-colony count on Noss revealed numbers to be stable since the previous survey at 45,777 individuals (*cf.* 45,696 in 1996; Maher *et al.* 2001).

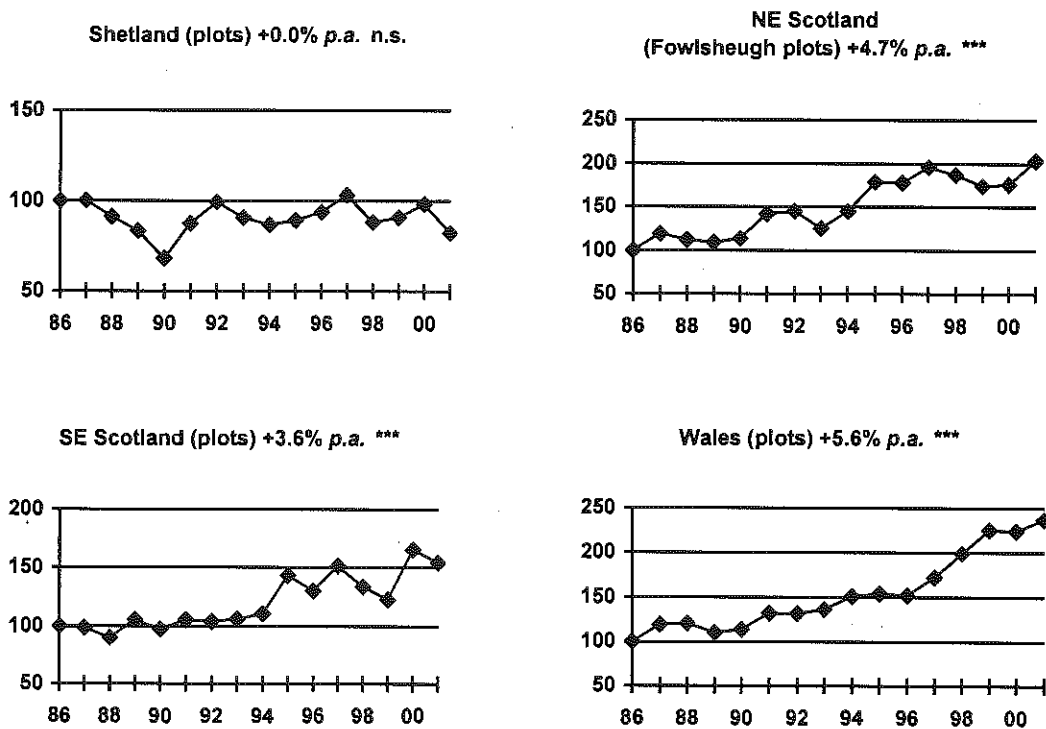


Figure 3.23.1 Regional population indices for breeding common guillemots, 1986-2001 (counts of adults in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends (t-test) indicated as: n.s. not significant, *** $P < 0.001$.

In south-east Scotland, overall numbers of common guillemots on the Forth Islands (Craigleith, the Lamb, Fidra and Inchkeith), the Isle of May and the Bass Rock showed little change from 2000. However, in study plots at St. Abb's Head there was a significant decrease of 8.6% ($t=2.428$, $d.f.=11$, $P<0.05$). In north-east England, numbers increased on the Farnes for the second successive year. A whole colony count increased by 7.3% between 2000 and 2001, to 35,436 birds (Walton 2001).

In north-east Scotland, whole colony surveys were carried out from Gamrie to Pennan and Buchan Ness to Collieston. Compared with the previous survey in 1995, numbers of common guillemots were found to be stable, increasing only slightly along both coastlines, by 1.4% to 45,254 birds at the

former site and by 5.4% to 29,389 birds at the latter (Gillon *et al.* 2001). Counts at two sets of study plots within the same stretches of coast were also carried out. In sample plots at Troup and Lion's Head (Gamrie to Pennan stretch), previously counted in 1998, a non-significant increase of 10.7% was recorded. Between Boddam and Cruden Bay (Buchan Ness to Collieston stretch), access restrictions due to foot and mouth outbreak prevented counts being made at six study plots sampled in 1998. Numbers in the remaining seven plots were found to have increased significantly by 17.6% ($t=3.196$, $d.f.=9$, $P<0.05$). Elsewhere in north-east Scotland, a significant increase of 15.5% ($t=3.592$, $d.f.=8$, $P<0.01$) occurred in study plots at Fowlsheugh. In north-west Scotland, a complete count of the south-east coast of Rum totalled 2,878 birds, an increase of 23.8% since 2000. Elsewhere in this region there was a non-significant increase at sample plots on Handa (+4.2%; Stoneman 2001).

Breeding success (Table 3.23.2)

The intensity of monitoring at the colonies listed in Table 3.23.2 varies and this may affect estimates of breeding performance (Walsh *et al.* 1995). Direct comparisons between colonies are therefore inadvisable without prior consultation with the authors. It was a relatively poor breeding season in 2001, with eight out of ten colonies recording below average productivity. Average breeding performance across the ten monitored colonies was 0.66 (s.e. ± 0.04) chicks fledged per breeding pair, below the mean of 0.73 (s.e. ± 0.01) from between three and 15 colonies that were monitored annually during 1986-2000. In 2001, productivity was the lowest on record for Fair Isle (Shetland), Papa Westray (Orkney), North Sutor (north Scotland) and the Isle of May (south-east Scotland).

Table 3.23.2 Common guillemot breeding success, 2000-2001 and colony averages: estimated number of chicks fledged per site regularly occupied by a pair or per pair laying. Superscript figures for individual colonies are numbers of study plots, figures are mean and standard error across all plots.

Colony	Colony average 1986-2000			2000 chicks fledged/pair			2001 chicks fledged/pair			2000-2001 change	
	Years	Mean	\pm s.e.	Sites ⁿ	Mean	\pm s.e.	Sites ⁿ	Mean	\pm s.e.	Mean	\pm s.e.
Handa	13	0.70	± 0.02	185 ³	0.74	± 0.02	207 ³	0.69	± 0.04	-0.05	-
Sumburgh Head	12	0.67	± 0.03	141 ¹	0.70	-	144 ¹	0.66	-	-0.04	-
Fair Isle	14	0.75	± 0.01	148 ²	0.75	± 0.04	174 ²	0.62	± 0.10	-0.13	-
Papa Westray	11	0.70	± 0.04	-	-	-	111 ¹	0.42	-	-	-
Marwick Head	14	0.72	± 0.02	73 ¹	0.68	-	78 ¹	0.69	-	+0.01	-
Mull Head	11	0.72	± 0.02	103 ¹	0.79	-	95 ¹	0.72	-	-0.07	-
North Sutor	7	0.71	± 0.04	87 ¹	0.61	-	114 ²	0.52	± 0.03	-0.09	-
Isle of May	15	0.79	± 0.01	1,012 ⁵	0.73	± 0.02	975 ⁵	0.63	± 0.01	-0.10	-
Durlston	6	0.84	± 0.02	62 ¹	0.87	-	-	-	-	-	-
Skokholm	5	0.87	± 0.04	112 ¹	0.87	-	110 ¹	0.97	-	+0.10	-
Skomer	12	0.74	± 0.02	225 ⁵	0.63	± 0.08	259 ⁵	0.65	± 0.08	+0.02	-
Total ^{no colonies}	-	-	-	2,148 ¹⁰	0.74	± 0.03	2,267 ¹⁰	0.66	± 0.04	-0.04 ⁹	± 0.02

This low productivity was possibly due to adults experiencing difficulties finding food. On the Isle of May, sandeels comprised 31% of the diet by number and 18% by mass. Weights of chicks near fledging were found to be considerably lower than the long-term mean (Wilson *et al.* 2001). Opportunistic observations also suggested a high level of chick neglect from mid-June onwards, a situation mirrored at Sumburgh Head (Shetland) where unattended chicks were observed for the first time since 1990. On Fair Isle, more sandeels were evident in the diet than on the Isle of May, forming almost 65% by number, although provisioning rates were the lowest on record (Shaw *et al.* 2001).

On Mainland Orkney, common guillemots at Mull Head and Marwick Head had slightly higher productivity than those found at other North Sea colonies to the north and south (Paice 2001). On Handa (north-west Scotland), a productivity of 0.69 per pair was just below average. In Wales, productivity on Skomer was slightly higher than in 2000, which was the poorest year on record. In contrast, breeding success on Skokholm was again high and well above average for this site.

3.24 Razorbill *Alca torda*

Breeding numbers (Table 3.24.1, Figure 3.24.1)

Tables 3.24.1a and 3.24.1b show overall regional changes in razorbill numbers at sample plots and whole colonies from 2000 to 2001. Generally, multiple plot counts are preferred for monitoring annual population changes in razorbills as they smooth out day-to-day fluctuations in numbers of birds attending breeding colonies. It should also be noted that razorbills are difficult to census, due to their habit of often nesting in crevices and under boulders, and that consequently there may be considerable variation in counts between individual observers.

As with guillemots, mean numbers of adult razorbills attending sample plots varied between regions from 2000 to 2001. In general, numbers of birds in sample plots decreased at northern and eastern colonies but increased at western colonies. In Shetland, significant decreases occurred at Sumburgh Head (16.9%, $t=2.556$, d.f. =8, $P<0.05$) and Burravoe (34.1%, $t=2.444$, d.f. =8, $P<0.05$). Counts of razorbills in these plots were particularly low during the second week of June, as reported for common guillemot in section 3.23. On Noss, there was little change in plot counts between 2000 and 2001 but a whole colony count totalled 1,984 individuals, an increase of 10.7% since the previous count in 1996 (Maher *et al.* 2001). Elsewhere in Shetland, there were non-significant decreases in plot counts at Troswick Ness (34.8), Hermaness (34.6%), Eshaness (19.7) and Fair Isle (10.8%).

Table 3.24.1 Population changes at monitored razorbill colonies, 2000-2001 (adults attending colony in first three weeks of June unless otherwise indicated). Regional totals of fewer than 50 birds are excluded. Trends for 1986-2000 are average annual rates of change shown by sample populations. Significance of trends indicated as: n.s. * $P < 0.05$, *** $P < 0.001$. Further details of the calculation of trends are given in section 1.2.2.

3.24.1a Counts of razorbills in study plots. Figures are summed means of 5-10, or exceptionally [4], replicate counts of each of the study plots.

	NW Scotland ^a	Shetland ^b	NE Scotland ^c	SE Scotland ^d	Wales ^e
1986-2000 annual % change	-	+1.8*	+2.3*	+4.6***	+3.6***
2000	497	614	306	1,121	2,073
2001	596	513	270	1,092	2,512
2000-2001 % change	+19.9	-16.4	-11.8	-2.6	+21.2

Colonies: ^a Handa; ^b Hermaness, Eshaness, Burravoe, Noss, Troswick Ness, Sumburgh Head, Fair Isle; ^c Fowlsheugh; ^d Isle of May, St. Abb's Head; ^e Skomer, Skokholm, Elegug Stacks, Stackpole Head NNR, South Stack.

3.24.1b Single counts of whole colonies of razorbills. Trends given for Wales are from whole-colony counts at Skomer, Skokholm, Stackpole and Elegug Stacks.

	Isle of May (birds)	Other SE Scotland (sites)	NE England (sites)	Wales
1986-2000 annual % change	+6.2***	-	-	+2.1***
2000	3,958	544	174	6,263
2001	4,114	529	173	7,181
2000-2001 % change	+3.9	-2.8 ^a	-0.6 ^b	+14.7 ^c

Colonies: ^a Inchkeith, Craigleith, Fidra, The Lamb, Bass Rock; ^b Farne Islands; ^c Stackpole Head NNR plus Elegug Stacks and nearby, Skokholm, Skomer, St. Margaret's Island, Ynys Gwylan.

In north-east Scotland, whole colony counts were carried out from Gamrie to Pennan and Buchan Ness to Collieston, along with counts at two sets of study plots within the same stretches of coast. At the former site, the whole colony count of 4,831 individual adults was similar to the previous count of 4,812 in 1995 (Gillon *et al.* 2001). However, within the same section, numbers in sample plots at Troup and Lion's Head had increased significantly by 29.2% since 1998 ($t=5.123$, $d.f.=9$, $P<0.001$). From Buchan Ness to Collieston, a whole colony count of 3,044 individuals represented an increase of 5.2% on 1995 figures. Along this stretch of coast, access restrictions due to the foot and mouth outbreak meant that seven study plots sampled in 1998 could not be counted. Razorbill numbers in the remaining ten plots were found to have increased significantly by 26.1% ($t=2.586$, $d.f.=9$, $P<0.05$). Elsewhere in north-east Scotland, a non-significant decrease of 11.7% was recorded in sample plots at Fowlsheugh.

In south-east Scotland, whole colony counts and plot counts on the Isle of May in 2001 were similar to those in 2000. A significant 16.6% decrease since 2000 was noted in plots at St. Abb's ($t=5.260$, $d.f.=11$, $P<0.001$). In the Firth of Forth, a complete count of Craigeith, the Lamb, Fidra and Inchkeith totalled 392 adults, a decrease of 14.8% since 2000 (Jones 2001).

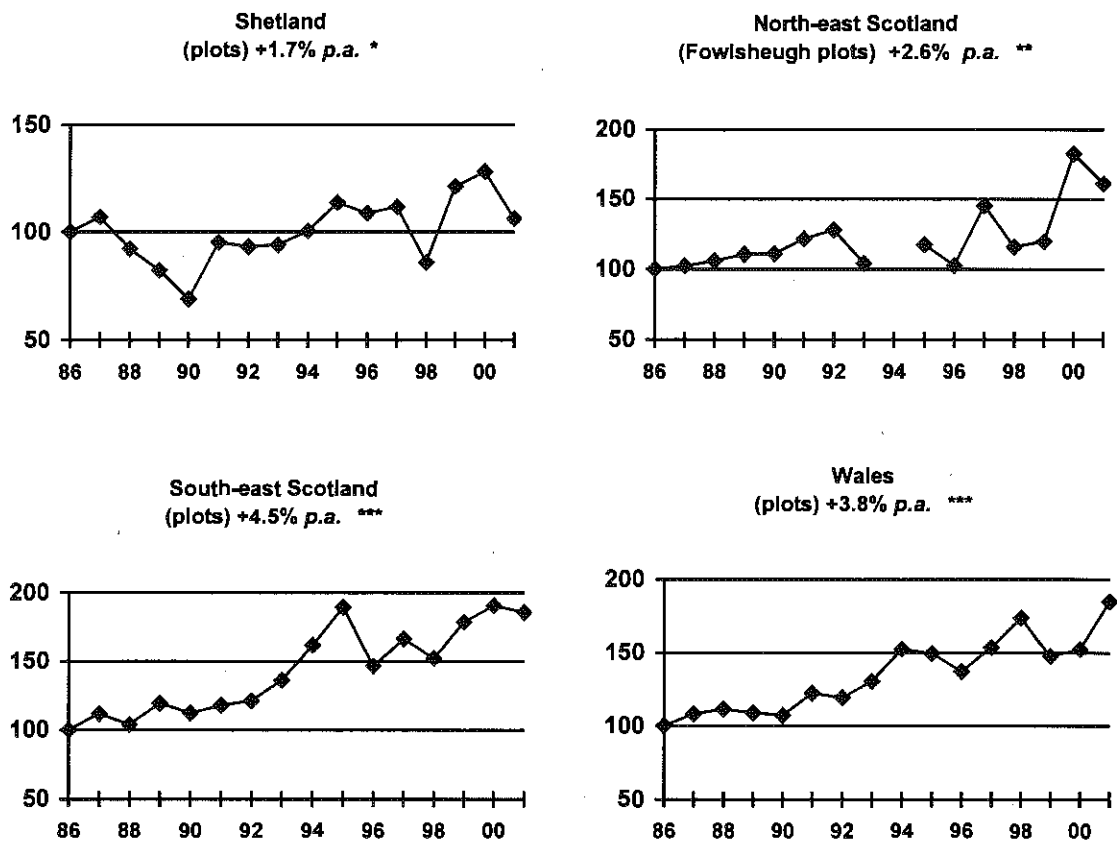


Figure 3.24.1 Regional population indices for breeding razorbills in various regions, 1986-2001 (counts of adults in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends indicated as: * $P<0.05$, ** $P<0.01$, *** $P<0.001$.

In Wales, numbers of razorbills in study plots increased at all five colonies monitored between 2000 and 2001. There were significant increases in plot counts on Skomer (20.1%, $t=7.445$, $d.f.=13$, $P<0.001$) and Skokholm (20.3%, $t=4.667$, $d.f.=17$, $P<0.001$). The increase within plots on Skomer was comparable to the increase of 22.6% in the whole colony count of 4,772 individuals, but on Skokholm there was little change across the whole colony. Elsewhere in Wales, there were non-

significant increases in plots at Elegug Stacks (5.5%), Stackpole Head NNR (26.0%) and South Stack (33.6%). Whole colony counts at these three sites had also changed little between 2000 and 2001.

In north-west Scotland, there was a significant increase of 20% in razorbill numbers in the study plot on Handa ($t=2.349$, $d.f.=8$, $P<0.05$). A whole colony count also revealed an increase of 9.4% since 1997, from 15,573 individuals to 17,042 in 2001 (Stoneman 2001).

Breeding success (Table 3.24.2)

It should be noted that the intensity of monitoring at the colonies listed in Table 3.24.2 varies and that this may affect estimates of breeding performance (Walsh *et al.* 1995). Direct comparisons between colonies are therefore inadvisable without prior consultation with the authors.

Mean productivity at six colonies monitored in 2001 was 0.70 (s.e. ± 0.06) chicks fledged per breeding pair, which was significantly lower than the mean of 0.69 (s.e. ± 0.01) at the one to six colonies monitored annually during 1986-2000. On Fair Isle (Shetland), productivity was much higher than in 2000 and slightly above average, although pulli weights were well below average, which may have led to a high rate of post fledging mortality (Shaw *et al.* 2001). At the small colony of North Sutor (north Scotland), productivity in 2001 was 0.60, the lowest on record at this site. On the Isle of May, breeding performance was below average (Wilson *et al.* 2001). Most losses occurred at the egg stage, while survival of chicks to fledging was again high (89%). On the Farnes, mean breeding success of 0.93 was well above the long-term average (1996-2000 mean 0.67, s.e. ± 0.04).

In Wales, breeding performance improved from 2000 at both reporting colonies, although it was still below average on Skomer. On Skokholm, mean productivity of 0.87 chicks fledged per pair was the highest recorded there since 1995.

Table 3.24.2 Razorbill breeding success, 2000-2001 and colony averages: estimated number of chicks fledged per site regularly occupied by a pair or per pair laying. Superscript figures for individual colonies are numbers of study plots. Where three or more study plots are monitored, colony figures are mean and standard error across all plots.

Colony	Colony average 1986-2000			2000 chicks fledged/pair			2001 chicks fledged/pair			2000-2001 change	
	Years	Mean	\pm s.e.	Sites ^a	Mean	\pm s.e.	Sites ⁿ	Mean	\pm s.e.	Mean	\pm s.e.
Fair Isle	10	0.61	± 0.04	86 ¹	0.47	-	93 ¹	0.65	-	+0.18	-
North Sutor	4	0.77	± 0.05	22 ¹	0.64	-	15 ¹	0.60	-	-0.04	-
Isle of May	15	0.69	± 0.02	149 ⁴	0.68	± 0.05	167 ⁴	0.60	± 0.09	-0.08	-
Farnes	5	0.67	± 0.04	24 ¹	0.54	-	14 ¹	0.93	-	+0.39	-
Skokholm	5	0.85	± 0.04	70 ¹	0.81	-	87 ¹	0.87	-	+0.06	-
Skomer	8	0.61	± 0.03	223 ⁵	0.48	± 0.03	299 ⁵	0.58	± 0.05	+0.10	-
Total ^{no. colonies}	-	-	-	574 ⁶	0.60	± 0.05	675 ⁶	0.70	± 0.06	0.10 ⁶	± 0.07

3.25 Black guillemot *Cephus grylle*

Breeding numbers (Table 3.25.1)

Unless otherwise stated, all population figures refer to early morning spring counts of individuals in adult plumage (Walsh *et al.* 1995). On Mainland Shetland, access for survey work was limited due to foot and mouth disease restrictions. In Yell Sound, a total of 1,013 birds were counted, representing a 28.5% decrease since the previous survey in 1998. It is believed that the apparent decline can be explained by the occurrence of very low tides during the survey with birds choosing to feed rather than attend colonies on those days (Heubeck 2001). Further survey work is planned in 2002 to confirm that no serious population decline has occurred. Elsewhere in Shetland, declines were apparent at all sites covered, although some were slight. On Noss, the monitoring plot on the north coast held 63 birds in 2001, compared with 69 in 2000, the lowest count recorded at this site. Numbers declined on Foula by 25.6%, from 156 birds in 2000 to 116 in 2001. On Fair Isle, numbers on the east coast showed a 19.6% decrease, declining from 173 birds in 2000 to 139 birds in 2001 (Shaw *et al.* 2001).

In Orkney, 400 birds were counted on North Ronaldsay, representing a decrease of 16.0% from 2000 (A. Duncan, pers. comm.). On Papa Westray, 206 birds were counted at North Hill, an increase of 58.5% on 2000 and the highest count there since 1992.

Table 3.25.1 Population changes at monitored black guillemot colonies, 2000-2001 (adults in breeding habitat in early morning, late March-early May). Trends for periods indicated are average annual rates of change shown by sample populations. Significance of trends indicated as: n.s. not significant, * $P < 0.05$. For further details of the calculation of these trends see section 1.2.2.

	Fair Isle (east coast)	Fetlar (east coast)	Foula (N & S coasts)	Orkney
Annual % change (period covered)	-3.0* (1986-2000)	+1.1 n.s. (1987-2000)	-	-4.5* (1983-2000)
2000	173	254	156	260
2001	139	248	116	312
2000-2001 % change	-19.7	-2.4	-25.6	+20.0 ^a

Colonies: ^a North Hill, Holm of Papay.

Additional whole colony counts were carried out in other areas for Seabird 2000. Along the northern coasts of Caithness and Sutherland numbers totalled 464 birds, a decline of 51% since the previous survey in 1986-89. In the southern Western Isles (from Shillay and Pabbay in the Sound of Harris southward to Barra Head on Berneray) at all but one colony numbers had almost doubled from 500 in 1988/89 to 958 in 2001. However, there was a major decline in the region's most important colony on the Monach Isles (down to 585 birds from 849). It is thought this count may be an underestimate as survey work was delayed by poor weather until early May, by which time most adults were perching on rocks rather than forming rafts, so some birds may have been hidden from sight (P.I. Mitchell, pers. obs.).

In south-west Scotland, a survey of the mainland coast between Oban and Campbeltown and associated islands revealed an overall decline of 23% from 1,611 birds in 1990/91 to 1,233 in 2001. This includes a decline of 45% on Gigha, the area's most important colony where numbers fell from 581 in 1991 to 320 in 2001. Conversely, the population on Sanda increased by 58% to 444 since 1991, to become one of the largest colonies in Britain. Elsewhere in this region, there were also large declines on Islay and Jura, of 36% (1,016 in 1991 to 653 in 2001) and 66% (104 in 1991 to 35 in 2001) respectively. However, increases were noted in south Ayrshire, where 119 birds were counted

along a stretch of coast that held only six birds in 1991, and in Dumfries and Galloway where 300 birds were counted in 2001 compared to 223 in 1991.

In north-east Scotland, towards the most eastern part of their range, numbers along the Aberdeenshire coast remained low at 24, although a modest increase on 16 in 1986.

Breeding success

Few data were collected in 2001. In Orkney, the average clutch/brood size of 35 nests checked on Auskerry in mid July was 1.66 (1995-2000 mean 1.30, s.e. \pm 0.07). On North Ronaldsay, the average number of young in nests located for ringing was 1.59, above the average recorded since 1996 (1.52, s.e. \pm 0.07). In western Scotland, of 31 sites checked, mink were active at seven sites and were possibly active at a further two (Craig 2001). On Old Lighthouse Island, north-east Ireland, 1.14 chicks fledged per nest (n=21) which was above average for this site (1986-2000 mean 0.96, s.e. \pm 0.08). In south-east Ireland, on Rockabill, an average of 1.11 chicks fledged from 38 nests.

3.26 Atlantic puffin *Fratercula arctica*

Breeding numbers (Table 3.26.1)

Few data were collected in 2001. On Fair Isle, counts of birds visible on land and/or on the sea and in the air adjacent to the colony were made in early May. A total of 13,488 birds was recorded, 10.7% lower than in 2000. The raw count was once again used to derive a total population estimate by applying a correction factor based on the proportion of a study group of colour-ringed birds at the Roskilie colony visible during the main count. The resulting population estimate of 54,000 birds would represent a 32.5% decrease on the 2000 estimate. However, on the evening of the count, birds were not in abundance at Roskilie and thus a true representation of the colour-ringed population was not possible. Birds may have been at sea for longer periods of time (related to the apparent sandeel shortage) and persistent great skua presence also meant that birds did not spend much time on the cliff top, thereby resulting in a low % of the population visible (Shaw *et al.* 2000).

On Eilean Mor, the largest of the Flannan Isles (north-west Scotland), 6,112 AOB were counted excluding the densest area of colony around McPhail's Bothy at the eastern end of the island. The McPhail's Bothy sub-colony was surveyed using random quadrat sampling in 1998 and resulted in 9,520 AOB (95% CLs 8,345 – 13,190). Combining the two surveys of Eilean Mor gives a total of 15,632 (95% CLs 14,457 – 19,302). The colony appears to have more than doubled since 1992 when it was estimated at 5,000-6,000 pairs (Murray 1995). Previously, the colony had increased at a slower rate since 1975 when it was 3,000-5,000 pairs (Murray 1995). Indeed comparisons of previous measurements of burrow density within the McPhail's Bothy sub-colony suggest that numbers of AOB on the island have been increasing since 1975, but the greatest increase occurred between 1992 and 1996 (Murray 1995; Thompson 1997).

Table 3.26.1 Density of apparently occupied Atlantic puffin burrows in the McPhail's Bothy sub-colony Eilean Mor, Flannan Isles.

	1975	1992	1996	1998
Density	0.25	0.39	2.12	1.904
AOB per m ²			(0.77 – 3.47)	(1.67 – 2.64)

On Lunga in the Treshnish Isles (south-west Scotland), 1,542 AOB plus 604 individuals were counted (S. Walker, pers. comm.). Combining units, allowing for 1-2 birds per 'pair' (Lloyd *et al.* 1991), would indicate a population of 2,146-3,688 individuals for this island. In south-east Scotland, 2,337 birds were counted on Inchkeith, almost 1,000 more than recorded there in 2000. On Handa in north-west Scotland, the peak spring count totalled 735 individuals, the highest figure since these counts

began in 1995. Adults were again noted in areas newly colonised during the previous two years after rats had been eradicated (Stoneman 2001).

On Coquet Island, north-east England, 17,208 AOB represented a 50.2% increase since the last full survey in 1998 (Morrison *et al.* 2001). In Wales, the peak spring count on Skomer (7,854 birds) was the lowest on record. On Ynys Gwylan Fawr, 1,052 apparently occupied burrows were counted. Although this was a slight decline from the 2000 count of 1,113 AOB, it was still well above the 1999 count of 524 occupied burrows and far exceeds previous counts (386 in 1993, 457 in 1998).

Breeding success (Table 3.26.2)

Breeding success on the Isle of May was 0.77 chicks fledged per egg laid, almost equal to the long-term average (0.76, s.e. ± 0.03 ; Wilson *et al.* 2001). Productivity on the Farnes in 2001 was 0.85 chicks per egg laid, the second highest value recorded and well above the 1994-2000 average of 0.72 (s.e. ± 0.07). Breeding performance has now increased in each year since 1998, when the lowest productivity (0.32) was recorded at this site (Walton 2001).

Table 3.26.2 Atlantic puffin breeding success, 2000-2001: estimated number of chicks fledged per egg or occupied burrow (Welsh colonies). Superscript indicates number of colonies.

Colony	2000 chicks fledged/pair				2001 chicks fledged/pair				2000-2001 change	
	Burrows	Range	Mean	\pm s.e.	Burrows	Range	Mean	\pm s.e.	Mean	\pm s.e.
Fair Isle	64	-	0.58	-	87	-	0.31	-	-0.27	-
Isle of May	182	-	0.73	-	185	-	0.77	-	+0.04	-
Farne Islands	100	-	0.77	-	100	-	0.85	-	+0.08	-
Skomer	69	-	0.75	-	90	-	0.71	-	-0.04	-
Total	415 ⁴	0.58-0.77	0.71	± 0.04	462 ⁴	0.31-0.85	0.66	0.12	-0.05 ⁴	± 0.08

In Shetland, productivity on Fair Isle was low, averaging 0.31 chicks per egg laid, well below the 1986-2000 mean (0.72, s.e. ± 0.03). Although pulli weights appeared to be average, many starved fledglings were found at the mouths of burrows and some adults were still attending burrows at the end of August (Shaw *et al.* 2001). This has continued the recent trend of low productivity on the island: the period 1998-2001 accounts for four out of the five lowest years since recording began in 1987. On Foula, dozens of dead, emaciated chicks were found lying around burrow entrances during the second week of July; also, few fish-carrying adults were observed, suggesting virtually complete breeding failure (Furness 2001). In Wales, breeding success on Skomer averaged 0.71 chicks fledged per occupied burrow - below the long-term mean (0.77, s.e. ± 0.02) for the third year in succession.

4 Acknowledgements

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