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Seabird numbers and breeding success in Britain and Ireland, 2003

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Contents

Summary

This report presents the results of monitoring of seabird populations and breeding performance throughout Britain and Ireland in 2003 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 2003 are summarised below:

- Fewer **red-throated divers** nested in Shetland in 2003 than in 2002 and did so later, possibly due to food shortages early in the season, but those that nested were quite successful. In Orkney breeding numbers were similar to 2002 and success was above average at all sites.

- A survey of **Leach's storm petrels** on Dun, St Kilda, revealed an apparent 48% decline in breeding numbers since it was last surveyed, in 1999, when it held 27,700 AOS to just 14,417 AOS in 2003. Predation of petrels by great skuas, whose population on St Kilda has increased dramatically, is known to be intense and the interactions between these two species is the subject of current research.

- Two new breeding colonies of **northern gannet** were established in 2003, in Orkney: at Sule Skerry and at Noup Head, Westray.

- Large increases in the breeding number of **European shags** were recorded in SE Scotland and NE England between 2002 and 2003, where numbers are now beginning to return to levels recorded prior to the 'wreck' in 1994. Long-term declines continue in NW Scotland and Shetland.

- Overall, the population of **Arctic skuas** decreased by *c.*15% compared with 2002, to its lowest level since 1989. The decline was highest on Shetland, where many sites had their least productive year on record, caused by a severe lack of sandeels. Breeding numbers of **great skuas** were generally more stable, although breeding success was very low in Shetland.

- Many of the larger breeding colonies of **lesser black-backed gulls** declined between 2002 and 2003. Numbers on Skomer and Skokholm were the lowest during the history of the SMP and numbers declined at major colonies in NW England, including S. Walney and Rockcliffe Marsh.

- The long term decline in breeding numbers of **black-legged kittiwake** continued in 2003 in Shetland, SE Scotland and SE England. The population on Orkney appears to have stabilised, following declines during the 1990s. Near breeding failure occurred in Shetland. Productivity was higher in Orkney but well below 2002 levels.

- Numbers of **roseate terns** reached their highest level since 1979, largely attributable to an increase on Rockabill (SE Ireland). However, fewer sites reported breeding than in any year since 1969. The 2003 breeding season was the most productive for 11 years.

- Numbers of **common guillemots** generally decreased between 2002 and 2003, particularly so in Shetland, also in Orkney between 2000 and 2003. Increases occurred in SE Scotland (whole colony counts only), NE England and in Irish Sea colonies. Productivity generally declined between 2002 and 2003, reaching its lowest ever level in Shetland; some colonies in Orkney were similarly unproductive.

- Large increases in breeding numbers of **Atlantic puffin** were noted in some of the larger colonies in SE Scotland and NE England, but declines also occurred in these regions. Many of the monitored colonies in the west of Britain decreased. Breeding success was higher than the long-term average in 2003.

1 Introduction

This is the fifteenth 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 2003 are summarised and compared with results from previous years, primarily 2002, with an analysis of longer term trends in the context of recent findings.

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 years, would be greatly appreciated by the authors. We are also keen to receive any existing additional informati 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 nature conservation 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 JNCC 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 by JNCC on Orkney Mainland, on St Kilda (north-west Scotland) and in Grampian (north-east Scotland); monitoring on Orkney and St Kilda was conducted in 2003. 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. A repeat complete census of British and Irish seabird colonies, Seabird 2000 (running from 1998-2002), has recently been published as *Seabird Populations of Britain and Ireland* (Mitchell *et al.* 2004). Population changes since the 1985-87 census (and the Seabird Group's Operation Seafarer in 1969-70) are summarised in Table 1.1.1. A new seabird colony database for the period from 1999 is being developed within the National Biodiversity Network framework (a system for sharing information on wildlife being made available on the internet). Results of Seabird 2000 are available from JNCC's website: www.jncc.gov.uk/marine/seabirds/seabird2000/default.htm and data on individual sites can be accessed at www.searchnbn.org.uk.

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 not comprehensively 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 2002 and 2003. Some of the changes indicated by these counts may be of a short-term nature, not necessarily indicative of longer-term trends. For example, 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.

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). Note that it has not been practicable to provide full listing in the tables of the sites used in the compilation of regional indices; please contact the authors for details.

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, there is inevitably some loss of count accuracy at the expense of obtaining complete geographical coverage. However, even 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.

Table 1.1.1 Breeding seabird numbers in Britain and Ireland. Most figures are for 1998-2002 (Mitchell *et al.* 2004) but those for Northern gannet and roseate tern include more recent updates. All counts are of pairs unless otherwise stated. [1] Not surveyed during Operation Seafarer and SCR. [2] Northern gannet figures are from the complete survey of north-east Atlantic colonies in 1994-95 (Murray and Wanless 1997) with updates for colonies counted subsequently. [3] Inland colonies were not surveyed during Operation Seafarer or SCR. [4] Roseate tern figures are from 2003 (this report). [5] Counts are of individuals. [6] Counts of pre-breeding adults were not carried out during Operation Seafarer and were not conducted in the Republic of Ireland during the SCR.

Species	*Scotland*	*England*	*Wales*	*Isle of Man*	*Channel Islands*	*Northern Ireland*	*Republic of Ireland*	*Total population*	% change since previous survey (coastal populations only)	
									Seafarer (1969-70)	SCR (1985-88)
Northern fulmar	485,852	6,291	3,474	3,147	317	5,992	32,918	537,991	+74	0
Manx shearwater [1]	126,545	367	168,133	34	10	4,633	32,545	332,267		
European storm-petrel [1]	21,370	1,475	2,805	0	60	0	99,065	124,775		
Leach's storm-petrel [1]	48,047	0	0	0	0	0	310	48,357		
Northern gannet [2]	173,645	2,552	30,688	0	5,950	0	31,136	243,971	+77	+31
Great cormorant	3,626	2,896	1,699	134	115	663	4,548	13,681		
coastal component [3]	3,626	1,315	1,634	134	115	663	4,073	11,560	+44	+7
European shag	21,487	3,863	914	912	1,403	301	3,426	32,306	-5	-25
Arctic skua	2,136	0	0	0	0	0	0	2,136	+106	-37
Great skua	9,634	0	0	0	0	0	1	9,635	+213	+26
Mediterranean gull	0	108	0	0	0	2	3	113		
Black-headed gull	43,191	82,728	1,986	2	0	10,107	3,876	141,890		
coastal component [3]	6,888	65,549	850	2	0	4,037	2,066	79,392	+6	+2
Common gull	48,113	44	0	6	0	557	1,060	49,780		
coastal component [3]	20,467	33	0	6	0	383	586	21,475	+65	+39
Lesser black-backed gull	25,057	64,208	20,722	114	1,734	1,973	2,876	116,684		
coastal component [3]	21,565	44,133	20,682	114	1,734	1,033	2,062	91,323	+83	+42
Herring gull	72,130	45,365	13,974	7,126	4,347	714	5,521	149,177		
coastal component [3]	71,659	43,932	13,930	7,126	4,347	707	5,413	147,114	-57	-17
Great black-backed gull	14,776	1,476	427	405	310	76	2,243	19,713		
coastal component [3]	14,773	1,466	425	405	310	71	2,241	19,691	-12	-6
Black-legged kittiwake	282,213	76,281	7,293	1,045	3	13,060	36,100	415,995	-7	-23
Sandwich tern	1,068	9,018	450	0	0	1,954	1,762	14,252	+18	-11
Roseate tern [4]	8	70	0	0	0	19	715	814	-66	+48
Common tern	4,784	4,676	674	0	174	1,704	2,485	14,497	-3	-2
Arctic tern	47,306	3,602	1,705	8	0	767	2,735	56,123	+7	-29
Little tern	331	1,521	75	20	0	0	206	2,153	+12	-25
Common guillemot [5]	1,167,841	91,986	57,961	4,566	476	98,546	138,108	1,559,484	+139	+32
Razorbill [5]	139,186	11,144	12,638	1,524	65	24,084	27,446	216,087	+29	+23
Black guillemot [6]	37,505	7	28	602	0	1,174	3,367	42,683		
Atlantic puffin	493,042	75,734	10,328	85	311	1,610	19,641	600,751	+33	+19

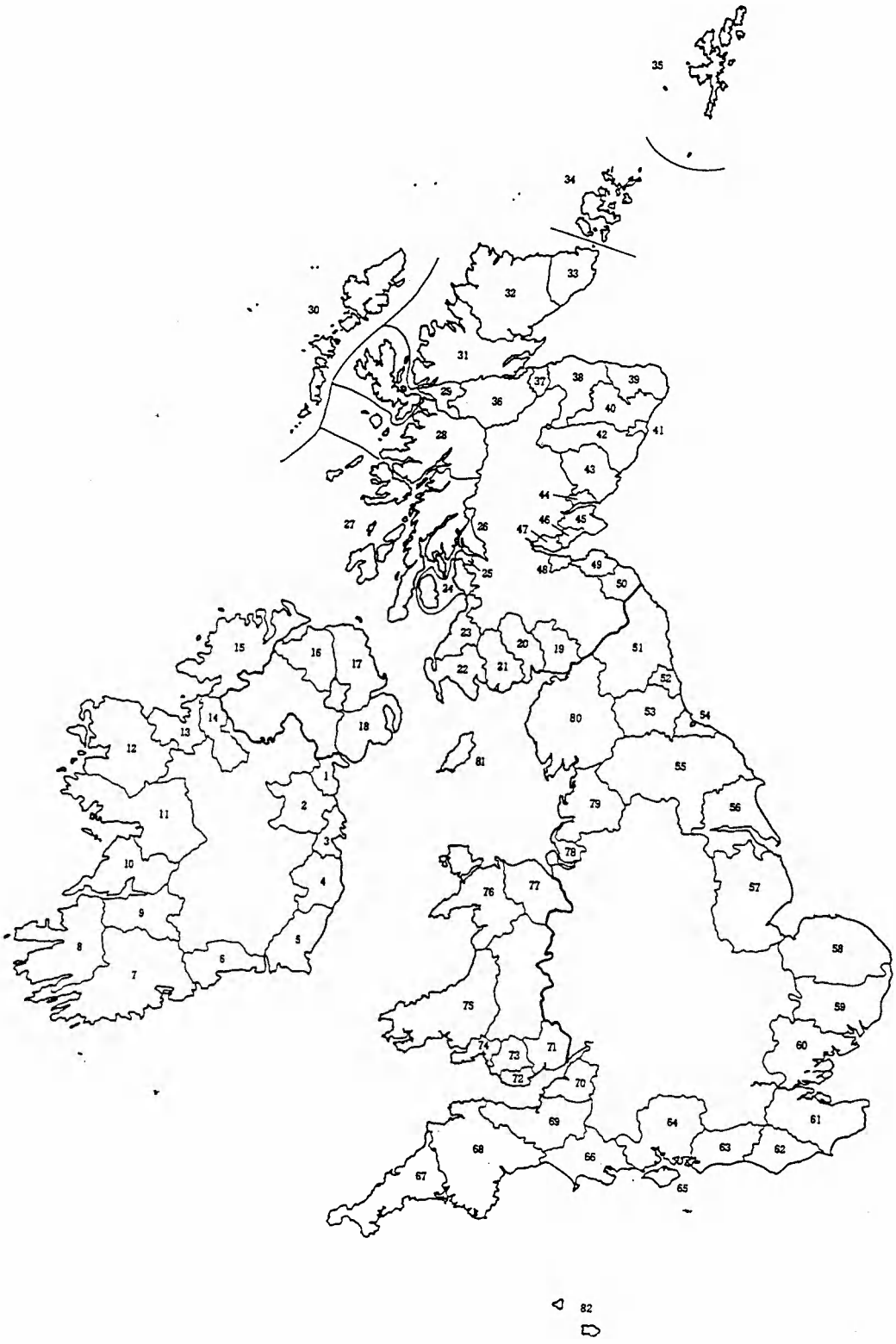

Figure 1.2.1 Coastal counties and districts of Britain and Ireland. See Table 1.2.1 for details of the coastal regions (combinations of counties or districts) used in this report. Reproduced, with permission, from Lloyd *et al.* (1991).

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

2 General features of the 2003 breeding season

Generally, weather conditions for breeding seabirds in 2003 were favourable throughout the summer. In April, anticyclonic conditions prevailed for the first three weeks resulting in the warmest, driest, and sunniest April for many years, especially in the south. Maximum temperatures were 2-3C° above normal across the UK, and in England and Wales rainfall was 20% below, and sunshine 25% above, average. Cyclonic conditions during the fourth week resulted in changeable conditions, a pattern that prevailed throughout much of May (Eden 2003a). Other than in the south, most regions were wetter than normal in May, although temperatures remained 1C° above average for most (Eden 2003b). Lower than normal pressure over the Atlantic dominated weather conditions in June; airflow was markedly southerly with a cyclonic bias resulting in a consistently warm but changeable month. Monthly rainfall was above average although sunshine was up to 30% below normal in the north and west but 25% above average in central and eastern regions (Eden 2003c). July was unsettled at the beginning and end but with an anticyclonic spell between 6 and 15 July providing better conditions. As in the previous three months it was generally warm; rainfall was below normal in the east although parts of the south-west recorded more than double the long-term mean (Eden 2003d).

Timing of breeding was variable, with the Isle of May reporting an earlier than average season for European shags and common guillemots, but normal for northern fulmar, black-legged kittiwake, Atlantic puffin and razorbill. However, in Shetland certain species that feed predominantly on sandeels *Ammodytes marinus* bred later than normal, which is thought to be associated with low availability of this resource early in the season: red-throated divers were late, as were European shags. Egg-laying of Arctic skuas was exceptionally late on Foula. Black-legged kittiwake breeding was, as in 2002, later than average in Shetland; at Sumburgh Head clutches were layed 10-12 days later than in 2002. Lesser black-backed gulls on Skomer had an apparently late breeding season, as did those in some colonies in north-west England. Arctic terns at Nigg, had a very late season, perhaps due to low food availability, and subsequently failed.

Even more than in 2002, the 2003 breeding season in Shetland (in common with many North Sea colonies) was severely affected by an apparently low availability of sandeels in the early part of the season (Furness 2003, Heubeck 2004, S. Gear, pers.comm.). Productivity of European shags was below average (lowest on record on Foula, where sandeel availability appeared to be especially low). Many sites reported their least productive year on record for Arctic skuas, and great skuas also fledged few chicks; on Foula sandeels were largely absent in the diet with adults largely bringing back fishery discards and herring *Clupea harrengus* (Furness 2003). Productivity of black-legged kittiwakes was the lowest since the SMP began in 1986, and five colonies fledged no chicks at all. Adult body mass was below average and few adults regurgitated food when caught, indicating low food availability (Furness 2003). Several colonies of Arctic terns deserted before or during incubation, and those birds that remained fledged few chicks. Productivity of common guillemots on Shetland was at an all-time low, and chick growth rates at Compass Head were low, suggesting the apparent food shortage in the region also had a deleterious effect on chick condition (Okill 2003b).

As in many previous years, productivity in Orkney, although low for many species, was not as low as in Shetland. It appears that whatever the mechanism for the apparent lack of sandeels in Shetland, Orkney was less acutely affected. Nevertheless, common guillemots in 2003 experienced their least productive season on record at Marwick Head and nearly the lowest at Papa Westray. Black-legged kittiwakes also had a very unproductive year, although the non-breeding event that occurred in Shetland did not pertain to Orkney.

Low food availability appeared not to have affected all North Sea colonies, however, as many species on the Isle of May (south-east Scotland) had a very successful season in 2003. This points to localised, rather than widespread, shortages or unavailability of sandeels within the North Sea. Indeed, European shags (which feed on older sandeels) had their most productive year ever in 2003 and black-legged kittiwake success was above average, although common guillemot and razorbill breeding success was still below average (Wilson *et al.* 2003).

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* and reported on the website www.bou.org.uk.

3.1 Red-throated diver *Gavia stellata*

In Shetland, fewer pairs nested in 2002 and did so later than usual, possibly due to food shortages early in the season. However, those birds that did nest were generally successful. In the Shetland Ringing Group's study area the number of successful pairs was at its highest since 1999, with many pairs raising two chicks. Overall breeding success was similar to 2002 and above average at most sites although productivity was low at Hermaness. In Orkney, numbers were stable but breeding success was slightly higher than in 2002 with above average values at all sites. Overall breeding success was above the long-term mean for both regions. In north-west Scotland, breeding success on Handa was the lowest in 16 years and on Eigg no young fledged for the fourth successive year.

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

In **Shetland**, overall productivity was slightly below that recorded in 2002, although still above the long-term average of 0.59 (s.e. ±0.04). However, the number of nesting pairs was far fewer, declining by 23.5%. On Foula, the breeding season was late with few adults present on lochs during May. Only eight breeding attempts were recorded, the fewest since records began, but breeding success was well above the long-term average, due to several factors. A dry summer resulted in no flooded nests and the late breeding season for divers meant unusually low predation pressure from great skuas, as many skua nests had failed due to food shortage by the time diver chicks hatched. Despite an apparent absence of sandeels adult divers were still able to find food by taking young saithe *Pollachius virens*, which were in poor condition and stunted in growth making them of suitable size (S. Gear, pers. comm.). On Fetlar, the number of nesting pairs was the lowest since 1996 but productivity remained above the long-term average for the site (French and Smith 2003). Seven nesting pairs at Lumbister, Yell was the lowest number to be recorded since 1998 but breeding success was the highest recorded since 1991 (M. Smith, pers. comm.). Divers were less successful at Hermaness, where the number of nesting pairs and breeding success was the lowest on record, again possibly due to food shortage early in the season (Duffield 2003).

Table 3.1.1 Red-throated diver breeding success, 1986-2002, 2002 and 2003: figures are estimated number of chicks fledged per breeding pair (Shetland, NW Scotland) or occupied site (Orkney). Note that the number of pairs does not necessarily indicate total populations in study areas.

Region/site	2002		2003		1986-2002	
	Pairs	Fldg/pair	Pairs	Fldg/pair	Mean (±s.e.)	No. of years
Shetland						
Hermaness	6	0.83	5	0.20	0.95 (±0.09)	17
Fetlar	24	0.92	19	0.63	0.52 (±0.05)	17
Yell	10	0.40	7	1.00	0.58 (±0.08)	14
Foula	11	0.45	8	0.88	0.44 (±0.06)	17
Sample total	51	**0.71**	39	**0.69**	**0.59 (±0.04)**	15
Orkney						
Hoy	63	0.65	64	0.62	0.57 (±0.03)	14
Rousay	6	0.17	2	0.50	0.31 (±0.12)	12
Mainland	12	0.67	14	0.93	0.61 (±0.07)	14
Sample total	81	**0.62**	80	**0.68**	**0.55 (±0.03)**	14
NW Scotland						
Handa	4	1.25	4	0.50	1.25 (±0.10)	16
Eigg	1	0.00	1	0.00	0.80 (±0.15)	17

Four areas were monitored by the Shetland Ringing Group (Okill 2003a). More successful sites and higher numbers of broods of two chicks were recorded in 2003 compared with 2002. However, apparent low food availability early in the season may have caused some pairs not to breed and those remaining pairs were reported breeding later than usual. The number of successful pairs (defined as pairs with chicks in July) - at 45 - was the highest recorded since 1999 (1980-2002 average 51.2, s.d. ±8.89) and mean brood size at fledging averaged 1.35, identical to the long-term mean (1979-2002, 1.35, s.e. ±0.02). As in 2002, two pairs of divers nested on artificial sites (one a specially constructed island, the other a man-made raft) situated at reservoirs where falling water levels previously caused nesting divers to fail. Both pairs were successful, each fledging a single chick.

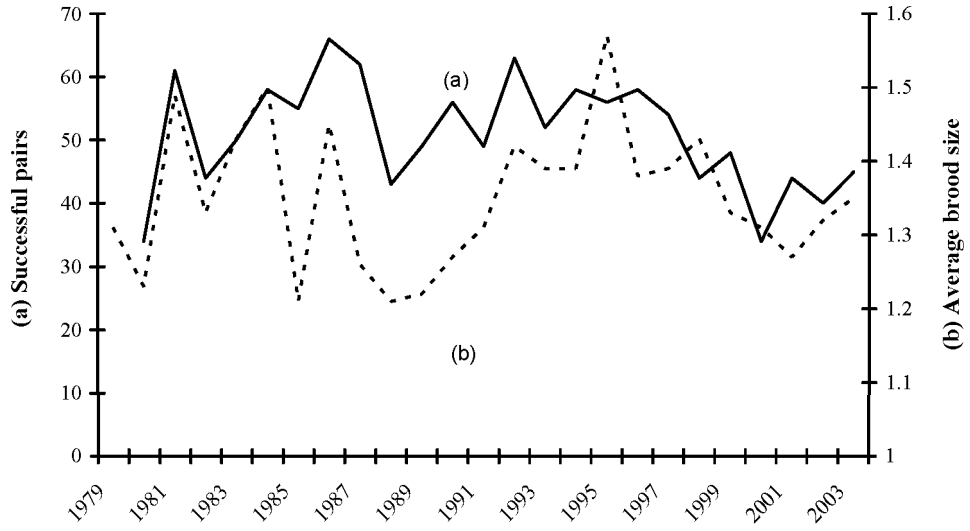

Figure 3.1.1 Annual variation in (a) numbers of 'successful' pairs (with chicks in mid-July) and (b) average brood-size near fledging at red-throated diver study areas in Shetland (parts of Unst, Eshaness, North Roe and Bressay), 1979-2003. Data are from Okill (2003a).

Divers were more successful in **Orkney**, where eighty monitored sites fledged an average of 0.68 chicks per nest, similar to that recorded in 2002. Numbers nesting at individual sites (other than on Rousay) were similar to 2002 and breeding success was above the long-term means at all (Meek 2003). A detailed study was again carried out on Hoy, where 135 sites were checked, 64 of which were found to be occupied. Of these, 32 nests were successful, 16 failed at the egg stage, six at the chick stage and ten failures could not be apportioned. In total, 40 chicks were fledged, 24 pairs rearing one chick and eight pairs rearing two chicks. It has been noted that divers in Orkney only occasionally rear broods of two, compared with those on Shetland in which the phenomenon is more common (Okill 2003a).

Outside the Northern Isles, the few data that were available for 2003 came from **north-west Scotland**. Four pairs again nested on Handa, where productivity was the lowest recorded since 1988 (Williams 2003). Two pairs fledged one chick each, one pair failed early in the season and one pair failed initially at the egg stage before relaying and hatching a chick which disappeared when one week old. On Eigg, one pair nested but as in previous years the eggs were depredated by an otter *Lutra lutra* (J. Chester, pers. comm.).

3.2 Northern fulmar *Fulmarus glacialis*

Decreases – some large - in the number of breeding northern fulmars occurred in Shetland and south-east Scotland between 2002 and 2003, and in Orkney since 1999. Conversely, a moderate increase occurred in north-west Scotland, (especially so on Mingulay and Berneray between 1998/2003), although the number on St Kilda decreased between 1999 and 2003. Many regions were rather unproductive in 2003, especially north Scotland, south-east Scotland and the Isle of Man, but breeding success was reasonable in south-west Scotland, Orkney and Wales.

Breeding numbers (Tables 3.2.1 and 3.2.2, Figure 3.2.1)

The regional population index of **Shetland** decreased for the third year running in 2003, reaching the lowest level since 1994. A particularly large decrease occurred at Hermaness, although small non-significant increases were seen at Burravoe and Eshaness. In **Orkney**, a similar decline to that in Shetland appears to have taken place at the JNCC triennial plots. The regional index decreased by 13% since the last count in 2000, with particularly large and statistically significant decreases occurring at Row Head (-20.1%, t=3.567, df.=8, P<0.01) and Marwick Head (-51.1%, t=4.548, df.=8, P<0.01).

Overall numbers across the monitored colonies in **south-west Scotland** remained similar between 2002 and 2003, although the number on Lunga (Treshnish Isles) increased by 16.5% to 523 AOS. The small colony at Mull of Galloway decreased further, to just 10 AOS.

Following a series of declines in the regional population index for **north-west Scotland** from 1996-2002, an increase occurred in 2003, with moderately large increases occurring Eigg (+19%) and Handa (+15%). A small increase was recorded on Canna, but the number there is still little above its lowest since monitoring began in 1986, following declines in the mid 1990s. A whole colony count on Mingulay in 2003 revealed 11,626 AOS an increase of 38% since the previous count of 8,424 in 1998. More dramatic, on nearby Berneray, 3,397 AOS was recorded in 2003, compared with 1,596 in 1998, an increase of 113% in five years. Conversely, the monitoring plots on St Kilda revealed a statistically significant 15% decrease between 1999 (the year of the previous count) and 2003 (df.=7, t=4.558, P<0.01).

Table 3.2.1 Regional population changes at monitored northern fulmar colonies, 2002-2003 (apparently occupied sites in late May or June). Counts with a reported inaccuracy of > ± 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 <0.01, *** P <0.001. Further details of calculation of trends are given in section 1.2.2.

Region	2002	2003	2002-2003 % change	% annual change
SW Scotland [a]	1,576	1,600	+1.5	-1.6 n.s. 1993-2002
NW Scotland [b]	666	739	+11.0	-1.6 n.s. 1986-2002
Shetland [c]	3,458	3,176	-8.2	+1.4** 1986-2002
NE Scotland [d]	217	223	+2.8	-
SE Scotland [e]	1,991	1,880	-5.6	+0.9 n.s. 1986-2002
NE England [f]	439	462	+5.2	+1.1 n.s. 1986-2002
Wales [g]	1,094	1,058	-3.3	+2.0*** 1986-2002

Colonies: [a] Mull of Galloway, Lunga (Treshnish Isles), Colonsay (sample areas), Sanda; [b] Canna, Eigg, Handa (plot counts); [c] Foula; 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, Inchmickery, Inchcolm, Craigleith, Lamb, Fidra, Tantallon, Bass Rock; St Abb's Head; [f] Farne Islands, Coquet, Boulby Cliff; [g] Caldey, Stackpole Head plus Elegug Stacks and adjacent coastline, Skomer, Skokholm, Bardsey, South Stack..

In **south-east Scotland** a small decline in the regional population index occurred between 2002 and 2003, resulting in the one of the lowest values since 1990, although the population in the region now appears to be stable after the severe decline between 1997 and 1998. There was much inter-colony variation in trends. On the Isle of May there was a 26% decrease between 2002 and 2003, where the lowest count since 1991 was recorded and a similar decline occurred on Inchkeith, which saw its lowest count since 1986. Conversely, numbers increased on Inchcolm by 24% between 2002 and 2003 and from 33 AOS in 2002 to 119 in 2003 on the Bass Rock.

The overall number of northern fulmar in **north-east England** increased slightly between 2002 and 2003, following a more substantial increase the previous year. Most of this increase was due to a rise of 27% at Boulby Cliff, while numbers on the Farnes and Coquet were similar to 2002. The small colony at Durlston to St Aldhelm's Head **(south-west England)**, was of a similar size to that in 2002.

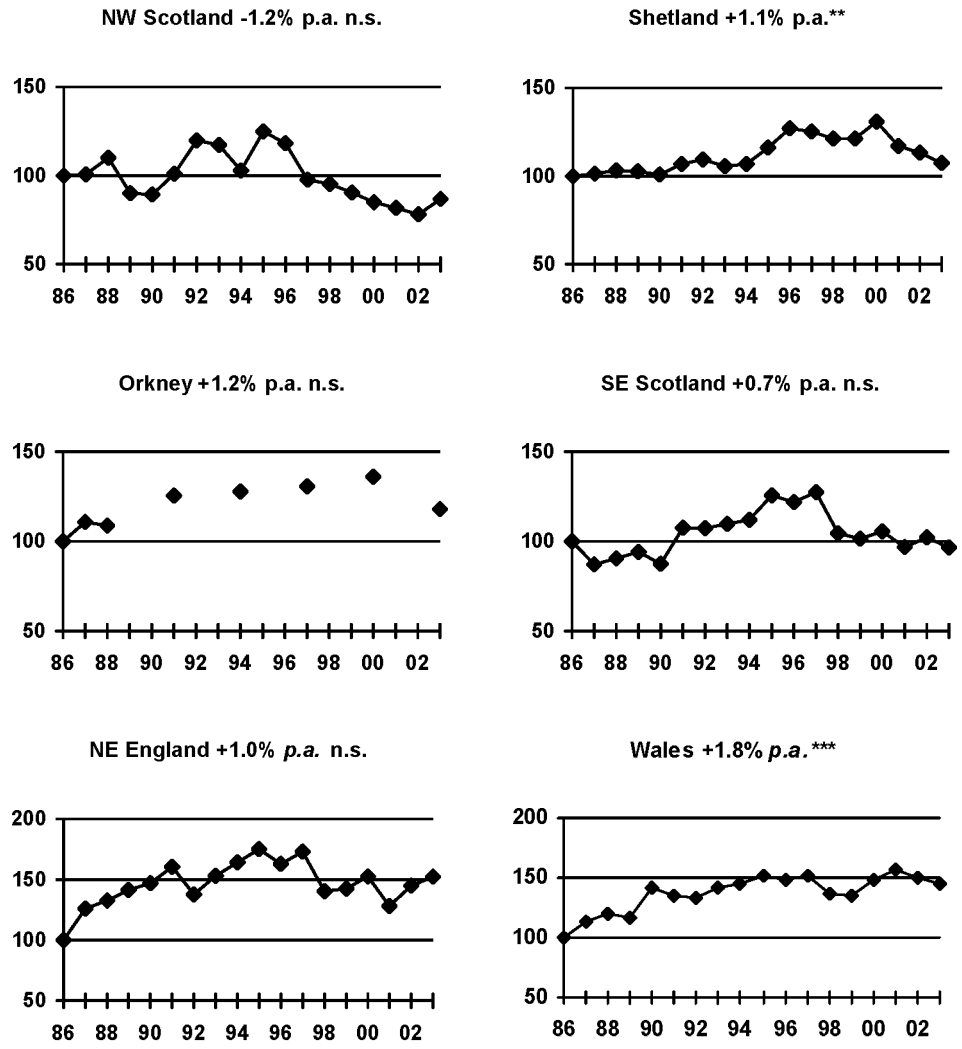

Figure 3.2.1 Regional population indices for breeding northern fulmars, 1986-2003 (apparently occupied sites in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Unless otherwise indicated, three or more colonies were counted in each year. Statistical significance of trends indicated as: n.s. not significant, ** P<0.01, *** P <0.001.

Table 3.2.2 Population changes of northern fulmar 2002-2003 and 1986-2002 at selected sites referred to in the text. P\W indicates plot or whole-colony counts.

Region/Site		2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. of years
SW Scotland						
Colonsay	W	606	567	-6.4	602 (69)	11
Lunga	W	449	523	+16.5	547 (96)	10
Sanda	W	480	500	+4.2	391 (95)	14
Mull of Galloway	W	41	10	-75.6	55 (18)	17
NW Scotland						
Handa	P	89	102	+14.6	118 (16)	16
Canna	W	406	434	+6.4	513 (94)	17
Eigg	W	171	204	+19.3	157 (38)	17
Shetland						
Troswick Ness	P	1052	999	-5.1	994 (130)	17
Sumburgh Head	P	251	241	-4.0	239 (29)	13
Burravoe	P	165	168	+1.6	167 (27)	16
Eshaness	P	334	350	+4.8	370 (24)	7
Hermaness	P	284	223	-21.5	301 (29)	14
Fair Isle	P	358	337	-5.9	369 (44)	10
NE Scotland						
Sands of Forvie	W	217	223	+2.8	278 (52)	14
SE Scotland						
Isle of May	W	338	248	-26.6	290 (69)	15
St Abb's Head	W	256	262	+2.3	318 (51)	17
Inchkeith	W	419	321	-23.4	464 (70)	16
Inchgarvie	W	222	205	-7.7	188 (39)	11
Fidra	W	206	194	-6.3	204 (61)	17
Inchmickery	W	37	35	-5.4	26 (12)	13
Inchcolm	W	166	206	+24.1	188 (44)	12
Craigleith	W	196	168	-14.3	161 (30)	16
The Lamb	W	18	9	-50.0	9 (5)	14
Tantallon	P	100	113	+13.0	109 (14)	4
Bass Rock	W	33	119	+260.1	89 (56)	7
NE England						
Farnes	W	254	242	-4.7	239 (27)	17
Coquet	W	67	70	+4.5	62 (10)	10
Boulby Cliff	W	118	150	+27.1	113 (20)	13
SW England						
St Aldhelm's Head	W	20	22	+10.0	30 (15)	2
Wales						
Skomer	W	635	634	-0.2	655 (67)	17
Skokholm	W	176	146	-17.0	142 (21)	11
Stackpole Head	W	40	50	+25.0	45 (6)	5
Elegug Stack	W	25	19	-24.0	29 (7)	7
Bardsey	W	43	41	-4.6	37 (9)	13
South Stack	W	51	24	-52.9	32 (14)	11
Caldey	W	97	106	+9.3	89 (25)	17
NW England/Isle of Man						
Glen Maye Gorge	W	25	28	+12.0	26 (6)	15
St Bee's Head	W	35	26	-25.7	66 (23)	15
NE Ireland						
Isle of Muck	W	24	32	+33.3	38 (20)	2

The overall number in **Wales** decreased slightly in 2003, although the population on Skomer, the largest colony, was the same as in 2002. A 17% decrease in the number of AOS on Skokholm occurred between 2002 and 2003. In **north-west England/Isle of Man**, the population at St Bee's

Head decreased to the equal lowest during the course of the SMP. The number at Glen Maye Gorge on the Isle of Man was similar to that in many recent years.

On the Isle of Muck (**north-east Ireland**), an increase was recorded in the small colony there.

Breeding success (Tables 3.2.3 and 3.2.4)

Mean productivity of northern fulmar across 28 sites in Britain and Ireland in 2003 was 0.36 (s.e. ±0.04) chicks per AOS, slightly lower than in 2002 although not significantly so.

In **Shetland**, mean productivity was, at 0.37 chicks per AOS, lower than in 2002. Particularly unproductive were breeders on Noss, Troswick Ness, Hermaness and Fair Isle, together raising a mean of between 0.26 and 0.37 chicks per AOS, well below the long term mean.

Slightly more successful were some colonies in **Orkney**, with an overall mean across five colonies of 0.48 chicks per AOS, the same as in 2002. However, there was much variation, with Rousay and Papa Westray having a very productive season, but Costa Head, Mull Head and Gultak experiencing among their lowest ever productivity. Particularly unproductive was Gultak, where just 0.18 chicks per AOS were raised.

At Ailsa Craig, **south-west Scotland**, a small sample of nests gave a productivity value of 0.71 chicks per AOS, similar to the long term mean for this colony.

Table 3.2.3 Northern fulmar breeding success grouped regionally, 2002-2003: 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	2002 chicks fledged/site				2003 chicks fledged/site				2002-2003 change	
	AOS^n	Range	Mean	±s.e.	AOS^n	Range	Mean	±s.e.	Mean^n	±s.e.
SW Scotland [a]	14[1]	-	0.71	-	14[1]	-	0.71	-	0.00[1]	-
NW Scotland [b]	498[3]	0.26-0.48	0.39	±0.07	438[3]	0.31-0.48	0.41	±0.05	+0.02[3]	±0.02
Shetland [c]	2,862[7]	0.23-0.74	0.41	±0.06	2,746[8]	0.25-0.56	0.37	±0.04	-0.03[7]	±0.03
Orkney [d]	663[5]	0.40-0.57	0.48	±0.03	707[5]	0.18-0.79	0.48	±0.12	0.00[5]	±0.12
N Scotland [e]	113[2]	0.14-0.25	0.20	±0.06	90[2]	0.02-0.05	0.04	±0.02	-0.16[2]	±0.04
SE Scotland [f]	275[3]	0.01-0.48	0.27	±0.14	222[2]	0.05-0.44	0.24	±0.20	0.00[2]	±0.04
NE England [g]	174[1]	-	0.69	-	240[2]	0.31-0.49	0.40	±0.09	-0.20[1]	-
Wales [h]	275[2]	0.41-0.49	0.45	±0.04	264[2]	0.49-0.50	0.50	±0.01	+0.04[2]	±0.04
Isle of Man [I]	219[5]	0.15-0.48	0.34	±0.07	93[3]	0.08-0.16	0.11	±0.02	-0.22[3]	±0.08
NE Ireland [j]	7[1]	-	0.43	-	-	-	-	-	-	-
Total	5,100[30]	0.01-0.74	**0.40**	±0.03	4,814[28]	0.02-0.79	**0.36**	±0.04	**-0.05**[26]	±0.03

Colonies: [a] Ailsa Craig; [b] Handa, St Kilda, Canna; [c] Hermaness, Burravoe (2003 only), Eshaness, Noss, Westerwick, Troswick Ness, Sumburgh Head, Fair Isle; [d] Costa Head, Mull Head, Gultak, Rousay, Papa Westray; [e] Easter Ross, Wilkhaven; [f] Isle of May, Tantallon, St Abb's Head (2002 only); [g] Farne Islands; [h] Skomer, Skokholm; [i] Traie Vane-Gob yn Ushtey (2002 only), Glen Maye , Bradda, Glen Mooar-Gob y Deigan, Cass Strooan-Peel Headlands (2002 only); [j] Old Lighthouse Island (2002 only).

North-west Scotland had a fairly unproductive year in 2003, with a mean of 0.41 chicks per AOS. Particularly low was St Kilda, at 0.31 chicks per AOS. Birds on Canna and Handa were about as productive as in 2002. The two monitored colonies in **north Scotland**, Easter Ross and Wilkhaven, virtually failed to raise any young in 2003, and were even less productive than in 2002, which was also

a poor year. Productivity of northern fulmars on the Isle of May **(south-east Scotland)**, was about average at 0.44 chicks per AOS, but birds generally failed at Tantallon, as they did in 2002. In **north-east England**, productivity was near average on the Farne Islands, but low on Coquet, at 0.31 chicks per AOS.

Northern fulmars at colonies in the **north-west England/Isle of Man** region were very unproductive in 2003, with a mean of just 0.11 chicks per AOS at three sites; near total failure occurred at Glen Mooar-Gob y Deigan and was little higher at Glen Maye and Bradda. In contrast, colonies in **Wales** had a productive year in 2003; both Skomer and Skokholm had near average breeding success and on Bardsey, productivity was 0.90, well above the colony mean of 0.76. Note that at the latter site breeding success is measured per egg laid, leading to a higher estimate when compared with sites where success is measured per AOS.

Table 3.2.4. Breeding success (chicks fledged per apparently occupied site) of northern fulmar 2002-2003 and 1986-2002 at selected sites referred to in the text. Figures in parentheses under 2002 and 2003 are the number of occupied sites from which the success estimate was derived. * Number of chicks fledged per egg laid.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
SW Scotland				
Ailsa Craig	0.71 (14)	0.71 (14)	0.70 (0.03)	11
NW Scotland				
Canna	0.45 (80)	0.48 (81)	0.39 (0.02)	17
Handa	0.48 (89)	0.45 (102)	0.48 (0.03)	14
St Kilda	0.26 (329)	0.31 (255)	0.38 (0.02)	11
N Scotland				
Easter Ross	0.14 (58)	0.02 (47)	0.20 (0.04)	9
Wilkhaven	0.25 (55)	0.05 (43)	0.32 (0.08)	6
Orkney				
Rousay	0.57 (83)	0.71 (111)	0.51 (0.05)	11
Costa Head	0.48 (159)	0.38 (178)	0.50 (0.01)	14
Mull Head	0.48 (163)	0.34 (190)	0.42 (0.01)	14
Gultak	0.47 (113)	0.18 (142)	0.44 (0.03)	14
Papa Westray	0.40 (145)	0.79 (86)	0.50 (0.05)	7
Shetland				
Hermaness	0.25 (551)	0.34 (403)	0.43 (0.03)	14
Noss	0.29 (268)	0.28 (191)	0.42 (0.03)	10
Eshaness	0.42 (334)	0.44 (350)	0.44 (0.02)	17
Westerwick	0.74 (71)	0.56 (59)	0.57 (0.04)	13
Troswick Ness	0.38 (1,053)	0.26 (999)	0.42 (0.02)	17
Sumburgh Head	0.39 (248)	0.42 (239)	0.46 (0.03)	17
Fair Isle	0.43 (356)	0.37 (337)	0.44 (0.02)	17
SE Scotland				
Isle of May	0.48 (131)	0.44 (109)	0.42 (0.02)	17
Tantallon	0.01 (100)	0.05 (113)	0.36 (0.05)	16
St Abb's Head	0.32 (44)	-	0.21 (0.04)	8
NE England				
Farne Islands	0.69 (174)	0.49 (170)	0.55 (0.03)	17
Coquet Island	-	0.31 (70)	0.51 (0.06)	6
NW England/Isle of Man				
Glen Maye	0.40 (25)	0.16 (28)	0.36 (0.04)	16
Bradda	0.48 (37)	0.10 (29)	0.33 (0.05)	11
Glen Mooar – Gob y Deigan	0.22 (36)	0.08 (36)	0.30 (0.03)	4
Wales				
Skomer	0.49 (99)	0.49 (118)	0.54 (0.04)	11
Skokholm	0.41 (176)	0.50 (146)	0.47 (0.02)	9
Bardsey *	0.95 (43)	0.90 (41)	0.76 (0.11)	7

3.3 Manx shearwater *Puffinus puffinus*

Breeding numbers and breeding success (Table 3.3.1)

In **north-west Scotland**, breeding success on Rum was again above the long-term average and similar to that of 2002, which had been the most successful year since 1997. Occupancy in a sample of 93 monitored burrows was 82%, the highest recorded since 1996. Reduced numbers of pulli on the slopes near fledging time may be indicative of rat activity (Ramsay 2004). On Canna, after a full survey in 1997 indicated that fewer than 100 occupied burrows remained, former core areas have been monitored annually using tape playback methods. In 2003, only one bird responded to taped calls from 100 burrows checked between the Nunnery and Garrisdale, where one also responded in 2001 but none had responded in 2002. No other signs of Manx shearwaters (e.g. depredated adults) were noticed on the island (Swann 2003a). On Sanda (**south-west Scotland**), there appeared to be no failures in a sample of 40 burrows checked resulting in productivity of 1.00 chick fledged per occupied burrow. This is far higher than the previous values of 0.82 and 0.71 recorded in 2001 and 2002 respectively (Morton 2003). In **Shetland**, Manx shearwaters continue to survive as a breeding species on Fetlar. Burrows examined with an endoscope revealed that three contained chicks with a further four showing signs of occupation (*cf.* one chick and six probably occupied in 2002) (French and Smith 2003).

On the Calf of Man (**north-west England**), an extensive tape playback survey in 2000 elicited four responses with two young subsequently ringed, the first time that breeding had been proven on the island. Since then, similar surveys in 2001 and 2002 resulted in 17 responses in each year with a further ten burrows showing signs of occupation in the latter year. In 2003, 50 occupied burrows were found during a more systematic and thorough search (C. Sharpe, pers. comm.). In **Wales**, it was another productive season on Bardsey with breeding success above the long-term average for the site: 88 chicks fledged from a sample of 100 study nests. As in 2002, a pair of carrion crows *Corvus corone* took eggs, robbing as many as 50 from accessible nest chambers during May and June (*cf.* 80 taken in 2002) (Stansfield 2003). On Skomer, hatching success and fledging success were near normal for the site, with productivity much higher than in previous years, being the highest value recorded since 1998, and consequently above the long-term mean. The survival rate of adults on Skomer, at 71.5% in 2001 (the most recent year for which an estimate is currently available), was unusually low, compared with the long term mean and the 2000 estimate (86.5%), although there has been no discernible trend in annual survival since recording began in 1977 (Perrins 2004). On Skokholm, tape-playback surveys of the nine sample plots yielded 252 responses (*cf.* 308, 259, 327 and 341 responses during 1999-2002 respectively) which would equate to 586 AOB using a conversion factor of 2.325 as applied in previous years (Thompson 2003). However, it should be noted that the conversion factor used is based on a small sample of burrows on Skomer, so may not be entirely suitable for use on Skokholm (C. Perrins, pers. comm.).

Table 3.3.1 Breeding success of Manx shearwaters, 2002-2003 and 1986-2002. Figures are the number of chicks fledged per occupied burrow or burrow with egg. Figures in parentheses under 2002 and 2003 are the number of occupied burrows from which success estimate was derived.

Region/site	2002	2003	1986-2002 mean	
			Mean (±s.e.)	No. of years
NW Scotland				
Rum	0.73 (99)	0.75 (93)	0.69 (0.05)	10
SW Scotland				
Sanda	0.71 (66)	1.00 (40)	0.76 (0.06)	2
Wales				
Skomer	0.57 (108)	0.70 (104)	0.55 (0.05)	12
Bardsey	0.80 (50)	0.88 (100)	0.80 (0.01)	7

3.4 European storm-petrel *Hydrobates pelagicus*

Breeding numbers and breeding success

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. Until recently, estimates for total breeding numbers of European and Leach's storm-petrels remained sketchy, but a standardised method for repeatable surveys has been developed, using 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 (Mitchell *et al.* 2004), which for the first time obtained quantitative assessments of the population size of these two species. Other methods are also used to monitor populations on an annual basis. The count unit is the apparently occupied site.

With the exception of 2000, birds on Mousa (**Shetland**), have experienced late breeding seasons since 1997. In 2003, breeding appeared to be successful: 50 chicks were ringed on 7 September (*cf.* 47 in 2002, 35 in 2001, 49 in 2000 and 38 in 1999) and the largest of the chicks was eight days from fledging (Okill 2003b). At least a further seven chicks were inaccessible, six adults were still incubating and ten sites contained cold eggs. A nocturnal search on Noss in July elicited no responses to tape playback (Marshall and Thomas 2003). In **Orkney**, an apparent significant decline on Auskerry between 1995 and 2001 (from 3,431 to 680 AOS) prompted a further more comprehensive survey in 2003. The resulting estimate of 978 AOS is slightly higher than that of 2001, but still considerably less than the results from the 1995 survey. However, the whole-island estimate in 1995 might have over-estimated the actual population on Auskerry (Churchill 2004).

On Shillay (**north-west Scotland**), a playback survey of two transects elicited 46 responses in 2003, compared with 73 in 2002. Reasons for this apparent decline are unknown. There was evidence of the presence of European storm-petrels elsewhere in the Western Isles; remains were found in great skua pellets and around their nests on Mingulay and a bird was heard calling from a wall during daytime on Berneray (A. Stevenson, pers. comm.).

A diurnal tape-playback survey of potentially suitable habitat on the Calf of Man (**Isle of Man/north-west England**), failed to find any breeding petrels (C. Sharpe, pers. comm.). On Bardsey (**Wales**), a diurnal tape-playback survey in June located 36 AOS, one more than in 2002 (Stansfield 2003). This is most likely an underestimate as diurnal attendance in burrows is much lower in June than during the peak incubation period in mid July (Ratcliffe *et al.* 1998). A minimum of 206 AOS was estimated from a comprehensive tape-playback survey on Skomer Island (Brown and Wilberforce 2003).

3.5 Leach's storm-petrel *Oceanodroma leucorhoa*

Breeding numbers

See chapter 3.4 for the background to methodology and survey techniques.

A diurnal tape-playback survey, carried out by JNCC in 1999, estimated that the island of Dun in the St Kilda archipelago (**north-west Scotland**) held 27,700 AOS (95% CLs 20,400-38,500), making it the largest surveyed colony in the east Atlantic. In a recent study, it was estimated that great skuas, whose population on St Kilda increased exponentially from 42 pairs in 1986 to 229 pairs in 1996, may be consuming *c.*15,000 Leach's storm-petrels each year (Phillips *et al.* 1999). This raised concerns that the population of Leach's storm petrel may be decreasing rapidly. A repeat census by JNCC in 2003, estimated the total population on Dun as 14,417 AOS (95% CLs 11,100-19,100). This represents a significant major (48%) decline of the population since 1999. However, it is not known if predation is the main source of the decline or if other factors such as food supply contributed to the decrease (O'Brien *et al.* 2003); this is the subject of current research.

3.6 Northern gannet *Morus bassanus*

Breeding numbers (Figure 3.6.1)

Only the colony on Fair Isle (**Shetland**) was counted in both 2002 and 2003 and was found to have increased by 17.7% from 1,585 AON to 1,866 AON (Shaw *et al.* 2003). Although a significant drop in numbers was recorded at the largest sub-colony, on Outer Stack, this was more than compensated for by large increases at all west coast sub-colonies. The newest sub-colony, on Sheep Rock, increased again from ten nests in 2002 to 13 and with no shortage of nest sites here the colony is likely to carry on expanding (D. Shaw, pers. comm.). Elsewhere, surveys of Hermaness and Noss revealed a decrease of 4.6% (to 15,633 AON) and an increase of 7.9% (to 8,652 AON) respectively, both changes occurring since 1999 although the decline noted at the former site may be due to a landslide, which could have destroyed several hundred nests (Duffield 2003).

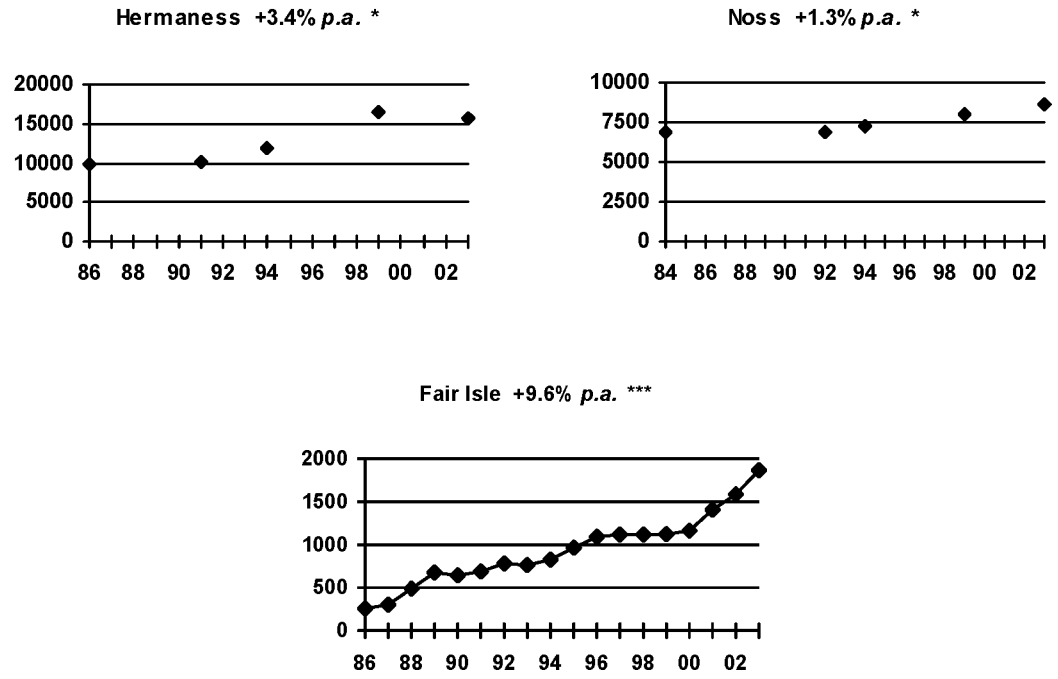

Figure 3.6.1 Northern gannet population trends for Hermaness, Noss and Fair Isle, 1984-2003 (apparently occupied nests in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trend indicated as: * P<0.05 *** P<0.001.

In **Orkney**, two new colonies were discovered in 2003: at Noup Head, Westray, five pairs built nests and at least two contained eggs, and 15 pairs with eggs or chicks were counted on Sule Skerry in mid-July. The latter colony was reduced to ten pairs within two weeks of the initial count due to predation by great black-backed gulls (Blackburn 2004). Until now the only gannetry in Orkney has been the long established one on Sule Stack which held 4,888 AON in 1994.

Breeding success (Table 3.6.1)

The mean breeding success across four colonies monitored in 2003 was 0.73 (s.e. $\pm$0.05) chicks fledged per occupied nest, higher than the average value in 2002 for the same four colonies and above the 1986-2002 mean of 0.69 (s.e. $\pm$0.01), based on between three and six colonies annually. In 2003, northern gannets at Ailsa Craig had their most successful breeding season on record and productivity

at Noss and Fair Isle was also above average. At Hermaness, breeding success was again below the long-term mean for the fourth year since 1998.

Table 3.6.1 Northern gannet breeding success, 1986-2002, 2002 and 2003: estimated number of chicks fledged per occupied nest. In 2002 and 2003, 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 2002 and 2003 figures for Fair Isle are for all nests totalled across sample plots.

Colony	2002 fledged/nest		2003 fledged/nest		1986-2002 fledged /nest	
	AON^n	Mean (±s.e.)	AON^n	Mean (±s.e.)	Mean (±s.e.)	Years
SW Scotland						
Ailsa Craig	241^2	0.74 (±0.10)	276^2	0.86 (±0.01)	0.68 (±0.02)	12
Shetland						
Hermaness	792^3	0.64 (±0.03)	741^3	0.63 (±0.01)	0.66 (±0.02)	14
Noss	464^4	0.78 (±0.02)	442^4	0.73 (±0.02)	0.70 (±0.01)	17
Fair Isle	224^1	0.61 (---)	226^1	0.69 (---)	0.68 (±0.02)	17
All colonies	1,721	**0.69 (±0.04)**	1,685	**0.73 (±0.05)**	**0.69 (±0.01)**	-

3.7 Great cormorant *Phalacrocorax carbo*

In the north and east of the UK, numbers of great cormorants changed little between 2002 and 2003 with changes in most regions of less than ± 10%. Larger changes, of ± 15% or greater, were recorded in the south and west although there was no clear division of regions, with increases recorded in SE England, NW England and Wales and decreases in SW Scotland and SW England. This is typical for the species; counts of breeding pairs of great cormorants can be difficult to interpret, particularly where regional coverage is incomplete as birds may move between colonies and variable proportions of adults breed each year. Mean productivity across all sites in 2003 was similar to that recorded in 2002 and close to the mean of the previous 10 years.

Breeding numbers (Tables 3.7.1 and 3.7.2, Figure 3.7.1)

In **south-west Scotland**, the region as a whole saw a decline of 16.5% compared with 2002. Decreases were recorded on Sanda, Ruadh Sgeir (Sound of Jura) and Eilean Buidhe (Loch Fyne) with the only increase noted at the small colony on Eilean Dubh (Lynn of Lorn). Little year to year change was evident in adjacent **north-west Scotland** where an increase on An Glas Eilean (Loch nan Uamh) was negated by decreases on Eilean an Inbhire Bhain (Loch Shieldaig) and at Loch an Tomain (North Uist). Elsewhere in the region, numbers at Balcary Point decreased by 32.6% to 95 AON since 1994. A colony of 18 AON on Sgat Mor (Loch Fyne) was the first record of breeding there (Craik 2003).

Table 3.7.1 Regional population changes at monitored great cormorant colonies, 2002-2003 (apparently occupied nests in May-June). Regional samples of fewer than 50 AON or of only one colony are excluded. Trends for 1986-2002 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.

Region	2002	2003	2002-2003 % change	% annual change
SW Scotland [a]	176	147	-16.5	+0.6 n.s. 1986-2002
NW Scotland [b]	96	98	+2.1	-
Shetland [c]	283	277	-2.1	-3.6** 1986-2002
N Scotland [d]	320	289	-9.7	-3.2** 1986-2002
SE Scotland [e]	411	425	+3.4	-0.4 n.s. 1986-2002
NE England [f]	263	239	-9.1	-1.1 n.s. 1986-2002
SE England [g]	60	81	+35.0	-
SW England [h]	147	112	-23.8	-1.8** 1986-2002
Wales [i]	557	723	+29.8	+0.2 n.s. 1986-2002
NW England/Isle of Man [j]	195	290	+48.9	+3.5*** 1986-2002
NE Ireland [k]	320	325	+1.6	+6.9*** 1986-2002

Colonies: [a] Sanda, Ruadh Sgeir, Corr Eilean, Carraig an Daimh, Eilean Dubh, Eilean Buidhe (Portavedie), Eilean Buidhe (Black Harbour); [b] Eilean an Inbhire Bhain, An Glas Eilean, Loch an Tomain; [c] Clett Stacks, Heads of Grocken, High Holm, W Muckle Roe; [d] Stacks of Occumster, Ceann Leathad, Traigh Bhuidhe, Neuk Mhor, Ord Point, Cnoc na Stri, North Sutor; [e] Carr Craig, The Lamb, Inchkeith, Inchmickery, Craigleith; [f] Farne Islands, Huntcliff, Boulby Cliff; [g] Dungeness; [h] Ballard Cliff, Gad Cliff; [i] Skomer, St Margaret's Island, Gwynedd 'A', Great Orme, Little Orme; [g] South Solway, St Bee's Head, Grune Point, Gob ny Skeddan, The Stacks, Peel Hill, Contray Head to Traie Cronkan; [k] Strangford Lough.

Regions to the north and along the east coast of the UK generally showed little change or only moderate decreases between 2002 and 2003. In **Shetland**, numbers remained stable between 2002 and 2003 although the annual rate of change depicts a significant decline since 1986. A 10.1% decrease in numbers at Heads of Grocken was the sole notable proportional change recorded in the region (Okill 2003b). Numbers decreased by 9.7% in **north Scotland** where, as in Shetland, a significant negative

annual rate of change has also been observed. Numbers fell at most of the regularly monitored colonies by 23-44%, except at North Sutor where the decrease was only 6.3%. A newly established colony of 25 AON was found at Cnoc na Stri. In **north-east Scotland**, the small colony at Sands of Forvie again increased in size, to 23 AON, after it was first noted 2001 when it held seven AON. Little change was noted in **south-east Scotland**; numbers at Craigleith, Carr Craig and The Lamb all decreased slightly compared to 2002 with larger proportional increases of *c.*20% were recorded at Inchkeith and Fast Castle. The population index for the region has remained quite stable since the mid-1990s. In **north-east England**, the decline in numbers evident since the early 1990s continued with a decrease of 9.1% recorded between 2002 and 2003. Numbers fell at all three colonies monitored with the largest proportional decreases noted at Saltburn and Boulby Cliffs.

South-west England was one of the few regions in the south-west of the UK to show a decrease between 2002 and 2003 although the long-term trend for the region is again one of decline since the early 1990s. Numbers decreased by 10.0% at Gad Cliff but the largest proportional decrease occurred at Ballard Cliff (-31.0%) where numbers fell to their lowest level since monitoring began (Morrison 2003). There was no change in the colony at White Nothe which held 34 AON in both 2002 and 2003. In contrast, numbers in **south-east England**, **Wales**, **north-west England** all increased and remained stable in **north-east Ireland.** In **south-east England,** numbers at Dungeness, the sole colony monitored in the region in 2002 and 2003, increased by 35% to 81 AON. Elsewhere in the region, 125 AON were recorded at Rye Harbour in late April, which represents an increase of 66.7% on the previous count of 75 AON in 2000. In **Wales,** an increase of 29.8% was atypical for the region where the long-term trend has shown few large fluctuations. A large increase of 48.7% was recorded at Little Orme's Head where 452 AON is the highest count recorded since monitoring began in 1986. At nearby Great Orme's Head, numbers decreased by only six nests between 2002 and 2003. An increase was also recorded on St Margaret's Island while at Gwynedd 'A' and Skomer numbers remained similar to 2002. The largest proportional increase noted in any region between 2002 and 2003 was recorded in **north-west England**, where numbers increased by 48.9%. Increases were noted at all five colonies monitored with particularly large increments noted in colonies at South Solway, St Bee's Head and Gob ny Skeddan (Isle of Man). Little change was observed at the one monitored colony in **north-east Ireland** where the trend has been one of increase. The 1.6% increase recorded at Strangford Lough between 2002 and 2003 was less than the annual rate of change measured since 1986.

Few data were received from colonies in **inland England**. Numbers remained stable at Aldermaston between 2002 and 2003 and at Rutland Water numbers more than doubled, increasing from 65 to 144 AON (+121.5%).

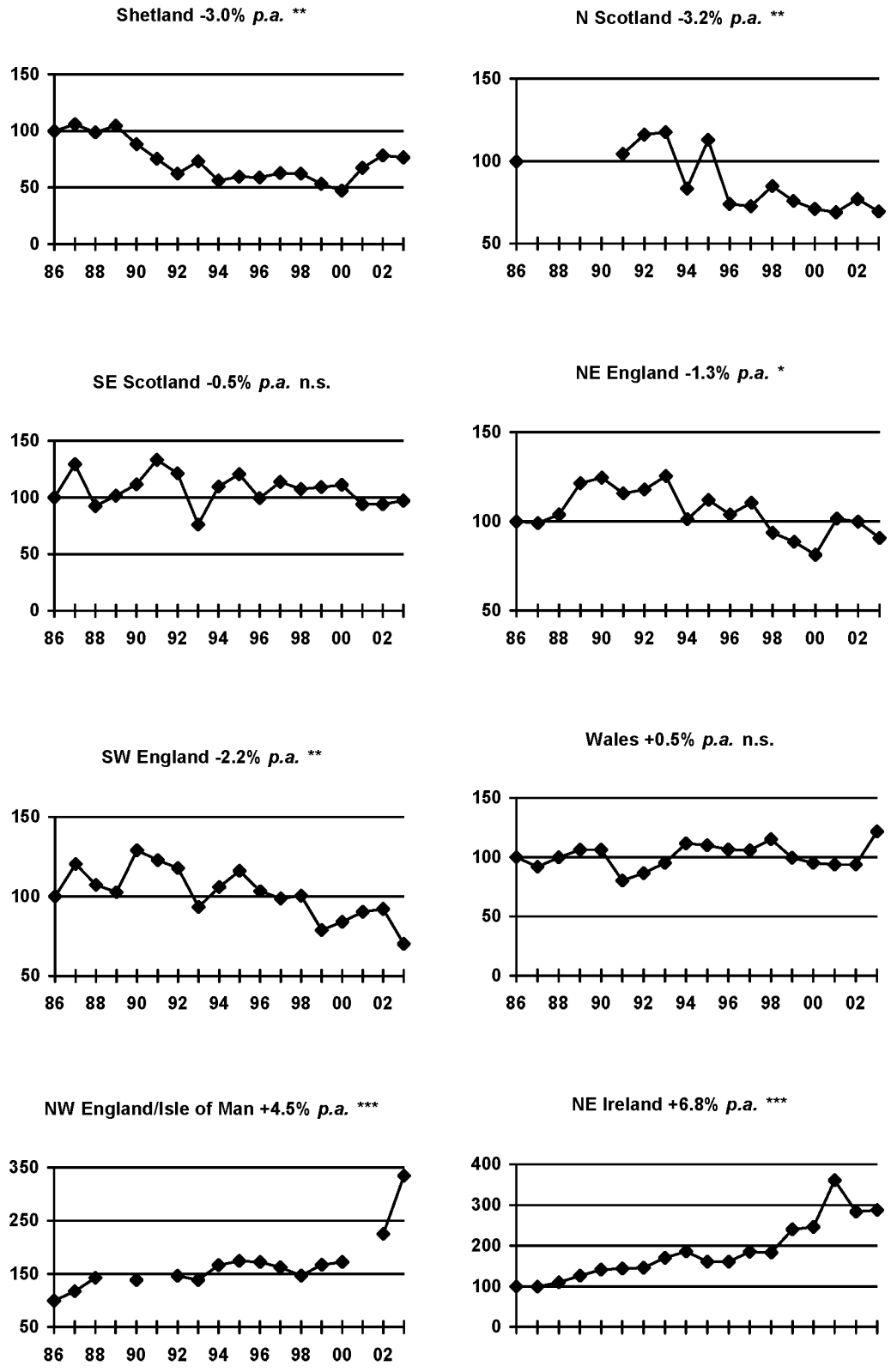

Figure 3.7.1 Regional population indices for breeding great cormorant, 1986-2003 (apparently occupied nests in late May or June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Significance of trends indicated as: n.s. not significant, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 3.7.2 Population changes of great cormorant 2002-2003 and 1986-2002 at selected sites referred to in the text.

Region/Site	2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. of years
SW Scotland					
Sanda	22	20	-9.1	24 (6)	15
Ruadh Sgeir	27	17	-37.0	19 (8)	3
Corr Eilean	30	30	0.0	39 (9)	9
Eilean Buidhe	85	64	-24.7	44 (24)	9
Eilean Dubh	12	16	+33.3	6 (3)	6
NW Scotland					
Eilean an Inbhire Bhain	24	20	-16.6	18 (4)	5
An Glas Eilean	26	37	+42.3	28 (4)	9
Loch an Tomain	46	41	-10.9	49 (7)	3
Shetland					
High Holm	50	50	0.0	43 (7)	14
Clett Stacks	148	149	+0.7	125 (27)	16
West Muckle Roe	79	71	-10.1	77 (12)	14
N Scotland					
Stacks of Occumster	19	11	-42.1	19 (12)	11
Ceann Leathad	34	26	-23.5	38 (14)	13
Ord of Caithness	61	34	-44.3	83 (31)	12
Cnoc na Stri	0	25	-	-	-
North Sutor	206	193	-6.3	223 (36)	12
NE Scotland					
Sands of Forvie	10	23	+130.0	8 (2)	2
SE Scotland					
Inchkeith	102	124	+21.6	92 (14)	2
Carr Craig	91	87	-4.4	112 (61)	16
Craigleith	78	72	-7.7	91 (24)	15
The Lamb	101	95	-5.9	121 (44)	16
Fast Castle	39	47	+20.5	41 (11)	10
NE England					
Farne Islands	190	179	-5.8	225 (43)	17
Saltburn	32	27	-15.6	42 (10)	16
Boulby	41	33	-19.5	22 (13)	9
Inland England					
Aldermaston	33	32	-3.0	17 (12)	5
SE England					
Dungeness	60	81	-9.1	81 (19)	3
SW England					
Gad Cliff	50	45	-10.0	77 (26)	15
Ballard Cliff	97	67	-31.0	109 (30)	13
Wales					
Skomer	8	8	0.0	16 (5)	16
St Margaret's Island	145	166	+14.5	210 (51)	17
Gwynedd 'A'	73	76	+4.1	106 (79)	7
Great Orme's Head	27	21	-22.2	47 (19)	12
Little Orme's Head	304	452	+48.7	250 (57)	8
NW England/Isle of Man					
South Solway A	56	69	+18.8	-	1
South Solway B	7	39	+314.3	-	1
St Bee's Head	42	75	+78.6	17 (13)	9
Grune Point	62	67	+8.1	55 (10)	8
Gob ny Skeddan	27	37	+37.0	16 (13)	5
NE Ireland					
Strangford Lough	320	325	+1.6	210 (74)	17

Breeding success (Table 3.7.3)

Mean productivity across all sites in 2003 was 1.95 chicks per AON (s.e. ±0.20, n=12), similar to that recorded in 2002 (1.95, s.e. ±0.18, n=11) and close to the mean of the previous 10 years (1993-2002) of 1.97 (s.e. ±0.08).

In **south-west** and **north-west Scotland**, great cormorants appeared to have a successful breeding season; productivity was greater than in 2002 and above average at Ruadh Sgeir, Eilean Buidhe, Eilean Dubh and An Glas Eilean. Colonies on Corr Eilean and Sgat Mor, from which no previous data is available, also appeared to be reasonably successful (Craik 2003). At North Sutor (**north Scotland**), productivity of 1.94 chicks fledged per was below the colony average and the lowest value to be recoded at this successful site since 1999 (Swann 2003b).

At Ballard Cliff in **south-west England**, breeding success increased compared with 2002, but was close to that recorded in 2001 (*cf.* 0.33) which was the first year in which the parameter was measured there (Morrison 2003). On the Isle of Man (**north-west England/Isle of Man**), productivity of the single colony monitored there in 2003 was above average and close to the sites highest value of 2.65 in 1999. Two sites on mainland England at South Solway were less successful; productivity was lower at both than in 2002, the first year in which data was gathered at the sites. Productivity on Skomer (**Wales**) was also low compared to the colony average.

Table 3.7.3 Breeding success (chicks fledged per occupied nest) of great cormorant 2002-2003 and 1986-2002 at selected sites referred to in the text. Figures in parentheses under 2001 and 2002 are the number of nests from which success estimate was derived.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
SW Scotland				
Ruadh Sgeir	1.48 (27)	3.08 (13)	2.10 (0.32)	4
Eilean Buidhe	1.34 (85)	1.69 (36)	1.57 (0.19)	9
Eilean Dubh	2.54 (13)	2.70 (10)	1.85 (0.34)	6
Corr Eilean	-	2.67 (30)	-	-
Sgat Mor	-	1.94 (17)	-	-
NW Scotland				
An Glas Eilean	0.92-1.35 (26)	2.00 (30)	1.60 (0.19)	9
N Scotland				
North Sutor	2.40 (108)	1.94 (143)	2.10 (0.15)	11
SW England				
Ballard Cliff	1.14 (97)	1.34 (35)	1.24 (0.10)	2
Wales				
Skomer	-	1.13 (8)	1.89 (0.56)	3
NW England/Isle of Man				
South Solway 'A'	1.79 (56)	1.16 (69)	-	1
South Solway 'B'	2.00 (7)	1.15 (39)	-	1
Will's Strand	2.44 (27)	2.61 (31)	2.48 (0.06)	4

Figures for sites in SW and NW Scotland are based on few visits and refer to approximate numbers of medium/large young in nests.

3.8 European shag *Phalacrocorax aristotelis*

Large increases were recorded in south-east Scotland and north-east England between 2002 and 2003, where numbers are now beginning to return to levels recorded prior to the wreck in 1994; an increase was also noted in south-west Scotland. In contrast, long-term declines continue in north-west Scotland and Shetland. However, in interpreting breeding numbers it should be noted that variable proportions of adults nest in a given year, and that changes in numbers nesting does not necessarily equate to a change in the number present or alive. The mean breeding success in 2003 of 1.34 chicks per nest was similar to the mean value for 2002 but slightly above the 1986-2001 mean of 1.31 (s.e. ±0.05) chicks per nest. There was a significant decrease of 0.25 (s.e. ±0.10) between colonies monitored in 2002 and 2003.

Breeding numbers (Tables 3.8.1 and 3.8.2, Figure 3.8.1)

The large increases recorded in **south-east Scotland** and adjacent **north-east England** between 2002 and 2003 indicate that the populations in these regions may be returning to levels recorded prior to the wreck which occurred in 1994 (Harris and Wanless 1996). In **south-east Scotland**, numbers increased by 60.1% between 2002 and 2003. Substantial increases occurred at most colonies, with numbers on Inchkeith and Inchmickery the highest recorded since 1986. Only the colony on Craigleith showed a substantial decline (-15.4). In **north-east England**, a total count of 1,678 AON on the Farne Islands represented an increase of 30.9% since 2002. This was also the highest count at the site in the post-wreck period with numbers now approaching the figure of 1,948 AON recorded in 1993 (Walton 2003). Between 1994 and 1999, European shag numbers increased slowly, if at all, with annual rates of growth of 0.3% in south-east Scotland and 2.9% in north-east England. However, between 1999 and 2003, the annual rates of increase measured 31.8% and 12.1% for the respective regions. These greater rates of increase have occurred since the cessation of sandeel fishing on the nearby Wee Bankie in 1999 during which time improved breeding performance has also been recorded on the Isle of May (Wilson *et al.* 2003.).

Table 3.8.1 Regional population changes at monitored European shag colonies, 2002-2003 (apparently occupied nests in May-June). Counts with a reported inaccuracy of > ±5%, and regional samples < 100 AON, are excluded. Trends for 1986-2002 are average annual rates of change shown by sample populations. Significance of trends 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.

Region	2002	2003	2002-2003 % change	% annual change
SW Scotland [a]	1,148	1,361	+18.6	+1.6 n.s. 1994-2002
NW Scotland [b]	752	738	-1.9	-4.4*** 1987-2002
Shetland [c]	795	665	-16.4	-3.3*** 1986-2002
N Scotland [d]	374	359	-4.0	-
SE Scotland [e]	1,690	2,705	+60.1	+6.2 n.s. 1994-2002
NE England [f]	1,282	1,678	+30.9	+5.8** 1994-2002

Colonies: [a] Mull of Galloway, Colonsay (sample plots), Sanda Island, Lunga, Carraig an Daimh, Eilean Buidhe, Ruadh Sgeir, Eilean na Cille; [b] Eigg, Canna, An Glas Eilean, Priest Island; [c] Fair Isle (plots), Noss, Sumburgh Head, Noness, Troswick-Virkie; [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.

An increase of 18.6% was also recorded in **south-west Scotland** where previously numbers have shown a slight upward trend since 1994. At the largest colonies monitored, Sanda and Lunga, numbers increased by 32.0% and 13.6% respectively since 2002, with the numbers at both colonies the highest since monitoring started. Increases were also recorded at smaller colonies on Eilean Buidhe

and Carraig an Daimh and in study plots on Colonsay but numbers decreased at Ruadh Sgeir and at the Mull of Galloway the count was less than half of that recorded in 2002. In **north-west Scotland**, there was little change between 2002 and 2003, with increases occurring on Eigg and Priest Island offset by decreases on An Glas Eilean and Canna; numbers at the latter site are now at their lowest since monitoring began. Elsewhere in the region, a large proportional increase of 51.1% was recorded on Mingulay where numbers had risen from 186 to 281 AON since the last comparable count in 1998. The long-term decline continues in **Shetland**, where numbers fell at all colonies monitored in 2002 and 2003, with numbers on Noss now at their lowest level since 1986. On Fair Isle, although 119 AON counted in study plots is the second lowest count on record, continuing the long-term decline recorded in these plots, whole colony counts have actually revealed increases since 1998 when the islands population reached its lowest level of 567 AON, followed by 663 in 2001 and 732 in 2003. The distribution of European shags around Fair Isle in the previous ten years shows slight expansion along most of the east and south coasts but has contracted substantially on the north and west coasts where three of the five study plots are located (Shaw *et al.* 2003).

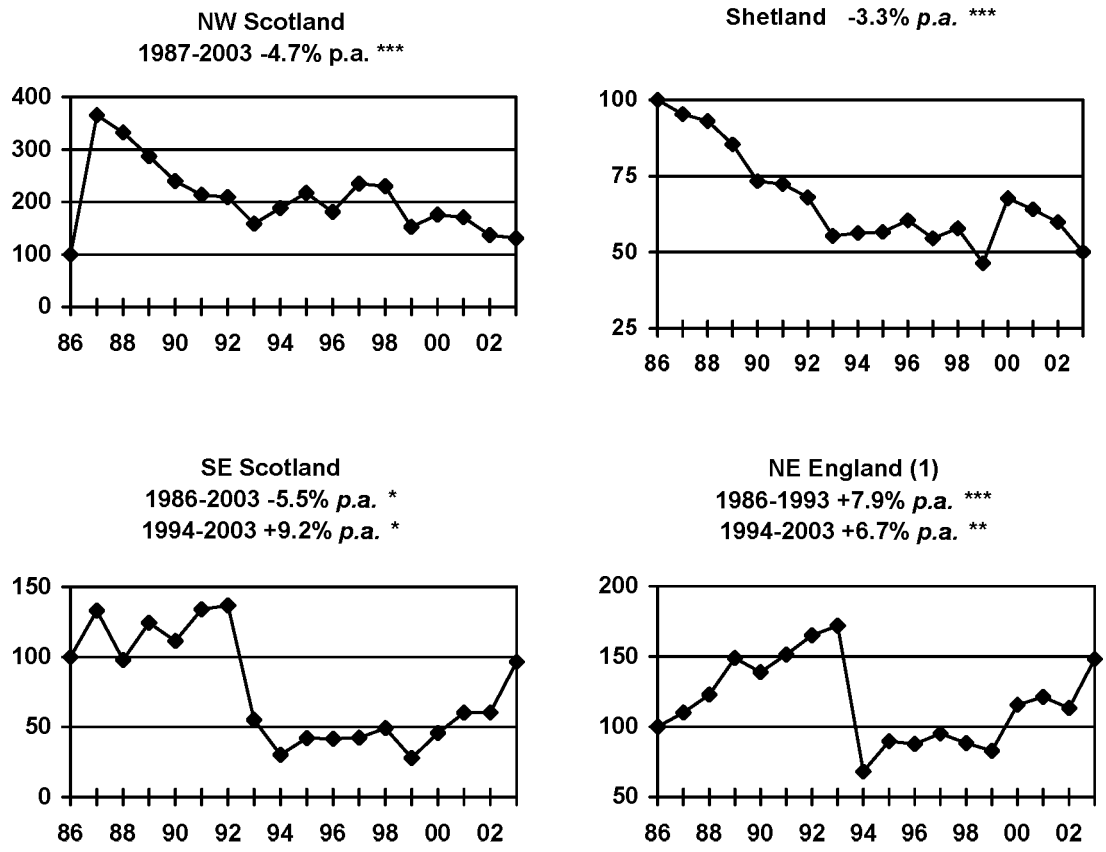

Figure 3.8.1 Population indices for breeding European shags, 1986-2003 (apparently occupied nests in late May or June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Trends are shown for the periods indicated. Three 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 many European shags on Canna not nesting in 1986. Statistical significance of trends indicated as: n.s. not significant, * P <0.05, ** P <0.01, *** P<0.001.

Table 3.8.2. Population changes of European shag 2002-2003 and 1986-2002 at selected colonies mentioned in the text. All counts refer to whole colony unless stated.

Region/Site	2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. of years
SW Scotland					
Lunga	286	325	+13.6	210 (78)	10
Mull of Galloway	54	25	-53.7	46 (13)	15
Eilean Buidhe	36	42	+16.7	32 (5)	9
Ruadh Sgeir	104	90	-13.5	92 (21)	9
Sanda	600	792	+32.0	569 (87)	10
Carraig an Daimh	9	15	+66.7	27 (17)	9
Colonsay (sample plots)	37	43	+16.2	40 (6)	10
NW Scotland					
Canna	638	603	-5.5	963 (290)	17
An Glas Eilean	40	32	-20.0	44 (39)	9
Eigg	46	63	+39.1	68 (16)	1
Priest Island	28	40	+42.9	20 (11)	2
Shetland					
Troswick to Virkie	170	115	-32.4	139 (21)	8
Sumburgh Head	249	216	-13.2	271 (111)	16
Noss	55	47	-14.5	78 (16)	17
Kettlaness	56	51	-8.9	35 (13)	5
Noness	130	117	-10.0	116 (19)	14
Fair Isle (sample plots)	135	119	-11.8	170 (41)	17
N Scotland					
North Sutor	374	359	-4.0	267 (59)	8
NE Scotland					
Portknockie	40	43	+7.5	12 (13)	12
SE Scotland					
Isle of May	676	968	+43.2	953 (531)	17
Inchkeith	104	139	+33.6	30 (27)	16
Inchmickery	52	70	+34.6	28 (10)	13
Fidra	186	254	+36.6	117 (59)	17
Craigleith	233	197	-15.4	328 (193)	16
The Lamb	102	124	+21.6	139 (107)	13
Bass Rock	25	24	-4.0	43 (33)	8
St Abb's Head	296	365	+23.3	283 (107)	17
NE England					
Farne Islands	1,282	1,678	+30.9	1,312 (346)	17
Wales					
Bardsey	71	52	-26.8	28 (17)	17
Ynysoedd Gwylan	133	89	-33.1	103 (34)	6
SW England					
St Aldhelm's – Durlston Head	48	52	+8.3	53 (8)	6

At North Sutor, the only colony monitored in **north Scotland,** there was little change between 2002 and 2003 (Swann 2003b). Few data were received from sizeable colonies in **Wales** and **south-west England** in 2003. The number on Bardsey decreased by 26.8% since 2002 with a similar proportional decrease of 33.1% noted at nearby Ynysoedd Gwylan, where numbers fell from 133 to 89 AON since 2001 (Stansfield 2003). Numbers increased slightly along the coast between St Aldhelm's and Durlston Head.

Breeding success (Tables 3.8.3 and 3.8.4)

For 13 colonies where detailed monitoring was undertaken in 2003, the mean breeding success of 1.34 (s.e. ±0.22) was close to the long-term mean of 1.31 (s.e. ±0.05) chicks per AON from between three

and 20 colonies sampled during 1986-2001, and also similar to the overall value recorded in 2002. However, a comparison of productivity between the 11 colonies sampled in both 2002 and 2003 revealed a significant decrease in breeding success of 0.25 (s.e. ±0.10).

In **Shetland**, overall productivity across three monitored colonies was significantly lower in 2003 than in 2002, with reduced productivity noted at all. Breeding numbers were lower than normal throughout the region and the season was noted as being later than usual at several sites. Success on Foula was the lowest on record, with broods noted as being small and chicks in poor condition, few of which regurgitated food on capture, suggesting they had been fed less than normal (Furness 2003). At Sumburgh Head, breeding success was lower than the average for the previous 15 years; 16% of nests with broods lost all chicks although this was not due to poor weather (Heubeck 2004). On Fair Isle, productivity was also below the mean for the last ten years (Shaw *et al.* 2003).

Table 3.8.3 European shag breeding success, grouped regionally 2002-2003: 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; * P<0.05.

Regions	2002 chicks fledged/nest				2003 chicks fledged/nest				2002-2003 change	
	Nests[n]	Range	Mean	±s.e.	Nests[n]	Range	Mean	±s.e.	Mean[n]	±s.e.
SW Scotland [a]	283[4]	0.48-2.50	1.50	±0.41	266[6]	0.46-2.19	1.56	±0.27	-0.10[3]	±0.04
NW Scotland [b]	138[3]	0.26-1.75	1.03	±0.43	66[2]	0.21-1.41	0.81	±0.40	-0.20[2]	±0.14
Shetland [c]	305[3]	0.66-1.98	1.39	±0.39	264[3]	0.14-1.33	0.83	±0.36	-0.59[3]	±0.04**
N Scotland [d]	88[1]	-	1.45	-	87[1]	-	1.09	-	-0.36[1]	-
SE Scotland [e]	211[2]	1.60-1.66	1.63	±0.03	255[2]	1.76-1.83	1.80	±0.04	+0.10[2]	±0.06
NE England [f]	316[1]	-	1.12	-	330[1]	-	0.42	-	-0.70[1]	-
Wales [g]	71[1]	-	2.63	-	141[2]	2.30-2.79	2.54	±0.24	+0.16[1]	-
Total	1,415[15]	0.26-2.63	**1.50**	±0.16	1,409[17]	0.14-2.79	**1.40**	±0.19	**-0.24[13]**	±0.08*
Detailed only	1,315[13]	0.26-2.63	**1.35**	±0.18	1,248[13]	0.14-2.79	**1.34**	±0.22	**-0.25[11]**	±0.10*

Colonies: [a] Ruadh Sgeir, Eilean Buidhe (2003 only), Carraig an Daimh (2003 only), Eilean Dubh (2002 only), Eilean na Cille, Eileanan Glasa (2003 only), Sanda; [b] Canna, Rum (2002 only), An Glas Eilean; [c] Sumburgh Head, Fair Isle, Foula; [d] North Sutor; [e] Isle of May, St Abb's Head; [f] Farne Islands; [g] Bardsey, Ynys Gwylan (2003 only).

In **south-west Scotland**, overall breeding success measured 1.56 chicks per AON with a slight decline measured over three colonies monitored in both 2002 and 2003 (Sanda, Ruadh Sgeir and Eilean na Cille) where productivity was also below the respective long-term means. At other colonies not monitored in 2002, breeding success was above average on Eilean Buidhe and Eileanan Glasa and measured 2.15 chicks per occupied nest at Carraig an Daimh where productivity was monitored for the first time. Overall, colonies in **north-west Scotland** were less productive than in 2002. Breeding success on Canna, where the success of European shags has been poor since 1999, was again low and well below the long-term average with most nests failing at the egg or chick stage. Once again, the reasons for the high failure rate appeared to be linked with high levels of predation, with rats being the main suspects. Most nests failed at the egg or small chick stage but it was noticeable that nests in more inaccessible locations survived and produced broods of 2 or 3 young, suggesting that food availability was not limiting breeding success in the colony (Swann 2003a). There was also further evidence of birds re-distributing within colonies, from under boulders to sites on narrow ledges on cliffs, where they could escape mammal predators. In one area, all traditional boulder nest sites had been abandoned and the birds had relocated to either the adjacent sea cliff or to the open areas at the top of the boulder slope at the base of the cliff (Swann 2003a). Birds nesting on An Glas Eilean faired better where, despite predation by large gulls, success was still above average although productivity had declined compared to 2002 (Craik 2003).

In **north Scotland**, productivity was below average at North Sutor having fallen from 1.45 chicks per AON in 2002 to 1.09 which was the lowest value recorded since 1997. Many nests failed early in the season, probably due to a food shortage and associated increased predation of nest contents by great black-backed gulls that were also finding it difficult to find food (Swann 2003b). On the Farne Islands **(north-east England)**, breeding success was low, measuring only 0.42 chicks per AON which is the lowest productivity recorded at the site during the SMP. The reasons behind the low success rate are unclear but could possibly be due to inexperience, as many birds had second attempts at nesting. Predation of nest contents by large gulls may have also been a factor (Walton 2003).

European shags were successful in some regions. Productivity improved on that of 2002 in **south-east Scotland** where values recorded at the Isle of May and St Abb's Head were the highest since monitoring began. At the former site, 37% of pairs raised three young with overall productivity continuing the upward trend observed since the closure of the nearby sandeel fishery on the Wee Bankie in 1999 (Wilson *et al.* 2003). Similarly, colonies in **Wales** were relatively successful too, with productivity on Bardsey and nearby Ynysoedd Gwylan also the highest to be recorded since monitoring began at both sites (Stansfield 2003).

Table 3.8.4. Breeding success (chicks fledged per occupied nest) of European shag 2002-2003 and 1986-2002 at selected colonies mentioned in the text. Figures in parentheses under 2001 and 2002 are the number of nests from which success estimate was derived.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
SW Scotland				
Sanda	1.60 (97)	1.50 (78)	1.95 (0.35)	2
Ruadh Sgeir	0.48 (104)	0.46 (90)	1.11 (0.16)	10
Eilean na Cille	1.41 (22)	1.24 (29)	1.86 (0.12)	10
Eilean Buidhe	-	2.19 (26)	2.04 (0.19)	9
Carraig an Daimh	-	2.15 (13)	-	-
Eileanan Glasa	-	1.83 (30)	1.80 (0.23)	6
NW Scotland				
Canna	0.26 (49)	0.21 (34)	1.22 (0.13)	17
An Glas Eilean	1.75 (40)	1.41 (32)	0.88 (0.22)	9
Shetland				
Sumburgh Head	1.61 (186)	1.13 (160)	1.23 (0.07)	15
Fair Isle	1.98 (53)	1.33 (61)	1.46 (0.06)	17
Foula	0.66 (55)	0.14 (43)	1.09 (0.18)	6
N Scotland				
North Sutor	1.45 (88)	1.09 (87)	1.53 (0.10)	11
SE Scotland				
Isle of May	1.66 (130)	1.83 (157)	0.92 (0.10)	17
St Abb's Head	1.60 (81)	1.76 (98)	1.32 (0.12)	13
NE England				
Farne Islands	1.12 (316)	0.42 (330)	1.04 (0.10)	14
Wales				
Bardsey	2.63 (71)	2.79 (52)	2.02 (0.10)	9
Ynysoedd Gwylan	-	2.30 (89)	1.72 (0.11)	4

3.9 Arctic skua *Stercorarius parasiticus*

Overall, the population of Arctic skuas at regularly monitored sites decreased in 2003 by almost 15% compared with 2002, to the lowest level since 1989. The decline was highest on Shetland where the population was well below the 10-year mean of 258.6 (s.e. ±11.7). On Orkney and Handa small to moderate decreases occurred compared with 2002. Many sites in Shetland reported their least productive year on record, caused by a severe lack of sandeels, worse than the food shortage reported in 2002. Conversely, breeding performance was highest at Papa Westray, Orkney, and food was apparently abundant on Handa.

Breeding numbers (Tables 3.9.1 and 3.9.2)

The long-term decline of the **Shetland** population continues. Numbers of apparently occupied territories (AOT) fell a further 21.4% from 2002 to an all-time low of around 151 AOT at six colonies. This represents just 42.7% of the peak count in 1992. Despite evidence of immigration of adults from other sites in Shetland, numbers of AOT on Fair Isle reached their lowest level since the 1950s (Shaw *et al.* 2003). Similarly, on Foula only about two thirds of the 2002 territories were occupied in 2003, but meaningful numbers were difficult to assess due to many adults visiting their territories only briefly (Furness 2003). Numbers of AOT at study sites on Noss and Fetlar remained at seven and nine, respectively, each around half their long term average. The only Shetland site not following the trend was Hermaness (Duffield 2003), where numbers increased from 7 AOT in 2002 to 10 in 2003, still the second lowest for 12 years.

Table 3.9.1 Regional population changes at monitored Arctic skua colonies, 2002-2003 (apparently occupied territories). Superscript = number of colonies counted in both years. Note that British totals are for the sample of monitored colonies in that year only and not the entire population.

Region	2002	2003	2002-2003 % change
Shetland	192	151	-21.4[6]
Orkney	129	122	-5.4[6]
NW Scotland	41	36	-12.2[1]
Britain	362	309	-14.6[13]

A moderate overall decrease was seen in **Orkney** in 2003, compared with 2002. The number at the largest site, North Hill (Papa Westray) continued to slowly recover from the low count of 52 in 2001, whereas the number at Birsay Moors on Mainland Orkney decreased by 10.9% since 2002 (Meek 2003). Elsewhere in Orkney, single pairs nested on North Ronaldsay (A. Duncan, pers. comm.) and Egilsay. Three AOT were reported from the study plot on Hoy (Meek 2003).

In **north-west Scotland**, a decline was observed on Handa, but numbers of AOT were still above the 17-year mean (31.2 AOT, s.d. ±6.3). Two study sites in Sutherland held three AOT, compared with four in 2002. One pair was present on St Kilda, with a second one prospecting. Numbers halved at Coll (**south-west Scotland**), from 20 in 1998 (J. Bowler, pers. comm.).

Table 3.9.2 Population (apparently occupied territories) changes of Arctic skua 2002–2003 and 1986-2002 at selected sites referred to in the text.

Region/site	2002	2003	2002-2003 % change	1986-2002	
				Mean (±s.d.)	No. of years
Shetland					
Hermaness	7	10	+42.9	13 (3)	11
Fetlar	9	9	0.0	19 (4)	13
Noss	7	7	0.0	14 (4)	17
Mousa	8	5	-37.5	18 (5)	13
Fair Isle	60	55	-8.3	88 (17)	16
Foula	101	*c.*65	-35.6	123 (16)	14
Orkney					
North Hill	65	68	+4.6	120 (34)	14
NW Scotland					
Handa	41	36	-12.2	31 (6)	17

Breeding success (Tables 3.9.3 and 3.9.4)

The lack of sandeels, which affected most of **Shetland's** Arctic skuas in 2002, intensified in 2003, resulting in a similarly unproductive year as 1990, when five sites produced fewer than 0.03 chicks per pair. The food shortage affected all areas of Shetland and only seven chicks fledged from monitored colonies in the region. On Foula egg-laying started exceptionally late in 2003 and the mean clutch size of 1.33 eggs per pair was very low. Many adults abandoned their eggs and only 2-3 chicks hatched, surviving just a few days (Furness 2003). Arctic skuas on Fair Isle were similarly unproductive. In addition to the lack of food, predation from great skuas was intense (Shaw *et al.* 2003). On Mousa breeding attempts of five pairs of Arctic skuas were abandoned early (H. Moncrieff, pers. comm.), and on Noss all nests failed due to losses before hatching (Marshall and Thomas 2003). Two chicks fledged on Hermaness but one was killed shortly afterwards by great skuas (Duffield 2003). At the three Fetlar study sites nine pairs reared no chicks and casual observations from the rest of Fetlar suggest that no chicks fledged on the entire island (French and Smith 2003).

At North Hill (**Orkney**), 10 randomly selected AOT produced 1.2 chicks per pair, perhaps indicating a much greater food supply than for Shetland breeders. No breeding data were collected at Birsay Moors, but on Hoy one chick fledged from three AOT. The single pair on Egilsay failed to raise any young.

In contrast to Shetland, food availability on Handa Island (**north-west Scotland**), appeared to be high throughout the season, resulting in a productivity of 1.11 chicks per pair (n=35). However, post-fledging mortality was high due to predation by great skuas, with 50 to 60% of young being killed within a week of fledging (Jones 2003). A single chick was seen on St Kilda, but it is unknown if it survived until fledging (R. Evans, pers. comm.).

Table 3.9.3 Arctic skua breeding success grouped regionally, 2002–2003: estimated number of chicks fledged per apparently occupied territory (AOT) at sample colonies (superscript 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 apparently occupied territories across all colonies. Note that the same colonies have not necessarily been monitored in each region each year and that the number of pairs given here are sample sizes (and do not necessarily indicate population changes between years).

Region	2002 chicks fledged/pair			2003 chicks fledged/pair		
	AOT^n	Range	Overall	AOT^n	Range	Overall
Shetland	192^6	0.07-0.57	0.18	151^6	0.0-0.2	0.03
Orkney	65^1	-	0.74	68^1	-	1.11

Table 3.9.4. Breeding success (chicks fledged per apparently occupied territory) of arctic skua 2002–2003 and 1986-2002 at selected sites referred to in the text.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
Shetland				
Hermaness	0.57	0.2	0.60 (0.11)	12
Fetlar	0.22	0.0	0.47 (0.13)	16
Noss	0.29	0.0	0.47 (0.08)	17
Mousa	0.25	0.0	0.54 (0.14)	13
Fair Isle	0.28	0.09	0.62 (0.10)	15
Foula	0.07	0.0	0.61 (0.13)	12
Orkney				
North Hill	0.74	1.11	0.64 (0.10)	14

3.10 Great skua *Stercorarius skua*

Between 2002 and 2003, numbers of apparently occupied territories (AOT) at regularly monitored study sites decreased by 5%. However, intra-regional variation was noticeable for both breeding numbers and breeding success. The large Handa population declined by 14.7%, whereas numbers remained generally stable on Shetland and increased on Orkney. Poor food supply depressed breeding success at the main Shetland sites of Foula and Fair Isle, while productivity was above average in Orkney.

Breeding numbers (Tables 3.10.1 and 3.10.2)

In **Shetland,** overall numbers remained very similar to those in 2002. Small decreases (between 2.8 and 6.1%) occurred at study sites on Mousa, Noss, Hermaness (Unst) and Fetlar, compared with 2002; only Noss and Fetlar remained above their long-term mean of 50.7 AOT (s.e. ±1.7) and 59.8 AOT (s.e. ±2.7), respectively. In contrast, the whole island census of Fair Isle revealed the second highest number of AOT since recording began in 1987 (Shaw *et al.* 2003).

The North Hill colony on Papa Westray (**Orkney**), reached its highest level since 1996 and an increase of four AOT was recorded at Birsay Moor (Meek 2003). At a study site on Hoy, numbers fell from 65 AOT in 2000 to 51 in 2003 (no data were available for 2001-2002).

Table 3.10.1 Regional population changes at monitored great skua colonies, 2002–2003 (apparently occupied territories). Superscript = number of colonies counted in both years.

Region	2002	2003	2002-2003 % change
Shetland	315	318	+0.95[5]
Orkney	36	44	+22.2[2]

In **north-west Scotland,** the annual transect survey of Handa found 224 AOT in 2003 compared to 245 in 2002, an apparent decline of 8.6%. However, subsequent thorough locating and marking of nests revealed a total of 209 AON, indicating that the transect survey had over estimated the number by 7% in 2003 (Jones 2003). On Canna, three pairs were noted in 2003 (one in 2002, when breeding was recorded for the first time) and on Priest Island the number of AOT doubled to six. Three pairs were observed on the Treshnish Isles in 2003 (**south-west Scotland**), one more than in 2002.

Table 3.10.2 Population (apparently occupied territories) changes of great skuas 2002–2003 and 1986-2002 at selected sites referred to in the text (- indicates no data available).

Region/Site	2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	No. of years
Shetland					
Hermaness	36	35	-2.8	44.4 (16.6)	14
Fetlar	66	62	-6.1	59.8 (7.6)	8
Noss	58	55	-5.2	50.7 (12.4)	15
Mousa	22	21	-4.5	15.1 (5.3)	9
Fair Isle	133	145	+9.0	107 (28.4)	16
Orkney					
North Hill	10	14	+40.0	10.0 (1.6)	7
NW Scotland					
Handa	245	224	-8.6	-	-

Breeding success (Tables 3.10.3 and 3.10.4)

In **Shetland,** there was marked inter-colony variation in productivity in 2003. On Fair Isle it was the lowest on record. Although the vast majority of pairs on Fair Isle laid eggs - in contrast to the 2002 season - only seven chicks fledged from 145 AOT (Shaw *et al.* 2003). Foula saw its lowest productivity in 13 recorded years. Birds had difficulties in finding food during May and June, and lost many eggs and small chicks. Great skuas fed very little on sandeels and in July chicks were fed almost entirely on fishery discards and herring (Furness 2003). Productivity was slightly higher on Fetlar, but here, too, was the lowest since recording began in 1995 and less than half the long term mean of 0.91 chicks per AOT (French and Smith 2003). On Hermaness, productivity was 0.69 chicks per AOT - one of the lowest values on record. Many medium/large size chicks throughout the reserve were killed and eaten by other great skuas (Duffield 2003). The only report of above average breeding success in 2003 came from Noss, where it was the highest for four years (Marshall and Thomas 2003).

In **Orkney**, breeding success at the North Hill colony on Papa Westray, was above the mean of 0.68 (s.e. ±0.09) fledged chicks per pair. Although systematic data were not collected at a study site on Hoy, there seemed to be more nest failures in 2003 compared with 2000 (Meek 2003). The single pair at North Ronaldsay failed during incubation.

Two pairs on the Treshnish Isles (**south-west Scotland**), each reared a single chick (Ward 2003).

Table 3.10.3 Great skua breeding success, grouped regionally 2002–2003: estimated number of chicks fledged per apparently occupied territory at sample colonies (superscript 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 number of pairs given here are sample sizes (and do not necessarily indicate population changes between years). (- indicates no data were available).

Region	2002 chicks fledged/AOT			2003 chicks fledged/AOT		
	Pairs^n	Range	Overall	Pairs^n	Range	Overall
Shetland	451^6	0.16-1.14	0.46	417^5	0.05-0.69	0.25
Orkney	10^1		1.1	10^1		0.8

Table 3.10.4 Breeding success (chicks fledged per apparently occupied territory) of great skuas 2002–2003 and 1986-2002 at selected sites referred to in the text.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
Shetland				
Hermaness	0.92	0.69	0.86 (0.06)	15
Fetlar	1.14	0.4	0.91 (0.10)	8
Noss	0.45	0.67	0.53 (0.07)	15
Mousa	0.68	-	0.78 (0.07)	9
Fair Isle	0.16	0.05	0.78 (0.07)	14
Foula	0.63	0.1-0.2	0.64 (0.09)	14
Orkney				
North Hill	1.1	0.86	0.68 (0.09)	7

3.11 Mediterranean gull *Larus melanocephalus*

Breeding numbers and breeding success

Mediterranean gull was an extreme rarity in Britain as recently as the 1930s but 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 with birds nesting annually from 1979 in increasing numbers, a trend mirrored in other countries in central and Western Europe (Donald and Bekhuis 1993). The breeding population in the United Kingdom now probably numbers about 110 pairs, with a further three pairs in the Republic of Ireland (Mitchell *et al.* 2004). However, it is difficult to interpret apparent year-to-year changes in breeding numbers of this still scarce species. This is in part due to the habit of birds moving between sites and in part due to the possibility that colonies have been missed or under- reported.

In **south-east England**, by far the stronghold of the species' in Britain and Ireland, 73-76 pairs were reported nesting in 2003 compared with 50 in 2002. This increase is due partly to an incomplete count at one of the larger colonies in 2002 and partly to a high proportion of non-breeding birds at a second. Productivity at the largest colony in the region was a minimum of 18 chicks fledged from 33 pairs, a mean of 0.55 chicks per pair, compared with 0.48 in 2001 and 0.58 in 2002. Again, success was thought to be low because birds had trouble finding terrestrial invertebrates during warm and dry weather in June and July. At a second site, a minimum of 22 young fledged from 22-25 pairs. At another established colony, that has held between one and five nesting pairs each year since 1994, gulls abandoned early in the season due to unknown factors.

Two pairs were reported breeding in **eastern England** in 2003, where five pairs bred in 2001 although none were reported in 2002. One pair definitely laid eggs, which were depredated before hatching. In **north-west England** in 2003, five pairs were reported at a site from which no previous breeding records had been supplied, although surveys there had not taken place for a number of years.

In **north-east Ireland**, after the first successful nesting of two pairs in 2002 (the species having initially attempted in 1995), three pairs bred at separate sites in 2003, one of which fledged a minimum of two young. No data were received from **south-east** or **north-west Ireland**, where a total of four pairs bred in 2002.

3.12 Black-headed gull *Larus ridibundus*

More than most gull species, black-headed gulls readily move their breeding sites between years; hence, changes in numbers at sample colonies are not necessarily representative of broader regional trends. Between 2002 and 2003, numbers declined in northern and southern regions of the UK, with increases in regions lying between these broadly defined areas. However, large declines were evident at two colonies not monitored annually but also lying in this central belt. Low productivity continues to be prevalent at many sites.

Breeding numbers and breeding success (Tables 3.12.1, 3.12.2 and 3.12.3)

In **south-west Scotland**, overall numbers at monitored colonies declined between 2002 and 2003. In the Mink-Seabird Project study area (between Mallaig and Tarbert on the Kintyre peninsula), a decrease of 39.6% was noted at the largest colony on Eilean Inshaig (Loch Craignish). Overall breeding success was low in 2003: seven sites holding 133 pairs fledged 0.42 chicks per pair compared with 0.71 chicks fledged from 162 pairs at eight sites in 2002 (Craik 2003). Compared with sites with no mink control (0.34 chicks per nest), sites where mink were controlled were more productive, raising 0.53 chicks per nest. That a greater difference between the two groups was not obvious (*cf* respective breeding success of 0.51 and 1.22 in 2002) was due to peregrine falcons *Falco peregrimus* depredating chicks at a mink controlled site that significantly reduced productivity there. Removing this site from the analysis would raise overall productivity at mink controlled sites to 0.79 chicks fledged per nest.

Table 3.12.1 Regional population changes at monitored black-headed gull colonies, 2002-2003. Figures are breeding pairs, apparently incubating adults or apparently occupied nests in May-June. Regional samples of less than 100 pairs are excluded.

Region	2002	2003	2002-2003 % change
SW Scotland [a]	160	126	-21.2
NE Scotland [b]	1,516	401	-73.6
NE England [c]	2,127	2,488	+17.0
E England [d]	1,070	1,179	+10.2
SE England [e]	10,361	5,629	-44.5
SW England [f]	128	107	-16.4
NE Ireland [g]	2,820	3,309	+17.3

Colonies: [a] Eilean Inshaig, Sgeir na Caillich, Eilean an Ruisg, Airds Islet, Linne Mhuirich islet, Black Rock (Crinan); [b] Sands of Forvie; [c] Farnes, Coquet Island; [d] Blakeney Point, Minsmere, Havergate; [e] Rye Harbour, Dungeness, Chichester, Langstone Harbour; [f] Brownsea Island; [g] Strangford Lough, Big Copeland Island.

In **Shetland**, only 3 pairs nested in the RSPB reserve on Fetlar (24 pairs in 2002) and breeding performance was again poor; no young fledged for the third year out of four (French and Smith 2003). On Mainland, colonies in the Tingwall Valley failed for the fourth year in succession (Okill 2003b). It was a more successful season on **Orkney**. On Egilsay, where no young were raised from 115 nests in 2002, breeding success improved, with 35 nests raising 26 chicks, a productivity of 0.74. At Mill Dam, Shapinsay, over 200 young fledged from 516 nests; numbers have increased at this site since 1998 when 462 pairs nested. Elsewhere, 168 pairs nested at Loch of Banks/The Loons and 113 pairs nested on Birsay Moors; however, no colony materialised at Lowrie's Water. In **north Scotland**, a decline of 73.5% was noted at the Sands of Forvie.

In **north-east England**, overall numbers increased by 17% between 2002 and 2003, with increases of 11.1% on Coquet and 163.4% at the smaller colony on the Farne Islands. Breeding success was lower than in 2002 and below average at both sites. In **east England**, data indicate a rise of 10.2% at those

colonies covered in 2002 and 2003. The fortunes of individual colonies varied, with increases noted at Blakeney Point and Havergate but a decrease at Minsmere. Numbers also appear to be increasing at Scolt Head, where 2,700 pairs were estimated to be nesting, compared with 2,000 pairs in 2001. However, not all colonies in this region are increasing, as at Old Hall Marshes numbers have fallen by 93.7%, from 1,786 pairs in 1997 to 112 pairs in 2003. No data were received from the large colony at Stiffkey Marshes. Productivity was low at Blakeney and Havergate but relatively high at Scolt Head, although few comparison years are available for any of these sites.

Table 3.12.2 Population change of black-headed gull 2002-2003 and 1986-2002 at selected colonies mentioned in the text. Figures are breeding pairs, apparently incubating adults or apparently occupied nests in May-June.

Region/Site	2002	2003	% change 2002-2003	1986-2002 Mean (±s.d.)	1986-2002 No. of years
SW Scotland					
Eilean Inshaig	111	67	-39.6	126 (103)	13
Shetland					
Fetlar	24	3	-87.5	33 (31)	7
N Scotland					
Sands of Forvie	1,516	401	-73.5	378 (410)	14
NE England					
Coquet Island	2,045	2,272	+11.1	2,985 (983)	15
Farne Islands	82	216	+163.4	107 (65)	16
E England					
Minsmere	571	183	-68.0	334 (228)	3
Blakeney Point	310	750	+141.9	170 (198)	2
Havergate	189	246	+30.2	376 (523)	5
SE England					
Rye Harbour	700	800	+14.3	396.4 (333)	13
Dungeness	60	70	+16.7	484 (383)	9
North Solent NNR	6,524	<120	-98.2		
Chichester Harbour	171	160	-6.4	1,104 (566)	11
Langstone Harbour	2,906	4,479	+54.1	1,007 (1,268)	14
SW England					
Brownsea Island	128	107	-16.4	117 (67)	8
NW England					
Rockliffe Marsh	70	12	-82.8	640 (339)	5
NE Ireland					
Strangford Lough	2,448	3,409	+39.3	4,364 (1,490)	17
Big Copeland Island	372	260	-30.1	230 (143)	5

A large decline was noted in **south-east England**, where numbers almost halved between 2002 and 2003. This was mainly due to a huge decline at North Solent, where few gulls were present in early April and only 120 pairs nested, compared with 6,524 pairs in 2002 (B. Lord, pers. comm.); the previous lowest count at this colony during the SMP was 2,230 pairs in 1998. Disturbance by a pair of peregrine falcons which took up residence in the colony was thought to be part of, but not the whole, problem. Some gulls displaced from North Solent may have subsequently nested at Langstone Harbour where an increase of 54.1% was recorded compared with 2002. Of the smaller colonies in the region, increases were noted at Rye harbour and Dungeness and a slight decrease was seen at Chichester Harbour. Breeding success was low at all colonies except Rye Harbour, where plenty of food was available inshore, although birds at Chichester and Langstone were more successful than in 2002. Flooding during spring tides, lack of food and fox predation were all factors contributing to the low productivity.

Table 3.12.3 Breeding success (chicks fledged per pair) of black-headed gull 2002-2003 and 1986-2002 at selected colonies mentioned in the text. Figures in parentheses under 2001 and 2002 are the number of nests from which the success estimates were derived.

Region/Site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
Shetland				
Fetlar	0.00 (24)	0.00 (3)	0.32 (0.13)	7
Orkney				
Egilsay	0.00 (115)	0.74 (35)	0.19 (0.12)	3
NE England				
Coquet Island	1.40 (2,045)	1.18 (2,272)	1.34 (0.10)	8
Farne Islands	0.70 (82)	0.45 (20)	0.99 (0.27)	6
E England				
Blakeney Point	0.10 (310)	0.20 (750)	0.10 (-)	1
Scolt Head	-	1.02 (2,700)	-	-
Havergate	0.26 (189)	0.24 (246)	0.26 (-)	1
SE England				
Rye Harbour	*c.*1.07 (*c.*700)	*c.*1.06 (800)	0.72 (0.21)	9
Chichester	0.02 (171)	0.30 (160)	0.29 (0.17)	5
Langstone Harbour	0.12 (2,906)	0.28 (4,479)	0.62 (0.14)	9
SW England				
Brownsea Island	0.23 (128)	0.70 (107)	0.23 (0.00)	2
NW England				
Rockcliffe Marsh	0.04 (70)	0.08 (12)	0.06 (0.02)	2

A decrease was also recorded in **south-west England**, where the number at Brownsea Island fell by 16.4%, although breeding success there was good compared with that in 2001 and 2002. Survey work at the Ribble Estuary **(north-west England)** recorded 8,460 pairs, an apparent decrease of 43.0% since the previous count in 1999, although some nests were lost to flooding before the 2003 count (J.D. Fletcher, pers.comm.). Numbers and breeding success at Rockcliffe Marsh were both lower than in 2002.

Data from **north-east Ireland** indicated an increase of 17.3% since 2002, mostly due to the 39.3% increase at the large Strangford Lough colony, a similar proportional decrease at the smaller colony on Big Copeland Island having little overall effect. At Larne Lough, a count of 1,246 pairs in 2003 represented a less than one percent change from 1,257 pairs in 2001.

3.13 Mew gull *Larus canus*

Breeding numbers and breeding success (Tables 3.13.1, 3.13.2 and 3.13.3)

In the Mink-Seabird Project study area (Mallaig to Tarbert on the Kintyre peninsula), spread over **north-west** and **south-west Scotland,** 58 sites held 1,260 pairs. Accurate counts undertaken at a suite of 18 colonies since 1994 revealed a 19.7% decrease between 2002 and 2003. This continues the decline recorded since 2000, although numbers have fluctuated since detailed monitoring began, initially declining up to 1996 then increasing between 1996 and 2000. Mink control efforts again enhanced breeding success in this study area. At 18 colonies where mink were successfully controlled 652 pairs fledged 383 chicks (0.59 per pair). This contrasted with 36 colonies with no (or unsuccessful) mink control which fledged *c.*220 chicks from 584 pairs, an average of only 0.38 chicks per pair, suggesting that mink reduced productivity by 36% at unprotected colonies (Craik 2003). Between 1996 and 2002, the average apparent reduction in productivity of mew gull due to mink predation was 58% (s.d. ±11%).

Table 3.13.1 Number of mew gull pairs in study colonies on the west coast of Scotland 1994-2003. Figures are sums of counts of pairs at 18 colonies in Argyll and Bute and southern Lochaber.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2002-2003 % change
No. of Pairs	926	850	719	732	876	883	943	870	861	790	-19.7

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

Data from other colonies in western Scotland, outwith the area covered by the Mink-Seabird project, revealed that numbers increased on Eigg, Sanda and on Handa between 2002 and 2003; counts reached maxima at each colony in 2003, as they did in 2002. On Canna, the small population declined further, with the number falling for the fifth consecutive year, to 5 pairs (Swann 2003a).

Table 3.13.2 Population changes of mew gull 2002-2003 and 1986-2002 at selected sites referred to in the text. Figures are apparently occupied nests.

Region/sites	2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. years
SW Scotland					
Sanda	76	82	+7.9	47 (12)	10
NW Scotland					
Handa	18	31	+72.2	12 (3)	16
Canna	8	5	-37.5	14 (3)	17
Eigg	72	74	+2.8	62 (8)	16
Shetland					
Hildasay	16	34	+112.5	14 (3)	3
Fair Isle	9	5	-37.5	8 (2)	17
Orkney					
North Hill	47	35	-25.5	50 (24)	3
N Scotland					
Nigg	142	81	-43.0	57 (48)	13
Alness Point	80	30	-62.5	89 (10)	7
E England					
Orford Ness	4	10	+150.0	10 (10)	12
Blakeney Point	4	3	-25.0	5 (1)	2
SE England					
Dungeness	12	11	-8.3	11 (1)	6
NE Ireland					
Strangford Lough	28	133	+375.0	83 (37)	16
Big Copeland	179	297	+65.9	122 (38)	4

In **Shetland**, visits to colonies to ring chicks indicated that it had been a poor breeding season with low numbers recorded and few chicks fledging at Sandy Loch, Sullom Voe and on Whalsay. As normal in recent years, many colonies in the Tingwall Valley failed. The number of pairs nesting at Hildasay increased but again few young fledged (Okill 2003b). Five pairs nested on Fair Isle, the fewest since 1997, and productivity was low again with only one chick fledging (Shaw *et al.* 2003).

In **Orkney**, the number decreased at North Hill, Papa Westray by 25.5% since 2002. On the Mainland, there was also evidence of a decline at Loch of Banks/The Loons, where 406 AON were

recorded in 2000 compared with 310 in 2003, although over the same period the number at Hobbister more than doubled, from 28 to 58 AON. Breeding success data were available only from Hoy, where1.12 chicks fledged from 17 pairs at Lodge Road and *c.*95 fledged young were noted at two sub-colonies at Whaness which contained 170 adults (*c.*1.12 chicks per pair) (Meek 2003). No previous productivity data are available for either colony.

Table 3.13.3 Breeding success (chicks per pair) of mew gulls 2002-2003 and 1986-2002 at selected colonies mentioned in the text. Figures in parentheses under 2001 and 2002 are the number of nests from which the estimates of success are derived.

Region/sites	2002	2003	1986-2002	
			Mean (±s.e.)	No. years
Shetland				
Fair Isle	0.00 (9)	0.20 (5)	0.52 (0.10)	14
Orkney				
Lodge Road	-	1.12	-	1
Whaness	-	*c.*1.12	-	1
N Scotland				
Nigg	1.39 (67)	0.85 (47)	1.08 (0.10)	7
Alness Point	0.00 (80)	0.00 (30)	0.60 (0.21)	7
SE England				
Dungeness	0.25 (12)	0.27 (11)	0.26 (0.09)	5

The colony at Nigg **(north Scotland)** has generally been increasing since its establishment in 1990, but between 2002 and 2003 numbers decreased by 43.0% to 81 pairs, the lowest figure recorded here since 1998. Breeding success was also below the long-term average (Swann 2003b). Elsewhere in the region, numbers declined at Alness Point, to 30 pairs, and accidental human disturbance again ensured no young were raised for the third successive year (A. Ramsey, pers. comm.).

Few mew gulls nest in England. Data were received from the small colonies at Orford Ness and Blakeney Point **(east England)**, where a notable increase was recorded at the former site, and Dungeness **(south-east England)** where numbers and breeding success were similar to 2002. In **north-east Ireland**, large increases were noted at two colonies between 2002 and 2003. At Strangford Lough, the population has now returned to levels recorded in 1999 (138 pairs) after decreases noted in 2000 (82 pairs) and 2002 (no count in 2001) while numbers have never been higher on Big Copeland Island.

3.14 Lesser black-backed gull *Larus fuscus*

Declines in the number of breeding lesser black-backed gulls occurred between 2002 and 2003 in Wales, north-west England and in south-west Scotland, while numbers in south-east Scotland increased (although the regional sample there was incomplete). Predation by mink continues to depress productivity in south-west Scotland.

Breeding numbers and breeding success (Tables 3.14.1, 3.14.2 and 3.14.3)

In **south-west Scotland**, numbers declined by 35% between 2002 and 2003. In the Mink-Seabird Project study area (Mallaig to Tarbert on the Kintyre peninsula), 19 sites held 511 pairs (17 sites held 816 pairs in 2002) which fledged 252 chicks, equal to 0.49 chicks per pair (productivity was estimated at 0.47 chicks fledged per pair from 612 pairs at 10 sites in 2002). Mink were active at seven of the 19 sites, comprising 175 pairs, from which only 28 chicks fledged (0.16 chicks fledged per pair) (Craik 2003). Elsewhere in the region, numbers were stable on Sanda, at 60 pairs. Between 2002 and 2003, numbers on Canna **(north-west Scotland)** decreased by 26.2% to 31 AON, the lowest count there since 1993. On Eigg, a small increase was noted since 2002 although the population there has

remained between 35-45 AON since 1998. A small number continues to nest at Nigg Oil Terminal **(north Scotland)** where six pairs were again present in 2003.

In **Shetland**, no birds were found on territory on Hildasay in early July, a colony which formerly held 50+ pairs as recently as 1998 (Okill 2003b). Elsewhere in the region, a survey of roof-nesting gulls in Lerwick found one pair, the first occurrence of this habit in the region (Okill 2003c) and the small colony on Mousa increased from three pairs in 2002 to 10 pairs. In **Orkney**, a 22.0% increase was recorded overall, although only two colonies were surveyed. A decrease at North Hill, Papa Westray was offset by a larger increase at Hobbister.

In **south-east Scotland**, the regional total increased by 24.1% to 1,707 pairs between 2002 and 2003 although the substantial colonies on Craigleith, Inchkeith and Inchcolm were not counted. However, in years when all colonies have been counted a decline is evident over the longer-term, as reported between 1994 and 2002 (Mavor *et al.* 2003). Most colonies increased since 2002, especially on Fidra, where numbers almost quadrupled, with smaller increases on Inchmickery and Inchgarvie. In contrast, on The Lamb numbers fell from 88 pairs in 1999 to zero in 2003. Breeding success on the Isle of May was low compared with recent years, with 0.53 chicks fledging per nest, the lowest productivity recorded in the period 2000-2003.

In **Wales**, the regional total decreased by 24.0% between 2002 and 2003, in part due to the similar proportional decreases noted at the largest reporting colonies on Skomer and nearby Skokholm; at both islands the population is the lowest recorded during the course of the SMP. During monitoring in the last week of May, the proportion of empty nests on Skomer was the highest recorded since 1996 (Brown and Wilberforce 2003). This was possibly due to late nesting as the sample plot counted last had the lowest percentage of empty nests. At three smaller colonies, on Bardsey, Caldey and South Stack, numbers increased since 2002 and, in contrast to Skomer and Skokholm, numbers are at, or near to, the peak for each site. Near to South Stack, numbers appear to have declined on The Skerries, falling by 37% from 747 pairs in 2000 to 472 pairs in 2003. In general, breeding success was again low at all colonies although it was above average on Bardsey and Skomer.

Table 3.14.1 Regional population changes at monitored lesser black-backed gull colonies, 2002-2003. Figures are breeding pairs, apparently incubating adults or apparently occupied nests in May-June. Regional samples < 100 pairs are excluded.

Region/site	2002	2003	2002-2003 % change
SW Scotland [a]	875	567	-35.2
Orkney [b]	109	135	+22.0
SE Scotland [c]	1,376	1,707	+24.1
Wales [d]	18,942	14,404	-24.0
NW England [e]	16,716	13,686	-18.1
NE Ireland [f]	447	450	+0.7

Colonies: [a] Tarbet Island, Reisa Mhic Phaidean, Eilean Dubh Mor, Eilean Gamhna, Eilean Mor, Eilean na Cille and islets, Eilean Eoghainn, Sgat Beag, Eilean a Bhuic, Glas Eilean, Eilean Aoghainn, Burnt Isles, Lunga, Sanda; [b] North Hill, Hobbister; [c] Isle of May, Inchgarvie, Haystack, Carr Craig, The Lamb, Inchmickery, Fidra; [d] Caldey, Stackpole, Skomer, Skokholm, Bardsey, South Stack, Elegug Stacks and nearby coast; [e] South Walney; [f] Lighthouse Island, Big Copeland Island, Strangford Lough, Isle of Muck.

At Orford Ness **(east England)**, a small decrease in the breeding number was found between 2002 and 2003, to *c.*6,000 pairs; it had been anticipated that resumption of fox control would increase numbers in 2003. Elsewhere in the region, numbers increased at Terrington Outer Trial Bank by 70.8% to 2,179 pairs between 2001 and 2003, with a smaller decrease of 14% noted at Havergate (290 pairs down to 249) over the same period. The ten pairs that nested at Dungeness **(south-east England)** was the highest figure there since 1996.

Table 3.14.2 Population changes of lesser black-backed gull 2002-2003 and 1986-2002 at selected colonies referred to in the text. Figures are breeding pairs, apparently incubating adults or apparently occupied nests in May-June.

Region/site	2002	2003	2002-2003	1986-2002	
			% change	Mean (±s.d.)	No. years
SW Scotland					
Sanda	60	60	0.00	85 (30)	10
NW Scotland					
Eigg	37	40	+8.1	37 (12)	16
Canna	42	31	-26.2	38 (5)	17
Orkney					
North Hill	25	11	-56.0	22 (8)	3
Hobbister	84	124	+47.6	84 (-)	1
N Scotland					
Nigg	6	6	0.00	4 (1)	4
SE Scotland					
Isle of May	1,198	1,253	+4.5	1,107 (416)	17
Inchgarvie	11	14	+27.3	17 (23)	10
Inchmickery	86	135	+57.0	150 (70)	6
Fidra	79	300	+279.8	329 (236)	10
E England					
Orford Ness	6,500	6,000	-7.7	13,253 (9,197)	5
SE England					
Dungeness	3	10	+233.3	6 (4)	6
Wales					
Skomer	15,185	11,064	-27.1	14,576 (2,446)	17
Skokholm	2,460	1,866	-24.1	3,168 (653)	17
South Stack	125	186	+48.8	58 (56)	13
Bardsey	612	652	+6.5	358 (152)	17
Caldey	507	594	+17.2	336 (202)	16
NE Ireland					
Big Copeland Island	180	200	+11.1	263 (72)	3
Old Lighthouse Island	190	190	0.00	208 (46)	8
Strangford Lough	66	50	-24.2	105 (66)	17
Isle of Muck	11	10	-9.1	15 (13)	3

Table 3.14.3 Breeding success (chicks fledged per pair) of lesser black-backed gull 2002-2003 and 1986-2002 at selected colonies mentioned in the text. Figures in parentheses under 2002 and 2003 are the number of nests from which the estimates of success are derived.

Region/Site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
SE Scotland				
Isle of May	1.30 (148)	0.53 (351)	0.89 (0.08)	14
Wales				
Skokholm	0.04 (2,460)	0.15 (1,866)	0.18 (0.02)	9
Skomer	0.14 (15,185)	0.41 (11,064)	0.24 (0.05)	14
Bardsey	0.99 (612)	0.92 (652)	0.65 (0.09)	7

Regionally, numbers were stable in **north-east Ireland** between 2002 and 2003. No change was noted at Old Lighthouse Island but an 11.1% increase was recorded at nearby Big Copeland Island. At Strangford Lough the long-term decline continued and numbers fell for the sixth successive year. Little change was noted on the Isle of Muck.

The following refers to combined counts of lesser black-backed and herring gulls made at mixed colonies of these two species. The annual census of the large inland colony at Tarnbrook Fell (**north-west England**) found an estimated 7,531 nests with eggs, 37.7% fewer nests than the 12,088 recorded in 2002. However, despite a relatively warm and dry spring the breeding season was noted as being late in 2003, with many gulls not building nests until after the start of survey work, which probably resulted in a lower than normal estimate of the population (Sowter 2003). Other nearby colonies also reported large declines in numbers perhaps suggesting widespread late nesting, or non-breeding by adults, in this region. At Rockcliffe Marsh, an estimated 2,250 pairs of gull were present (*c.*10,000 pairs in 2002) fewer than half of which attempted to breed, subsequently fledging a maximum of 120 young (M. Carrier, pers. comm.). On South Walney, the number fell by 30.9% between 2002 and 2003, from 25,074 to 17,317 pairs. The ratio of herring to lesser black-backed gulls was estimated at 1:3 (M. Venters, pers. comm.). At the Ribble Estuary, monitoring revealed the number breeding had fallen by 18.3% to 3,986 pairs since 1998; a sample indicated the species composition was approximately 16% herring gulls and 84% lesser black-backed gulls (D. Fletcher, pers. comm.). In **north-east England**, no accurate count was carried out on the Farne Islands, but the population was estimated at fewer than 1,000 pairs (1,057 in 2002) (Walton 2003). Nearby Coquet held 89 pairs, a decrease of 36.5% since 2002 (P. Morrison, pers. comm.).

3.15 Herring gull *Larus argentatus*

Breeding numbers of herring gulls showed mixed patterns of regional change between 2002 and 2003, with modest declines in south-west, north-west, north, and south-east Scotland (but with a substantial increase at the one monitored colony in north-east Scotland) and a small increase in Wales. It should be noted, however, that few colonies are counted annually and population trends at individual colonies within regions varied, so data from small samples of colonies are not necessarily indicative of widespread changes. The relatively few colonies at which estimates of productivity were made suggest a fairly successful year, except on Canna and at Rockcliffe Marsh.

Breeding numbers and breeding success (Tables 3.15.1 and 3.15.2)

In **south-west Scotland**, an overall decline (-7.6%) in breeding number occurred between 2002 and 2003, although there was much variation between colonies. Substantial decreases occurred at Eilean Mor and islets (Sound of Jura), Burnt Islands (Kyles of Bute) and Sanda. In contrast, increases were seen at Sgeir nan Gobhar (Sound of Mull) and Sgeir nan Tom (Loch Linnhe), both colonies reaching their highest count in 2003. A similar overall decline occurred in **north-west Scotland**, with numbers on Canna falling from 862 pairs in 2002 to 587 in 2003, continuing the decline there since 1989 and reaching the lowest number since monitoring began in 1971. Productivity on Canna was extremely low, at an estimated 0.05 chicks per pair; most nests apparently failed at the egg or small chick stage (Swann 2003a). In the Mink-Seabird Project study area (Mallaig to Tarbert on the Kintyre peninsula), spread over north-west and south-west Scotland, mean productivity across 10 sites where mink were successfully removed was 0.77 chicks per AON, compared with 0.58 chicks per AON across 50 sites with no or unsuccessful mink control. Thus it appears that mink reduced herring gull productivity at these sites by about 25% in 2003 (Craik 2003).

In **Shetland** the Noss colony declined in size between 2002 and 2003, and is now at its lowest since the SMP began in 1986. Productivity was fairly high in 2003, at 0.93 chicks per AON, compared with 0.78 in 2002. A survey of roof-nesting gulls in Lerwick in 2003 revealed 97 AON, an increase of 66% compared with the previous count in 1994, despite the control measures implemented there since 1999 (Okill 2003c).

The scant data from **Orkney** showed a mixed trend: the colony at Hobbister increased between 2002 and 2003, while the already small colony at North Hill, Papa Westray, declined to just 16 AON, from 31 in 2002.

At Nigg - the only colony counted in **north Scotland** - a moderate decrease in the number breeding was observed, following the record high in 2002. At Sands of Forvie **(north-east Scotland)**, a large increase was observed, from 177 AON in 2002 to 401 in 2003, but the former count may have underestimated the actual number as it was made in mid to late June, later than is recommended.

A small overall decrease in breeding number occurred in **south-east Scotland** between 2002 and 2003, although the trend varied between colonies. The number on Fidra declined steeply, from 1,296 AON in 2002 to 900 in 2003. The large colony on the Isle of May increased slightly in size, as did the colony at St Abb's Head. Productivity on the Isle of May was 1.02 chicks per AON (0.61 in 2002) (Charras and Parkinson, 2003).

In **north-east England**, a small increase was observed in the number breeding between Boulby and Cowbar Nab. The colony at Saltburn, which has been declining since its peak in 1992, fell to its lowest ever during the SMP. At Longnewton Reservoir, the colony decreased to just 17 AON, following the high of 44 in 2002. In **eastern England**, the Orford Ness colony decreased by 22%, from 2,575 AON in 2002 to 2,000. A count at Terrington in 2003 revealed 917 AON, compared with the previous count in 2001 of 865 AON; on Havergate Island the number declined from 125 to 41 AON during the same period. At Dungeness **(south-east England)**, a small increase in the number breeding occurred. On the Dorset coast **(south-west England)**, increases were noted between Durlston and St Aldhelm's and at Ballard. A small sample at Ballard gave a productivity of 1.2 chicks per AON, similar to 2002.

The sampled population in **Wales** increased slightly overall, but with differences between colonies. A 37% decrease occurred on St Margaret's Island between 2002 and 2003, and numbers also fell on Bardsey and at Stackpole Head. In contrast, increases occurred on Caldey Island, Skokholm (following a low in 2002), South Stack and Elegug Stacks. On the Skerries (Anglesey), a 25% decrease was observed between 2000 (when they were last surveyed) and 2003, when 708 AON were counted. On Skomer the number decreased from 505 in 2001 to 458 in 2003 (no count was possible in 2002). Productivity was measured at two sites on Skomer in 2003 –the larger sample gave a figure of 0.54 chicks per pair, the smaller 0.83, representing a far more successful year than 2002, when just 0.18 chicks per pair were fledged (Brown and Wilberforce 2003).

Table 3.15.1 Regional population changes at monitored herring gull colonies, 2002-2003. Figures are breeding pairs or apparently occupied nests in May-June. Regional samples < 200 pairs are excluded.

Region/site	2002	2003	2002-2003 % change
SW Scotland [a]	6,680	6,175	-7.6
NW Scotland [b]	2,351	2,203	-6.3
N Scotland [c]	269	231	-14.1
NE Scotland [d]	177	401	+126.6
SE Scotland [e]	4,666	4,519	-3.2
Wales [f]	3,634	3,752	+3.2

Colonies: [a] Lunga, Sanda, Mull of Galloway, 39 islets in Argyll and Bute [b] Handa, Canna, Eigg, 18 islets in Lochaber; [c] Nigg; [d] Sands of Forvie NNR; [e] Isle of May, Inchgarvie, Inchmickery, Eyebroughty, Carr Craig, Fidra, Haystack, The Lamb, St Abb's Head; [f] Caldey, Elegug Stacks and nearby coast, Skokholm, St Margaret's Island, Bardsey, South Stack..

Table 3.15.2 Population changes of herring gull 2002-2003 and 1986-2002 mean of selected colonies referred to in the text. Figures are breeding pairs or apparently occupied nests in May-June

Region/site	2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	No. years
SW Scotland					
Eilean Mor and islets	193	94	-51.3	149 (67)	7
Sgeir nan Gobhar	29	67	+131.0	47 (11)	7
Sgeir nan Tom	72	82	+13.9	31 (33)	7
Ruadh Sgeir	47	35	-25.5	71 (21)	7
Loch Fyne (seven colonies)	707	673	-4.8	844 (119)	4
Burnt Islands	671	545	-18.8	679 (18)	4
Lunga	63	37	-41.3	76 (13)	10
Sanda	855	610	-28.7	823 (115)	7
NW Scotland					
Sligneach Mor	173	130	-24.9	176 (36)	7
Canna	862	587	-43.5	1,265 (175)	17
Eilean MhicNeill	106	82	-22.6	85 (15)	7
Shetland					
Noss	59	45	-23.7	74 (14)	17
Orkney					
Hobbister	73	110	+50.7	-	-
North Hill	31	16	-48.4	-	
N Scotland					
Nigg	269	231	-14.1	63 (98)	13
NE Scotland					
Sands of Forvie	177	401	+126.6	408 (151)	6
SE Scotland					
Fidra	1,296	900	-30.6	1,329 (261)	8
Isle of May	2,367	2,559	+8.1	2,260 (585)	17
St Abb's Head	257	298	+16.0	394 (160)	17
NE England					
Boulby-Cowbar Nab	435	470	+8.0	416 (95)	17
Longnewton Reservoir	44	17	-61.4	28 (10)	8
Saltburn	33	28	-15.2	135 (72)	16
E England					
Orford Ness	2,575	2,000	-22.3	5,375 (2,425)	3
SE England					
Dungeness	55	59	+7.3	-	-
SW England					
Durlston-St Aldhelm's Head	65	98	+50.8	79 (19)	5
Ballard	16	21	+31.3	11 (6)	6
Wales					
Caldey Island	1,638	1,787	+9.1	1,255 (472)	16
Stackpole Head	128	120	-6.3	71 (27)	17
Elegug Stacks	105	131	+24.8	102 (18)	10
Skokholm	243	278	+14.4	333 (57)	17
St Margaret's Island	350	222	-36.6	229 (116)	11
Bardsey	660	621	-5.9	410 (152)	17
South Stack	413	470	+13.8	315 (129)	10
NW England					
South Walney	4,822	4,329	-10.2	11,714 (5,244)	6
St Bee's Head	345	299	-13.3	540 (102)	16
NE Ireland					
Strangford Lough	142	207	+45.8	748 (526)	17
Big Copeland	258	260	+0.8	207 (60)	4
Lighthouse Island	87	90	+3.4	116 (43)	8

Decreases in breeding numbers occurred in **north-west England**; the South Walney colony fell by 10% to 4,329 AON and the number at St Bee's Head fell from 345 AON to 299. At Rockcliffe Marsh, productivity was extremely low, estimated at 0.08 chicks per pair from the 250 pairs that attempted to breed (M. Carrier, pers. comm.).

In **north-east Ireland**, the Strangford Lough colony increased by 46% to 207 AON. Numbers at Big Copeland and Lighthouse Island remained similar to those of 2002.

3.16 Great black-backed gull *Larus marinus*

Decreases in the number of breeding great black-backed gulls occurred between 2002 and 2003 in south-west Scotland, north Scotland, Orkney (large decrease) and Wales. Increases were seen in north-west Scotland and in Shetland. Breeding success was generally fairly high, but quite low on Canna. Total breeding failure occurred at Nigg.

Breeding numbers and breeding success (Tables 3.16.1, 3.16.2 and 3.16.3)

At monitored colonies in **south-west** and **north-west Scotland**, there were changes of -12.2% and +4.8% respectively between 2002 and 2003. In the Mink-Seabird Project study area (Mallaig to Tarbert on the Kintyre peninsula), 584 pairs were found at 56 sites. At 51 sites where productivity was monitored, breeding success averaged 0.72 chicks per pair across *c.*569 nests. Mink control was carried out at eight of these sites, at which productivity was 0.81 young per pair from 58 nests. This compared with breeding success of 0.71 chicks per pair from 511 nests at 43 sites with no mink control (Craik 2003). Mink were thought to be active at 14 of these sites at which productivity was 0.33 chicks per nest from 60 nests. Outwith this study area, declines were recorded at Sanda, Lunga, Eigg and Canna, where the numbers recorded were the lowest at each site since 1986 (except Sanda), while a small increase was recorded on Handa. On Canna, breeding success, at 0.35 chicks fledged per nest, was higher than in 2002, although 28 of 34 pairs monitored still failed (Swann 2003a).

Table 3.16.1 Regional population changes at monitored great black-backed gull colonies, 2002-2003. Figures are breeding pairs or apparently occupied nests in May-June. Regional samples of < 50 pairs are excluded.

Region	2002	2003	2002-2003 % change
SW Scotland [a]	449	394	-12.2
NW Scotland [b]	209	219	+4.8
Shetland [c]	65	72	+10.8
Orkney [d]	118	71	-39.8
N Scotland [e]	173	159	-8.1
Wales [f]	253	235	-7.1

Colonies: [a] Sanda, Lunga, 35 islets in Argyll and Bute; [b] Eigg, Canna, Handa, eight islets in Lochaber; [c] Noss, Mousa; [d] North Hill, Hobbister; [e] Nigg; [f] Skomer, Skokholm, Middleholm, Stackpole Head plus Elegug Stacks, South Stack, Bardsey, St Margaret's Island.

A moderate increase in numbers was recorded in **Shetland** between 2002 and 2003. After the low figure reported on Noss in 2002, numbers increased by 18.4%. Breeding success was high with 1.11 chicks fledged per nest, although the sample size (nine nests) was small (Marshall and Thomas 2003). At High Holm, breeding success appeared to be low; 65 adults were present in late June but only four live chicks could be found, and a number of dead chicks were noticed (Okill 2003b). In contrast, a large decease was recorded in **Orkney** between 2002 and 2003, where numbers fell by 27% at North Hill and by 65% at Hobbister, although 396 nests were recorded on Copinsay compared with 305 in

1999. Breeding success data were available only from Swona where, during searches for chicks large enough to ring, it was estimated that productivity was 40% lower than normal despite many nests showing signs of hatching (Meek 2003).

Between 2002 and 2003 in **north Scotland**, numbers fell at Nigg (by 8%) for only the second time since the colony became established; total breeding failure occurred at this normally successful colony in 2003 (Swann 2003b). Although few great black-backed gulls nest in **south-east Scotland**, numbers in this region have been increasing since 1986 (Mitchell *et al.* 2004). On islands in the Firth of Forth, only six pairs were reported nesting then compared with 37 pairs in 2003. A 15% increase was recorded on the Isle of May between 2002 and 2003.

Table 3.16.2 Population changes at selected great black-backed gull colonies referred to in the text. For details of numbers found in the Mink-Seabird Project study area refer to the text.

Region/Site	2002	2003	2002-2003	1986-2002	
			% change	Mean (±s.d.)	No. of years
SW Scotland					
Sanda	36	30	-16.7	35 (8)	11
Lunga	49	37	-24.4	55 (13)	10
NW Scotland					
Eigg	11	9	-18.2	17 (5)	16
Canna	68	60	-11.8	78 (10)	17
Handa	35	39	+11.4	37 (11)	15
Shetland					
Noss	49	58	+18.4	70 (14)	17
Mousa	16	14	-12.5	-	1
Orkney					
North Hill	78	57	-26.9	70 (20)	3
Hobbister	40	14	-65.0	-	-
N Scotland					
Nigg	173	159	-8.1	95 (54)	13
SE Scotland					
Isle of May	20	23	+15.0	12 (8)	12
NE England					
Farne Islands	8	6	-25.0	3 (2)	10
Wales					
Skokholm	49	65	+32.7	37 (13)	13
Skomer	79	84	+6.3	51 (16)	17
Middleholm	32	32	0.00	36 (15)	9
St Margaret's Island	80	36	-55.0		
NW England					
Rockcliffe Marsh	37	37	0.00	44 (10)	6
NE Ireland					
Strangford Lough	14	34	+142.9	59 (23)	17

In **Wales**, a 7.1% decrease was recorded overall between 2002 and 2003. A decrease of 55% was noted at St Margaret's Island, while increases were recorded on Skomer and Skokholm but there was no change at Middleholm. Numbers doubled on Angelsey to 29 pairs since 2000 but the number fell to 41 pairs at Ynys Gwylan-fawr between 2001 and 2003, a 32.8% decrease. Productivity data suggested that Welsh colonies were more successful than most of those in other UK regions in 2003.

At Rockcliffe Marsh (**north-west England**), in contrast to the declines in numbers of other large gulls there was no change in the numbers of greater black-backed gulls between 2002 and 2003 and productivity was close to average for the site (M. Carrier, pers. comm.). Small numbers continue to nest on the Farne Islands (**north-east England**), Orford Ness (**east England**) and Ballard (**south-west England**); productivity from six nests at the latter site was 1.83 chicks per nest (Morrison 2003). At

Dungeness **(south-east England)**, one pair nested successfully, fledging two young. This is believed to be the first breeding record in Kent.

The recovery continues at Strangford Lough **(north-east Ireland)** after the decline between 2000 and 2001 when numbers fell from 41 pairs to one.

Table 3.16.3 Breeding success of great black-backed gull (chicks fledged per pair) 2002-2003 and 1986-2002 at selected colonies mentioned in the text. Figures in parentheses under 2002 and 2003 are the number of nests from which the estimates of success are derived.

Region/Site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
NW Scotland				
Canna	0.09 (33)	0.35 (34)	0.96 (0.24)	6
Shetland				
Noss	0.57 (7)	1.11 (9)	0.55 (0.04)	3
N Scotland				
Nigg	1.95 (134)	0.00 (159)	1.72 (0.14)	12
SW England				
Ballard	1.83 (12)	1.83 (6)	0.92 (0.08)	2
Wales				
Skokholm	1.09 (49)	0.91 (65)	1.20 (0.09)	11
Skomer	1.28 (25)	1.40 (25)	1.22 (0.07)	7
Bardsey	3.00 (3)	2.00 (3)	1.66 (0.41)	6
Ynys Gwylan Fawr	-	1.12 (41)	1.66 (0.04)	4
NW England				
Rockcliffe Marsh	1.22 (37)	0.68 (37)	0.72 (0.08)	3

3.17 Black-legged kittiwake *Rissa tridactyla*

Between 2002 and 2003, declines were noted in the populations of all regions in the north and east of the UK with increases occurring only in those regions lying in the south-west. Evidence from Shetland suggested a non-breeding event in 2003, accounting for some of the observed decline. Whole colony counts in Orkney revealed increases at three colonies between 2000 and 2003. Long term data suggest that outside Shetland, Orkney and south-east Scotland have experienced the largest declines since the early 1990s. Overall, productivity was slightly lower than that recorded in 2001, averaging 0.61 chicks fledged per breeding pair at 42 colonies, below the long-term mean. However, in 39 colonies monitored in both 2002 and 2003, a non-significant increase was recorded despite many colonies in Shetland fledging no young and low productivity in Orkney and north Scotland.

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 numbers at sample colonies may not always necessarily reflect larger scale regional population changes.

The long-term decline of the **Shetland** population continued, as revealed by numbers in productivity plots and those few colonies counted in both 2002 and 2003, suggesting a between year decline of 13.8%. It should be noted that because comprehensive counts of kittiwakes across Shetland are achieved only within a three year period (not annually), indices are presented triennially for this region. Although the rate of decline is highly significant over the long-term, the level of decline between 2002 and 2003 may be an exaggeration as data also suggest that extensive non-breeding occurred in 2003, e.g. only 48% of all nests (trace and well-built) at Sumburgh Head were being incubated on 14 June compared with 93% on 10 June 2001 (Heubeck 2004). On Foula, the largest single colony surveyed in Shetland in 2003, numbers decreased by 20.1% to 1,081 AON since 2002 (S. Gear, pers. comm.).

Table 3.17.1 Regional population changes at monitored black-legged kittiwake colonies, 2002-2003 (apparently occupied nests in late May or June) and 1986-2002 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 1986-2002 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.

Region	2002	2003	2002-2003 % change	% annual change
SW Scotland [a]	1,525	1,289	-15.5	+3.5*** 1986-2002
NW Scotland [b]	1,974	1,971	-0.2	-1.4* 1986-2002
Shetland [c]	2,437	2,100	-13.8	-9.9*** 1986-2002
NE Scotland [d]	809	759	-6.2	-9.0 ** 1992-2001
SE Scotland [e]	14,576	12,095	-17.0	-4.0*** 1986-2002
NE England [f]	8,486	7,901	-6.9	-1.2 n.s. 1986-2002
SE England [g]	1,121	556	-50.4	-4.5*** 1986-2002
Wales [h]	2,270	2,730	+20.3	-2.1*** 1986-2002
NW England [i]	997	1,020	+2.3	+1.0 n.s. 1986-2002
SE Ireland [j]	809	829	+2.5	+0.6 n.s. 1986-2002
NW Ireland [k]	884	1,073	+21.4	-

Colonies: [a] Lunga, Colonsay, Mull of Galloway, Sanda; [b] Canna, Handa (productivity plots); [c] Sumburgh Head, Noness, Ramna Geo, Westerwick, Hermaness, Fair Isle (all productivity plots), South Havra, Kettlaness, West Burra, Troswick Ness, Boddam, Foula; [d] Covesea, Portknockie, Sands of Forvie NNR; [e] Isle of May, Inchkeith, Craigleith, The Lamb, Fidra, Inchcolm, Bass Rock, St Abb's Head; [f] Farne Islands, Coquet, Boulby Cliffs; [g] Fan Bay-West Langdon Cliffs; [h] South Stack, Bardsey, Caldey, Skomer, Elegug Stacks; [i] St Bee's Head; [j] Dunmore East; [k] Downpatrick Head.

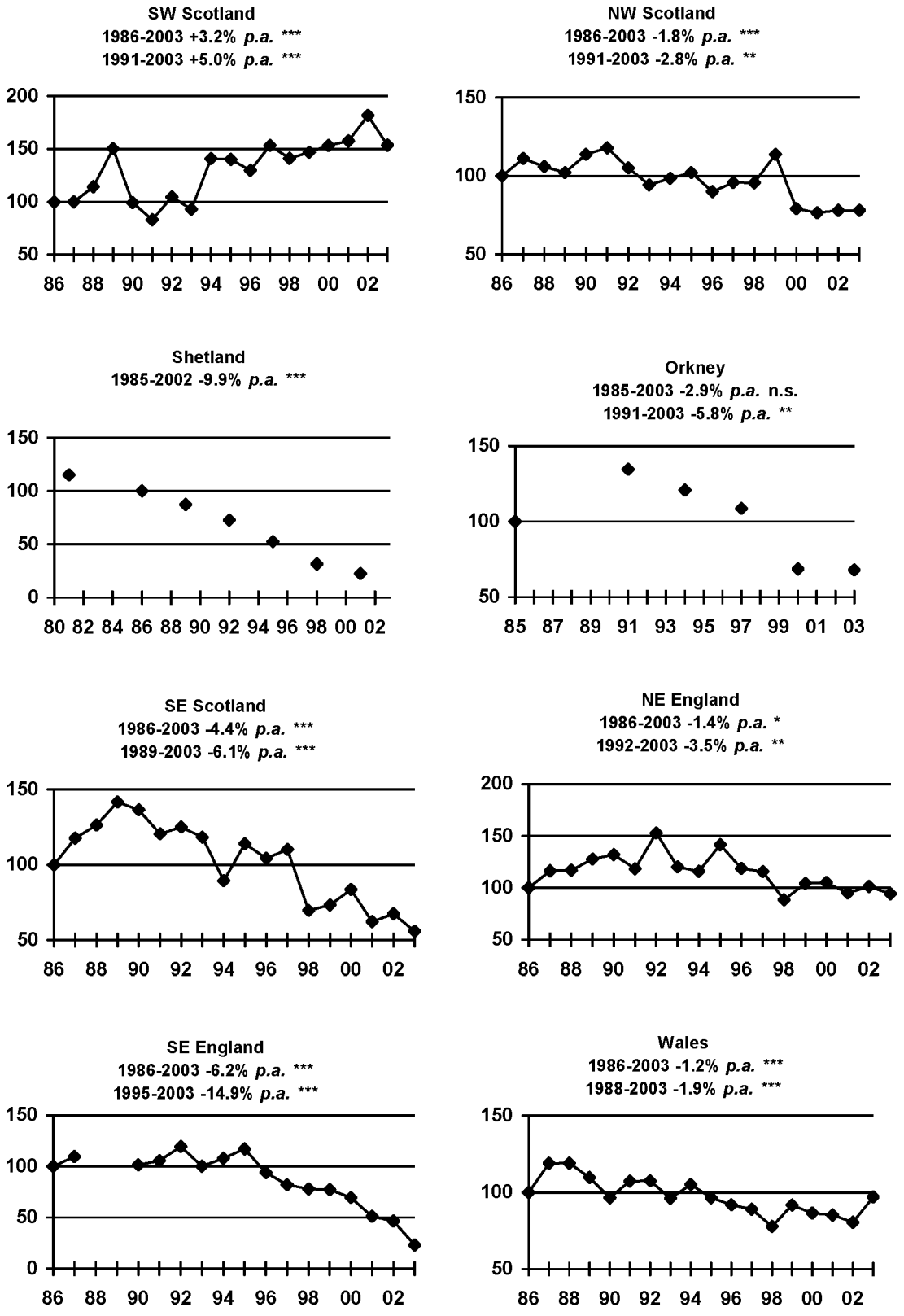

Figure 3.17.1 Regional population indices for breeding black-legged kittiwakes, 1986-2003 (apparently occupied nests in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends (t-test) indicated as: n.s. not significant, * $P < 0.05$, ** $P < 0.01$, *** $P<0.001$. For Shetland, chain indices are presented for 1981, then 1985-1987, 1988-1990, 1991-1993, 1994-1996, 1997-1999 and 2000-2002 and plotted as the middle year of each three-year group.

In **Orkney**, whole colony counts were carried out at four colonies as part of the JNCC's triennial monitoring scheme. At Row Head numbers had fallen by 33.5% to 939 AON since 2000 but at the other colonies numbers had increased over the same period; by 43.6% (to 803) at Mull Head, by 6.6% (to 177) at Gultak and by 25.9% (to 1,436) at Costa Head. At the latter colony, the peak count of AON in study plots was found to have decreased by 16% which, when compared against the increase in the whole colony count, suggests some redistribution of nests within the colony has occurred. In contrast to Shetland, there was no evidence of non-breeding at any of these four colonies, as in mid-June the percentage of nests being incubated in study colonies ranged between 87-96% (pers. obs.). Combining whole-colony counts revealed no net change has occurred since 2000 when the colonies held 3,379 AON (*cf.* 3,345 in 2003); however, the regional long-term trend parallels the decline recorded in many other UK regions since the early 1990s.

A decrease was also recorded in **south-west Scotland**, one of the few regions to have shown a significant increasing trend in black-legged kittiwake numbers, where numbers at the Mull of Galloway fell by 31.0%. On Canna, **(north-west Scotland)**, 1,290 AON was the highest count recorded there since monitoring began (Swann 2003a). Overall, there was little change in total numbers between 2002 and 2003 in this region although a significant decline is evident since 1991. Elsewhere in the region, survey work on Mingulay revealed 2,939 AON with Berneray holding 2,035 AON, changes of +2.8% and -22.1% respectively, both occurring since 1998.

On the East coast of Britain, where some of the higher rates of decline have been recorded, numbers fell in all regions by a minimum of 6% between 2002 and 2003, with particularly large decreases noted in south-east Scotland and south-east England. On North Sutor **(north Scotland)**, the number of nests recorded, at 236, was again the lowest on record, the sixth consecutive year of decline at this site (Swann 2002b). Similarly, in **north-east Scotland**, the number at the Sands of Forvie was also at its lowest level, having decreased by 12.1% since 2002 and now nearly a quarter of the 1992 total (Drysdale 2003). In contrast, the small colony at Portknockie, which held ten nests in 1987, continues to grow, with 122 AON in 2003. In **south-east Scotland**, the regional total decreased by 17% between 2002 and 2003 and although the fortunes of individual colonies differed, all have lost large proportions of their populations since the early 1990s. Since 2002, a particularly large decrease, of 25.3%, occurred at the largest colony at St Abb's Head, with a 9% fall recorded at the Isle of May; again numbers are the lowest on record at both sites and currently only 35-40% of their 1989-90 populations (19,066 and 8,129 AON respectively). A small decrease was evident on the Forth Isles (Craigleith, Inchkeith, Lamb, Fidra and Inchcolm combined) although these islands now hold only 53% of their 1993 population (2,269 AON). At the Bass Rock, numbers increased by 17.6% over the previous year but the population is again only 30% of the 1997 total (3,044 AON).

In **north-east England**, little change was evident on the Farne Islands or the small colony on Coquet Island. However, a large proportional decrease of 21.6% was evident at Boulby Cliffs. This region has also shown a significant rate of decline since the early 1990s although the rate of decline measured from 1986 had been non-significant until 2003. In **east England**, little change was noted at Sizewell but at Lowestoft numbers fell by 21.9% to 121 AON, the lowest figure to be recorded there since 1990. At South Foreland **(south-east England)**, numbers fell by 50.4% since 2002, the eighth successive year of decline and the colony now holds 19% of the peak count recorded in 1992 (2,878 AON). The small colonies in **south-west England** at Blacker's Hole and Berry Head both increased.

A decrease was noted in **north-east Ireland** on the Isle of Muck where numbers fell by 18.7%, in contrast to other regions bordering the Irish Sea, where, along with west of Ireland increases were recorded between 2002 and 2003. The regional totals of **Wales**, **north-west England**, **south-east Ireland** and **north-west Ireland** all increased, although only in Wales was more than one colony surveyed in each year and the observed increases from the single reporting colonies in north-west England (St Bee's Head) and south-east Ireland (Dunmore East) were small. Notable increases were recorded at Skomer, where numbers recovered after a decline between 2001 and 2002, at the small colony on Caldey and also at Downpatrick Head (north-west Ireland).

Table 3.17.2 Population changes of black-legged kittiwake 2002-2003 and 1986-2002 at selected sites referred to in the text. Figures refer to the number of apparently occupied nests.

Region/Site	2002	2003	2002-2003 % change	1986-2002	
				Mean (±s.d.)	No. of years
SW Scotland					
Mull of Galloway	422	291	-31.0	314 (69)	16
Lunga	986	880	-10.8	765 (152)	10
Colonsay	108	107	-0.9	100 (22)	8
NW Scotland					
Canna	1,264	1,290	+2.1	983 (197)	17
N Scotland					
North Sutor	332	236	-28.9	593 (195)	8
NE Scotland					
Covesea	369	347	-6.0	297 (116)	13
Portknockie	110	122	+10.9	90 (32)	9
Sands of Forvie	330	290	-12.1	740 (214)	15
SE Scotland					
Isle of May	3,666	3,335	-9.0	5,879 (1,593)	17
Firth of Forth islands	1,246	1,208	-3.1	1,623 (420)	9
Bass Rock	774	910	+17.6	1,723 (955)	6
St Abb's Head	8,890	6,642	-25.3	13,478 (3,358)	17
NE England					
Farnes	5,055	5,192	+2.7	5,721 (551)	17
Coquet	81	84	+3.7	55 (19)	9
Boulby Cliffs	3,350	2,625	-21.6	3,652 (815)	15
E England					
Sizewell	230	237	+3.0	-	-
Lowestoft	155	121	-21.9	150 (49)	16
SE England					
South Foreland	1,121	556	-50.4	2,185 (543)	15
SW England					
Blacker's Hole	54	55	+1.8	60 (20)	12
Berry Head	9	37	+311.1	21 (15)	5
Wales					
Skomer	1,863	2,324	+24.8	2,276 (199)	17
Elegug	91	66	-27.5	277 (143)	13
Bardsey	292	290	-0.7	237 (48)	17
Caldey	24	42	+75.0	11 (11)	3
NW England					
St Bee's Head	997	1,020	+2.3	1,189 (186)	15
NE Ireland					
Isle of Muck	300	244	-18.7	403 (286)	4
SE Ireland					
Dunmore	809	829	+2.5	937 (128)	17
NW Ireland					
Downpatrick Head	884	1,073-	+21.4	-	-

Breeding success (Tables 3.17.3 and 3.17.4, Figure 3.17.2)

The overall productivity of black-legged kittiwakes in 2003 averaged 0.61 (s.e. ±0.07) chicks fledged per breeding pair at 42 colonies, below the mean for the period 1986-2002 of 0.71 (s.e. ±0.02) at 30 to 61 colonies monitored annually and slightly below that recorded in 2002 (0.66, s.e. ±0.06). In 39 colonies monitored in both 2002 and 2003, there was a non-significant increase in mean breeding success of 0.08 (s.e. ±0.06) chicks fledged per pair. As usual, these mean productivity estimates for the UK contain marked regional variation with regions bordering the northern North Sea generally having poorer breeding success than those lying to the south and west.

In **Shetland,** 2003 was one of the poorest breeding seasons for black-legged kittiwakes since monitoring began in 1986. A significant decrease occurred between 2002 and 2003 with an average of 0.02 chicks fledged per nest (*cf.* 0.20 in 2002); in total only 14 chicks fledged from 1,256 nests monitored at eight colonies. Five colonies (Noness, Westerwick, Foula, Sumburgh Head and Fair Isle) fledged no chicks at all. As in 2002, the breeding season was characterised by late laying (e.g. 10-12 days later at Sumburgh Head than in 2002), extensive non-breeding (see *Breeding numbers*) and early failure of breeding attempts with very few chicks hatched (e.g. only 3.2% of nests hatched at Sumburgh Head and 50.0% of nests failed at the incubation stage on Fair Isle with the rest failing early during the chick rearing period). This indicated low abundance of sandeels during May and June (Heubeck 2004). On Foula, only one of 19 adults caught at the nest in early July regurgitated food (whitefish fragments) and, as in 2001 and 2002, mean body weight was about 30g below normal, at 350g (Furness 2003).

Table 3.17.3 Black-legged kittiwake breeding success, 2002-2003, grouped regionally: 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<0.05, **P<0.01).

Region	2002 chicks fledged/nest				2003 chicks fledged/nest				2002-2003 change	
	Nests[n]	Range	Mean	±s.e.	Nests[n]	Range	Mean	±s.e.	Mean[n]	±s.e.
SW Scotland [a]	190[1]	-	0.44	-	169[1]	-	0.43	-	-0.01[1]	-
NW Scotland [b]	1,289[3]	0.21-1.28	0.70	±0.31	1,230[3]	0.31-1.00	0.73	±0.21	+0.03[3]	±0.23
Shetland [c]	1,278[8]	0.00-0.49	0.20	±0.06	1,256[8]	0.00-0.11	0.02	±0.01	-0.18[8]	±0.07*
Orkney [d]	1,068[8]	0.97-1.46	1.10	±0.05	1,196[7]	0.04-0.72	0.48	±0.09	-0.56[7]	±0.10**
N Scotland [e]	83[1]	-	0.43	-	111[1]	-	0.18	-	-0.25[1]	-
NE Scotland [f]	535[2]	0.21-0.44	0.32	±0.12	696[3]	0.73-1.04	0.93	±0.10	+0.56[2]	±0.27
SE Scotland [g]	1,268[3]	0.33-0.96	0.59	±0.19	1,115[3]	0.77-0.97	0.86	±0.03	+0.27[3]	±0.22
NE England [h]	1,463[5]	0.67-1.24	0.93	±0.12	1,405[5]	0.25-1.69	0.88	±0.23	-0.05[5]	±0.18
E England [I]	155[1]	-	0.95	-	96[1]	-	1.26	-	+0.31[1]	-
SW England [j]	48[1]	-	0.81	-	50[1]	-	0.71		-0.10[1]	-
NW Eng. /I. of Man [k]	44[1]	-	0.18	-	-	-	-	-	-	-
Wales [l]	1,424[4]	0.00-1.12	0.53	±0.23	1,394[4]	0.24-1.12	0.61	±0.18	+0.08[4]	±0.17
NE Ireland [m]	-	-	-	-	85[1]	-	1.20	-	-	-
SE Ireland [n]	867[2]	0.67-1.29	0.98	±0.31	1,288[3]	0.58-1.51	0.92	±0.29	+0.12[2]	±0.10
NW Ireland [o]	884[1]	-	0.73	-	1,073[1]	-	1.01	-	+0.28[1]	-
Total	10,596[41]	0.00-1.46	**0.66**	±0.06	11,146[42]	0.00-1.69	**0.61**	±0.07	**+0.08[39]**	±0.06

Colonies: [a] Ailsa Craig; [b] Canna, Handa, St Kilda; [c] Noness, Hermaness, Westerwick, Foula, Noss, Ramna Geo, Sumburgh Head, Fair Isle; [d] Papa Westray, Rousay, Marwick Head, Row Head, Mull Head, Gultak, Costa Head, Hoy (2002 only); [e] North Sutor; [f] Bullers of Buchan, Sands of Forvie (2003 only), Fowlsheugh; [g] Isle of May, Dunbar, St Abb's Head; [h] Farne Islands, Coquet Island, Gateshead-Newcastle, Saltburn, Bempton; [i] Lowestoft; [j] Durlston Head-St Albans Head; [k] Contrary Head-Traie Cronkan (2002 only); [l] Bardsey, Elegug Stacks, Skomer, Great Orme; [m] Isle of Muck (2003 only); [n] Dunmore, Ram Head (2003 only), Rockabill; [o] Downpatrck Head.

In **Orkney,** overall breeding success was low at 0.48 chicks fledged per nest with a highly significant decrease noted at those colonies monitored in 2002 and 2003. At all colonies productivity was less than that recorded in 2002 and also well below the long-term means. At Costa Head, Marwick Head and Row Head breeding success was at its value lowest since monitoring began while at Mull Head, Papa Westray and Rousay there had been only one year when productivity was lower. However, unlike in Shetland, there was little evidence of non-breeding (see *Breeding numbers* section) or failure during incubation, suggesting adequate food supplies early in the breeding season. Instead, many dead chicks were noticed in nests and lying on ledges below sub-colonies from mid-July onwards. Corpses appeared intact (i.e. cause of death appeared not to be due to predation) and many were close to

fledging, pointing to a food shortage occurring later than in Shetland (pers. obs.). In **north Scotland**, breeding success was also the lowest on record at North Sutor, averaging only 0.18 chicks fledged per nest.

In **north-east Scotland,** overall breeding success at two colonies counted in 2002 and 2003 was much increased, with productivity at Fowlsheugh the highest recorded since 1989 and that at Bullers of Buchan above average. Breeding success was also above average at Sands of Forvie (not monitored in 2002), equalling the high of 1.02 chicks fledged per pair recorded there in 1992. Similarly, overall breeding success in **south-east Scotland** was higher than it was in 2002. Productivity was higher than average on the Isle of May and at St Abb's Head where it was the highest recorded since 1996. In contrast, breeding success at Dunbar declined compared with 2002 and was below average for the site. Birds in this region apparently had little difficulty finding food which perhaps explains the increased productivity; 98% of food samples brought to nests on the Isle of May contained sandeels, accounting for 91% of the diet by weight (Wilson *et al.* 2003). However, numbers of nests in study plots are declining at all sites, especially at St Abb's Head, where two of five plots have been omitted from study in recent years as they now contain few nests.

The regional value for **north-east England** was slightly below that recorded in 2002. There was much variation among colonies with breeding success higher than in 2002 on Coquet, the Farne Islands and at Saltburn but lower at Gateshead and Bempton. However, breeding success was below average at all colonies other than Coquet where productivity of 1.69 chicks fledged per nest was the highest on record. In contrast to Coquet, productivity at Bempton was the lowest yet recorded with evidence again pointing at non-breeding; only 38% of well built nests later contained eggs or young (T. Charlton, pers. comm.). In **east England**, the small colony at Lowestoft continues to be relatively successful compared to many east coast colonies fledging 1.26 young per nest in 2003, well above average for the site.

Along the west coast there was also much variation between regions. Overall breeding success in **north-west** and **south-west Scotland** was similar to that recorded in 2002 but only on Canna was productivity above average where it equalled that of 1995 as the highest recorded for the site. Productivity was typically low on St Kilda, poor for the third year in succession on Ailsa Craig and at its lowest since 1988 on Handa. In **Wales**, overall productivity increased on 2002 but, as in west Scotland, there was much individual variation between colonies. At Elegug Stacks and Great Ormes Head breeding success improved on that recorded in 2002 but remained below average at the former site where productivity has now been low for three successive years. Breeding success also remained below average on Skomer, the only Welsh colony where black-legged kittiwake productivity was less that that recorded in 2002. Breeding success was again high at Bardsey where it has been above average since 1996 and in recent years has been remarkably consistent; between 2000 and 2003, productivity has measured 1.12, 1.13, 1.12 and 1.12 chicks fledged per nest respectively. In **south-west England**, productivity at Durlston Head was close to the long-term mean.

All regions of Ireland were relatively successful in 2003 especially when compared with those in the north of Scotland. On the Isle of Muck **(north-east Ireland)**, 1.20 chicks fledged per nest compared with 1.03 in 2001. In **south-east Ireland**, a non-significant increase was detectable when considering those colonies monitored in both 2002 and 2003. Productivity was similar to last year at Dunmore but much higher at Rockabill, where 1.51 chicks fledged per nest, near the long-term average. After a two year gap data was once again received from Ram Head where breeding success was slightly above average. At Downptrick Head **(north-west Ireland)**, initial monitoring in 2002 and 2003 recorded breeding success of 0.73 and 1.01 chicks fledged per nest respectively.

Table 3.17.4 Breeding success of black-legged kittiwake (fledglings/AON) 2002-2003 and 1986-2002 at selected colonies mentioned in the text. Figures in parentheses under 2002 and 2003 are the number of nests from which the estimates of success were derived.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
SW Scotland				
Ailsa Craig	0.44 (190)	0.43 (169)	0.49 (0.09)	16
NW Scotland				
Handa	1.28 (696)	0.88 (681)	1.31 (0.06)	16
Canna	0.60 (358)	1.00 (356)	0.66 (0.06)	17
St Kilda	0.21 (235)	0.31 (193)	0.45 (0.06)	16
Shetland				
Noness	0.08 (53)	0.00 (38)	0.42 (0.17)	7
Hermaness	0.44 (147)	0.04 (141)	0.43 (0.09)	14
Westerwick	0.00 (33)	0.00 (12)	0.33 (0.11)	16
Foula	0.21 (131)	0.00 (101)	0.65 (0.10)	16
Noss	0.20 (186)	0.01 (310)	0.27 (0.06)	17
Ramna Geo	0.18 (110)	0.11 (77)	0.52 (0.12)	10
Sumburgh Head	0.00 (177)	0.00 (113)	0.51 (0.12)	17
Fair Isle	0.48 (441)	0.00 (464)	0.76 (0.11)	17
Orkney				
Mull Head	1.11 (116)	0.72 (136)	1.11 (0.04)	17
Papa Westray	1.03 (125)	0.04 (126)	0.85 (0.10)	14
Rousay	1.09 (162)	0.36 (160)	0.87 (0.09)	14
Costa Head	1.07 (199)	0.40 (244)	1.14 (0.05)	10
Gultak	0.97 (32)	0.70 (112)	0.88 (0.06)	17
Marwick Head	1.02 (170)	0.68 (200)	1.11 (0.04)	17
Row Head	1.04 (203)	0.49 (218)	1.08 (0.04)	17
N Scotland				
North Sutor	0.43 (83)	0.18 (111)	0.72 (0.07)	13
NE Scotland				
Bullers of Buchan	0.44 (172)	0.73 (193)	0.55 (0.10)	13
Sands of Forvie	-	1.06 (92)	0.40 (0.09)	13
Fowlsheugh	0.21 (295)	1.04 (411)	0.68 (0.09)	15
SE Scotland				
Isle of May	0.47 (477)	0.77 (423)	0.55 (0.09)	17
Dunbar	0.96 (537)	0.83 (501)	0.94 (0.09)	16
St Abb's Head	0.33 (254)	0.97 (191)	0.68 (0.08)	16
NE England				
Coquet Island	1.20 (81)	1.69 (84)	1.04 (0.07)	10
Bempton	0.76 (277)	0.25(297)	1.04 (0.08)	16
Farnes	0.79 (644)	0.86 (638)	0.92 (0.07)	16
Gateshead	1.24 (213)	0.81 (204)	1.12 (0.05)	14
Saltburn	0.67 (243)	0.80 (182)	0.85 (0.07)	17
E England				
Lowestoft	0.95 (155)	1.26 (96)	1.07 (0.07)	17
SW England				
Durlston Hd – St Albans Hd	0.81 (48)	0.71 (50)	0.69 (0.10)	12
Wales				
Bardsey	1.12 (292)	1.12 (290)	0.72 (0.12)	15
Elegug Stacks	0.00 (87)	0.24 (66)	0.32 (0.07)	12
Skomer	0.61 (797)	0.53 (704)	0.68 (0.05)	17
Great Ormes Head	0.38 (248)	0.54 (298)	0.54 (0.06)	14

Table 3.17.4 (continued).

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
NE Ireland				
Muck	-	1.20 (85)	1.03 (-)	1 [2001]
SE Ireland				
Rockabill	1.29 (58)	1.51 (109)	1.02 (0.13)	7
Dunmore	0.67 (809)	0.68 (829)	0.67 (0.04)	17
Ram Head	-	0.58 (350)	0.52 (0.08)	10
NW Ireland				
Downpatrick Head	0.73 (884)	1.01 (1,073)	0.73 (-)	1 [2002]

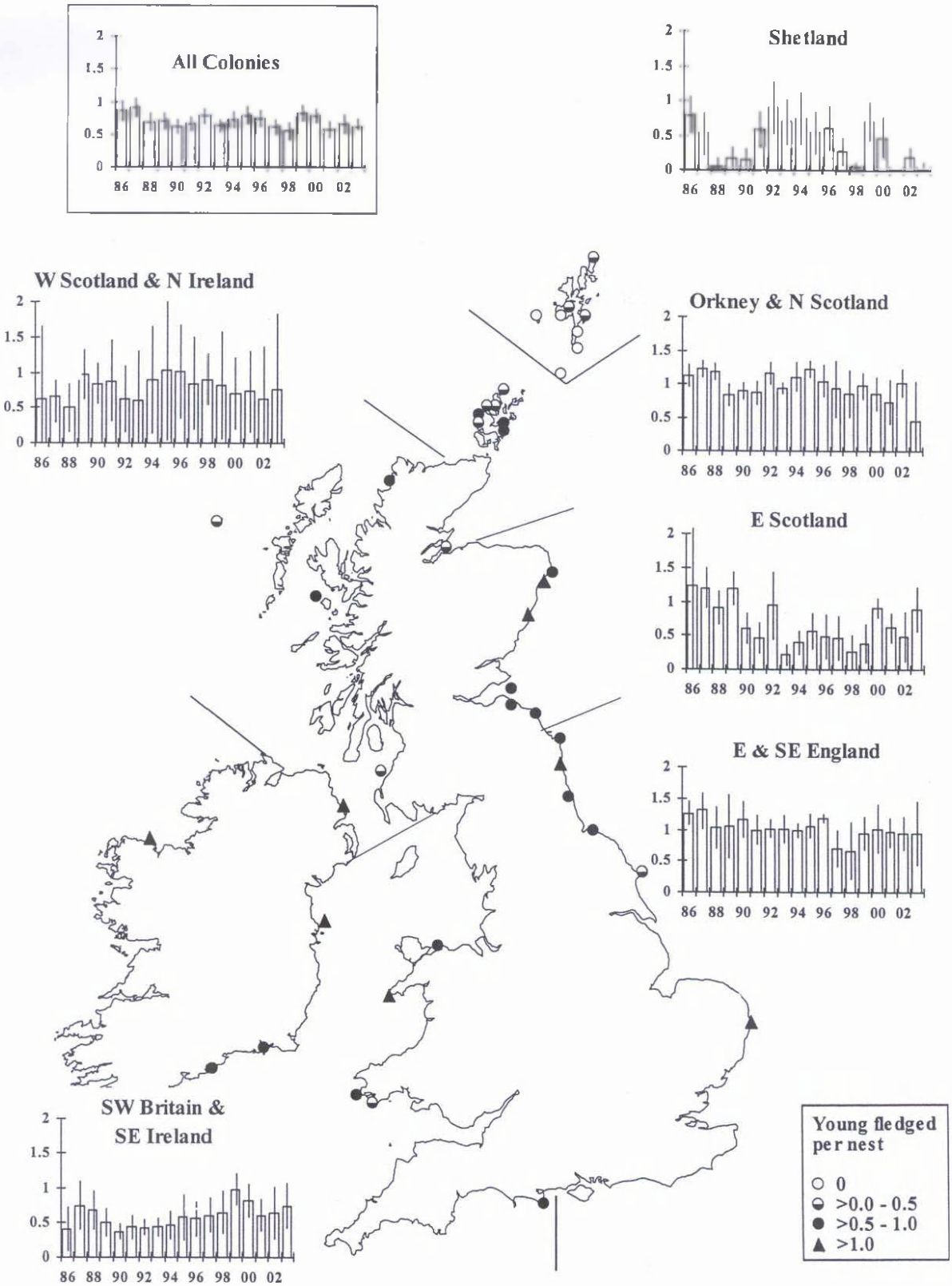

Figure 3.17.2 Breeding performance (chicks fledged per well-built nest) at black-legged kittiwake colonies during 1986-2003, showing regional and annual variation. Symbols on map represent 2003 data for individual colonies; histograms show annual averages (with 95% confidence limits) for the regions indicated. A histogram for SW and NW Ireland where one colony was monitored in 2002-2003 is not

3.18 Sandwich tern *Sterna sandvicensis*

Overall, numbers in the UK and Ireland remained stable in 2003. Declines in all eastern England regions were offset by an increase in Wales and Ireland. Breeding success in 2003 was higher than in 2002 with much inter-site and inter-regional variation.

Breeding numbers (Tables 3.18.1 and 3.18.2)

A distant count at Loch Ryan **(south-west Scotland),** estimated that a declining number of pairs used the badly eroded site (P. Collin pers. comm.). The only record from **Orkney** came from Tuquoy, Westray, where two separate colonies were found (Meek 2003), but no counts could be made.

In **north-east Scotland**, the site at Loch of Strathbeg remained unoccupied whilst the colony at the Sands of Forvie continued to increase, reaching the highest total for the region for 12 years. On the Isle of May **(south-east Scotland)**, birds bred again in small numbers after their absence in 2002.

Table 3.18.1 Regional population changes (breeding pairs) at monitored Sandwich tern colonies, 2002-2003 and 1986-2002. Superscript = number of colonies counted in both years. Note that British and Irish totals are for the sample of monitored colonies in that year only and not the entire population.

Region	2002	2003	2002-2003 % change
SW Scotland	+	26	-
NE Scotland	975	1008	+3.4[2]
SE Scotland	0	58	-[2]
NE England	3,584	3,237	-9.7[3]
E England	4,602	3,815	-17.1[4]
SE England	≤597	514	-13.9[5]
SW England	75	195	+160.0[2]
NW England	360	350	-2.8[1]
Wales	782	1,227	+56.9[1]
NE Ireland	2,132	2,235	+4.8[3]
NW Ireland	303	363	+19.8[3]
SE Ireland	825	1,252	+51.8[1]
Britain and Ireland	14,235	14,254	+0.1[26]

The population in **north-east England** declined to its lowest level since 1977, with numbers on the Farne Islands and Coquet being around 20% below their long-term average. For the first time in seven years numbers in **east England** declined, but they remained above the 17-year mean (3,775.8, s.d. ±541). It is thought that Sandwich terns regularly move between the two main sites at Blakeney and Scolt Head following events at either of the colonies. This was most noticeable in 2001 and 2002 when, after a major influx of nesting large gulls, the decline at Blakeney was met by a corresponding increase at Scolt Head (M. Rooney, pers. comm.). Birds nested for a third consecutive year at Holkham, but numbers decreased by over two-thirds from 2002.

In **south-east England,** breeding was reported from fewer sites, but the apparent overall decline in numbers might be misleading, as no comparative data for 2002 were available for the main site at Burntwick Island. Rye Harbour reported its highest number of breeding birds since colonisation of the site in 1984. For the first time in 22 years no nesting took place at the North Solent NNR, possibly due to the presence of a pair of peregrine falcons (B. Lord, pers. comm.)

Table 3.18.2 Population changes of Sandwich tern breeding pairs at selected sites referred to in the text in Britain and Ireland,. (- indicates that no data were available, + indicates birds were present but no quantitative data available).

Region/Site	2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. of years
SW Scotland					
Loch Ryan	+	26	-	32 (38)	15
NE Scotland					
Sands of Forvie	975	1,008	+21.3	496 (450)	16
SE Scotland					
Isle of May	0	58	+100.0	54 (138)	17
NE England					
Coquet	1,689	1,238	-26.7	1,556 (277)	17
Farne Islands	1,881	1,999	+6.3	2,436 (595)	17
Lindisfarne	14	0	-100.0	-	-
E England					
Scolt Head	3050	650	-78.7	1,676 (1,391)	17
Holkham	800	250	-68,8	510 (409)	2
Blakeney	750	2,900	+286.7	1,954 (1,293)	17
Havergate	2	15	+650.0	86 (92)	17
SE England					
Burntwick Island	+	315	-	186 (135)	4
Rye Harbour	*c.*162	*c.*250	+154.3	48 (56)	17
Chichester Harbour	33	0	-100.0	11 (14)	17
Langstone Harbour	29	144	+396.6	30 (46)	17
North Solent NR	226	0	-100.0	186 (62)	16
Pitts Deep - Hurst	147	120	-18.4	47 (48)	12
SW England					
Brownsea	75	194	+158.7	89 (52)	17
Wales					
Anglesey	782	1,227	+59.9	590 (183)	17
NW England					
Hodbarrow	360	350	-2.8	256 (160)	14
NW Ireland					
Lower Lough Erne	21	78	+271.4	49 (21)	17
Lough Swilly	219	110	-49.8	166 (73)	17
Mulroy Bay	63	175	+177.8	-	-
NE Ireland					
Green Is., Carlingford	917	387	-52.8	463 (367)	17
Larne Lough	373	443	+18.8	213 (139)	17
Strangford Lough	842	1,405	+66.9	968 (544)	17
SE Ireland					
Lady's Island Lake	825	1,252	+51.8	1,068 (308)	17

In **south-west England** numbers on Brownsea increased by over 150% from 2002, reaching their highest level since 1969. Breeding was confirmed for the first time since 1998 on the Isles of Scilly. A major increase at the Anglesey colony led to highest recorded total in **Wales** since 1969. The colony at Hodbarrow **(north-west England)**, continued to decline slightly, but remained well above the 1986–2002 mean for the site (255.6, s.d. ±160.4).

Overall, the population in **north-east Ireland** increased by just under 5% from 2002 to its highest level since 1988. A sharp decline at Carlingford was compensated by a corresponding increase at Strangford Lough, whilst an 18.8 % increase at Larne Lough from 2002 contributed to the region's rise in numbers. In **north-west Ireland,** numbers were up by almost 20% from 2002 at the three monitored sites. This was mainly due to an approximately fourfold increase at Lower Lough Erne, reaching its highest total since 1988. After seven years absence Sandwich terns returned to Mulroy Bay in 2002 and numbers nearly trebled subsequently, probably due to birds moving from Lough

Swilly where there was a corresponding decline (Perry and Speer 2003). In **south-east Ireland**, numbers at Lady's Island Lake recovered from the low in 2002 and reached 1,252 pairs, their highest level since 1996 and well above the 1986-2002 mean (1067.9, s.d. ±308.4).

Breeding success (Tables 3.18.3 and 3.18.4)

The mean breeding success in 2003 across 15 colonies was 0.8 chicks per pair: above the value for 2002 and the 1986-2002 mean of 0.71 (s.e. ±0.04).

After last year's failure due to flooding at Loch Ryan (**south-west Scotland**), productivity in 2003 was high, with *c.*26 pairs fledging at least one chick per pair.

In **Orkney,** at least 40 chicks fledged at Tuquoy, Westray, from an unknown number of pairs (J. Williams, pers. comm.). Productivity at the Sands of Forvie (**north-east Scotland**), at 0.71 chicks per pair, was lower than 2002, due to stoat and gull predation (A Drysdale, pers. comm.).

Breeding success at Coquet in **north-east England** was again low with only 0.4 chicks fledged per pair. Compared with 2002, overall productivity was lower in **east England,** but remained above the 1986–2002 mean (0.71, s.e. ±0.04). Predation by rats depressed breeding success at the largest colony at Blakeney. Productivity data were available from only two sites in **south-east England**, making a comparison with previous years difficult. Whilst a food shortage probably resulted in a low breeding success at Langstone Harbour (0.39 chicks per pair, C. Cockburn, pers. comm.), Rye Harbour in Kent reported their highest number of fledged chicks since 1969.

Table 3.18.3 Sandwich tern productivity, 2002–2003, grouped regionally: expressed as number of chicks fledged per breeding pair at sample colonies (superscript 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 no data were available).

Region	2002 chicks fledged/pair			2003 chicks fledged/pair		
	Pairs[n]	Range	Overall	Pairs[n]	Range	Overall
SW Scotland	+[1]		0.00	26[1]		>1.0
NE Scotland	975[1]		*c.*0.95	1008[1]		*c.*0.71
SE Scotland	0		-	58[1]		0.31
NE England	1,703[2]	0.00-030	0.29	1238[1]		0.40
E England	4,602[4]	0.73-1.00	0.88	3815[4]	0.20-1.00	0.80
SE England	597[5]	0.00-0.93	≥0.29	394[2]	0.40-1.20	*c.*0.91
SW England	75[1]		0.33	195[2]	0.00-0.90	0.90
Wales	782[1]		0.79	1227[1]		1.20
NW England	360[1]		0.02	350[1]		1.00
NW Ireland	21[1]		>0.48	78[1]		>0.62
Total	9,115[16]	0.00-1.00	**≥0.69**	8,389[15]	0.00-1.20	**>0.80**

Similarly, in **south-west England**, the colony on Brownsea experienced its best ever year for number of fledged chicks and productivity was well above the 12-year average of 0.65 chicks per pair (s.e. ±0.11).

Productivity of the 1,227 pairs on Anglesey (**Wales**), was the highest since 1997. At Hodbarrow (**north-west England**), productivity was more than twice the long-term mean of 0.41 chicks per pair (s.e. ±0.14).

In **north-west Ireland,** at least 48 chicks fledged from 78 pairs, a higher productivity than in the previous two years. Flooding depressed productivity at Lough Swilly. At Mulroy Bay, mink predation resulted in poor breeding success, with less than 0.12 chicks fledged per pair (Perry and Speer 2003). In **south-east Ireland**, a sample of 52 nests in an enclosure produced between 0.75-0.81 chicks per egg-laying pair, indicating a moderately successful breeding season (S. Newton, pers. comm.).

Table 3.18.4. Productivity of Sandwich terns expressed as chicks per pair 2002–2003 and 1986-2002 at selected sites referred to in the text. (- indicates no data available)

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
SW Scotland				
Loch Ryan	0.00	>1.0	-	-
NE Scotland				
Sands of Forvie	0.95	*c.*0.71	0.61 (0.13)	13
NE England				
Coquet	0.30	0.4	0.71 (0.06)	10
E England				
Scolt Head	0.90	0.77	0.70 (0.12)	13
Holkham	0.91	1.0	0.71 (0.07)	2
Blakeney	0.73	0.79	0.72 (0.09)	13
Havergate	1.00	0.20	0.72 (0.14)	12
SE England				
Rye Harbour	*c.*0.93	*c.*1.20	0.38 (0.14)	12
Langstone Harbour	0.03	0.39	0.52 (0.16)	6
Pitts Deep - Hurst	0.11	+	-	-
SW England				
Brownsea	0.33	0.90	0.65 (0.11)	12
Wales				
Anglesey	0.79	1.20	0.82 (0.08)	12
NW England				
Hodbarrow	0.02	1.00	0.41 (0.14)	13
NW Ireland				
Lower Lough Erne	>0.48	>0.62	0.32 (0.07)	8
SE Ireland				
Lady's Island Lake	<0.28	*c.*0.78	0.68 (0.13)	4

3.19 Roseate tern *Sterna dougallii*

Numbers of roseate terns reached their highest level since 1979, largely attributable to an increase at Rockabill, where 50 more pairs were recorded than in 2002. However, fewer sites reported breeding than in any year since 1969. The 2003 breeding season was the most productive for 11 years, with the colonies in south-east Ireland rearing the highest number of fledged chicks per pair.

Breeding numbers (Table 3.19.1)

Table 3.19.1 Roseate tern numbers (breeding pairs) at most colonies in Britain and Ireland 1992–2003. (- indicates that no data were available)

Region: Colony	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2002-2003 % change
E Scotland:													
Inchmickery	0	0	2	0	0	0	0	0	0	0	0	0	
Forth B	17	17	7	11	7	8	8	9	10-11	1	2	8	+300.0
Forth C	-	-	-	1	1	0	0	0	1	1	0	0	
New colony	0	0	0	0	0	0	0	0	1	0	0	0	
NE England:													
Farne Islands	4	3	2-3	2	2	3	3	4	1	1	1	0	-100.0
Coquet Island	29	*c*30	*c*38	38	24	25	29	34	34	42	57	70	+22.8
New colony A	0	0	0	1	14	2	3	0	0	0	0	0	
New colony B	0	0	0	0	0	0	0	0	0	0	1	0	-100.0
Wales:													
Anglesey A	0	16	18	10	1	2	3	3	2	7	7	0	-100.0
Anglesey B	0	0	0	0	0	1	0	0	0	0	0	0	
Anglesey C	7	5	2	0	0	0	2-3	0	0	0	0	2	-
NE Ireland:													
Larne Lough	3	0	4	7	13	7	3	10	4	6	4	19	+33.3
Carlingford L.	0	0	0	0	0	2	0	0	0	0	0	0	
SE Ireland:													
Rockabill	378	427	394	554	557	602	578	611	618	605	588	638	+8.5
Lady's Island	76	76	140	60	120	48	80	116	>78	46	96	77	-19.8
Total*	520	578	614	686	744	703	712	788	>750	709	758	821	+8.3

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

It appears that after the decline in 2000 and 2001, the breeding population in Britain and Ireland has recovered, increasing by 8.3% between 2002 and 2003 to its highest total in 24 years.

UK numbers increased by 36.5% to their highest level since 1990. However, only five of the UK sites reported nesting, the least since 1969, but a small number of birds were prospecting at two further sites. In **east Scotland**, the only remaining site recovered from the low of the previous two years to just above the 22-year average of 7.4 pairs (s.e. $\pm$1.4). In **north-east England,** Coquet Island was the sole contributor to the region's highest total since 1975. The marked increase in numbers since 2000 follows the earlier creation of nesting terraces and nest boxes for this species on the island (P. Morrison, pers. comm.). For the first time since recording began, no roseate terns nested on the Farnes, despite birds being present.

Two pairs returned to a site newly colonised in **south-east England** in 2002. For the first time in 11 years no nesting attempts were made at a site on Anglesey **(Wales)**, but an intensive survey discovered 2 nesting pairs at a second Anglesey site for the first time since 1997.

Numbers in **north-east Ireland** reached their highest level since 1990, due to an increase at the only remaining site at Larne Lough Islands. After a brief decline in 2001 and 2002, numbers on Rockabill **(south-east Ireland)**, rose again to an all-time high of 638 pairs. Some adult mortality, attributable to

predation by peregrine falcons, was noted. A sample of birds on Rockabill, whose origins were identified from ringing, showed that 88.7% was recruited from Rockabill, and the largest cohort (19%) was ringed in 2000 (Maljkovic *et al.* 2003). The colony at Lady's Island Lake decreased by almost 20% since 2002. A new site in the region was used by five nesting pairs.

Breeding success (Table 3.19.2)

Whilst breeding was reported from fewer sites, overall breeding success was very high, resulting in the highest productivity since 1992 and well above the 10-year mean of 1.27 fledged chicks per pair (s.e. ±0.06).

At Forth B in **Scotland**, productivity was again high, with 1.11 chicks fledged per pair. In **north-east England**, only Coquet reported breeding. Productivity on this site was below the 2002 level but above the 13-year mean of 1.03 chicks per pair (s.e. ±0.06).

Table 3.19.2 Breeding success of roseate terns 2002–2003.

Region/Site	Pairs	2002 fledged/pair	Pairs	2003 fledged/pair
E Scotland				
Forth B	2	≤1.00	8	1.11
Forth C	-	-	-	-
NE England				
Farnes	1	2.00	0	-
Coquet	57	1.25	70	1.13
New colony B	1	1.00-2.00	0	-
SE England				
Colony A	2	0.00	2	0.00
Wales				
Anglesey A	7	1.00	0	-
NE Ireland				
Larne Lough	4	≤0.75	19	0.37
SE Ireland				
Rockabill	588	1.39	638	1.58
Lady's Island Lake	96	*c.*1.00	77	1.53
New colony	-	-	5	*c.*1.6
Total	**758**	**1.32**	**818**	**1.50**

No chicks hatched in **south-east England** and for the first time in three years roseate terns failed to raise any young in **Wales.**

Productivity at Larne Lough Island **(north-east Ireland)** was only 0.37 chicks per pair; the lowest for three years. At Rockabill **(south-east Ireland)**, productivity was 1.58 chicks fledged per nest (n=110), the highest since 1993. The overall rate of roseate tern chick provisioning was lowest during early chick growth with a peak during mid chick growth. Clupeids were the most common food presented to chicks (61.8%) (Maljkovic *et al.* 2003). At Lady's Island Lake, 14 clutches were stolen by egg collectors, but four pairs relaid. The overall productivity at the site, of 1.53 chicks per pair, was the highest since 1990.

3.20 Common tern *Sterna hirundo*

Between 2002 and 2003, overall breeding numbers remained stable or increased in most regions. However, considerable declines were noted in north Scotland and north-east England. Breeding data suggest that productivity in 2003 was above average.

Breeding numbers (Tables 3.20.1 and 3.20.2)

Overall, numbers in **west Scotland** increased by nearly a quarter. This was largely due to an almost six-fold increase at a ternery on the Treshnish Isles since 2002 (*c.*440 pairs). Numbers at 34 sites monitored as part of the Mink-Seabird Project remained generally stable. However, birds deserted at least six of the sites, mainly after predation incidents. Disturbance early in the season caused desertion of large numbers of terns at Glas Eileanan, Sound of Mull, formerly the largest common tern colony in the British Isles. The remaining pairs left after adults were killed by a resident otter. A raptor preyed heavily upon adults on Dubh Sgeir, Sound of Jura (Craik 2003), where 304 breeding pairs were present in 2003 (zero in 2002). In addition, a census of terns from the south of Harris to the north of South Uist to evaluate the effects of mink eradication on tern and gull populations in the Outer Hebrides (Curtis 2003), reported only 280 pairs compared with 414 in 2002. However, differences in sites surveyed limit useful comparisons between the two years.

Table 3.20.1 Regional population changes at monitored common tern colonies, 2002–2003 (breeding pairs). Superscript = number of colonies counted in both years. Regional samples <100 pairs not included.

Region	2002	2003	2002-2003 % change
SW & NW Scotland	1,316	1,634	$+24.2^{36}$
N Scotland	<568	405	-28.7^{10}
NE Scotland	389	496	$+27.5^{6}$
SE Scotland	169	329	$+94.7^{4}$
NE England	1,760	1,293	-26.5^{10}
E England	1,128	1,142	$+1.3^{10}$
SE England	601	618	$+2.8^{7}$
SW England	215	240	$+11.6^{2}$
Wales	844	983	$+16.5^{4}$
NW England	196	226	$+15.3^{4}$
NE Ireland	1,592	2,042	$+28.3^{4}$
SE Ireland	1,016	1,124	$+10.6^{2}$
Britain and Ireland	9,794	10,532	$+7.5^{89}$

Five sites in **Shetland** together reported 12 pairs of common terns, two more than in 2002. Overall numbers decreased in **north Scotland** by 29% due to substantial declines at two of the largest colonies - Alness Point and Barmac. These decreases were only partially compensated by the over 70% increase at the Avoch Fish Farm. Two new sites were colonised, together supporting 36 pairs. The colony at Nigg reached its lowest level in four years (126 pairs), well below its average of 171 pairs.

Overall numbers in **north-east Scotland** reached their highest level since 1991. This was largely due to a 50% increase at Site X, a colony rapidly increasing since its formation in the mid 1990s. At St Fergus, numbers reached the highest total since 1986, reversing the declining trend since 1998. In contrast, numbers at the Sands of Forvie fell to their lowest level since 1996. Numbers at all monitored colonies in **south-east Scotland** increased since 2002. At Leith Docks, numbers reached an all-time high, whilst numbers at Grangemouth equalled the highest figure recorded there (139 pairs in 1993), and Long Craig reported the second highest total (126) since 1980. Although the colony on the Isle of May recovered slightly from its low in 2002 it remained well below the long-term mean of 160 pairs.

Table 3.20.2 Population changes of common terns 2002–2003 and 1986-2002 at selected sites referred to in the text. (P = pairs; I = individuals).

Region/Site		2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. years
SW Scotland						
Sgeir na Caillich	P	421	200	-52.5	205 (120)	13
Glas Eileanan	P	229	117	-48.8	549 (206)	17
N Scotland						
Alness Point	P	110	30	-72.7	121 (71)	15
Avoch, Ross	P	70	120	+71.4	66 (6)	3
Barmac's	P	210	80	-61.9	152 (148)	14
Nigg	P	139	126	-9.4	171 (109)	14
NE Scotland						
'Site X'	P	*c.*134	*c.*200	+49.3	48 (50)	6
Loch of Strathbeg	P	22	64	+190.9	92 (36)	16
Kirkhill	P	10-12	15-20	+54.5	24 (21)	7
SE Scotland						
Isle of May	P	2	60	+2900	160 (114)	17
Leith Docks	P	+	795	-	450 (158)	14
NE England						
Coquet	P	1,083	923	-14.8	770 (180)	17
Farnes	P	91	76	-16.5	228 (87)	17
Teesmouth	P	420	85-100	-76.2 (min.)	227 (152)	7
C England						
Rye Meads	P	47	52	+10.6	42 (4)	12
E England						
Scolt Head	P	260	280	+7.7	164 (80)	17
Blakeney	P	165	168	+1.8	206 (66)	17
SE England						
Pitts Deep - Hurst	P	*c.*375	*c.*200	-46.7	141 (97)	16
Langstone Harbour	P	88	146	+65.9	67 (45)	17
Chichester Harbour	P	40	45	+12.5	21 (27)	17
SW England						
Brownsea	P	179	207	+15.6	148 (35)	17
Lodmoor	P	36	33	-8.3	28 (15)	5
Wales						
Shotton Pools	P	555	607	+9.4	317 (131)	17
Cemlyn	P	46	57	+23.9	65 (27)	15
NW England						
Seaforth	P	143	168	+17.5	66 (65)	17
NE Ireland						
Larne Lough	P	482	636	+31.9	309 (172)	15
Carlingford Lough	P	459	510	+11.1	359 (141)	13
Strangford	P	651	894	+37.3	576 (86)	17
SE Ireland						
Rockabill	P	774	917	+18.5	346 (230)	17
Lady's Island Lake	P	*c.*461	+	-	307 (97)	14
Dublin Port	P	242	207	-14.5	130 (86)	8

In **north-east England**, total numbers declined by a quarter from 2002. Numbers fell or remained stable at almost all sites in the region. The largest decline, of nearly 80% from 2002, occurred at Teesmouth, the second largest colony in the region. After its record high in 2002, the population at Coquet declined by 15%, but remained well above the 1986-2002 mean of 770 pairs (s.d. ±179.7). For the third year in succession, numbers on the Farnes decreased and reached their lowest level since 1975. The only site in the region with a marked increase in numbers was Saltholme: between 44 and 50 pairs used the raft that was installed in 2002.

Few data were available from **central England**. A moderate increase occurred at Rye Meads, Hertfordshire and a total of at least 37 pairs were reported from six sites in Bedfordshire.

In **east England,** overall numbers remained stable across ten sites in 2003. Only the population at Snettisham showed a notable change, increasing by over 32% to 115 pairs, the second highest total in 18 years. Overall, numbers in **south-east England** remained stable in 2003. However, much inter-colony variation occurred. Most noticeable was an almost 50% decrease at Pitt's Deep, where the population fell to the 2001 level. The colony at Dungeness remained stable, while the closely linked colonies of Langstone and Hayling recovered from last year's decline. After four years of decline a 145% increase to 86 breeding pairs occurred at Rye Harbour. The colonies in the Medway were not counted in 2003.

Following the decrease in 2002, numbers on Brownsea Island **(south-west England)**, recovered and reached their highest level since 1969. The colony at Lodmoor declined for a second year running. A total of 83 pairs was reported from four sites in the Isles of Scilly, a decrease of almost 30% since 2002.

All monitored colonies in **Wales** that held birds in the last 5 years saw sizeable increases, resulting in the highest total of breeding pairs in the region since 1986. At the four regularly monitored sites in **north-west England**, numbers remained stable or increased; most notably, the population at Seaforth recovered from the decline between 2001 and 2002. At the Ribble Estuary, numbers increased by 13.3% from the low of 98 pairs in 2000, but no counts were made in 2001 and 2002.

All monitored sites in **north-east Ireland** reported moderate to large increases, resulting in the region's highest total since 1986. The region's largest colony at Strangford Lough continued to increase after its low of 341 pairs in 2001, reaching its highest total since 1986. Similarly, the two other main colonies in the region, at Larne Lough and Carlingford, reached record numbers.

Comparisons with 2002 of the population in **south-east Ireland** was difficult, as no count took place in 2003 at Lady's Island Lake, the region's second largest colony, and no monitoring was carried out after 8 June at Dublin Port. However, Rockabill, the region's largest colony, reported an increase of 18.5%, reaching its highest level ever. A new site reported 62 pairs, based on a common to Arctic tern ratio of 5:2 for a 'commic' count of 86 pairs.

Breeding success (Tables 3.20.3 and 3.20.4)

For most regions, overall productivity was similar to or higher than in 2002. The only exceptions were north-east England and south-east Ireland, where productivity was below the long-term average. Scottish colonies remain comparatively unproductive, but overall productivity was above the long-term mean of 0.47 chicks per pair (s.e. $\pm$0.04). Colonies in England experienced an average breeding season, with a productivity of 0.82 chicks per pair (1989-2002 mean = 0.82, s.e. $\pm$0.07), and productivity in Wales and south-east Ireland was again high, although 1.17 chicks per pair was lower than average in the latter region (1991-2002 mean = 1.48, s.e. $\pm$0.14).

Productivity in **west Scotland** was 0.56 chicks per pair: similar to that in 2002. Mink-free islands generally fared better than those where the presence of mink was detected. The highest productivity was experienced on the mink-free Mussel Raft, Loch Creran, where 27 pairs fledged 60 chicks. However, predation by peregrines falcons depressed productivity at Sgeir nan Caillich, Loch Melfort (200 pairs, no fledged chicks), and Dubh Sgeir, Sound of Jura (304 pairs, 200 fledged chicks) (Craik 2003).

Table 3.20.3 Common tern productivity, grouped regionally, 2002–2003: expressed as number of chicks fledged per breeding pair at sample colonies (superscript 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 number of pairs given here are sample sizes (and do not necessarily indicate population changes between years). (- indicates no data were available).

Region	2002 chicks fledged/pair			2003 chicks fledged/pair		
	Pairs^n	Range	Overall	Pairs^n	Range	Overall
SW Scotland	1,033^{13}	0.00-2.29	0.59	959^{14}	0.00-2.22	0.54
NW Scotland	177^{11}	0.00-1.50	0.32	193^{8}	0.00-1.02	0.68
N Scotland	<568^{8}	0.00-0.01	0.00	405^{8}	0.00-1.11	0.40
NE Scotland	285^{6}	0.00-1.00	0.30	25^{2}	0.09-0.71	0.44
SE Scotland	163^{3}	0.00-0.82	>0.38	266^{3}	0.41-133	0.84
Total Scotland	2,226^{41}	0.00-2.29	**>0.36**	1,922^{36}	0.00-2.22	**0.57**
NE England	1,206^{4}	0.23-1.97	1.81	971^{4}	0.12-1.04	1.00
C England	83^{5}	0.00-2.25	1.23	56^{3}	1.38-2.00	1.41
E England	1,018^{9}	0.04-1.48	0.56	1,046^{10}	0.00-1.61	0.76
SE England	601^{7}	0.04-1.46	0.19	374^{7}	0.00-1.40	0.58
SW England	215^{2}	0.06-1.00	0.21	323^{3}	0.34-1.06	0.76
NW England	196^{4}	0.00-0.71	0.56	228^{5}	0.07-2.00	0.61
Total England	3,283^{27}	0.00-1.97	**0.94**	2994^{30}	0.00-2.00	**0.82**
Wales	843^{4}	0.07-2.17	**1.20**	983^{4}	0.99-2.04	**1.26**
NE Ireland	75^{1}		1.47	-		-
SE Ireland	1,016^{2}	1.24-1.35	1.32	917^{1}		1.17

After last year's complete failure, most sites in **north Scotland** experienced another poor breeding season. An apparent lack of food caused a second year of complete failure at Nigg (Swann 2003b), whilst disturbance and predation by foxes and cats respectively had similarly detrimental effects at Alness and McDermott's (A. Ramsey, pers. comm.). However, productivity was high at the Avoch Fish Farm and at the newly colonised site at Ardullie, where 28 pairs fledged 20 chicks.

In **north-east Scotland**, comparison with previous years was limited as very few productivity data were received. Although monitoring was difficult at St Fergus, 2003 was thought to have been a productive year (Bliss and Paterson 2004). In contrast, stoat and gull predation depressed productivity at the Sands of Forvie (>0.09 chicks per pair) (A. Drysdale, pers. comm.).

For the first time in three years, productivity in **south-east Scotland** was above the 1986–2002 mean (0.60 chicks per pair, s.e. ±0.09). The largest colony at Leith Docks fledged young, but no count data were available. A high productivity of 1.33 chicks per pair was reported from Long Craig (126 pairs), whereas productivity at Grangemouth was average for this site.

After three excellent years, productivity at Coquet (**north-east England**) was average for this site. Most nests (14 pairs) were flooded at Fairburn Ings (K. Sutcliffe, pers. comm.), whilst at Boultham Mere gulls deterred terns from the rafts (S. Botham, pers. comm.) resulting in low productivity of 0.12 chicks per pair (ca. 25 pairs). Productivity on the Farne Islands was not monitored.

Table 3.20.4 Productivity of common terns expressed as chicks per pair 2002–2003 and 1986-2002 at selected sites referred to in the text. (- indicates no data available)

Region/site	2002	2003	1986-2002 Mean (±s.e.)	No. of years
SW Scotland				
Eilean an Ruisg	2.29	1.67	2.29 (0. 24)	5
Sgeir nan Caillich	0.71	0.00	0.78 (0.35)	5
Glas Eileanan	0.00	0.00	0.37 (0.17)	4
N Scotland				
Avoch Fish Farm	0.00	1.11	0.57 (0.44)	3
Nigg	0.01	0.00	0.58 (0.15)	13
NE Scotland				
St Fergus	0.07	>0.19	0.16 (0.06)	10
Site X	1.00	-	0.73 (0.10)	5
SE Scotland				
Grangemouth	>0.16	*c.*0.41	0.44 (0.07)	7
NE England				
Coquet	1.97	1.04	1.08 (0.16)	17
Farnes	0.23	-	0.67 (0.19)	7
C England				
Rye Meads	1.32	1.38	1.55 (0.18)	7
E England				
Hoveton Great Broad	1.48	1.58	-	-
Snettisham	0.09	0.02	0.36 (0.12)	11
Holkham	0.04	0.00	0.50 (0.15)	12
Blakeney	0.27	0.27	0.54 (0.15)	11
SE England				
Pitts Deep – Hurst	*c.*0.04	-	0.41 (0.12)	8
Langstone Harbour	0.08	0.23	0.60 (0.15)	15
Hayling Island	0.29	0.38	N/A	
SW England				
Brownsea Is	0.06	0.85	0.61 (0.08)	14
Lodmoor	*c.*1.00	*c.*1.06	1.68 (0.24)	5
Wales				
Shotton	1.05	0.99	1.34 (0.15)	14
Cemlyn	0.07	2.04	0.40 (0.16)	8
NW England				
Seaforth	0.67	0.77	0.63 (0.07)	17
Rockcliffe	0.71	0.04	0.14 (0.07)	10
NE Ireland				
Belfast Lough	1.47	-	1.51 (0.16)	3
SE Ireland				
Rockabill	1.35	1.17	1.63 (0.14)	12
Dublin Port	1.24	-	1.48 (0.10)	5

Productivity figures were available from only three sites in **central England.** At Rye Meads, Hertfordshire, productivity was similar to 2002, below the long-term average of 1.55 chicks per pair (s.e. ±0.18). Two sites in Leicestershire fledged 2-3 and 5 chicks from one and three pairs, respectively.

Overall, breeding success in **east England** improved from 2002 and productivity was above the long-term mean of 0.64 chicks per pair (s.e. ±0.08). However, there was much inter-colony variation. The largest colony in this region, at Scolt Head, fared best, reaching its second highest productivity since 1986. Despite a late season at Breydon Water (197 pairs), probably due to disturbance from a helicopter search, productivity was similar to the 1986-2002 mean (1.07 chicks per pair, s.e. ±0.07) (P. Allard, pers. comm.). Predation by gulls depressed productivity at Holkham and Blakeney for a second year.

The 2003 breeding success in **south-east England** was slightly below average. This was largely attributable to low productivity at Langstone Harbour, following a food shortage (C. Cockburn, pers. comm.). In contrast, food was plentiful at Rye Harbour in Kent, leading to a high productivity of over 1.4 chicks per pair for a third consecutive year. The colony at Chichester Harbour appeared to be re-established and, despite some flooding at the periphery of the colony, 34 chicks fledged from 45 pairs. Only a few fledged juveniles were noted at Pitt's Deep-Hurst, but no count was made.

While productivity was above average on Brownsea Island **(south-west England)**, gull predation and inclement weather depressed productivity on the Isles of Scilly. The colony at Lodmoor raised one chick per pair, as in 2002.

In **Wales** overall productivity was above average and all colonies reported a good breeding season. However, at Shotton over 200 chicks were killed, possibly by a mink, resulting in a lower than average productivity of 0.99 chicks per pair for this site.

Productivity in **north-west England** was 0.61 chicks per pair, similar to that in 2002. While productivity at Seaforth was above average, the smaller colonies at Hodbarrow and Rockliffe Marsh failed almost entirely to raise fledged young.

Common terns at Belfast Lough **(north-east Ireland)**, raised around 145 fledged chicks from an unknown number of pairs and at least two chicks fledged from 2 pairs at Lower Lough Erne. In **south-east Ireland**, productivity on Rockabill was, with 1.17 chicks per pair (n = 157), comparatively low for this colony. This was largely due to predation by a peregrine falcon (Patrick *et al.* 2003).

3.21 Arctic tern *Sterna paradisaea*

Between 2002 and 2003 large declines were noted in the regional populations of Arctic terns in Shetland, west and north-east Scotland. Little change was reported from north-east England and Wales, with an increase recorded in all other regions. Major breeding failures were experienced at colonies in Shetland, Orkney and north Scotland due to an apparent shortage of sandeels, while productivity was above average in west Scotland and north-east England and continued to be high in Wales.

Breeding numbers (Tables 3.21.1 and 3.21.2)

Only 130 pairs were found breeding at over 30 sites visited as part of the Mink-Seabird Project in **west Scotland**. This is the lowest recorded number since the start of the project in 1987 and only a quarter of the numbers recorded in 2002. (Note that the 2002 volume of this report (Mavor *et al.* 2003) erroneously stated the number of Arctic terns on Fladda, Sound of Luing, as 1,350 pairs; the correct number is 350 pairs). A survey, complementing the programme of 'Mink control to protect important birds in SPAs in the Western Isles' (Curtis 2003) recorded 1,185 breeding pairs of Arctic terns. This was 26% fewer than that reported in 2002, but due to differences in sites surveyed only limited comparisons between the two years can be made (Curtis 2003). Elsewhere in the region, the species kept a foothold on Handa with one breeding pair, and on the Isle of Eigg numbers fell by 50% from the record high of *c.*190 pairs in 2002. In addition, 500 pairs were recorded at 18 sites on Tiree.

Several sites in **Shetland** reported large declines. The most notable decrease occurred on Foula, where only around 50 pairs were present. Following a 50% decline from 800 pairs between 2001 and 2002, this is the lowest number of breeding Arctic terns ever recorded at Foula. Similarly, Fair Isle experienced a record low of 80 pairs, less than 3% of the number present in 2001. On Mousa, 165 individuals were present at the beginning of the season, with some displaying, but no nesting followed (H. Moncrieff, pers. comm.). The only site not following the decline was Hermaness, where numbers more than trebled from 23 pairs in 2002 (Duffield 2003).

Table 3.21.1 Population changes at monitored Arctic tern colonies, 2002–2003 (breeding pairs). Superscript = number of colonies/sites counted in both years. Regional samples <100 pairs not included.

Region	2002	2003	2002-2003 % change
SW & NW Scotland	856	423	-50.6[37]
Shetland	1,211	698	-42.4[10]
Orkney	2,563	3,094	+20.7[7]
N Scotland	238	198	-16.8[10]
NE Scotland	621	376	-39.5[7]
SE Scotland	238	581	+144.1[5]
NE England	3,955	3,836	-3.0[3]
Wales	1,994	2,044	+2.5[3]
NE Ireland	846	1,095	+29.4[3]
SE Ireland	*c.*103	*c.*161	+56.3[2]

Almost 6,000 breeding pairs were reported from **Orkney**, the increase being due to higher survey effort rather than an actual increase in numbers. An increase of 160% was noted at North Ronaldsay, from around 740 pairs in 2002. In contrast, numbers fell at North Hill, Papa Westray, from 1,506 pairs in 2002 to only 638 in 2003. A further 3,500 individuals were noted at Westray and 840 on Auskerry.

In **north Scotland**, two new sites were colonised with small numbers of birds, but overall numbers declined for a third consecutive year. Moderate to large decreases occurred at most sites, such as at Barmac, where only a third of the 60 pairs present in 2002 nested in 2003. A noticeable increase of 25 pairs occurred at Portgower after the low of <5 pairs in 2001 and 2002. In **north-east Scotland**, numbers fell to their lowest level since 1987. This was mainly due to large declines at the Sands of Forvie and Kinloss. The colony at St Fergus, however, remained stable and an increase of 118% from 2002 occurred at River Spey. Only two sites in **south-east Scotland** reported nesting Arctic terns. The main colony, on the Isle of May, recovered from its low in 2002, increasing by 153% to above the 1986-2002 mean (469 pairs, s.e. ±247.7). Disturbance prevented five pairs from nesting at a third site.

A marginal overall decrease of 3% occurred in **north-east England**. A decline of around 400 pairs at Long Nanny was offset by a corresponding increase on the nearby Farne Islands, while numbers at Coquet decreased by 12%. At Lindisfarne, 60 common/Arctic terns were recorded, the same number as in 2002. In **east England,** numbers at Blakeney returned to 1998 levels of 20 pairs (6 in 2002) and one other site reported two breeding pairs. Numbers on Foulney **(north-west England)**, increased to the highest level since 1997.

Overall, numbers in **Wales** remained stable at a high level, with the largest colony, on the Skerries, increasing slightly by 5%, reaching its highest total on record. At the **Isle of Man**, seven pairs were reported nesting in 2003.

The population of Arctic Terns increased in **north-east Ireland** from 2002 to 2003 by almost 30%. This was largely attributable to a major increase in number of pairs at Big Copeland, where the population reached its highest recorded level. Strangford Lough recorded its fourth highest count in 20 years. No count data were available from the largest colony in **south-east Ireland**, Lady's Island Lake, but numbers on Rockabill reached their highest ever level.

Table 3.21.2 Population changes of Arctic terns 2002–2003 and 1986-2002 at selected sites referred to in the text. (P = pairs; I = individuals).

Region/Site		2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. years
SW Scotland						
Fladda	P	*c.*350	0	-100.0	93 (117)	8
NW Scotland						
Isle of Eigg	P	*c.*190	80	-57.9	52 (49)	16
Shetland						
Fair Isle	P	115	80	-30.4	913 (694)	16
Foula	P	400	*c.*50	-87.5	729 (410)	16
Fetlar	P	480	192	-60.0	567 (340)	12
Orkney						
North Hill	P	1,506	683	-54.7	2,327 (1,105)	15
North Ronaldsay	I	1,111	2,902	+161.2	-	-
Rousay	I	300	300	0	-	-
Onziebust	P	5	15	+200.0	-	-
N Scotland						
Nigg	P	113	105	-7.1	96 (62)	13
NE Scotland						
Sands of Forvie	P	257	58	-77.4	91 (97)	14
St Fergus	P	176	180	+2.3	343 (136)	15
SE Scotland						
Isle of May	P	228	577	+153.1	469 (248)	17
NE England						
Coquet	P	874	765	-12.3	652 (161)	17
Farnes	P	1,301	1,721	+32.3	2,614 (984)	17
Long Nanny	P	1,780	*c.*1,350	-24.2	522 (608)	15
Wales						
Skerries	P	1,555	1,634	+5.1	825 (418)	15
NW England						
Foulney	P	43	49	+14.0	42 (12)	16
NE Ireland						
Strangford Lough	P	277	272	-1.8	159 (87)	17
Big Copeland	P	542	*c.*800	+47.6	338 (199)	11
SE Ireland						
Rockabill	P	87	139	+59.8	34 (36)	17
Lady's Island Lake	P	*c.*188	-	-	162 (88)	13

Breeding success (Tables 3.21.3 and 3.21.4)

An apparent severe food shortage resulted in a very low productivity in Shetland, north Scotland and some colonies in Orkney, whilst predation depressed productivity in most other regions. Arctic terns in Wales continued to be the most productive.

Very few productivity data were available for **west Scotland**. Whilst breeding numbers counted during the Mink-Seabird Project were low, productivity was 1.03 chicks per pair, the highest since 1995. Some of the sites, however, experienced losses from predation by raptors and otter. No precise measurement of breeding success was made on Tiree, but overall, productivity was thought to have been high.

Productivity was very low in **Shetland,** for a third consecutive year. Due to a third season of severe sandeel shortage, several colonies deserted before or during incubation. Those birds that remained fledged only small numbers of chicks. The highest productivity was recorded on Hermaness and Noss, with 0.26 and 0.33 chicks per pair respectively.

In contrast to the successful season in 2002, most sites in **Orkney** experienced low productivity in 2003. The colonies on the North Hill of Papa Westray and Rousay (200 pairs) failed to rear any chicks. At West Westray, 1,190 chicks were ringed but the final outcome is unknown. On North Ronaldsay, Arctic terns reared large numbers of chicks to 'ringing age', but a subsequent visit revealed many dead and very few fledged chicks (A. Duncan, pers. comm.). Whilst one of the sub-colonies on Auskerry experienced heavy predation by great skuas, a second sub-colony fledged substantial numbers of chicks (J. Williams, pers. comm.).

For a second consecutive year, all eight regularly monitored sites in **north Scotland** failed completely, with only the newly colonised site at Ardullie fledging chicks - 8 from 12 pairs. An apparent food shortage led to very late nesting and subsequent total failure at Nigg (Swann 2003b), whilst heavy predation by foxes and cats caused total failure at McDermotts/Barmac and disturbance affected three other sites.

Table 3.21.3 Arctic tern productivity, 2002–2003, grouped regionally: expressed as number of chicks fledged per breeding pair at sample colonies (superscript 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 number of pairs given here are sample sizes (and do not necessarily indicate population changes between years). (- indicates no data were available).

Region	2002 chicks fledged/pair			2003 chicks fledged/pair		
	Pairs[n]	Range	Overall	Pairs[n]	Range	Overall
SW Scotland	541[15]	0.00-2.00	0.66	94[11]	0.00-2.07	1.05
NW Scotland	194[2]	0.00-0.02	0.02	35[3]	0.00-2.00	1.06
Shetland	2,722[14]	0.00-0.46	0.11	543[6]	0.00-0.33	0.12
Orkney	2,395[5]	0.00-1.05	0.86	1024[4]	0.00-0.20	0.03
N Scotland	238[8]		0.00	198[10]	0.00-0.67	0.04
NE Scotland	583[5]	0.00-0.39	0.19	375[5]	0.00->0.25	>0.12
SE Scotland	238[5]		0.00	4[1]		>0.25
NE England	2,175[2]	0.53-0.64	0.59	3,836[3]	0.59-0.95	0.77
E England	6[1]		0.17	20[2]	0.06-1.00	0.15
Wales	1,994[3]	0.00-1.43	*c.*1.42	2,044[3]	0.78-1.56	*c.*1.46
NW England	43[1]		0.81	49[1]		0.55
SE Ireland	87[1]		0.66	139[1]		0.40

There was much inter-colony variation in breeding success in **north-east Scotland**. The colonies at Kinloss and River Spey experienced total failures and predation by stoats and gulls depressed productivity at the Sands of Forvie. However, a productive breeding season was reported from St Fergus, where a minimum of 43 chicks fledged from 180 pairs; many more were suspected to have fledged, but high vegetation made monitoring difficult (Bliss and Paterson 2004). On the Isle of May (**south-east Scotland**), 185 Arctic/common tern chicks fledged, resulting in a maximum productivity of 0.3 chicks per breeding pair.

Overall productivity in **north-east England** was above average (1990–2002 mean = 0.66, s.e. ±0.26). Birds on Coquet and the Farne Islands (sample of 298 nests) were more successful than in 2002, while predation by common kestrels *Falco tinnunculus* depressed productivity at Long Nanny for a second year. Flooding caused almost total failure at the small **east England** colony and predation by fox reduced productivity on Foulney (**north-west England**); also in this region, the small colony on the Isle of Man was deserted before hatching, for unknown reasons (C. Sharpe, pers. comm.).

For a seventh consecutive year productivity at the two major colonies in **Wales** was very high, at 1.46 chicks per pair, well above the 1968-2002 mean of 1.06 (s.e. ±0.10).

The theft of many eggs at Big Copeland **(north-east Ireland)**, led to only 50 chicks fledging from around 800 pairs. Arctic terns at Rockabill **(south-east Ireland)**, suffered a poor season in 2003. The low productivity was presumed to be a consequence of the regular presence of peregrine falcons at the site, discouraging birds from incubating for long periods and later in the season preying on large chicks (Patrick *et al.* 2003).

Table 3.21.4 Productivity of Arctic terns expressed as chicks per pair during 2002–2003 and 1986-2001 at selected sites referred to in the text.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
SW & NW Scotland				
Fladda	0.90	-	0.54 (0.27)	3
Isle of Eigg	0.02	-	0.17 (0.08)	6
Shetland				
Foula	0.01	0.00	0.16 (0.06)	15
Fair Isle	0.00	0.00	0.28 (0.09)	14
Fetlar	0.46	0.03	0.15 (0.06)	12
Orkney				
North Hill	1.05	0.00	0.2 (0.12)	9
NE Scotland				
Sands of Forvie	0.39	>0.03	0.32 (0.10)	12
Kinloss	0.00	0.00	0.19 (0.08)	9
St Fergus	0.03	+	0.10 (0.04)	11
SE Scotland				
Isle of May	0.00	0.30 'commics'	0.32 (0.08)	11
NE England				
Farnes	0.64	0.90	0.56 (0.13)	7
Coquet	0.53	0.95	0.75 (0.09)	13
Long Nanny	0.45-0.90	*c.*0.59	0.69 (0.15)	12
Wales				
Skerries	1.41	1.44	1.09 (0.11)	11
NW England				
Foulney	0.81	0.55	0.34 (0.06)	17
SE Ireland				
Rockabill	0.66	0.40	1.01 (0.14)	7

3.22 Little tern *Sterna albifrons*

There was little change in the overall numbers of breeding pairs between 2002 and 2003. However, much inter- and intra-regional variation occurred and most of the northern colonies declined since 2002, whereas the larger colonies in the east and south east of England and in Wales remained stable or increased. Whilst some colonies reported total failures, overall productivity in 2003 was one of the highest on record, with several major colonies reporting their most successful year ever.

Breeding numbers (Tables 3.22.1 and 3.22.2)

Numbers at the Coll reserve **(west Scotland)**, continued to decrease in 2003, to almost half the level of those in 1999. The extent of an apparent decline at Tiree was difficult to assess as, in contrast to 2002, most of the birds nested at scattered colonies around the coastline and movement between sites after failure was likely (J. Bowler, pers. comm.).

A further 10 pairs were located on Gunna, an island not visited in 2002. Four pairs were present at Balranald, two more than in 2002. A survey in the Western Isles recorded only 58% of the number reported in 2002, but differences in sites surveyed limit comparisons between the two years (Curtis 2003).

Little terns kept a foothold on **Orkney**, where one pair was present on South Ronaldsay. The species returned to Dalchalm **(north Scotland)**, after being absent in 2002, and numbers increased by 36% since 2001.

After four consecutive years of increase, the colony at the Sands of Forvie **(east Scotland)**, declined to its lowest level since 1998. In the south of the region, however, numbers increased for the first time since 1997 to 10-13 pairs.

The population in **north-east England** declined slightly, by 11.3%. Fifteen pairs, the highest number since 1988, settled very late at Dona Nook, most likely following the desertion of the colony at Tetney in early June after flooding. Easington saw its lowest number for 13 years, whereas numbers at Lindisfarne increased to just under the 1986-2002 mean of 18.7 pairs (s.d. ±16.1). Declines of 16% and 24% respectively occurred at Long Nanny and the Cleveland colonies. In **east England**, overall numbers recovered slightly by just over 8% from 2002, although much variation occurred between colonies. After an intensive helicopter search for several weeks in May in the Great Yarmouth area, birds were found to have relocated to nearby Winterton Dunes, where numbers reached a minimum of 233, the highest ever recorded for this site. Only nine pairs settled at Great Yarmouth, the lowest count since 1983. The three other main Norfolk colonies - Scolt Head, Holkham and Blakeney - together increased by 13% since 2002. High levels of human disturbance caused desertion of several sites in Suffolk and a late influx of large numbers at Hamford Water suggested relocation of some of the Suffolk birds to this site, where numbers peaked at their second highest level on record.

A small overall increase occurred in **south-east England.** The largest colonies, at Hayling and Pitt's Deep-Hurst, remained stable, but the smaller colony at Rye Harbour increased by 25%, returning to its 2001 level. However, this colony remained well below its long-term mean of 36.3 pairs (s.d. ±16.0). Birds returned in small numbers to Swale NNR after being absent in 2002.

The colony at Chesil Bank **(south-west England),** experienced a major decline of nearly 39% from 2002 to its lowest since 1990. Numbers at Gronant **(Wales)**, almost doubled from 2002, reaching the colonies highest ever level.

Table 3.22.1 Population changes at monitored little tern colonies, 2002–2003 (breeding pairs).
Regional samples < 40 pairs are excluded. Superscript = number of occupied colonies counted in both years.
(*The Great Britain total is for monitored colonies only and is not a population estimate).

Region	2002	2003	2002-2003 % change
E Scotland	85	*c.*47	-44.7[4]
NE England	221	196	-11.3[12]
E England	*c.*653	*c.*709	+8.6[15]
SE England	201	218	+8.4[8]
SW England	65	40	-38.5[1]
Wales	*c.*57	110	+93.0[1]
Great Britain*	1,282	1,377	+7.4[41]
SE Ireland	40	77	+92.5[1]

Table 3.22.2 Population changes of little terns 2002–2003 and 1986-2002 at selected sites referred to in the text.

Region/Site	2002	2003	2002-2003 % change	1986-2002 Mean (±s.d.)	1986-2002 No. years
N Scotland					
Dalchalm	0	15	+100.0	11 (13)	13
E Scotland					
Sands of Forvie	76	29	-61.8	32 (22)	17
NE England					
Saltfleetby	3	0	-100.0	6 (7)	17
Gibraltar Point	49	49	0	26 (16)	17
Tetney	16	0	-100.0	31 (32)	17
Crimden Dene	45	40	-11.1	16 (23)	17
Long Nanny	50	42	-16.0	36 (13)	17
Easington Lagoon	34	30	-11.8	39 (19)	17
E England					
Great Yarmouth	98	9	-90.8	188 (64)	17
Winterton Dunes	124–160	233	+*c.*64.1	*c.*62 (70)	3
Benacre	80	7	-91.3	16 (23)	15
SE England					
Rye Harbour	19	25	+31.6	36 (16)	17
Hayling Oysterbeds	122	125	+2.5	56 (58)	5
SW England					
Chesil Bank	65	40	-38.5	64 (23)	17
Wales					
Gronant	*c.*57	110	+93.0	61 (17)	17
NW England					
Hodbarrow	24	15	-37.5	18 (8)	17
Foulney Is	1	*c.*5	+400.0	10 (11)	17
SE Ireland					
Kilcoole	40	77	+92.5	32 (11)	16

At Hodbarrow **(north-west England)**, 24 pairs were present early in the season but only 15 nested, a decline of 37% from 2002. At nearby Haverigg, four pairs fewer than in 2002 were counted, whilst numbers increased to 5 to 6 pairs on Foulney Island after the re-colonisation of the site in 2002. Numbers at the Isle of Man increased to 21 pairs in 2003, following a decline from 57-60 pairs in 1985 to a low of only six pairs in 2002.

At Kilcoole **(south-east Ireland)**, numbers of nesting pairs increased by 92% from 2002, reaching a 20+ year high of 77 pairs.

Breeding success (Table 3.22.3, Table 3.22.4)

Despite local failures caused by tidal inundation, predation and food shortage, 2003 was a very successful breeding season for little terns helped by benign weather, abundant food supply and low levels of predation. Productivity was at its highest level in England and Wales since 1986 (1986-2002 mean = 0.49 chicks per pair, s.e. $\pm$0.04) and at its second highest in south-east Ireland, whilst in Scotland, productivity was above average for the first time in four years (1986-2002 mean = 0.36, s.e. $\pm$0.06).

On Tiree **(south-west Scotland)**, productivity was the highest since 1986: 37 chicks fledged from between 47 and 59 pairs. Eight large chicks were located on Gunna, but the final outcome at this colony was unknown (J. Bowler, pers. comm.). No fledged chicks were reported from **Orkney** in 2003. Productivity in **north Scotland** was high, at 0.73 chicks per pair at Dalchalm, but the one pair at Loch Fleet failed for a second year.

Table 3.22.3 Little tern breeding success, 2002–2003, grouped regionally: estimated number of chicks fledged per breeding pair at sample colonies. Superscript 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	2002 chicks fledged/pair			2003 chicks fledged/pair		
	Pairs[n]	Range	Overall	Pairs[n]	Range	Overall
SW Scotland	78[6]	0.00-0.71	0.17	47[8]	0.00-2.00	<0.79
Orkney	2[2]	0.00-1.00	0.50	-		-
N Scotland	1[1]		0.00	16[2]	0.00-0.73	0.69
NE Scotland	82[2]		0.00	36[2]	0.07-0.29	>0.11
SE Scotland	3[1]		0.00	*c.*11[1]		>0.27
Scotland total	166[12]	0.00-1.00	**0.08**	110[13]	0.00-2.00	**>0.50**
NE England	221[12]	0.00-1.00	0.42	1.96[7]	0.00-0.93	0.31
E England	610[12]	0.00-1.25	>0.46	718[13]	0.00-2.04	>1.13
SE England	201[6]	0.00-1.00	0.24	212[6]	0.00-1.24	0.15
SW England	65[1]		0.09	40[1]		0.10
Wales	57[1]		1.09	110[1]		>1.77
NW England	25[2]	0.17-2.00	>0.24	23[3]	0.00-0.40	0.26
Total England and Wales	1,179[34]	0.00-2.00	**>0.42**	1,316[31]	0.00-2.04	**>0.85**
SE Ireland	40[1]		0.30	77[1]		2.30

For a third year in succession productivity was very low in **east Scotland**. Human disturbance proved to be a problem at Lossiemouth (M. Cook, pers. comm.), whereas stoat and gull predation was the cause of very low productivity at the Forvie colony (A. Drysdale, pers. comm.).

Tidal inundation affected productivity to some extent at all colonies in **north-east England**. Additionally, predation by fox and inclement weather resulted in a total failure at Lindisfarne. At Easington, six carrion crows destroyed all nests within 36 hours and no chicks fledged from the relaid clutches due to subsequent tidal flooding, disturbance and predation, resulting in the worst year since 1991 for this site (Kerman 2003). Despite tidal inundation, severe predation by common kestrels and exposure to the elements, productivity at Long Nanny was higher than in 2002. Crimdon Dene was the only productive site in the region, where 34-40 chicks fledged from 40 pairs.

With a productivity of 1.11 chicks per pair, **east England** experienced its best breeding season for 18 years. However, there was much inter-site variation and the high productivity was largely from Winterton Dunes and Hamford Water. At Winterton, 233 pairs produced 450-500 fledged young, the largest number of chicks produced in a single colony since recording began in 1969. At Hamford Water, numbers of fledged chicks were particularly difficult to assess as counts could only made by boat, but it is believed that around 170 chicks fledged from between 80 and 113 pairs. Heavy predation by mew gulls depressed productivity at Blakeney Point and tidal inundation resulted in the loss of several nests at Scolt Head. It is of particular note that all but one of the monitored Suffolk sites failed completely due to various incidents of human disturbance.

Overall, colonies in **south-east England** experienced their worst season since 1998. Human disturbance accounted for total failures at the two Swale sites, while a severe food shortage led to only one fledged chick at Hayling. Only a few fledged chicks were seen at Pitt's Deep-Hurst (40-45 pairs). In contrast, at Rye Harbour a good food supply and low predation resulted in the site's highest productivity since 1980 (B. Yates, pers. comm.).

Table 3.22.4 Breeding success (chicks fledged per pair) of little terns 2002–2003 and 1986-2002 at selected sites referred to in the text.

Region/site	2002	2003	1986-2002	
			Mean (±s.e.)	No. of years
N Scotland				
Loch Fleet	0.00	0.00	-	-
NE Scotland				
Sands of Forvie	0.00	>0.07	0.32 (0.08)	16
Lossiemouth	0.00	0.29	0.75 (0.48)	4
NE England				
Long Nanny	0.02	0.26	0.57 (0.13)	17
Gibraltar Point	0.51	0.14	0.30 (0.06)	17
Crimden Dene	0.56	*c.*0.93	0.65 (0.26)	8
Easington Lagoons	0.94	0.00	0.44 (0.10)	17
Lindisfarne	1.00	0.00	0.63 (0.19)	15
E England				
Great Yarmouth	0.05	0.22	0.71 (0.14)	17
Winterton Dunes	*c.*0.41	*c.*2.04	0.22 (0.12)	3
Benacre	1.25	0.00	0.39 (0.23)	7
Hamford Water	1.18	*c.*1.76	0.91 (0.20)	8
SE England				
Chichester Harbour	1.00	0.00	0.23 (0.11)	13
Hayling Island, Langstone	0.24	0.01	1.35 (0.37)	5
Langstone Harbour	0.00	-	0.39 (0.11)	17
Rye Harbour	0.30	1.24	0.32 (0.08)	16
SW England				
Chesil Bank	0.09	0.10	0.30 (0.05)	17
Wales				
Gronant	1.09	1.77	0.88 (0.15)	17
NW England				
Hodbarrow	>0.17	0.27	0.30 (0.08)	17
SE Ireland				
Kilcoole	0.30	2.30	0.86 (0.19)	16

At Chesil, the only colony in **south-west England,** productivity, at 0.10 chicks per pair, was similarly low to that in 2001 and 2002, largely due to predation by fox. Favourable weather, low predation and a high level of protection led to the best ever year for the colony at Gronant **(Wales)**: 1.77 chicks per pair, twice the long-term average and the best ever for this site (Bentley *et al.* 2003). Although productivity in **north-west England** was the highest since 1998, it was very low at only 0.26 chicks per pair. An unkown number of chicks fledged from eight pairs at Haverigg, while fox predation depressed productivity at Foulney (0.4 chicks per pair). On the Isle of Man, only two chicks fledged from 21 pairs. Despite high levels of human disturbance, 14 nests contained hatched young but most of these disappeared over a single weekend in early July (S. Thomas, pers. comm.).

At Kilcoole **(south-east Ireland)**, both productivity and numbers of fledged young were the highest at this colony since 1985. The overall rate of chick provisioning of 3.7 items per chick per hour indicates a plentiful food supply and good foraging success (Maljkovic *et al.* 2003).

3.23 Common guillemot *Uria aalge*

Between 2002 and 2003 numbers of common guillemots generally decreased, particularly so in the single study plot in Orkney and throughout Shetland. Declines in study plot counts in Orkney between 2000 and 2003 were notable. Increases in numbers occurred in south-east Scotland (whole colony counts only), north-east England and in Irish Sea colonies. Productivity declined at most monitored colonies between 2002 and 2003, and reached its lowest ever level in Shetland. Some colonies in Orkney were similarly unproductive. All colonies except Skomer recorded productivity below the long-term mean.

Breeding numbers (Tables 3.23.1 and 3.23.2, Figure 3.23.1)

In **Shetland**, the regional population index reached its lowest level since the SMP began, in 1986, having declined by 42% since 2000. A particularly large (-25.6%) and statistically significant decrease occurred in plot counts at Sumburgh Head between 2002 and 2003 ($t=4.444$, d.f.=8, $P<0.01$). Troswick Ness also showed a significant decrease (-16.9%, $t=3.680$, d.f.=8, $P<0.01$). Smaller declines occurred in plots at Noss (-14%), Hermaness (-11%) and Eshaness (-5.7%). Fair Isle plot counts were 18% below those of 2002.

In **Orkney**, numbers of common guillemot in the study plot on Papa Westray decreased by 61.6% compared with 2002. In JNCC's triennial study plots on Orkney Mainland, an overall decrease of 12.2% was seen since the last counts there in 2000, suggesting the dramatic decline as seen on Papa Westray was not widespread in Orkney. Nevertheless, the declines at Marwick Head, Costa Head, Gultak and Mull Head showed statistically significantly ($P<0.01$) declines of between -10.5 and -15.8% since 2000. Numbers in the plots at Row Head also declined, by 9.3%, but this was not statistically significant. This provides some of the first evidence that the common guillemot population in Orkney is now - as in Shetland - in decline, following the steady increase in numbers seen between 1988 and 2000 (Figure 3.23.1).

At the Mull of Galloway **(south-west Scotland)**, the whole colony count in 2003 revealed a steep 32.2% decline since 2002, following the record high count in that year. In **north-west Scotland**, a small decline was recorded in the number in the plot on Handa between 2002 and 2003, following a decline there between 2001 and 2002. A whole-island count of Handa in 2003 revealed a 20% decrease since the previous comparable count in 1998. Also in the region, JNCC's triennial monitoring plot counts on Hirta, St Kilda showed a small but non-significant decline compared with the previous count in 1999. A whole-island count of Mingulay and Berneray in 2003 revealed 16,512 and 27,853 individuals, respectively; compared with comparable counts in 1998 these counts indicate increases of 22.2% and 46.0%, respectively.

In **south-east Scotland** numbers in those sites in which whole colony counts were undertaken generally increased between 2002 and 2003 (Jones 2003). An increase of 100% was noted on the Forth island of The Lamb, up from 990 in 2002 to 1,987 in 2003, but it is likely that a component of this apparent increase is due to methodological difficulties involved in assessing numbers of breeding guillemots, as the number present on a cliff may vary significantly from day to day (Walsh *et al.* 1995). The 2002 count was unusually low, so the apparent large increase in 2003 may be an artefact. A large increase also occurred on Craigleith. The number on Fidra was slightly lower in 2003 (595) than in 2002 (611). The whole-island count of the substantial colony on the Isle of May recorded an increase of 9.7% between 2002 and 2003, although some caution should be used when interpreting whole-colony counts (see legend to Table 3.23.1b). The only plot counts in the region, at St Abb's Head, showed a small decrease in number since 2002, a further sign that the population here is levelling off or declining, following overall increases between 1986 and 2000 (Rideout and Sheard 2003).

On the Farne Islands, **north-east England**, the whole-colony count increased by 11.2% between 2002 and 2003, the fourth consecutive year in which an increase occurred. The population index for the region is now 203%, compared with the baseline of 100 in 1986 when the SMP started. The stretch of coast between St Aldhelm's Head and Durlston **(south-west England)**, saw a modest decline in the number of common guillemot between 2002 and 2003, although this is still above the long term mean for the section. The number at Berry Head (peak June count) decreased for the third consecutive year, the population now numbering some 650 individuals.

Table 3.23.1 Regional population changes at monitored common guillemot colonies, 2002-2003 (adults attending colony in first three weeks of June). Trends for 1986-2002 are average annual rates of change observed in sample populations. Significance of trends is indicated as: n.s. not significant, * P < 0.05, ** P < 0.01, *** 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 replicate counts of each of the study plots.

Region	1999	2000	2002	2003	% change since previous count	% annual change
NW Scotland [a]			3,414	3,268	-4.3	+1.1** 1986-2002
NW Scotland [b]	1,973			1,898	-3.8	+1.4 n.s. 1990-2003
Shetland [c]			8,499	7,125	-16.2	-0.5 n.s. 1986-2002
Orkney [d]			833	320	-61.6	+6.2*** 1986-2002
Orkney [e]		6,919		6,072	-12.2	+0.9* 1986-2003
SE Scotland [f]			1,921	1,812	-5.7	+3.6*** 1986-2002
Wales [g]			11,626	12,995	+11.8	+5.8*** 1986-2002

Colonies: [a] Handa; [b] St Kilda (triennial, although 2002 postponed to 2003); [c] Hermaness, Burravoe, Eshaness, Noss, Troswick Ness, Sumburgh Head, Fair Isle; [d] Papa Westray; [e] Costa Head; Mull Head, Gultak, Marwick Head, Row Head (triennial); [f] St Abb's Head; [g] 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.

Region	2002	2003	2002-2003 % change	% annual change
SW Scotland [a]	3,117	2,113	-32.2	+4.9** 1986-2002
SE Scotland [b]	30,515	34,279	+12.3	+3.4*** 1986-2002
NE England [c]	38,056	42,338	+11.2	+5.2*** 1986-2002
Wales [d]	28,339	30,187	+6.5	+5.6*** 1986-2002
SW England [e]	1,649	1,335	-19.0	-
NW England [f]	8,080	8,260	+2.2	+2.5** 1986-2002
NE Ireland [g]	1,321	1,404	+6.3	-

Colonies: [a] Mull of Galloway; [b] Isle of May, Inchkeith, Craigleith, Fidra, The Lamb, Inchcolm, Bass Rock; [c] Farne Islands; [d] Stackpole Head NNR, Elegug Stacks and nearby coast, Skokholm, Skomer, Bardsey; [e] St Aldhelm's - Durlston, Berry Head (peak June count); [f] St Bees Head; [g] Isle of Muck.

The population index for plot counts of colonies in **Wales** increased between 2002 and 2003; indeed the index has shown a more or less steady increase since around 1990 and in recent years the rate of increase has accelerated. However, the index is biased by the particularly large increases at Stackpole Head (+24%) and South Stack (+33%); other colonies showed more modest changes (Elegug Stacks, +9%; Skokholm, 0%; Skomer -1.3%). Numbers on Skomer (Wales' largest common guillemot colony) and adjacent Skokholm have levelled off in the last few years, following steady increases in the last 1-2 decades.

In **north-west England**, at St Bee's Head, the number increased slightly since 2002 count, to 8,260 individuals, continuing the increase observed there since 1996, although the rate of increase appears to be slowing down. The number of common guillemots on the Isle of Muck **(north-east Ireland)** increased by 6.3% between 2002 and 2003.

Recoveries of guillemots ringed at breeding colonies and subsequently found as oiled casualties near the site of spills indicate some of the breeding colonies from which the wintering birds originated (Mark Grantham/BTO, pers. comm.): the *Erika* spill, (Brittany, December 1999) resulted in recoveries, many of them adults, mainly from Great Saltee Island, Canna, Sanda and Skomer; the *Prestige* spill (Galicia, November 2002) yielded birds of similar origin, but mostly immature birds; the *Tricolor* spill (November 2002, eastern English Channel) yielded far fewer recoveries, but a large proportion was adults from the Isle of May. There is little evidence as yet that the mortality of common guillemots associated with these oil spills has affected the numbers breeding at colonies. There are no relevant data on numbers at Great Saltee, which appeared to suffer heavy casualties in the *Erika* and *Prestige* spills. Canna experienced a decline in the number of breeding guillemots in 2002, but this is likely to be partly due to predation by rats (Bob Swann, pers. comm.). There is no apparent effect on Sanda, although the accuracy of count precision there is poor. The rate of population increase on Skomer has levelled off in recent years, but with no indication of decline (Brown *et al.* 2004). The whole island count of the Isle of May indicated no decline (in fact numbers increased between 2002 and 2003), although the abandonment of monitoring plots in 2002 has reduced the likelihood of detecting small year to year changes. The return rate of colour-ringed adult guillemots on the Isle of May between 2002 and 2003 was below average, as it was between 2001 and 2002, although not markedly so (Wilson *et al.* 2003). It should be noted, however, that as 90% of common guillemots recovered after the *Prestige* spill were first- or second year-olds, we would not expect to see any effect on numbers of adults at the breeding colonies until they reach breeding age, mostly at 4-5 years old, i.e. during 2005-2007. In any case, mortality would need to have been very great indeed and over a very wide area to cause a detectable change, given that the mortality rate of immature birds is thought to be 'naturally' very high (Harris and Wanless 2004).

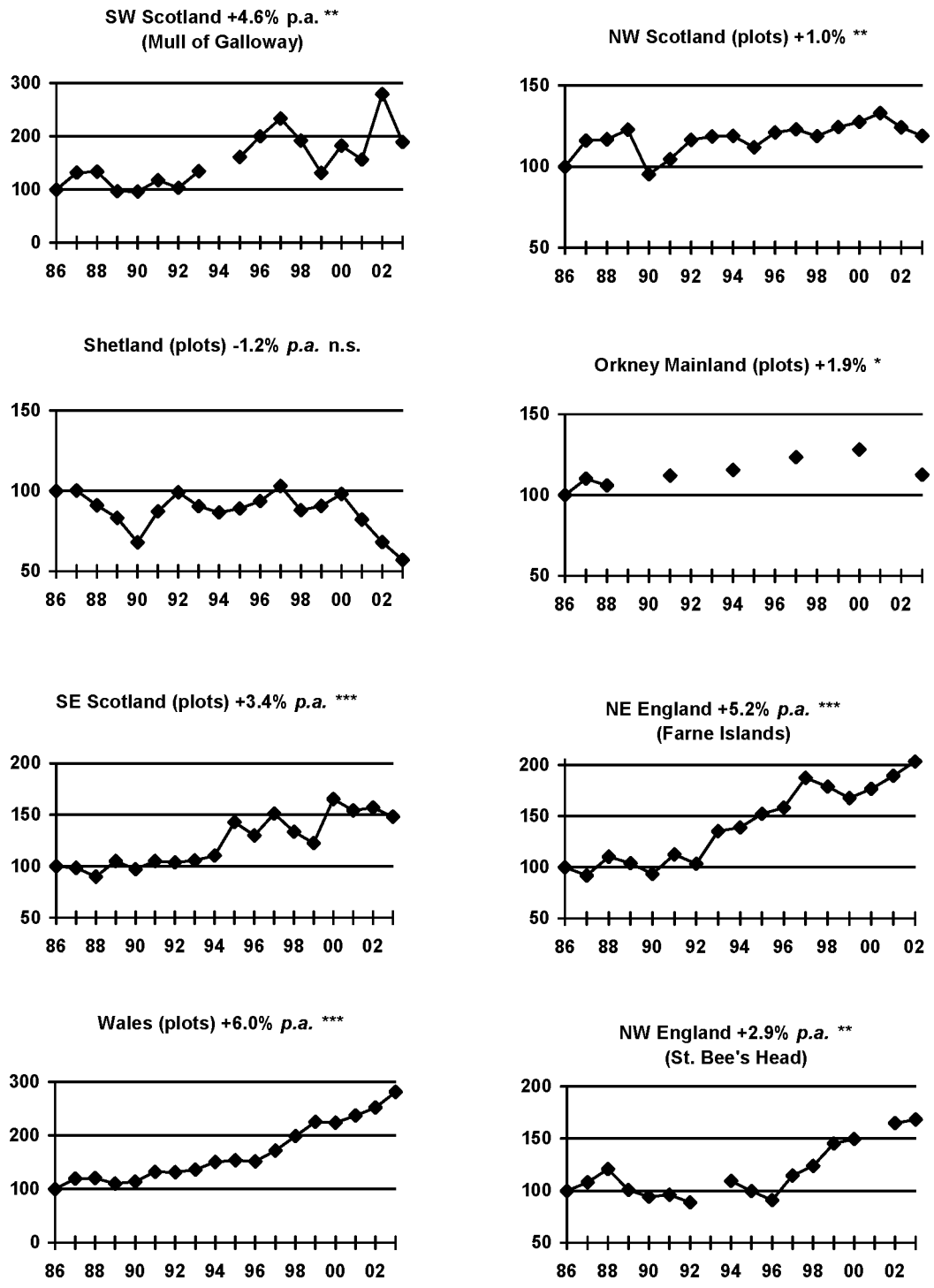

Figure 3.23.1 Regional population indices for breeding common guillemots, 1986-2003 (counts of adults in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends (t-test) indicated as: n.s. not significant, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 3.23.2 Population changes of common guillemots 2002-2003 and 1986-2002 at selected sites referred to in the text. P\W indicates plot or whole-colony counts.

Region/Site		2002	2003	2002-2003 % change	1986-2002	
					Mean (±s.d.)	No. years
SW Scotland						
Mull of Galloway	W	3,117	2,113	-32.2	1,641 (609)	16
NW Scotland						
Handa	P	3,413	3,268	-4.2	3,449 (143)	5
Shetland						
Noss	P	1,987	1,701	-14.4	2,643 (272)	17
Hermaness	P	1,958	1,739	-11.2	2,986 (574)	8
Eshaness	P	297	280	-5.7	378 (54)	17
Troswick Ness	P	296	246	-16.9	343 (30)	14
Sumburgh Head	P	1,353	1,006	-25.6	1,582 (300)	17
Burravoe	P	133	131	-1.5	197 (34)	15
Fair Isle	P	2,475	2,022	-18.3	2,708 (429)	13
Orkney						
Papa Westray	P	833	320	-61.6	-	-
SE Scotland						
Forth Islands total	W	3,186	4,737	+48.7	-	-
Craigleith	W	1,558	2,119	+36.0	1,779 (666)	13
The Lamb	W	990	1,987	+100.7	2,948 (801)	16
Fidra	W	611	595	-2.6	305 (212)	13
Isle of May	W	24,369	26,722	+9.7	21,494 (4,367)	17
Bass Rock	W	2,960	2,820	-4.7	3,333 (607)	6
St Abb's Head	P	1,921	1,812	-5.7	1,541 (306)	14
NE England						
Farne Islands	W	38,056	42,338	+11.2	26,400 (7,150)	17
SW England						
St Aldhelm's-Durlston	W	791	686	-13.3	534 (99)	14
Berry Head	W	858	649	-24.4	855 (130)	9
Wales						
Elegug Stacks	P	3,212	3,501	+9.0	1,883 (573)	15
	W	8,771	10,342	+17.9	6,429 (1,579)	10
Stackpole Head	P	391	485	+24.0	390 (64)	7
	W	1,103	1,070	-3.0	966 (118)	13
Skokholm	P	227	227	0.00	227 (-)	1
	W	1,157	1,073	-7.3	723 (246)	12
Skomer	P	4,128	4,074	-1.3	2,521 (1,005)	17
	W	14,434	14,676	+1.7	9,256 (2,989)	17
South Stack	P	3,535	4,708	+33.2	3,087 (286)	17
Bardsey	W	754	711	-5.7	393 (202)	14
NW England						
St Bee's Head	W	8,080	8,260	+2.2	5,583 (1,132)	15
NE Ireland						
Isle of Muck	W	1,321	1,404	+6.3	980 (276)	4

Breeding success (Table 3.23.3)

The intensity of monitoring at the colonies listed in Table 3.23.3 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.

Mean productivity of common guillemots across the 10 monitored colonies in 2003 (0.57 chicks per pair, s.e. ±0.04) was markedly lower than that across the 11 colonies monitored in 2002 (0.75 chicks per pair, s.e. ±0.02). Only on Skomer was productivity above the 2002 level and the long-term mean.

Table 3.23.3 Breeding success of common guillemot, 2002-2003 and colony averages 1986-2002: 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 1986-2002			2002 chicks fledged/pair			2003 chicks fledged/pair			2002-2003 change	
	Years	Mean	±s.e.	Sites[n]	Mean	±s.e.	Sites[n]	Mean	±s.e.	Mean	±s.e.
Handa	15	0.70	±0.01	241[3]	0.70	±0.05	195[3]	0.68	±0.01	-0.02	-
Sumburgh Head	14	0.67	±0.02	134[1]	0.64	-	123[1]	0.29	-	-0.35	-
Fair Isle	16	0.74	±0.01	169[2]	0.72	±0.06	174[2]	0.48	±0.06	-0.24	-
Papa Westray	13	0.68	±0.04	119[1]	0.73	-	231[1]	0.49	-	-0.24	-
Marwick Head	16	0.72	±0.01	89[1]	0.73	-	115[1]	0.53	-	-0.20	-
Mull Head	13	0.72	±0.01	94[1]	0.74	-	112[1]	0.70	-	-0.04	-
North Sutor	9	0.70	±0.04	24[1]	0.83	-	96[1]	0.49	-	-0.34	-
Isle of May	17	0.77	±0.02	955[5]	0.68	±0.02	1,014[5]	0.68	±0.02	0.00	-
Durlston	7	0.84	±0.02	64[1]	0.83	-	-	-	-	-	-
Berry Head	1	0.65	-	-	-	-	32[1]	0.59	-	-	-
Skokholm	7	0.88	±0.03	113[1]	0.88	-	-	-	-	-	-
Skomer	14	0.73	±0.02	244[5]	0.72	±0.05	269[5]	0.76	±0.05	+0.04	-
Total [no colonies]	-	-	-	2,246[11]	**0.75**	±0.02	2,361[10]	**0.57**	±0.04	**-0.15**[9]	- ±0.05

At Sumburgh Head **(Shetland)**, 2003 was the least productive season on record, with only 0.29 chicks per pair fledged, under half the productivity recorded in 2002 and well below the long term mean for the colony (0.67, s.e. ±0.02 chicks per pair). Attendance of chicks by adults was low, leading to increased predation of eggs and chicks by gulls (Heubeck 2004). Chick growth rates at nearby Compass Head were low in 2003, suggesting that the food shortage which was apparent in the region had a deleterious effect on chick condition as well as on productivity (Okill 2003b). Similarly, on Fair Isle, mean productivity in 2003 was the lowest in the history of the SMP, at just 0.48 chicks per pair, in contrast to near average productivity in 2002 (Shaw *et al.* 2003).

In **Orkney**, productivity in 2003 was lower than in 2002 at the three monitored colonies, especially so on Papa Westray, and at Marwick Head where just 0.49 and 0.53 chicks per pair fledged, respectively. Indeed, productivity at Marwick Head was the lowest on record and nearly the lowest at Papa Westray. In contrast, at Mull Head productivity was about average, at 0.70 chicks per pair.

On Canna **(north-west Scotland)**, eggs depredated by brown rats were found and it is thought that rats have been responsible for a major redistribution of common guillemots (and razorbills) into areas inaccessible to this predator (Swann 2003a). In **north Scotland**, at the single plot at North Sutor, productivity was low, at 0.49 chicks per pair, compared with the very productive season in 2002, when 0.83 chicks per pair was fledged.

On the Isle of May **(south-east Scotland)**, mean productivity across the five plots in 2003 was again low, at 0.68 chicks per pair, below the long term mean of 0.77. Productivity at this colony has shown a trend of general decline since the late 1990s.

At Berry Head **(south-west England)**, productivity was recorded at 0.59 chicks per pair; little comparable data has been recorded at this colony, however. On Skomer **(Wales)**, productivity was high, at 0.76 chicks per pair, and a little above the long term mean of 0.73 (s.e. ±0.02).

3.24 Razorbill *Alca torda*

Breeding numbers of razorbills showed mixed trends in 2003. Numbers present at colonies in Shetland generally declined, such that the regional population index was at its second lowest recorded level. In contrast, numbers in Orkney continued to increase. In north-west Scotland, increases were seen on Berneray and, particularly, on Mingulay, compared with 1998 data, although low numbers were present on Handa compared with 2002. Overall, little change occurred in south-east Scotland and in Wales. Productivity was generally below average in the few colonies studied.

Breeding numbers (Tables 3.24.1 and 3.24.2, 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 between 2002 and 2003. 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, because of their habit of often nesting in crevices and under boulders, so there may be considerable variation in counts between individual observers.

Table 3.24.1 Population changes at monitored razorbill colonies, 2002-2003 (adults attending colony in first three weeks of June unless otherwise indicated). Regional totals of fewer than 50 birds are excluded. Trends for 1986-2002 are average annual rates of change shown by sample populations. Significance of trends is indicated as: n.s. not significant, ** $P < 0.01$, *** $P < 0.001$. Further details of the calculation of trends are given in section 1.2.2.

3.24.1a Counts of adult razorbills in study plots, grouped regionally. Figures are summed means of 5-10 replicate counts of each of the study plots.

Region	1999	2000	2002	2003	% change since previous count	% annual change
NW Scotland [a]			567	430	-24.2	-
NW Scotland [b]	104			132	+26.9	+4.0** 1986-2003
Shetland [c]			480	400	-16.7	+1.4 n.s. 1986-2002
Orkney [d]			95	26	-72.6	-
Orkney [e]		787		936	+18.9	+3.7** 1986-2003
SE Scotland [f]			170	151	-11.2	+4.4*** 1986-2002
Wales [g]			2,514	2,494	-0.8	+3.8*** 1986-2002

Colonies: [a] Handa; [b] St Kilda (triennial, except 2002 postponed to 2003); [c] Hermaness, Eshaness, Burravoe, Noss, Troswick Ness, Sumburgh Head, Fair Isle; [d] Papa Westray; [e] Costa Head, Marwick Head, Row Head, Mull Head, Gultak (triennial); [f] St Abb's Head; [g] Skomer, Skokholm, Elegug Stacks, Stackpole Head NNR, South Stack.

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

Region	2002	2003	2002-2003 % change	% annual change
SW Scotland [a]	595	393	+33.9	+7.9** 1986-2002
SE Scotland (birds) [b]	3,050	3,105	+3.3	+5.0*** 1986-2002
SE Scotland (sites) [c]	610	519	-14.9	-
NE England (sites) [d]	220	244	+10.9	-
Wales [e]	7,087	6,509	-8.2	+2.9*** 1986-2002
NW England [f]	263	277	+5.3	+1.7 n.s. 1986-2002
NE Ireland [g]	746	872	+16.9	-

Colonies: [a] Mull of Galloway; [b] Isle of May; [c] Inchkeith, Craigleith, Fidra, The Lamb, Bass Rock; [d] Farne Islands, Coquet; [e] Caldey, Stackpole Head NNR, Elegug Stacks plus nearby coast, Skokholm, Skomer; [f] St Bee's Head; [g] Isle of Muck.

In **Shetland**, the regional population index for razorbills in 2003 was lower than in any year since 1990. The numbers of razorbills in study plots decreased by an average of 17% compared with 2002. Particularly large decreases occurred at Noss (-45.4%), Hermaness (-32.2%) and Sumburgh Head (-28.0); at the former site it was the lowest plot count since the SMP began. At Eshaness a decrease was recorded for the third consecutive year. On Fair Isle a small increase in the plot count was recorded.

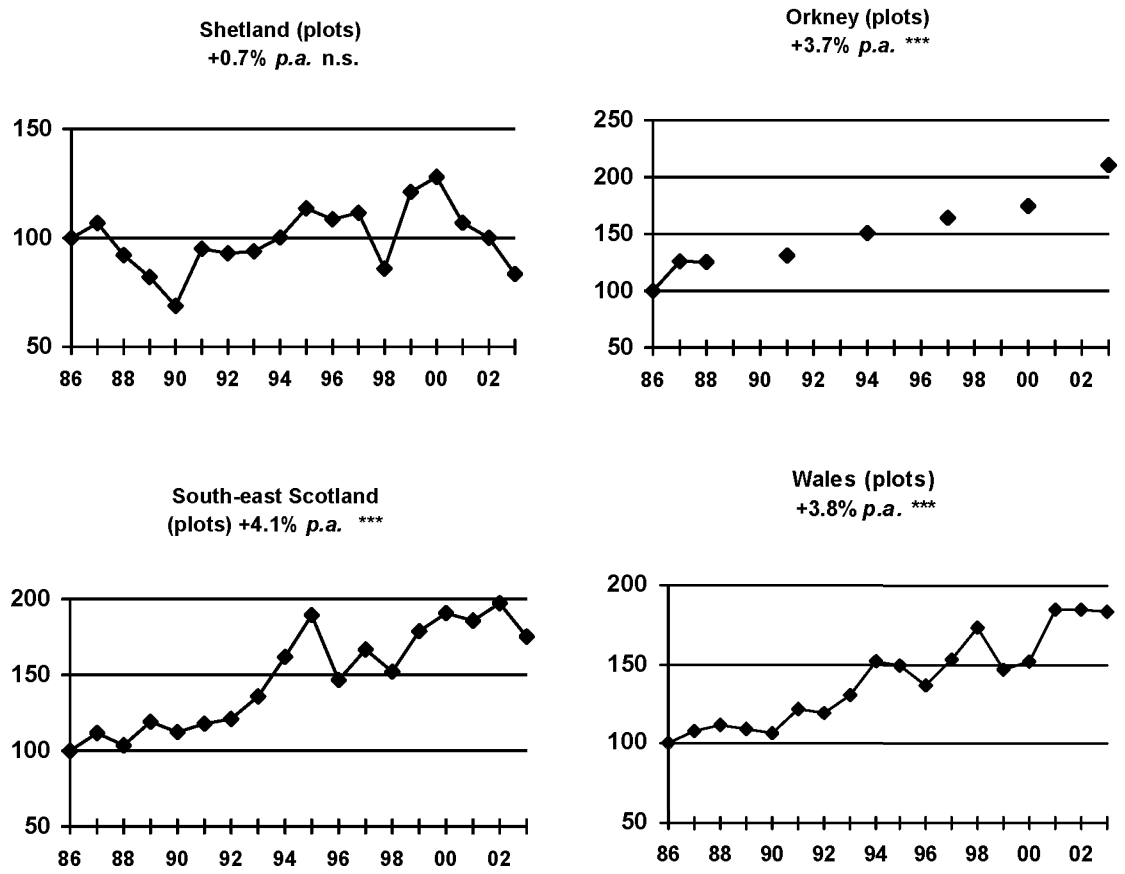

Figure 3.24.1 Regional population indices for breeding razorbills in various regions, 1986-2003 (counts of adults in June). Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends indicated as: n.s. not significant, *** P<0.001.

In **Orkney,** a large decrease occurred in the plot on Papa Westray, from 95 birds in 2002 to just 26 in 2003. Elsewhere in the region, an overall increase of 19% was seen at JNCC's triennial monitoring plots, compared with the previous counts, in 2000. However, the only statistically significant increase in that study was at Costa Head (+55.7%, t=5.382, df.=8, P<0.001). The regional population index for Orkney continues to show year on year increases, such that in 2003 the index was more that twice its level compared with 1986, when monitoring began. This is in marked contrast to colonies in Shetland, which have large shown declines during the late 1980s, in 1998 and since 2000.

On the Mull of Galloway (**south-west Scotland**), a large decrease was recorded between 2002 and 2003 in the whole colony count, although the 2002 count was exceptionally high and the colony appears to be fairly stable over the long term. On Lunga, a small increase occurred between 2002 and 2003. On Handa (**north-west Scotland**), a decrease of 24% occurred between 2002 and 2003 in the study plots there, the lowest count in the six years that these have been counted. In JNCC's study plots on Hirta, St Kilda, a significant overall increase of 27.8% occurred between 1999 (the year of the last count) and 2003 (t=3.564, df.=8, P<0.01). The trend in razorbill numbers over the last 13 years on Hirta appears to be one of stability or slight increase. A whole island count of Berneray (probably

Britain's largest razorbill colony) and Mingulay in 2003 revealed increases of 19% and 122%, respectively, since the previous counts in 1998, taking the totals to 19,579 and 14,201 individuals, respectively.

Table 3.24.2 Population changes of razorbills 2002-2003 and 1986-2002 at selected sites referred to in the text. P\W indicates plot or whole-colony counts.

Region/Site		2002	2003	2002-2003 % change	1986-2002	
					Mean (±s.d.)	No. years
SW Scotland						
Lunga	W	1,138	1,247	+9.6	967 (325)	10
Mull of Galloway	W	595	393	-33.9	333 (106)	14
NW Scotland						
Handa	P	567	430	-24.2	534 (50)	5
Shetland						
Noss	P	86	47	-45.4	72 (14)	15
Hermaness	P	59	40	-32.2	60 (15)	15
Eshaness	P	54	50	-7.4	52 (16)	17
Troswick Ness	P	18	15	-16.7	18 (4)	17
Sumburgh Head	P	182	167	-8.2	214 (34)	17
Burravoe	P	13	11	-15.4	12 (4)	12
Fair Isle	P	68	70	+2.9	68 (4)	4
Orkney						
Papa Westray	P	95	26	-72.6	-	-
NE Scotland						
Sands of Forvie	W	46	21	-54.4	32 (8)	6
SE Scotland						
Forth Islands (sites)	W	417	430	+3.1	338 (84)	7
Isle of May	W	3,050	3,105	+1.8	3,002 (842)	17
Bass Rock	W	193	89	-53.9	127 (62)	7
St Abb's Head	P	170	151	-11.2	168 (21)	14
NE England						
Farne Islands	W	209	222	+6.2	171 (28)	8
Boulby Cliffs	W	11	22	+100.0	9 (4)	5
SW England						
St Aldhelm's - Durlston	W	36	40	+11.1	19 (8)	7
Wales						
Caldey	W	47	33	-29.8	32 (30)	9
Elegug Stacks	P	345	431	+24.9	295 (75)	15
	W	614	738	+20.2	611 (114)	9
Stackpole Head	P	62	49	-21.0	67 (9)	7
	W	91	72	-20.9	130 (61)	10
Skokholm	P	127	126	-0.8	-	-
	W	1,011	1,103	+9.1	993 (175)	11
Skomer	P	1,224	1,096	-10.5	814 (209)	16
	W	5,095	4,242	-16.7	3321 (688)	17
South Stack	P	691	792	+14.6	511 (93)	17
NW England						
St Bee's Head	W	263	277	+5.3	236 (50)	15
NE Ireland						
Isle of Muck	W	746	872	+16.9	464 (196)	4

At the small colony of Sands of Forvie (**north-east Scotland**), a decrease of 54% occurred between 2002 and 2003. In **south-east Scotland**, a small decrease in numbers occurred in the plot counts at St Abb's Head, although on the Bass Rock, a decrease of 54% was recorded, following a high count in 2002. On the Isle of May, little difference was recorded in the whole island count between 2002 and 2003, in contrast to the large decline between 2001 and 2002. On the Forth Islands, an overall small increase was recorded, but with variation between the islands.

In **north-east England**, a small increase occurred on the Farne Islands between 2002 and 2003, to 222 sites - the most in the nine years of records for the colony. At Boulby Cliff 22 birds in 2003 was the highest count in the eight years of records from this colony. In **south-west England**, the small colony at St Aldhelm's-Durlston increased from 36 individuals in 2002 to 40 in 2003.

In **Wales**, the overall population index, as revealed by plot counts, was similar to that in 2001 and 2002 - as high as at any time since the SMP started in 1986. There was much intra-regional variation, however, with Elegug Stack and South Stack recording increases of 25% and 15%, respectively, while Skomer saw decreases in plot and whole-island counts compared with 2003. The population on nearby Skokholm appears to be fairly stable. In **north-west England**, a slight increase in numbers was recorded at St Bees Head between 2002 and 2003. In **north-east Ireland**, the number on Isle of Muck increased from 746 in 2002 to 872 in 2003.

Breeding success (Table 3.24.3)

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.

Productivity decreased at four of the five razorbill colonies studies in both 2002 and 2003. Particularly low productivity occurred on Fair Isle **(Shetland)**, where just 0.43 chicks per site were fledged, compared with 0.63 in 2002. Similarly unproductive was Skomer **(Wales)** with 0.48 chicks per site fledging, although more successful than in 2002. The colony at North Sutor **(north Scotland)** was again productive in 2002. Razorbills on the Isle of May **(south-east Scotland)** were less productive in 2003 than in 2002, raising just 0.59 chicks per site, well below the long term mean for the colony and among the lowest productivity recorded there during the SMP. On Canna **(north-west Scotland)**, eggs depredated by brown rats were found and it is thought that rats have been responsible for a major redistribution of razorbills (and common guillemots) into areas inaccessible to this predator (Swann 2003a). The Farne Islands **(north-east England)** had a productive season in 2003, above the long-term mean for the colony.

Table 3.24.3 Razorbill breeding success, 2002-2003 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 1986-2002			2002 chicks fledged/pair			2003 chicks fledged/pair			2002-2003 change	
	Years	Mean	±s.e.	Sites[n]	Mean	±s.e.	Sites[n]	Mean	±s.e.	Mean	±s.e.
Fair Isle	12	0.62	±0.03	90[1]	0.63	-	101[1]	0.43	-	-0.20	-
North Sutor	6	0.76	±0.05	15[1]	0.87	-	14[1]	0.71	-	-0.16	-
Isle of May	17	0.68	±0.02	167[4]	0.65	±0.08	177[4]	0.59	±0.02	-0.06	-
Farnes	7	0.68	±0.06	21[1]	0.52	-	53[1]	0.72	-	+0.20	-
Skokholm	7	0.84	±0.03	89[1]	0.80	-	-	-	-	-	-
Skomer	10	0.58	±0.04	297[5]	0.36	±0.07	358[5]	0.48	±0.04	+0.12	-
Total [no. colonies]	-	-	-	679[6]	**0.64**	±0.08	703[5]	**0.59**	±0.06	**-0.02**[5]	±0.08

3.25 Black guillemot *Cepphus grylle*

Breeding numbers of black guillemot in Shetland changed little between 2002 and 2003. In Orkney, a large decline was noted on North Ronaldsay, although numbers in other areas of Orkney increased between 2002 and 2003. Breeding success was high in the few Irish sites monitored, and close to average on Orkney. It appears that mink are depressing numbers and productivity of black guillemots in north-west and south-west Scotland.

Breeding numbers (Table 3.25.1, Figure 3.25.1)

Unless otherwise stated, all population figures refer to early morning spring counts of individuals in adult plumage (Walsh *et al.* 1995).

In **Shetland**, although numbers along 12 stretches of coast monitored in 2002 and 2003 increased slightly a larger sample covering 15 stretches previously surveyed in 2000 suggested that numbers had fallen by 12.7% from 2,379 birds to 2,077 (Heubeck 2004). However, annual rates of change suggest that the black guillemot population has remained fairly stable in most of Shetland since 1985, although significant increases have been recorded in Yell Sound (Mavor *et al.* 2003) where no monitoring was carried out in 2003.

Table 3.25.1 Population changes at monitored black guillemot colonies, 2002-2003. Units are 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 < 0.001. For further details of the calculation of these trends see section 1.2.2.

Region/site	2002	2003	2002-2003 % change	% annual change
Shetland				
Shetland excl. Yell Sound	1,595	1,624	+1.8	-0.5 n.s. 1985-2002
Orkney[b]	755	656	-13.1	-4.1*** 1983-2002

Colonies: [a] Fetlar (east coast), Lunning, Levaneap, Noss (north coast), Kirkabister, Aithsetter, West Burra, Kettla Ness, Boddam-Virkie, Tingon (east), Foula (east coast), Fair Isle (east coast); [b] North Hill, Holm of Papa Westray, North Ronaldsay.

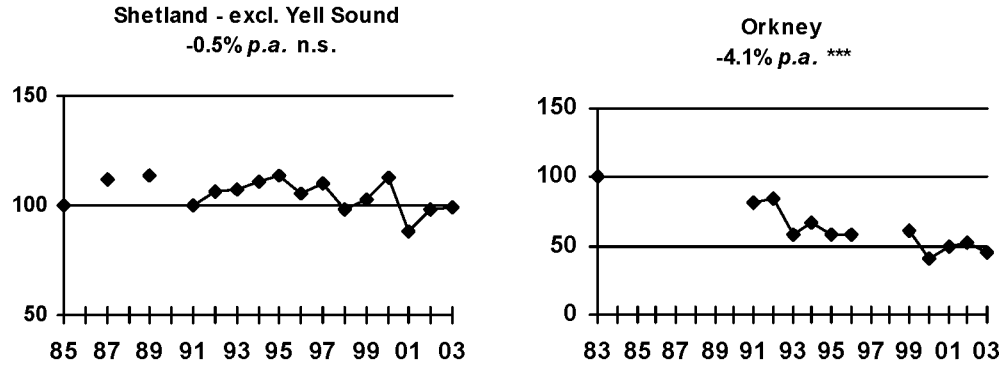

Figure 3.25.1 Regional population indices for breeding black guillemots in Shetland, 1985-2003. Based on counts of adults in breeding habitat late March-early May. Average annual rates of change were calculated by regression of natural log of index against year (see section 1.2.2. for details). Statistical significance of trends indicated as: n.s, not significant; *** P<0.001.

In **Orkney**, the significant overall decline in numbers continued, with a decrease of 13.1% occurring since 2002. Of the three colonies monitored, increases were actually noted at North Hill (up 25.8% to 161 birds) and Holm of Papa Westray (up 10.9% to 142 birds) but numbers at North Ronaldsay fell by 29.3% to 353 birds, the lowest count there since regular monitoring began in 1997.

Breeding success (Table 3.25.2)

In **Orkney**, breeding success was above average at North Ronaldsay although slightly down on that recorded in 2001 (when 1.59 chicks per pair were fledged). On Auskerry, productivity was marginally higher than in 2002 but still below average for the colony. Observers commented that chicks there were unusually small compared with visits on similar dates in previous years. Data received from Swona indicated that black guillemots had a less successful breeding season than in 2001 and 2002 although sample sizes are low. In a study area stretching from Mallaig to Tarbert (**north-west** and **south-west Scotland)**, 29 localities checked held a total of 113 breeding adults. However, ten of these sites held no birds, seven of which were affected by the presence of mink (Craik 2003). It was another successful season on Old Lighthouse Island (**north-east Ireland**): 12 of 19 nests in which the outcome was known raised two chicks. As a result, overall breeding success surpassed the high reached in 2002, with an average of 1.53 chicks fledged per nest. Black guillemots had a very successful season on Rockabill (**south-east Ireland**), where productivity was the highest on record, with 54 chicks fledging from 41 nests.

Table 3.25.2 Breeding success of black guillemots, 2002-2003 and 1986-2002. Figures are the number of chicks fledged per active site where an egg or apparent incubation was recorded. Figures in parentheses are the number of active sites from which the breeding success estimates were derived.

Region/site	2002	2003	1986-2002 mean	
			Mean (±s.e.)	No. of years
Orkney				
North Ronaldsay	-	1.53 (30)	1.39 (0.15)	7
Auskerry	1.21 (36)	1.24 (33)	1.33 (0.07)	8
Swona	1.75 (8)	1.38 (13)	1.71 (0.04)	2
NE Ireland				
Old Lighthouse Island	1.41 (17)	1.53 (19)	1.01 (0.08)	13
SE Ireland				
Rockabill	1.17 (35)	1.32 (41)	1.16 (0.04)	5

3.26 Atlantic puffin *Fratercula arctica*

Large increases in breeding numbers were noted in some of the larger colonies in south-east Scotland and north-east England (most notably on the Isle of May), but declines also occurred in these regions, especially on Coquet Island, where there were many unoccupied burrows in 2003 and on Fidra, where habitat availability declined. Many of the monitored colonies in the west of Britain decreased. Breeding success was fairly high in 2003.

Breeding numbers (Table 3.26.1)

Complete surveys were carried out at several east coast colonies in 2003. Large increases were noted at Fidra, the Farne Islands and the Isle of May since previous counts carried out in the mid to late nineties with the Isle of May now holding the largest single Atlantic puffin colony in Britain and Ireland, at 69,300 apparently occupied burrows (Harris *et al.* in prep.).

The colonies on Craigleith and Coquet Island were both found to have decreased in size since previous surveys. At Craigleith, the decline is attributed to the rapid spread of an alien plant, the tree-mallow

Lavatera arborea, which in 1999 was estimated to cover 55% of the island, increasing to 95% cover by 2003. The plant grows in dense stands, rendering underlying areas of soil less suitable for puffin burrows and the dense nature of the growth also hampers accurate assessment of the number of occupied burrows under the canopy. Tree-mallow was also found in a localised area on Fidra where, although well-established, it is not very dense and attempts are now being made to control it (Harris *et al.* 2004). Numbers on Coquet had fallen considerably since 2002 to 11,292 AOB, with an equal number of unoccupied burrows. The reason for the high proportion of unoccupied burrows in 2003 was unclear but the decline in numbers was noticeable by late April/early May when` observers reported that only a fraction of the 18,000 'pairs' recorded in 2002 had returned at that time (P. Morrison, pers. comm.). The total burrow count has been stable during the period 2001 and 2003.

Table 3.26.1 The number of Atlantic puffins (apparently occupied burrows) at east coast colonies in 2003 with percentage change since previous count. Superscript denotes year of previous count.

Colony	Previous count	2003	% change
SE Scotland			
Isle of May	41,542 [1998]	69,300	+66.8%
Fidra	405 [1999]	1,466	+262.0%
Craigleith	28,000 [1999]	12,100	-56.8%
NE England			
Farne Islands	34,710 [1993]	55,674	+60.4%
Coquet	18,729 [2002]	11,292	-39.7%

Declines in the numbers of occupied burrows were also noted at colonies on the west coast of Britain. On Lunga in the Treshnish Isles **(south-west Scotland)**, only 858 AOB plus 296 individuals were counted compared with 1,793 AOB plus 343 individuals in 2002, suggesting a decrease of at least 46.0% since then (Ward 2003). On Ynys Gwylan Fawr **(Wales)**, only 307 of 1,300 burrows checked were occupied; a decline of 71% since the last survey in 2001 (Stansfield 2003). The reasons for the decline at both colonies are unknown.

The peak spring count of individuals on Handa **(north-west Scotland)** and Skomer **(Wales)** were also lower than in 2002, by 19.2% and 17.4% respectively, but there was little change on Skokholm over the same period, where 4,169 individuals was (marginally) the highest April count on record (4,115 in 2002).

Breeding success (Table 3.26.2)

Atlantic puffins had a fairly successful breeding season in 2003. Breeding performance increased at three colonies compared with 2002 and the overall mean was higher than the long-term average of 0.72 (s.e. ±0.03) of two to seven colonies monitored annually from 1986-2002.

On Fair Isle **(Shetland)**, Atlantic puffins had a more successful breeding season compared with the other auk species. Although breeding success was lower than the record value of 2002 it was still higher than the productivity values recorded between 1998-2001 and close to the long-term mean for the colony (0.69, s.e. ±0.04) (Shaw *et al.* 2003).

On the Isle of May **(south-east Scotland)**, breeding success was higher than in 2002 and was close to the long-term average (0.76, s.e. ±0.03) (Wilson *et al.* 2003).

Productivity on the Farnes **(north-east England)** in 2003 was equal to the highest value on record, in 1995. There was no repeat of the high rainfall of 2002 which flooded many burrows, although periods of heavy rain in May did affect small areas (Walton 2003).

Table 3.26.2 Atlantic puffin breeding success, 2002-2003. Estimated number of chicks fledged per egg or occupied burrow (Welsh colonies). Superscript indicates number of colonies.

Colony	2002 chicks fledged/pair				2003 chicks fledged/pair				2002-2003 change	
	Burrows	Range	Mean	±s.e.	Burrows	Range	Mean	±s.e.	Mean	±s.e.
Fair Isle	62	-	0.74	-	55	-	0.65	-	-0.09	-
Isle of May	174	-	0.72	-	195	-	0.77	-	+0.05	-
Farne Islands	100	-	0.65	-	100	-	0.89	-	+0.24	-
Skomer	78	-	0.69	-	87	-	0.78	-	+0.09	-
Total	414[4]	0.65-0.74	**0.70**	±0.02	437[4]	0.65-0.89	**0.77**	±0.05	**+0.07**[4]	±0.07

In **Wales**, breeding success on Skomer averaged 0.78 chicks fledged per occupied burrow – the highest value to be recorded since 1996 and slightly above the long-term mean (0.76, s.e. ±0.02) (Perrins 2004).

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