

Birds in South-east Scotland 2007-13



Ray D. Murray, Ian J. Andrews & Mark Holling

T. Brewis, N. Crowther, H.E.M. Dott, A. Heavisides,
P.M. Macdonald, D. Parkinson, D.G. Pyatt & S. Welch

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A tetrad atlas of the birds of Lothian and Borders

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Assisted by

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P.M. Macdonald, D. Parkinson, D.G. Pyatt & S. Welch



Published by
The Scottish Ornithologists' Club
Aberlady

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8 Interpretation of the species maps, charts and tables

Each species account is accompanied by a set of the most relevant maps, altitude charts, tables and trend graphs. A quick guide to the maps and charts is provided on the inside front and back covers, with more detail and examples provided below. The maps reproduced in this book only represent a subset of those generated for the writing of the species accounts.

For all the maps, the standard background includes the coastline, colour shaded altitude, rivers, major water bodies and urban areas. 10-km squares are included to provide a guide to location and scale (details of these elements can be found on the inside covers). The colour shading extends down to the low-tide line (e.g. at Dalmeny and Aberlady Bay). The limit of the study area is defined by the unitary authority boundaries of West Lothian, Midlothian, City of Edinburgh, East Lothian and the Scottish Borders; where this does not coincide with a river, it is shown in brown. Note that the island of Inchkeith (Fife) is included to conform to the coverage of the last *Atlas*. The current (2018) boundary between the Lothian and Borders SOC recording areas is mapped as a white line.

Breeding season distribution, 2008-13

Breeding evidence collected during the six breeding seasons (2008 to 2013 inclusive) is mapped at tetrad level using three sizes of red dots to reflect the established codes of *possible*, *probable* and *confirmed* breeding (the largest dot referring to *confirmed* breeding within a given tetrad). Birds recorded as *observed* in the tetrad and 'flying' over the tetrad are shown as small dark grey and purple squares respectively. Counts of the different breeding categories (dot sizes) are included in the breeding statistics table (see below).

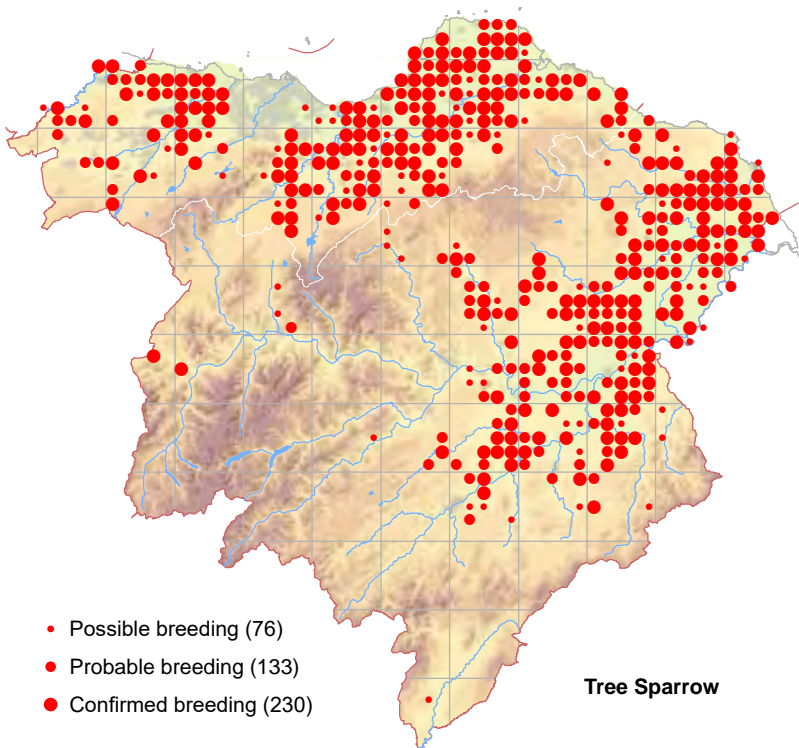


Figure 8.1 Breeding season distribution, 2008-13.

Breeding season abundance, 2008-13

For species that occur in SE Scotland in summer, but do not breed, their distribution is illustrated by means of a breeding season abundance map. The dots are magenta rather than red. The limits for each dot size and the number of tetrads in each category is given in parentheses.

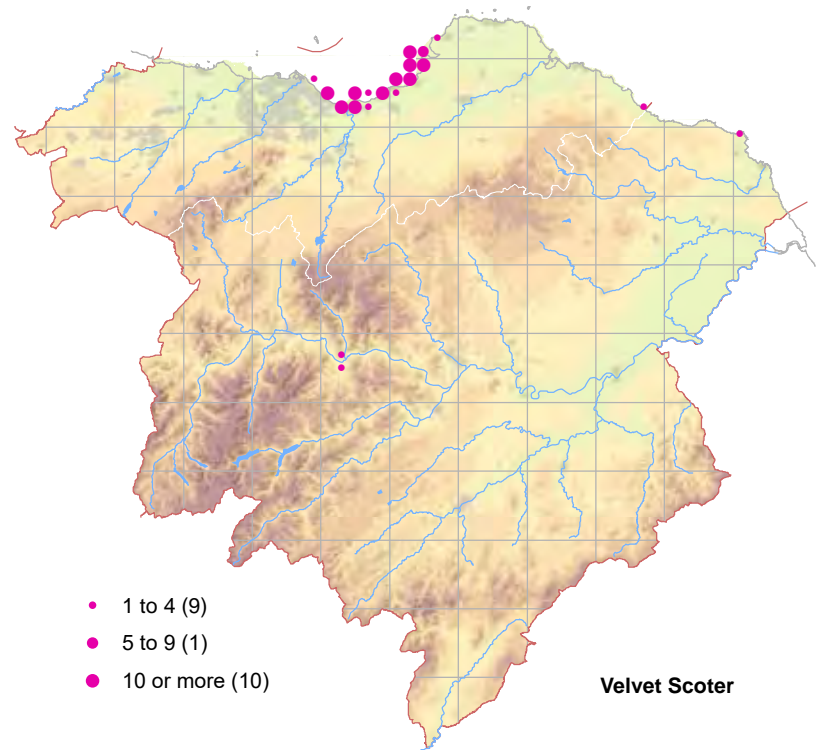


Figure 8.2 Breeding season abundance, 2008-13.

Breeding distribution change between 1988-94 and 2008-13

Due to space constraints, the 1988-94 breeding distribution maps (*SES Atlas 1988-94*) are not republished. However, having access to these two comparable datasets, collected some 20 years apart, provides the opportunity to map changes in the breeding distribution of species between the two atlases. Differences are mapped in terms of losses, no change (stable) and gains at tetrad level. The number of tetrads in each category is given in parentheses.

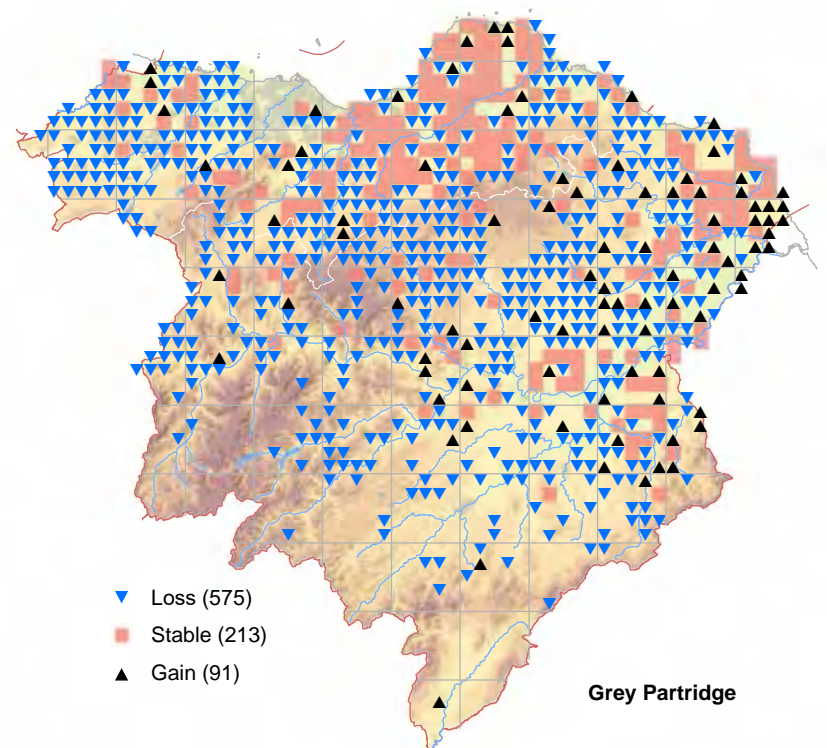


Figure 8.3 Breeding distribution change between 1988-94 and 2008-13.

Sensitive species

In discussion with members of the LBRSG, species that are considered to be at risk from human disturbance are mapped at 10-km level only. The tetrad dots for each 10-km square are plotted in descending order of confirmation (thus confirmed breeding first) in the centre of the 10-km square to which they refer. Winter tetrad dots are placed in order of descending abundance. Such maps are highlighted by a ‘Sensitive species: dots are centralised within each 10-km square’ label. As well as raptors, other sensitive and locally rare species such Black-necked Grebe, Little Ringed Plover, some terns and Little Owl are treated in this fashion.

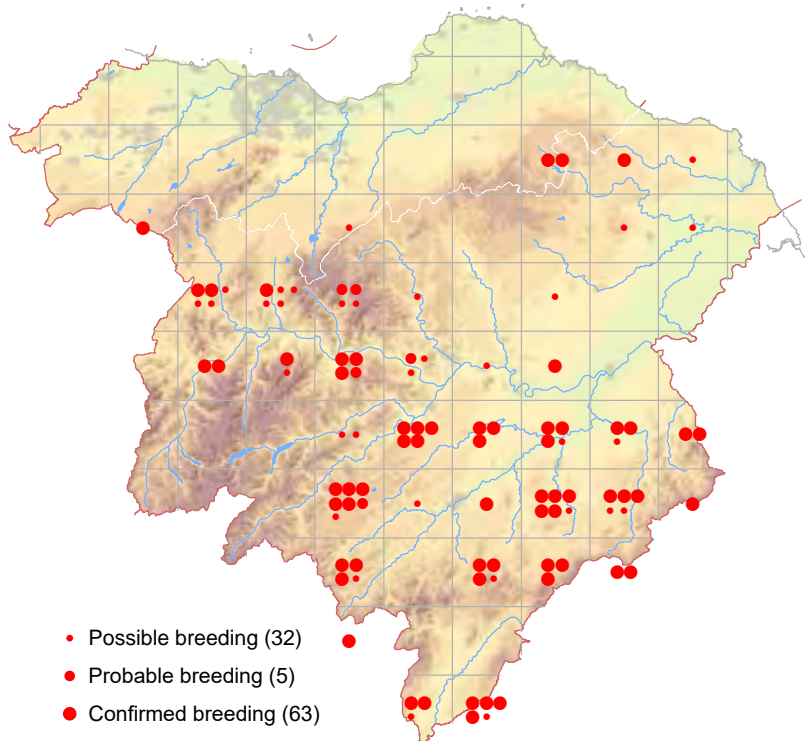


Figure 8.4 Goshawk: breeding season distribution, 2008-13.

Winter distribution and abundance, 2007/08 – 2012/13

The winter map shows the distribution and abundance of species at tetrad level during the six winters from 2007/08 to 2012/13. The maximum count of each species in each tetrad is mapped with blue dots. The three dot sizes were selected specifically for each species to best highlight variations in abundance across the region. The limits for each dot size are indicated and the number of tetrads in each category is given in parentheses. Only two dot sizes are used for the scarcer species to avoid giving the false impression of abundance. Birds recorded as being in flight are not differentiated.

Altitude histograms

Each tetrad in SE Scotland was assigned a mean altitude (in metres) based on the statistical analysis of a detailed digital terrain model. For tetrads where only part of the area lies within SE Scotland, we use the mean altitude for only the land within our area. The distribution of all the tetrads in the region is reflected in the background grey shading of the histograms. Each species record in a tetrad could therefore be assigned an altitude that is the mean altitude of the tetrad. This allows comparisons to be made of the altitudinal distribution of species (a) between 1988-94 and 2008-13 and (b) between the winter and breeding seasons. These have been plotted as histograms where the y-axis is the number of tetrads in each altitude band, and the altitude increases to the right. The following should be noted:

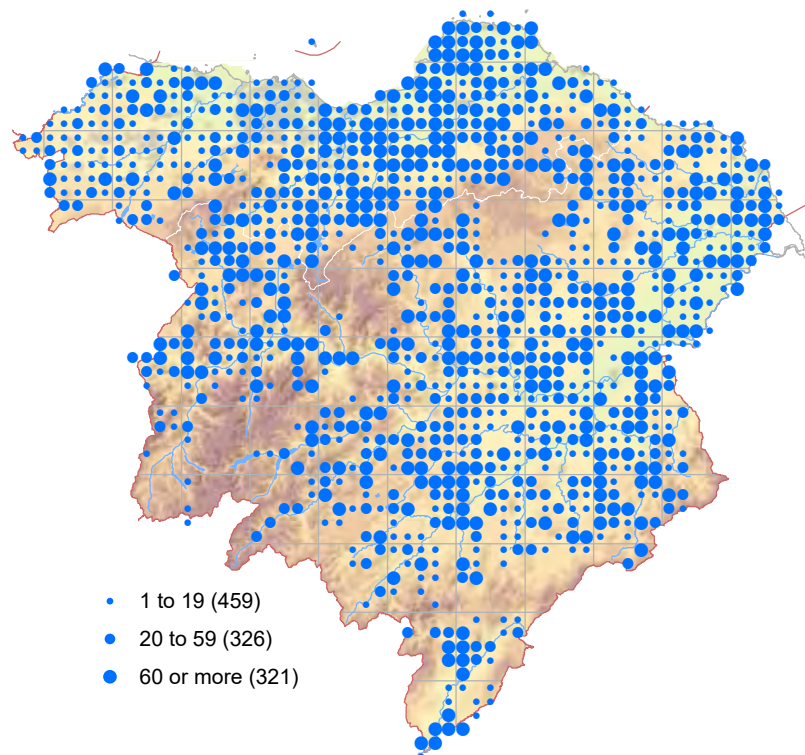


Figure 8.5 Fieldfare: winter distribution and abundance, 2007/08 – 2012/13.

- (1) Because some coastal tetrads have a high range of altitudes, such as where there are cliffs, some ‘marine’ species appear in tetrads with a mean altitude of up to 100 m.
- (2) In tetrads with high relief, the methodology assigns a mid-altitude, as explained above, yet some bird species may occur only in the valleys or on the high ground. Consequently, in these tetrads, it should be noted that species that breed only in the valley bottoms are assigned an altitude which is higher than that at which they actually breed and, conversely, species that breed only on the higher ground are assigned a ‘lower’ altitude. In tetrads of moderate to low relief, there is not a significant issue.
- (3) The heights of the bars refer to the total number of tetrads in each altitude band. The changes are net changes and the counts of tetrads do not necessarily equate to the number of dots (e.g. gains and losses) as plotted on the maps. Note that a gain and a loss in a particular altitude band will cancel each other out, implying no change in that altitude band.
- (4) The labels on the y-axis refer to the maximum altitude within the band to the right of it. For example, the altitude band above the ‘50’ label includes tetrads with an average altitude of between 40.01 and 50 m. The band labelled 0 m includes only inter-tidal tetrads (therefore all the records that plot here will be in the ‘observed’ category).

Altitudinal change between breeding season and winter, 2007-13

The left-hand histogram on the species map pages (exemplified here as Figure 8.6) provides a comparison between the altitudes of tetrads occupied in winter and the breeding season. The blue ‘areas’ indicate altitude bands where a species was more widespread in winter than summer; red ‘areas’ highlight altitude bands where a species was more widespread in summer than in winter.

Note: breeding season records where the maximum breeding code for a tetrad was *observed* are included, and all winter records are included. However, records where the maximum breeding code for a tetrad was

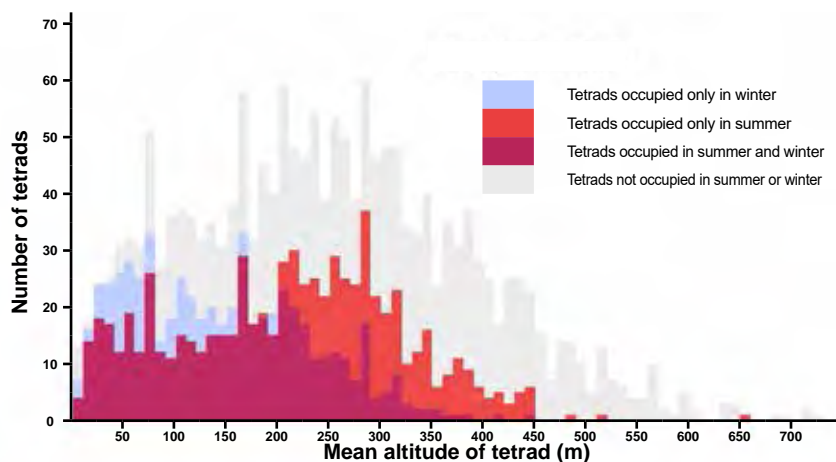


Figure 8.6 Black-headed Gull: altitudinal change between breeding season and winter, 2007-13. Key: pale blue = tetrads only occupied in winter (November to February); red = tetrads only occupied only in summer (April to July); purple = tetrads occupied in both summer and winter; grey = tetrads not occupied in either.

‘flying’ are excluded in both seasons.

Breeding season altitudinal change between 1988-94 and 2008-13

The histogram on the right on the species map pages (illustrated here as Figure 8.7) shows the relationship between the altitude of tetrads occupied in the 1988-94 and 2008-13 breeding season surveys. Declining species show a dominant green colour; the histograms for increasing species are dominantly orange.

Note: records from 2008-13 where the maximum breeding code for a tetrad was *observed* or ‘flying’ are excluded since there are no

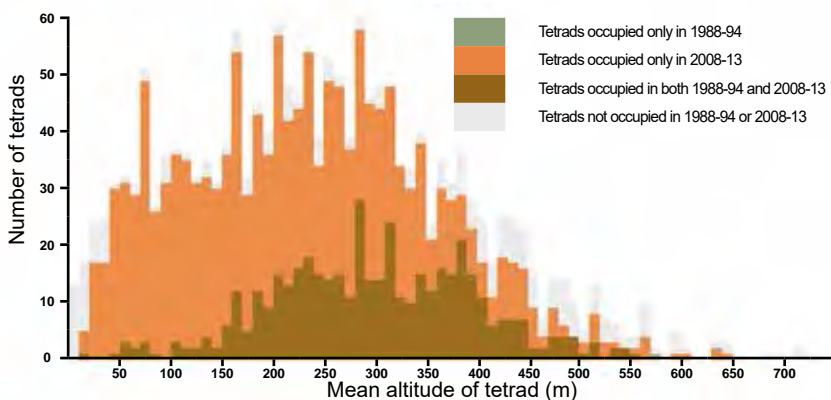


Figure 8.7 Buzzard: breeding season altitudinal change between 1988-94 and 2008-13. KEY: Green = tetrads only occupied in 1988-94; orange = tetrads only occupied in 2008-13; brown = tetrads occupied in both 1988-94 and 2008-13; grey = tetrads not occupied in 1988-94 or 2008-13.

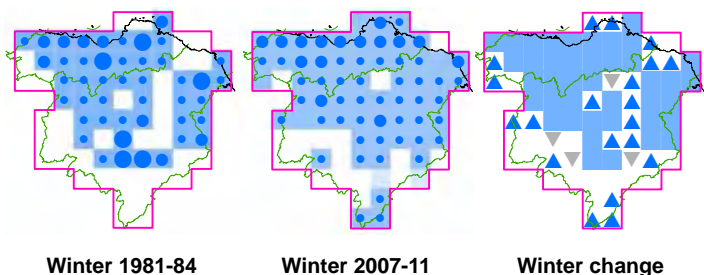


Figure 8.8 Grey Wagtail: 10-km maps showing breeding season and winter distribution and its change between this Atlas and previous atlases. Change map key: solid mid blue square = always present; solid blue up triangle = apparent gain; solid grey down triangle = apparent loss; blank = apparently never present. See *Bird Atlas 2007-11*, Table 4.1A (page 73).

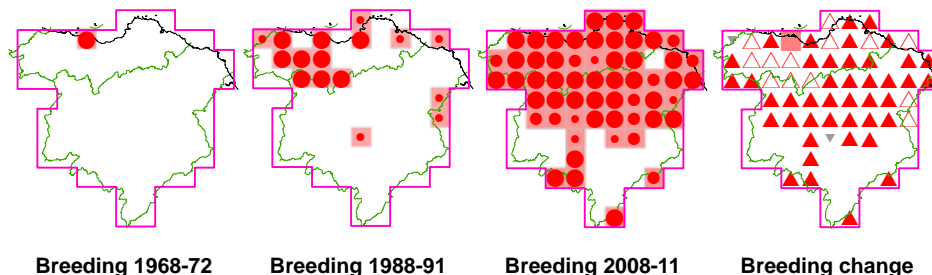


Figure 8.9 Greylag Goose: 10-km maps showing breeding season and winter distribution and its change between this Atlas and previous atlases. Change map key: solid mid pink square = always present; solid pale pink square = old apparent loss then recovery; large solid grey down triangle = recent apparent loss; small solid grey down triangle = old apparent gain then recent apparent loss (not plotted in *Bird Atlas 2007-11* due to the differing use of the small dot in 1988-91); large open red up triangle = old apparent gain; large solid red up triangle = recent apparent gain; blank = old apparent gain then apparent loss or apparently never present. *Observed* records are not plotted on the 10-km maps. See *Bird Atlas 2007-11*, Table 4.1B (page 73).

comparable data for most species for 1988-94. Since all the tetrads in the first category are intertidal, with no breeding birds, the breeding season comparison charts always have a blank first column.

10-km maps

The 10-km maps illustrated here provide an extract from the BTO national data for the 80 hectads that are predominantly in the study area. It should be borne in mind that some individual records that contribute to these maps may be from outside our *Atlas* area (i.e. of birds not recorded in Lothian or Borders), and that they are not 10-km maps derived from our tetrad data (which covered different survey periods). The winter maps reflect abundance, whilst in the breeding season it is ‘breeding status’ (*possible, probable* or *confirmed*) that is mapped.

Winter

The winter 1981-84 map is as published (*Winter Atlas 1981-84*). The mid-shaded blue squares on the Winter 2007-11 map correspond to those plotted in the BTO Atlas. *Bird Atlas 2007-11* used only one symbol representing presence as opposed to absence. The pale blue squares refer to records from the early November period that was not covered in the 1981-84 atlas (and are excluded from the winter change map). The three sizes of dots presented here reflect average TTV counts from our data (the size classes are specific to each species). Where no dot is plotted, the record(s) came only from roving or *ad hoc* records. The addition of these dots allows comparisons to be made with the 1981-84 map. However, it should be noted that the data were collected using a different survey methodology and are for illustration only.

Breeding

The breeding maps are as published (*Breeding Atlas 1968-72, 1988-91* and *2007-11*), including the lack of a ‘probable’ category and the use of the smallest dot as ‘seen’ rather than ‘possible’ in 1988-91. Pale pink squares refer to out-of-season breeding records which do not have a comparable entry in the *Breeding Atlas 1988-91* (and are excluded from the breeding change map).

Breeding statistics, 1988-94 to 2008-13

The breeding statistics (counts of tetrads and their percentages of the species total) for each species in 1988-94 and 2008-13 are presented in a table within the species accounts. The difference in the number of tetrads between the two survey periods is indicated for each category,

	Breeding Statistics					
	1988-94		2008-13		Change	
	Tetrads	%	Tetrads	%	Tetrads	%
Observed	0	0	3	1	+3	+
Possible	5	63	149	32	+144	+2880
Probable	1	13	157	33	+156	+15600
Confirmed	2	25	160	34	+158	+7900
Total	8		469		+461	+5763
Percentage of total	0.5		27			
Breeding code change					+458	+5725

Figure 8.10 Breeding statistics table for Nuthatch.

as is that change expressed as a percentage gain or loss. A change of +200% indicates an increase of 200% or two times the original number of tetrads (e.g. 50 plus 2x50 to 150). A change of -90% indicates a decrease of 90% or 0.9 times the original number of tetrads (e.g. 30 less 0.9x30 to 3). The total is the sum of all the codes (including observed) with the respective percentage change. Note however that the observed category was not recorded for the majority of species in 1988-94 (Figure 8.10).

An equals sign (=) indicates that there has been no change in that category. If there were no breeding season records in both periods, the change for that category is left blank. If there were breeding season records in one period, but not the other, a negative sign indicates a loss and a plus sign, a gain.

The 'percent of total' figures represent the percentage of the 1,770 tetrads in SE Scotland in which the species was recorded. The 'breeding code change' excludes the 'observed' category and provides the best indication of change by comparing the total of the three breeding codes.

It is important to note that where categories of breeding evidence are referred to in the text the intended meaning always relates to the highest recorded categories, as mapped, unless stated otherwise. For example, the text may refer to the proportion of records with a certain level of breeding evidence, or specific category of breeding evidence, but this corresponds only to those tetrads for which this was the highest recorded level, or individual breeding code, and the proportion of those records in the raw data may in some cases be significantly different.

Non-breeding waterbird counts

The Wetland Bird Survey (WeBS) monitors non-breeding waterbirds in the UK, with volunteers undertaking monthly counts at key sites. The principal aims are to identify population sizes, determine trends in numbers and distribution, and identify important sites for waterbirds. For coastal sites, data from WeBS (and its predecessor, the Birds of Estuaries Enquiry) were supplied by the BTO for the South Forth area and Tynninghame (see Figure 6.4, page 69). Some missing legacy data were also incorporated from the files of the Lothian Recorder.

The South Forth area covers the coastline of the Firth of Forth from Blackness in the west to Ravensheugh Sands NT68F in the east. All the subsections were summed to give the South Forth total. This figure excludes the Tynninghame Estuary and the mainly rocky shore south to Dunglass.

Histograms of these WeBS data are included where appropriate on the map pages for the relevant species account; where space does not permit they are included in Appendix 10.

Long-term trend graphs illustrate population changes between 1991

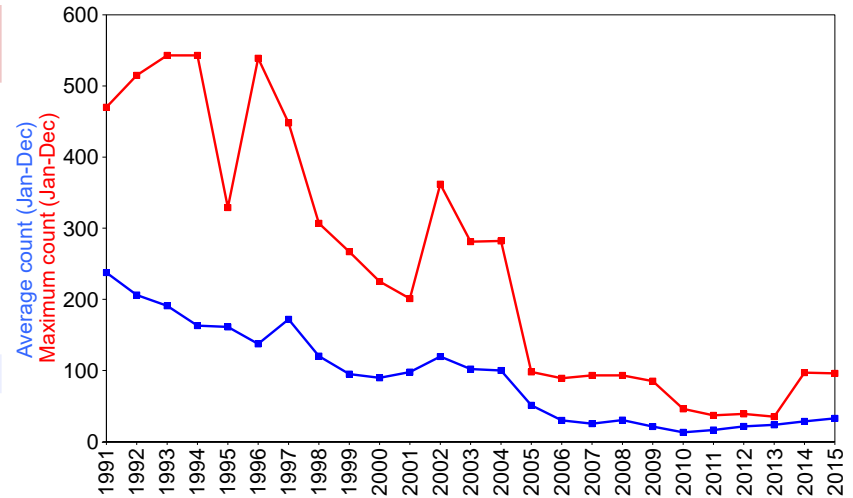


Figure 8.11 Great Crested Grebe: South Forth WeBS counts by year, 1991-2015.

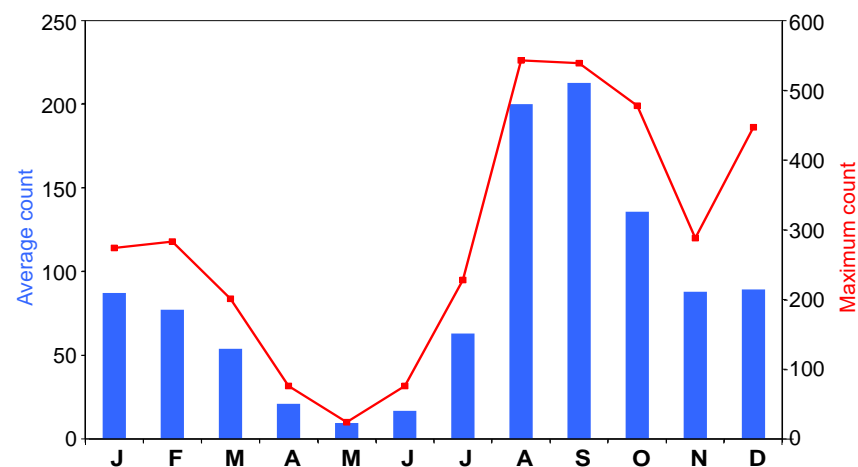


Figure 8.12 Great Crested Grebe: South Forth WeBS counts by month, 1991-2015.

and 2015. These plot the annual average (blue) and annual maximum (red) of the 12 monthly counts for the South Forth area in any year (Figure 8.11).

Counts have also been plotted by month to show the fluctuation in numbers through the year. Using the 1991-2015 South Forth dataset, the graphs show the average (blue bars) and maximum (red line) counts in each month over the 25 years (Figure 8.12).

The long-term decline and the (former) late summer peak in numbers of Great Crested Grebes is evident.

Index map

Each species map page includes an index map showing the 100-km (myriads) and 10-km squares (hectads) that cover SE Scotland, and a quick guide to the 25 2-km squares (tetrads) that make up each hectad.

Additional maps and charts

Where space permits, a range of other graphs and tables are presented to support the texts.

Ian J. Andrews

Mute Swan

Cygnus olor

A familiar sight on marshes, ponds, lochs and rivers, the Mute Swan is a widespread resident across Lothian and Borders. Readily recognisable, aggressive in defending its nest and young, but eager to come to be fed at ponds, it is one of the few bird species easily recognised by the public.

Although the pattern of drainage in SE Scotland is clear on the map, few Mute Swans actually breed by rivers. Clusters of occupied tetrads are evident in the Edinburgh parks, the Ettrick Forest lochs, and the rural landscapes in East Lothian between Aberlady and Dunbar, the northern Lammermuirs around Gifford, and between Jedburgh and Kelso – all areas where large farms and estates have developed waters for landscaping, fishing and shooting. The ‘linear pond’ of the Union Canal NS97/NT07 is also evident.

Amalgamated data over the six years of the *Atlas* show pairs in 278 tetrads, but some sites are not occupied in each year, others cross tetrad boundaries, and the movement of families from nests at ponds to rivers is often noted.

Mute Swans prefer to breed on smaller water bodies, half of those occupied being 600 m² in area or less. This size of water body usually restricts numbers to one pair per loch. The larger waters in the uplands are deeper and often have actively eroded shorelines and lack vegetation suitable for feeding. Larger lowland lochs can hold several pairs, with Linlithgow Loch and Yetholm Loch/Marsh each with up to five pairs during the *Atlas* period.

Hills are generally avoided except for the reservoirs of the northern hills in NT05/06, NT35 and NT56/66. Reservoirs in the Tweedsmuir Hills are all too stony and deep. Most occupied tetrads (60-70%) are found below 200 m with few above 300 m.

Moulting flocks of non-breeding birds build up in the summer. Estuaries are attractive to swans when moulting, with abundant food and no territorial adults to harass them. The highest counts were at the Esk mouth at Musselburgh, the largest being 219 birds in July 2010. Other important non-breeding, summering sites are Yetholm Loch (a July maximum of 130 in 2008), Lees NT83J/P (100), St Margaret’s Loch NT27R (60) and Linlithgow Loch (52).

There has been little change in the breeding distribution in the lowlands of Lothian and the Tweed-Teviot basin. Since 1988-94, however, there has been an expansion in range, infilling gaps in the core areas, and expanding onto the higher ground of Lothian, the Ettrick Forest waters and Peeblesshire. The number of occupied tetrads rose by 85%, and those with *confirmed* breeding by 32%.

The hectad maps show that breeding distribution was stable up to 1988, but the lower percentage of tetrads showing *confirmed* breeding hints that all was not well in 1988-91, the population only just recovering from widespread mortality, due in part to severe winters in the late 1970s and early 1980s.

The winter map is similar to that of the breeding season although an additional 43 tetrads are occupied. The greatest numbers winter in East Lothian, and on the Tweed and Teviot Haughs. The highest counts were all in the river haughs of Borders, with maxima of 194 at the Tweed Haughs (February 2012), 172 at Redden Haugh NT73Y (February 2008), and 120 at Kirkmains NT62S (December 2008). In March, 297 were counted along the Tweed between Kelso and Coldstream on 13 March 2011. This was the largest count in SE Scotland during 2007-13. Other high counts include 80 at St Margaret’s Loch and 72 at The Hirsell.



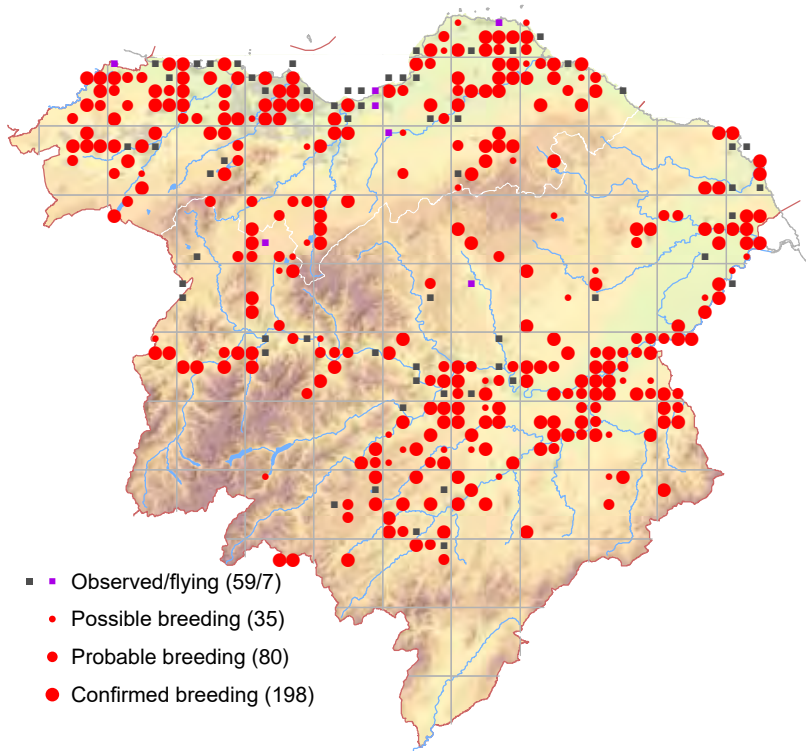
Craiglockhart Pond, 19 May 2010. © Peter Macdonald

The most recent comprehensive breeding survey across the whole of SE Scotland was in 2002, when 232 territorial pairs of Mute Swans were located (Brown & Brown 2005). Although Lothian had complete coverage in 2008-13, breeding data from Borders was patchy. Thus, only 125-166 pairs were reported annually in 2008-13 (*Bird Reports*). Between 2002 and 2008-13, the well-monitored Lothian population declined by 12%. Assuming the same decline across SE Scotland as a whole would give an average population in 2008-13 of *c.* 203 pairs. This figure is far higher than the 141 territorial pairs found in 1990 (*SES Atlas 1988-94*), a time when the population was still on the increase. The total mid-April Lothian population declined more steeply from 619 to 400 birds between 2005 and 2013 (Brown & Brown 2015).

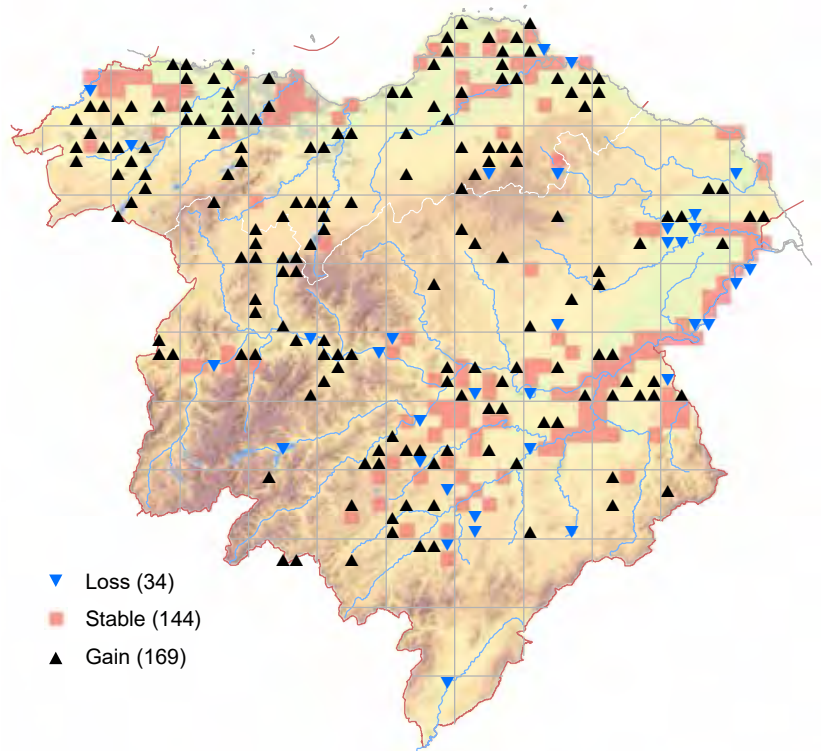
Around 1,950 Mute Swans can be found in SE Scotland in winter, a quarter being breeding adults, a third juveniles and the remainder non-breeding adults.

Ray Murray & Stephen Welch

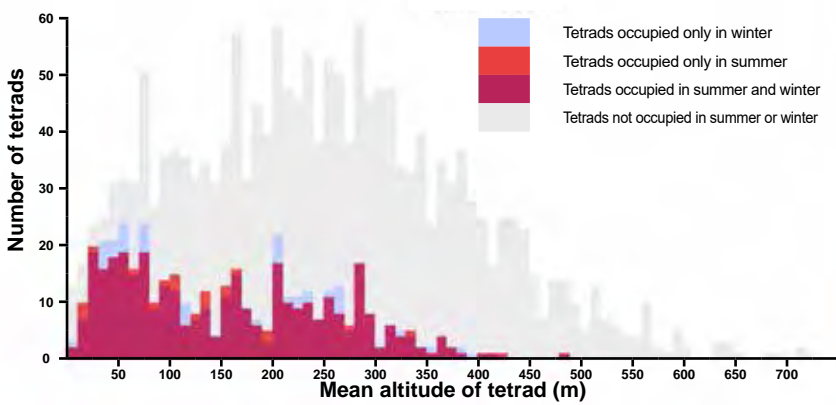
	Breeding Statistics					
	1988-94		2008-13		Change	
	Tetrads	%	Tetrads	%	Tetrads	%
Observed and flying	20	10	66	17	+39	+195
Possible	7	4	35	9	+28	+400
Probable	34	17	80	21	+46	+135
Confirmed	137	69	198	52	+61	+45
Total	198		379		+174	+88
Percentage of total	11		22			
Breeding code change, excluding observed					+135	+76



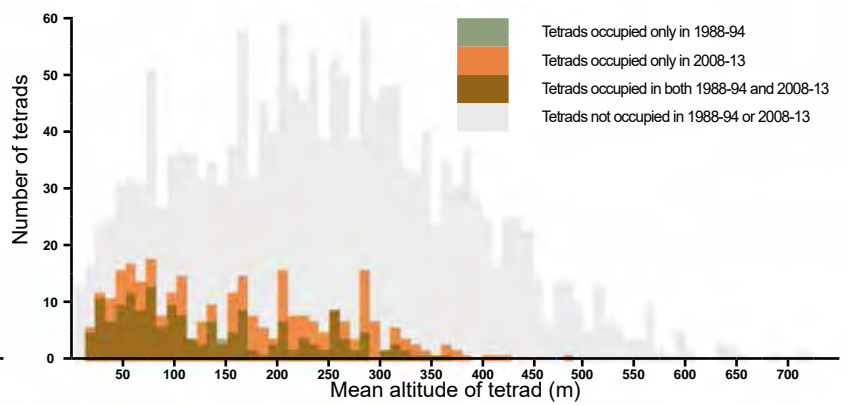
Breeding season distribution, 2008-13



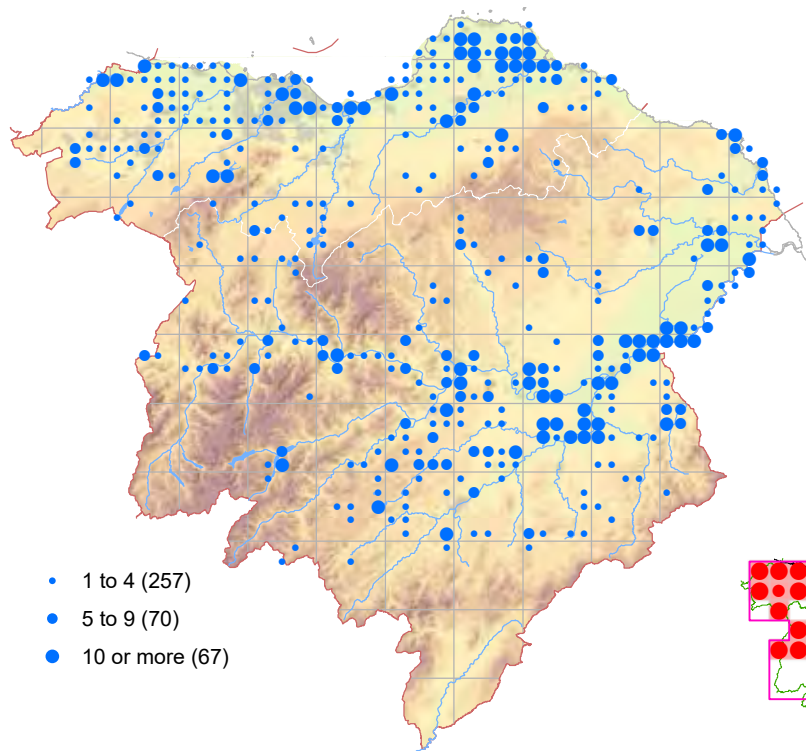
Breeding distribution change between 1988-94 and 2008-13



Altitudinal change between breeding season and winter, 2007-13



Breeding season altitudinal change between 1988-94 and 2008-13

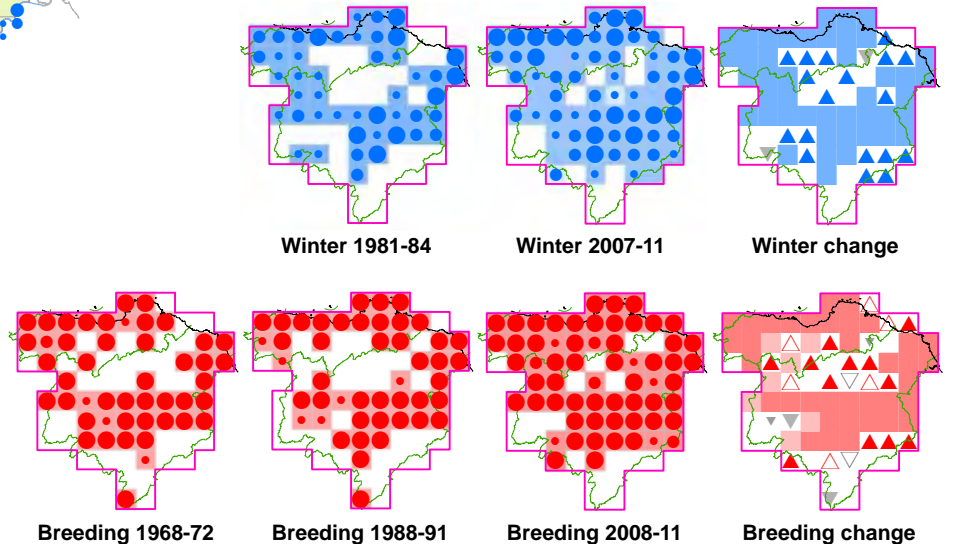


Winter distribution and abundance, 2007/08 – 2012/13

For WeBS counts, see page 524

08	28	48	58	68							
87	97	07	17	27	37	47	57	67	77	87	
86	96	06	16	26	36	46	56	66	76	86	96
05	05	15	25	35	45	55	65	75	85	95	
04	14	24	34	44	54	64	74	84	94		
03	13	23	33	43	53	63	73	83			
02	12	22	32	42	52	62	72	82			
01	11	21	31	41	51	61	71	81			
NS	NT	10	20	30	40	50	60	70			
NY			39	49	59	69					
				48	58						
					47						

E	J	P	U	Z
D	I	N	T	Y
C	H	M	S	X
B	G	L	R	W
A	F	K	Q	V



Winter 1981-84 Winter 2007-11 Winter change Breeding 1968-72 Breeding 1988-91 Breeding 2008-11 Breeding change

Long-tailed Duck

Clangula hyemalis



Musselburgh, 26 March 2018. © Ian Andrews

Usually viewed some distance offshore, Long-tailed Ducks are easily recognised with their black and white markings and the male's elegant long tail. They are primarily winter visitors from Iceland or northern Europe, but the yodelling display calls of the males, competing for the attention of females, reveals a link to their breeding activities.

Long-tailed Ducks have a predominantly coastal range, from South Queensferry NT17J eastwards to Burnmouth NT96Q. The incidence of occupied tetrads, and the number of birds recorded, is patchy at both the western and eastern ends of the range. The highest occupancy and numbers are in the central part between Musselburgh and Gullane. Long-tailed Ducks feed mostly on bivalves, especially cockles and mussels, so the sandier and muddier substrates are preferred. The rocky nature of the shoreline and offshore zone east of Gullane Point may

explain the patchier range here. Only around the smaller, sheltered bays from Pefferside NT68B to Belhaven Bay and Thorntonloch to Pease Bay are numbers higher. There, flocks of up to 25 birds were recorded. Some high counts off the headlands on this shore probably involve passage birds moving along the coast. Given their preference for mollusc-rich shores, the relative lack of birds west of Musselburgh is puzzling, especially off Cramond, where muddy and sandy substrates are widespread. Most counts here were of just 1-2 birds.

Long-tailed Ducks are typically present between Seafield and Aberlady for much of the winter. It is unknown how much movement there is between these flocks. The highest counts were at Gosford Bay with 92 on 12 February 2011 and 54 on 4 November 2007. There were several counts in the 40s at Musselburgh and Joppa-Eastfield NT37G. WeBS counts in the *Atlas* period regularly showed composite monthly totals of 50-70 for the South Forth, with a high count of 116 in February 2011. Records on freshwater are rare. The 10-km record in NT53 in *Bird Atlas 2007-11* appears to be an error as there was no supporting tetrad record.

Comparisons with historical data extending back to the early 1970s show that during the *Atlas* period numbers were at a very low ebb. A large reduction has been evident since the mid-1980s, with the mean counts now less than half those of the early 1990s. Then, counts of over 200 birds along single stretches of coast were annual, the highest WeBS total being 910 at Aberlady/Gullane Point in January 1989. The peak and mean WeBS counts for South Forth show the population in SE Scotland during the *Atlas* years at an all-time documented low level. This fall mirrors that of the Baltic Sea wintering population which underwent a precipitous decline from c. 4,272,000 in 1992/93 to c. 1,486,000 in 2007-09 (Skov *et al.* 2011).

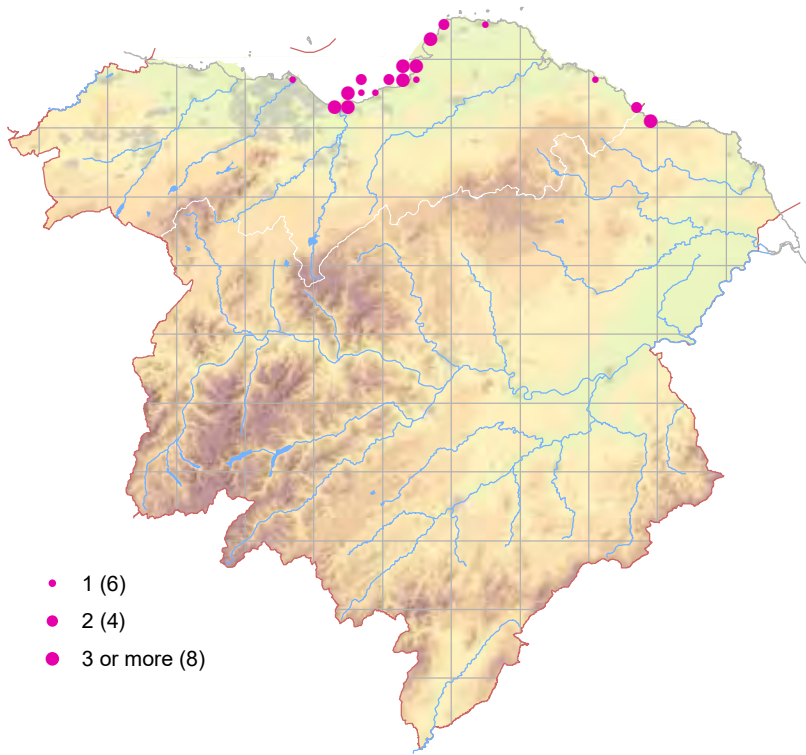
Ringling recoveries are rare, and most British wintering birds are thought to be an offshoot of the Baltic population (*Migration Atlas*), though other authorities suggest they may come from Iceland/Greenland (Stroud *et al.* 2001). Although some Scottish birds may be from Iceland and Greenland (*Birds in Scotland*), there are no ringing data to substantiate this.

The breeding season map highlights the concentrations of spring passage birds in mid-April to early May. Birds are almost entirely restricted to the coast between Eastfield and Gullane Point. Gosford Bay typically held the largest numbers: 179 in April 2010 and 150 in April 2009. The Eastfield-Musselburgh peak at this season was 61 in April 2012.

Midsummer records are exceptional, with only one in the *Atlas* period (Musselburgh on 17-26 June 2013), and there are no records on freshwater during the breeding season. Autumn migration begins with early records in late September, but most of the population arrives much later. Light passage was evident on the North Sea coast in November, for example 44 heading north at St Abb's Head on 7 November 2010.

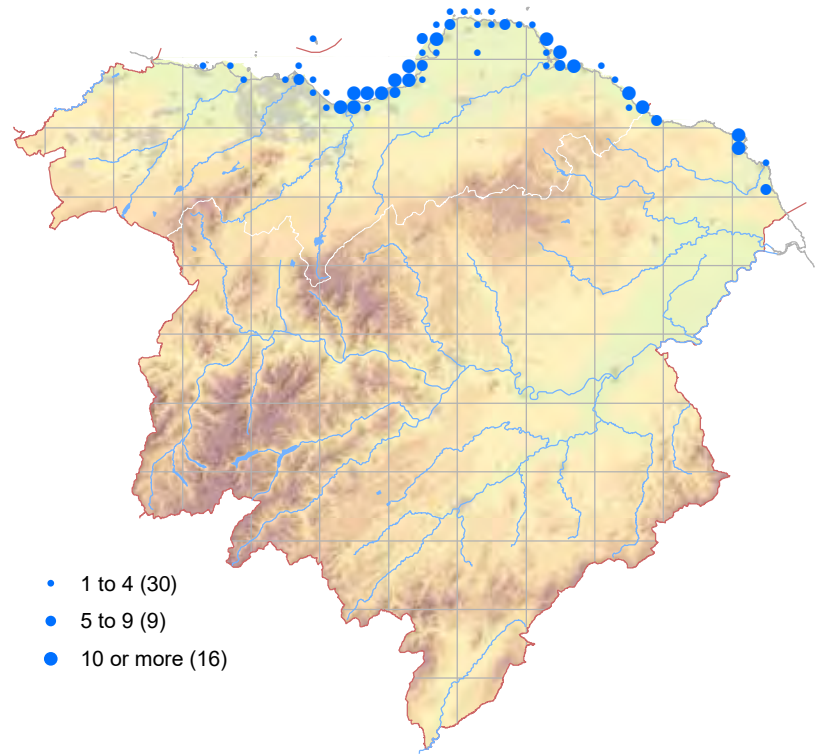
Combined WeBS and Rocky Shore Counts during the *Atlas* period suggest a winter population of 50-100 birds.

Ray Murray, Tom Brewis & Harry Dott



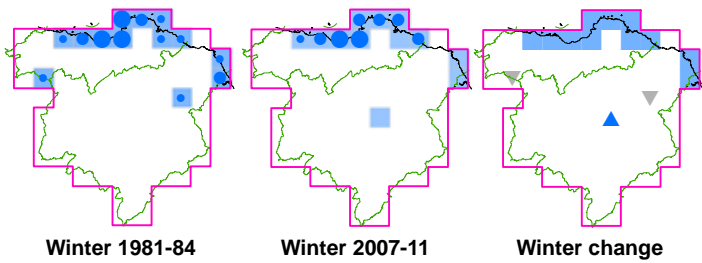
- 1 (6)
- 2 (4)
- 3 or more (8)

Breeding season abundance, 2008-13

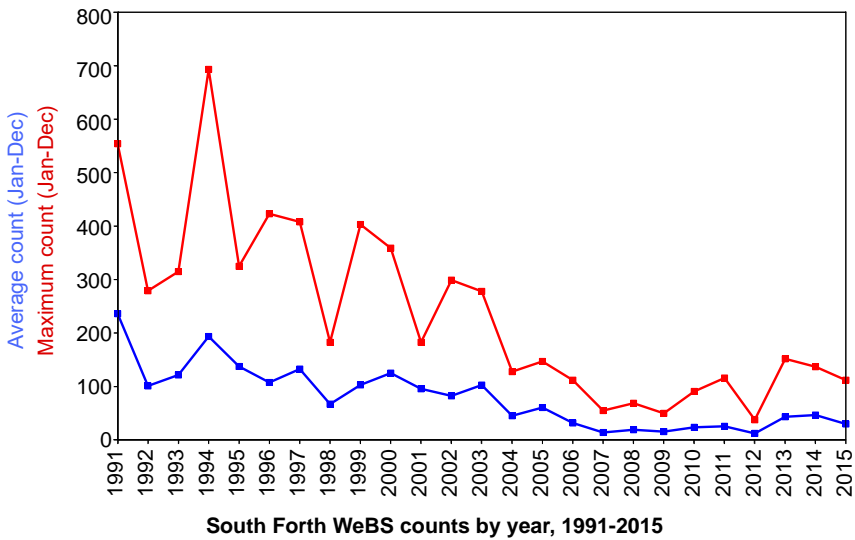
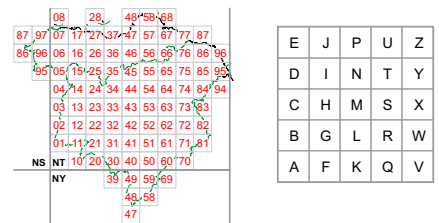


- 1 to 4 (30)
- 5 to 9 (9)
- 10 or more (16)

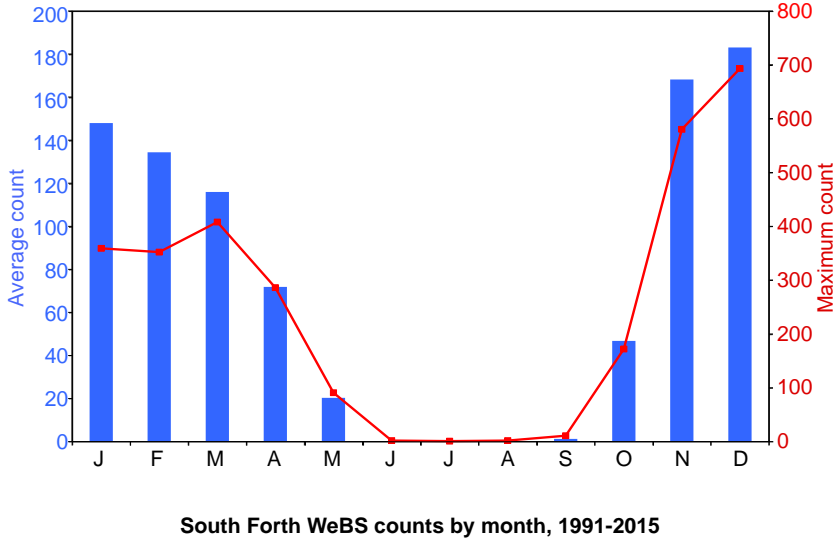
Winter distribution and abundance, 2007/08 – 2012/13



Winter 1981-84 Winter 2007-11 Winter change



South Fort WeBS counts by year, 1991-2015



South Fort WeBS counts by month, 1991-2015

Sand Martin

Riparia riparia

Sand Martins are summer visitors and colonial breeders, typically breeding along riverbanks, but they will readily choose any vertical face that offers an opportunity to dig a burrow, including mineral extraction sites and drainage pipes, and at least one colony was found in the vertical face of a silage heap.

A few Sand Martins arrive at coastal locations in SE Scotland from early March, but the bulk of the population doesn't reach the area until April. They are common passage migrants and large numbers can assemble on rivers, lochs and ponds if poor weather interrupts their migration. After breeding, Sand Martins leave earlier than our other hirundines, with most birds having left by early September.

The breeding distribution of Sand Martins shows a strong association with the river network. The Tweed network dominates the summer map, but the Tyne, Eye and Liddel are also notable. The flat river haughs with eroded exposures of sand and gravel are ideal nesting sites, for example the Tweed at Drumelzier NT13, Innerleithen/Walkerburn NT33 and Melrose, the Teviot at Nisbet NT62 and the Liddel/Hermitage NY48/58/59. Some riverine locations such as the Esk NT25/26/36, upper Almond NS96/NT06, lower Whiteadder NT75/85 and Ale NT42 have few records due to the galleries of woodland that extend down to the rivers themselves.

Some sections of the coast, where there are eroding sand cliffs (e.g. Brander NT86Z) or sand dunes (e.g. North Berwick and Scoughall NT68B) offer nesting opportunities. Mineral extraction sites are also used, but their locations are not however evident from the map.

The distribution of *observed* records is largely riverine and coastal. Although breeding may not be occurring in such tetrads, the river channels provide a ready supply of insects. The Union Canal NS97/NT07/17 is the largest group of such tetrads, the solid canal bank being unsuitable for nesting but still providing a food supply.

The wide distribution of the species is reflected in a broad altitudinal distribution. Below 350 m, approximately one third of all tetrads are occupied. Above this, the rate of occupation quickly decreases.

The highest counts all involved non-breeding assemblies. A total of 1,000 passage birds held up by bad weather was recorded on the lower Tweed at Paxton (NT95L) on 13 April 2011. Other large counts were probably of mainly recently fledged juveniles with adults gathering to take advantage of fly hatches, including 1,000 at Bemersyde Moss on 26 July 2008, with 2,040 at Folly Loch on 21 July 2010. There is a large colony in the neighbouring tetrad NT62M.

Colonies are typically small and are often abandoned or may suddenly change in size between years, after winter floods erode cliffs. During the *Atlas* period there were twelve colonies of over 100 nests reported. About half of the largest colonies were in man-made sites, despite their relative rarity compared to riverine sites. In quarries, extraction work constantly destroys old sites and creates new ones. The largely unmonitored and inaccessible colony at the Dunbar limestone quarry NT77D/I is Lothian's prime site. The largest colonies recorded in the *Bird Reports* were 645 burrows on the Tweed at Hoseburgh NT23Z in 2001, 816 at Eckford Sandpit NT72I in 2001 and 528 on the Tweed at Birgham Haugh NT73Z in 2002.

The change map shows that in 2008-13 Sand Martins occupied 115% more tetrads than in 1988-94, increasing from 177 to 381 (excluding *observed* birds). The increase is marked at all altitudes (see altitude change chart) but is particularly obvious between 275 m and 325 m, for example in the upper tributaries of the Tweed. The upper limits of the breeding range have also extended from 420 m to 500 m, and the number of tetrads above 250 m has increased five-fold, whereas those below that level have only doubled. Nesting colonies can now be found in low bluffs of loose



Pentland Hills, 8 June 2015. © Dennis Morrison

soil by upland burns. In periods of low population, similar to that which prevailed in *SES Atlas 1988-94*, Sand Martins bred at lower levels where perhaps breeding conditions were better.

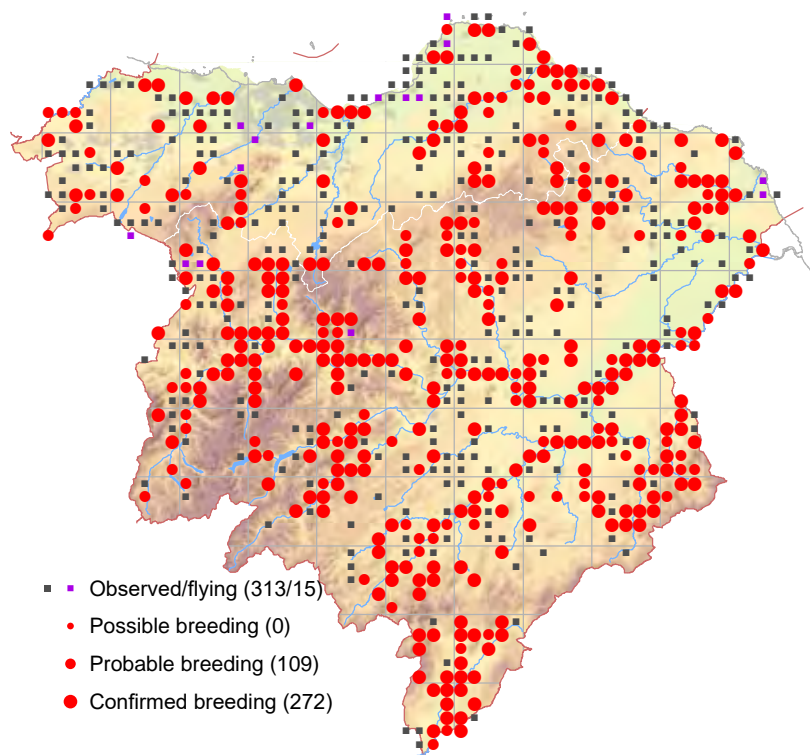
The hectad maps show a decline in range between 1968-72 and 1988-91 with the south and west most affected. These losses are widely attributed to the Sahel droughts of 1968/69 and 1983/84 reducing food supply and survival on their non-breeding grounds (Robinson *et al.* 2008). In addition, high rainfall during the breeding season may also reduce productivity and breeding population size (Cowley & Siriwardena 2005). The 2008-11 map shows that all but two (marginal) hectads are now occupied.

Bird Atlas 2007-11 showed strong regional population differences across the UK with breeding range and abundance falling in the south and east but rising strongly in the north and west, including all of SE Scotland.

TTV data suggest a population of 10,000-15,000 pairs. This compares with an estimate of 7,000 pairs for *SES Atlas 1988-94*, a figure largely based on counts of burrows derived from *Bird Reports*. If both estimates were accurate then it would point to a 40-114% increase in population between the two local atlases. This increase is supported by the 115% increase in the number of tetrads with breeding evidence.

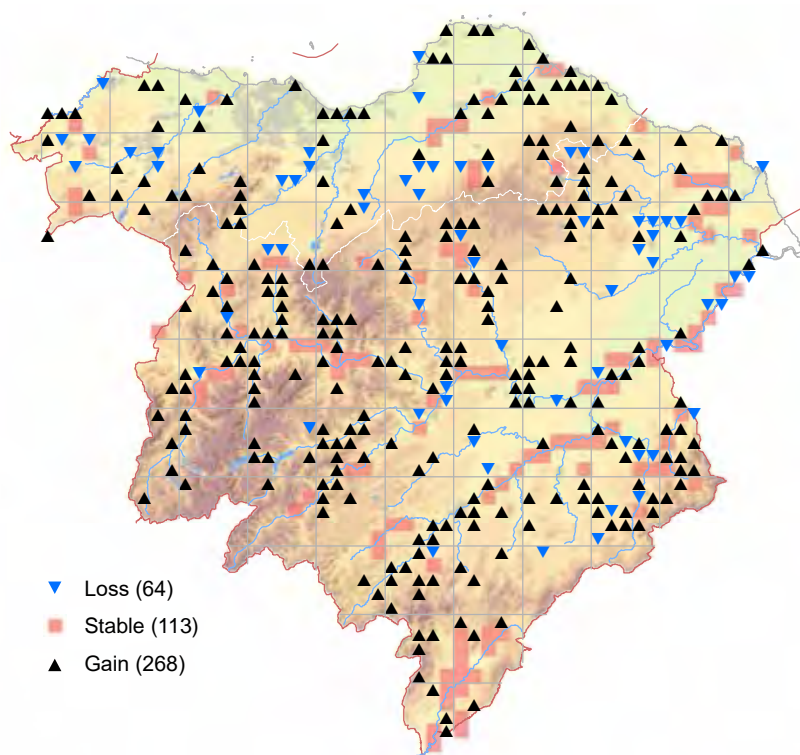
Ray Murray, Stephen Welch & Tom Brewis

	Breeding Statistics					
	1988-94		2008-13		Change	
	Tetrads	%	Tetrads	%	Tetrads	%
Observed and flying	185	51	328	46	+143	+77
Possible	0	0	0	0		
Probable	31	9	109	15	+78	+252
Confirmed	146	40	272	38	+126	+86
Total	362		709		+347	+96
Percentage of total	21		40			
Breeding code change, excluding observed					+204	+115



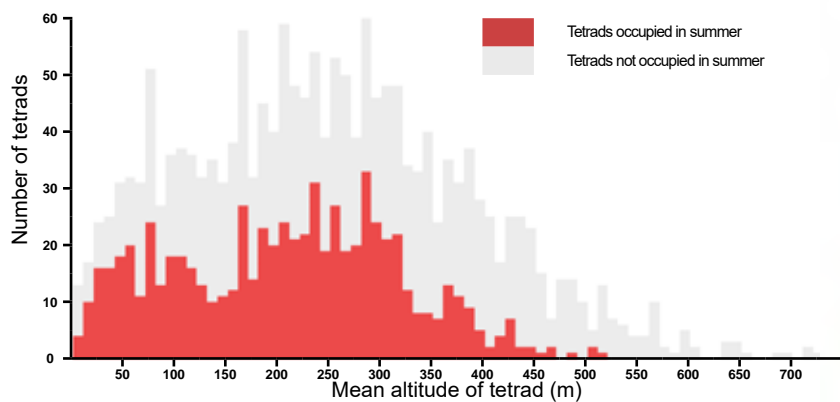
- Observed/flying (313/15)
- Possible breeding (0)
- Probable breeding (109)
- Confirmed breeding (272)

Breeding season distribution, 2008-13

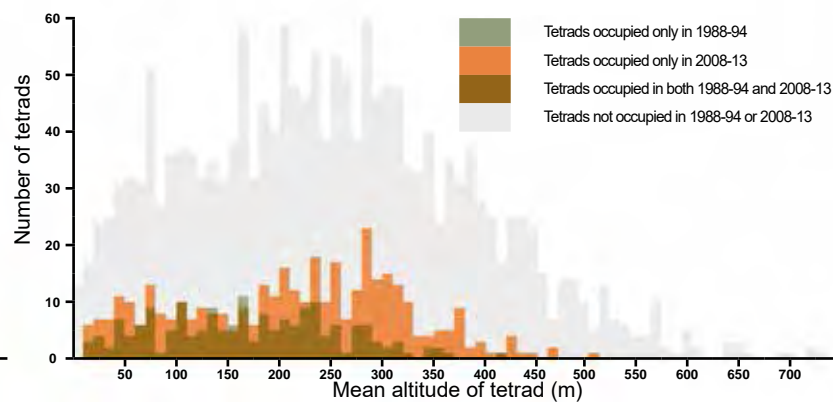


- ▼ Loss (64)
- Stable (113)
- ▲ Gain (268)

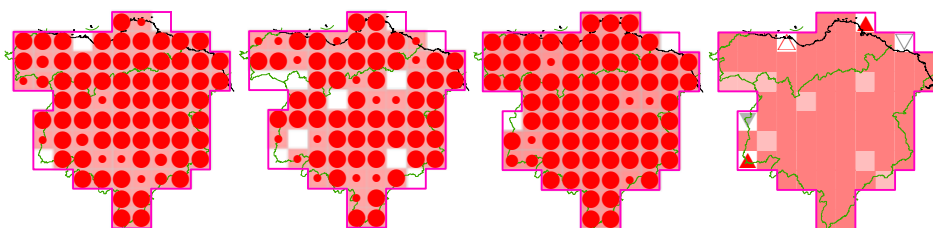
Breeding distribution change between 1988-94 and 2008-13



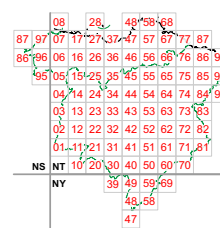
Altitudinal change between breeding season and winter, 2007-13



Breeding season altitudinal change between 1988-94 and 2008-13



Breeding 1968-72 Breeding 1988-91 Breeding 2008-11 Breeding change



E	J	P	U	Z
D	I	N	T	Y
C	H	M	S	X
B	G	L	R	W
A	F	K	Q	V