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The Nightingale in Britain

The Great Bustard in Hungary

Spotted Crakes breeding in Britain & Ireland

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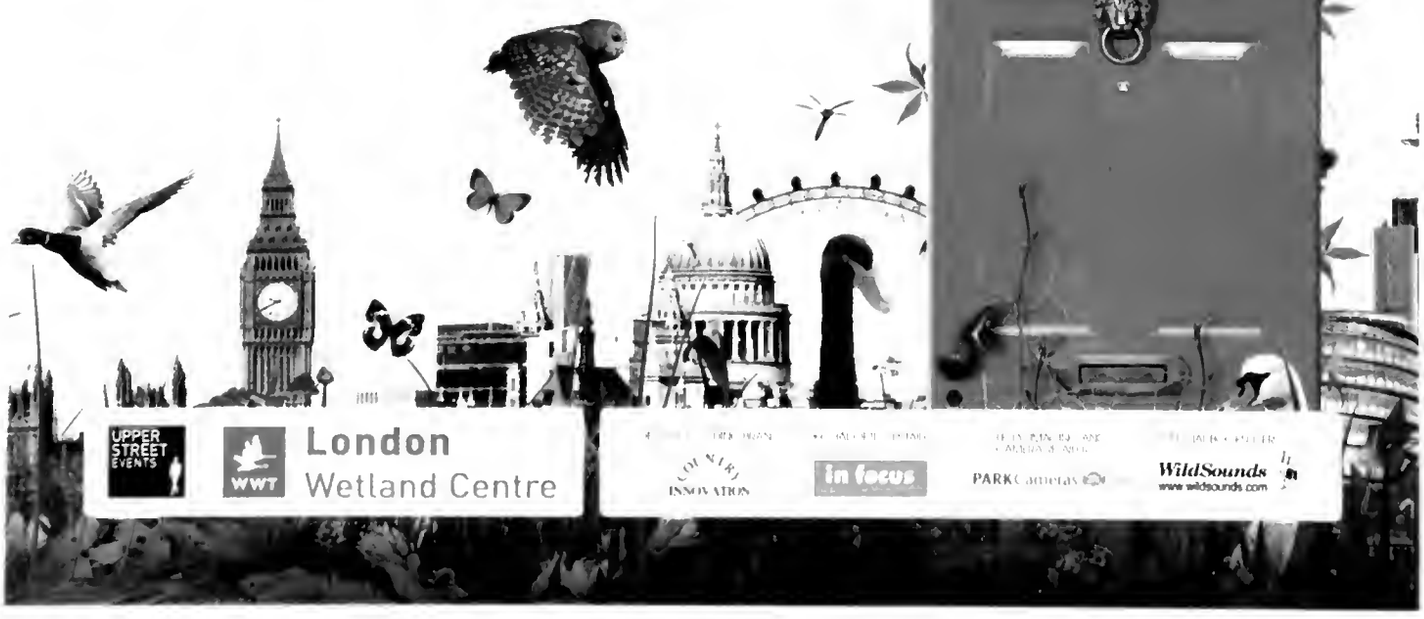

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Conservation priority species

The Nightingale in Britain: status, ecology and conservation needs

Chas A. Holt, Chris M. Hewson and Robert J. Fuller

Richard Allen

Abstract The Common Nightingale *Luscinia megarhynchos* is currently on the UK's Amber list of birds of conservation concern, but the recent population trend indicates that the species now warrants Red-list status. England lies at the edge of the Nightingale's global distribution; national surveys and Atlases reveal a contraction in range towards the southeast counties, while favoured sites away from this core are becoming increasingly isolated. The population in England has been in decline since at least the mid 1960s, with an especially steep decline up to the late 1970s. In mainland Europe the recent pattern (post 1970s) is one of relative stability. Knowledge of habitat requirements and pressures facing Nightingales in England has developed considerably in the last decade. Reduced woodland management activity in recent decades, combined with effects of intensified browsing by increasing deer populations are considered to have caused deterioration of habitat quality in woodland. Understanding the species' ecology outside the breeding season is now a key priority. A national census takes place in spring 2012 which will contribute to a suggested strategy for the conservation of the Nightingale in England, outlined here.

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Introduction

The Common Nightingale *Luscinia megarhynchos* (hereafter 'Nightingale') is an iconic species in the British avifauna[1]. Arguably, the Nightingale has greater cultural resonance than any other species, being widely represented in music, art and literature (Mabey 1993, 2010). Its name is recognised by everyone, including those with little or no interest in ornithology.

The last national survey of Nightingales in England was undertaken in spring 1999, before which Fuller *et al.* (1999) reviewed the problems faced by the species and its prospects. Thirteen years on, the next survey is due to take place in spring 2012 and this paper presents a summary of how our knowledge of Nightingales has developed in the intervening period. We review the species' status in Britain, consider threats faced at different times of the year, and summarise the findings from recent and ongoing research.

Rob Fuller

103. A typical location for a Fenland Common Nightingale *Luscinia megarhynchos* territory: a field margin with a drainage ditch under a dense understorey of willow *Salix*, Elder *Sambucus nigra* and nettles *Urtica dioica*. As shown here, treelines such as poplar *Populus* are often also a feature of such sites.

General background

The nominate race of Nightingale breeds throughout Europe as far north as Germany and as far east as western Turkey. The races *L. m. africana* and *L. m. hafizi* occur from northeast Turkey and the Caucasus east to Mongolia. The core distribution of *megarhynchos* is in Iberia, the Mediterranean and north into west-central Europe. To the north and east of this range it is replaced by the closely related Thrush Nightingale *L. luscinia*.

The Nightingale is a species that frequents dense undergrowth, favouring a range of scrub and woodland types, often associated with riparian habitats. In Britain, where the species' requirements appear to be somewhat more exacting than in other areas within the range (Fuller *et al.* 2007), it is found almost exclusively in lowland England, where it haunts thickets within scrub and regenerating woodland of suitable stages of vegetation succession.

In Britain, the breeding season of the Nightingale stretches from mid April to early July. Unlike in the rest of Europe, just a single brood is raised. Nests are typically located on or close to the ground, within nettles *Urtica dioica* or other dense vegetation. The mean clutch size is 4.6 eggs and mean fledging age is 12 days (Robinson 2005). During the breeding season, adults forage on the ground on invertebrates, especially ants and beetles, and the young are fed a diet that also includes lepidopteran larvae (Cramp 1988). In autumn, berries are also consumed.

In late summer, before their autumn migration, adult Nightingales undergo a complete post-breeding moult and juveniles a partial moult. Autumn migration begins in mid July, and the peak period of passage on the south coast of Britain is during the first half of August, with the species becoming very scarce after mid September (Wernham *et al.* 2002).

[1] This paper deals primarily with the Nightingale as a breeding bird in England, since the species has never bred in Scotland and has only very rarely bred in Wales.

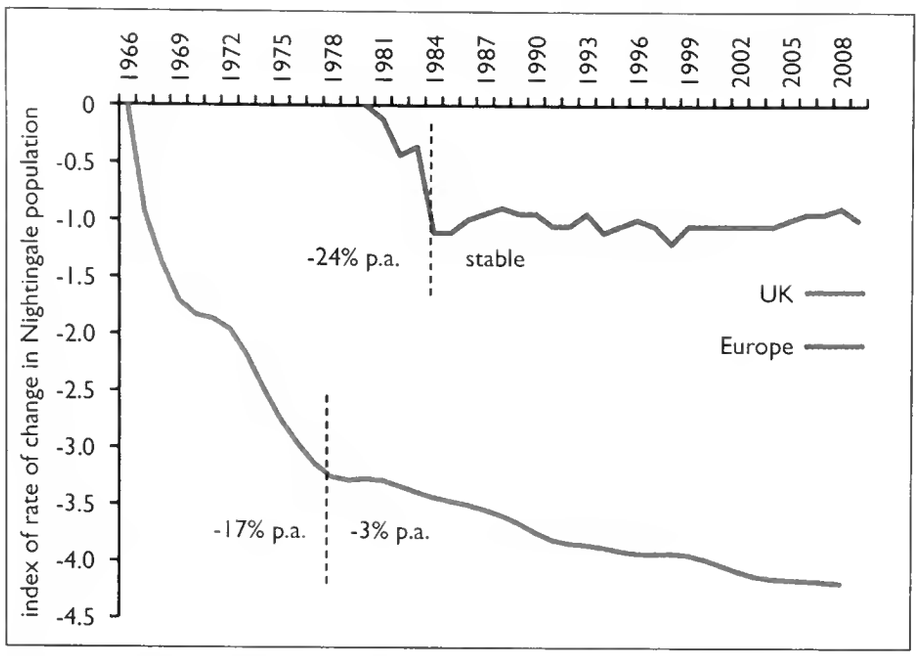

Fig. 1. Rate of change of breeding populations of Common Nightingales *Luscinia megarhynchos* in the UK (1966–2008, estimated from a joint CBC & BBS trend) and the rest of Europe (1980–2009, Pan-European Common Bird Monitoring Scheme). Smoothed trend; cut point in UK trend determined with broken stick model; underlying rates of year-on-year change are shown.

The status of the Nightingale in Britain

Population trends and conservation listing

Annual monitoring by the BTO/RSPB/JNCC Breeding Bird Survey (BBS) shows that Nightingales in the UK declined by 60% between 1995 and 2009 (Risely *et al.* 2011). Among the regular breeding bird species in Britain, only the Turtle Dove *Streptopelia turtur*, Wood Warbler *Phylloscopus sibilatrix* and Willow Tit *Poecile montana* have declined to a greater extent over that period. Like the Nightingale, two of those species (Turtle Dove and Wood Warbler) are long-distance migrants, a group which has declined markedly both in Britain (e.g. Hewson & Noble 2009) and elsewhere in Europe (e.g. Heldbjerg & Fox 2008).

Incorporation of data from the Common Birds Census (CBC) (the predecessor to BBS) indicates that numbers of Nightingales have fallen by more than 90% in the last 40 years. Had the results of such analyses been available at the time of the most recent Birds of Conservation Concern (BoCC) review (Eaton *et al.* 2009), the Nightingale would have been placed on the Red list. Instead, it was placed on the Amber list and is consequently at risk of not receiving the attention it warrants in terms of conservation initiatives. The Nightingale population has been decreasing in the UK since the mid 1960s (fig. 1); during the period up to 1978, the rate of decline was especially steep (by, on average, 17% per annum), with a relatively shallow decline (3% p.a.) since then. This reduction in numbers has been accompanied by a marked contraction of range within England towards the southeast (see below).

Rob Fuller

104. Recent decades have seen the disappearance of Nightingales from much woodland where they formerly occurred in England. Even where ride edges and coppice are managed to produce potentially suitable habitat, such as at this site in Worcestershire, birds are frequently absent.

Population trends for

the Nightingale in mainland Europe (fig. 1) show a similar pattern – that of a very steep initial decline – although this ended about six years after the steep decline in Britain and was followed by stability. Interestingly, recent declines have been reported in other European countries in the northwest of the species' range: Germany, the Netherlands and Belgium (BirdLife International 2004; Gregory *et al.* 2007). This contrasts with relative stability in central Europe (P. Vorisek pers. comm.).

These findings suggest that the population in Britain may be affected by large-scale population dynamics, with numbers declining in Britain first, when the total pool of birds in Europe was reduced (Hewson *et al.* 2005; Fuller *et al.* 2007). The mechanism for this could be either lower productivity or falling overwinter survival of birds from elsewhere in the species' range followed by a decrease in natal dispersal towards Britain. Even if breeding habitat quality was stable in Britain (which is unlikely to be the case; see below), the species might still decline at the margins of its range during a period of wider population decline. Of ten woodland species at the edge of their European range in Britain, the Nightingale shows the strongest systematic pattern of range change consistent with the notion that conditions in Britain are marginal (Fuller *et al.* 2007). However, the range contraction in Britain is the opposite of that expected in response to a changing climate on the breeding grounds, both in terms of climate envelope modelling for this species (Wilson *et al.* 2002; Huntley *et al.* 2007) and the observed response of first-year birds of other species to warm springs (Studds *et al.* 2008).

The decline in England is also illustrated by the species' occurrence on migration on the south coast. Mean spring (April–June) and autumn (July–September) totals at Dungeness and Portland Bird Observatories in five-year periods during 1962–2009 (fig. 2) show a marked drop in numbers from the late 1980s or early 1990s. It is notable that this decline occurred *after* the most pronounced period of decline in breeding numbers, both in Britain and in mainland Europe. Although it is not known how numbers at coastal observatories relate to the breeding population either in Britain or in mainland Europe, the marked decline in autumn may reflect lower reproductive output. The decline in autumn totals at Portland (in Dorset) occurred slightly earlier than that at Dungeness (in Kent), which matches the onset of range contraction towards southeast England during the 1980s, which would have involved disproportionate losses at the western edge of the range, to the north of the Dorset coast.

In some years, above-average numbers of Nightingales are recorded in Britain. Such years are often characterised by warm, dry anticyclonic weather in spring (Marchant *et al.* 1990) and may also be related to a relatively productive breeding season in Britain and other parts of the range in the previous year.

Distribution in Britain

In Britain, the Nightingale has always been restricted to the English counties south of a line between the estuaries of the Humber and

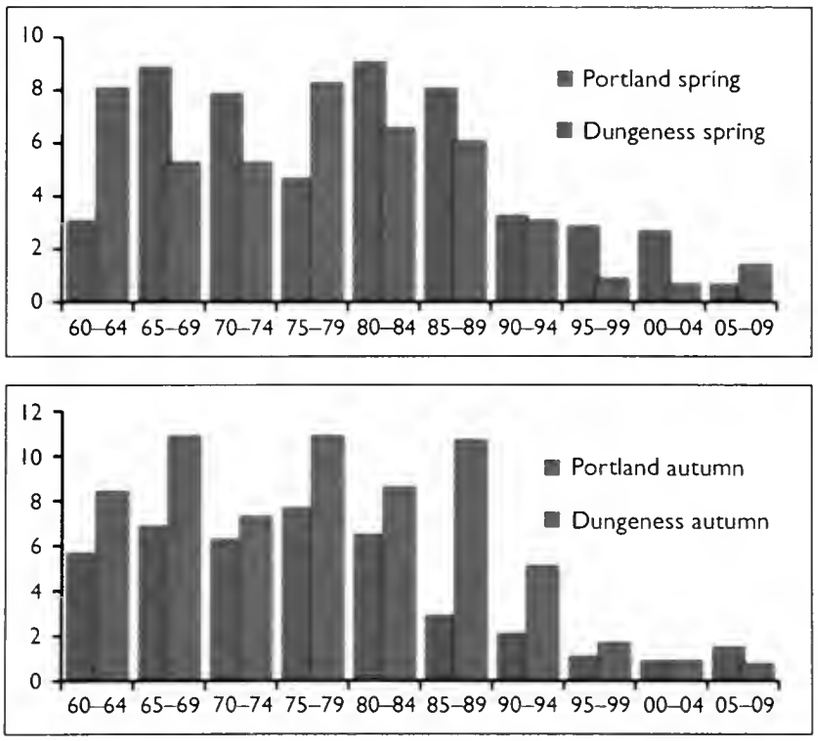

Fig. 2. The mean number of Nightingales recorded at Portland (Dorset) and Dungeness (Kent) Bird Observatories during five-year periods between 1962 and 2009 in spring and autumn.

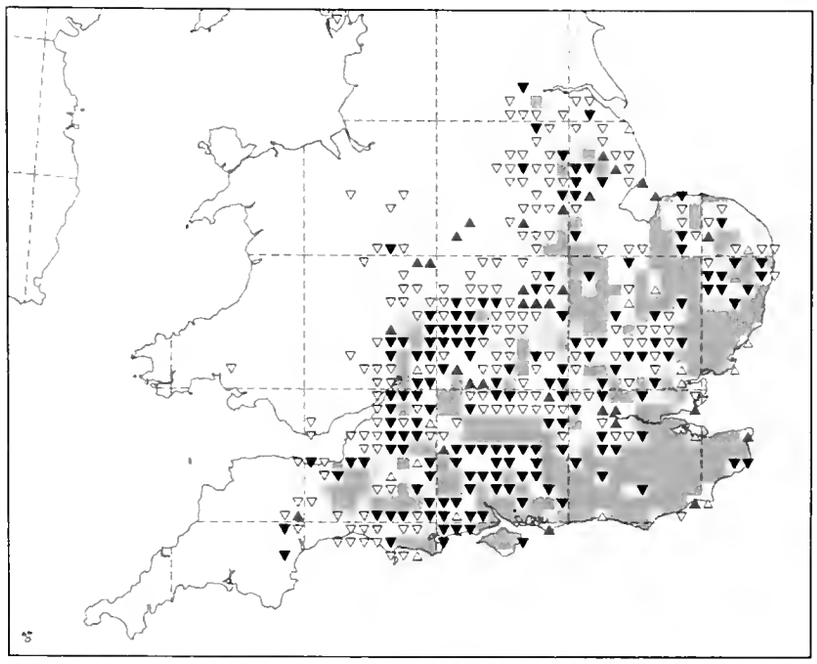

Fig. 3. Provisional Bird Atlas 2007–11 map showing history of breeding occupancy by Nightingales in Britain, 1968–2011. Downward (grey) arrows show apparent losses: solid = lost between 1988–91 and 2007–11; open = lost between 1968–72 and 1988–91. Upward (red) arrows show apparent gains: solid = gained between 1988–91 and 2008–11; open = gained between 1968–72 and 1988–91. Dark pink shading indicates squares where the species was recorded during all three Atlas periods; paler shading indicates recorded in 1968–72 and 2007–11 (but not in 1988–91).

the Severn. Farther north there are very few confirmed breeding records. The limits to distribution in England are almost certainly dictated by climate. Summer temperature and potential evapotranspiration in winter are positively and negatively associated, respectively, with presence/absence; in other words, the species is associated with areas of more continental climate (Wilson *et al.* 2002). The stronghold counties for Nightingales are Sussex, Kent, Essex and Suffolk, which in combination supported 70.1% of an estimated total of 4,565 singing males in 1999 (Wilson *et al.* 2002). Earlier national surveys had registered totals of 3,230 singing males in 1976 (Hudson 1979) and 4,770 in 1980 (Davis 1982). However, comparing the totals derived from the three surveys is difficult owing to methodological differences, and the apparent increase between 1976 and 1980 is considered spurious (Fuller *et al.* 1999). Although the 2012 survey of Nightingales will be largely comparable with that in 1999, a greater understanding of the significance of nocturnal song output (see below) has resulted in a different methodology.

The three atlases of breeding birds in Britain & Ireland – in 1968–72 (Sharrock 1976), 1988–91 (Gibbons *et al.* 1993), and the current 2007–11 Atlas – illustrate the gradual contraction of the Nightingale's range in Britain, towards the southeast (fig. 3).

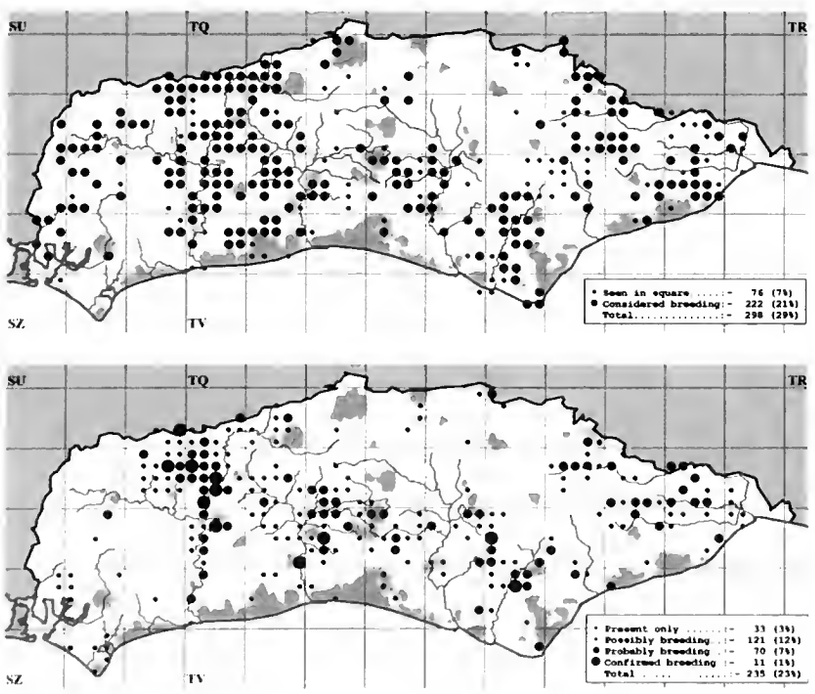

Fig. 4. Distribution of Nightingales in Sussex at tetrad scale, in 1988–91 (upper) and 2007–11 (provisional; lower). Maps reproduced with permission of Sussex Ornithological Society.

As the Nightingale's range has contracted, peripheral 'hotspots' have become increasingly isolated and favoured areas, such as Thorne Moors (Yorkshire/Lincolnshire), Paxton Pits (Cambridgeshire) and Cotswold Water Park (Gloucestershire/Wiltshire), persist as isolated outposts of high population density. Although this observed range contraction contradicts the predictions of climate change modelling, Bird Atlas 2007–11 shows that recent losses along the northern fringe of the range have been approximately

balanced by recent gains there. This may result from a tendency towards northward-biased natal dispersal in response to warmer springs (albeit by a diminishing pool of first-year birds). Recent losses at the 10-km-square level have been concentrated in western parts of the British range (in east Dorset/Hampshire and Gloucestershire/Avon), but they have also been scattered through other parts of the range, particularly the Home Counties. While such losses are fewer within the stronghold counties, such areas have not been immune, reflecting a general 'thinning' throughout the range. For example, Nightingales may have been lost from 25% of the 300 tetrads in Sussex where the species was found 20 years ago (fig. 4).

Chas Holt

105. Street names featuring the Nightingale are often a reminder of the bird communities lost as a result of housing developments.

Reasons for the decline and range contraction in Britain

Why has the Nightingale declined in Britain in recent decades? It is important to recognise that large-scale population dynamics may have a marked impact on the Nightingale in Britain, where conditions for the species may be rather marginal compared with much of Europe. The observed trend may reflect the interaction of a variety of factors – environmental quality on the breeding grounds, migratory behaviour, dispersal and settlement patterns, and wider population pressures (Fuller *et al.* 2007). More specifically, six hypotheses were proposed by Fuller *et al.* (1999) to account for the decline of the Nightingale in England:

1. changes in land use on the breeding grounds (including a reduction in coppicing and the maturation of both scrubby areas and post-war lowland conifer plantations);
2. increasing deer populations;
3. changing predation pressure;
4. reduction in food quality;
5. pressures on migration;
6. deteriorating conditions in winter.

Since 1999, several studies of Nightingales in England have examined aspects of hypotheses (1) and (2). Hypotheses (3) and (4) both remain unstudied (and are potential factors often suggested as contributing to declines of bird species across a range of habitats, but are particularly difficult to investigate effectively). Only relatively recently has attention started to focus on hypotheses (5) and (6). Here, we present an overview of research developments with respect to some of the possible causes listed by Fuller *et al.* (1999), all of which remain valid hypotheses in 2012. In reality, the declining Nightingale population probably reflects a combination of all of them to varying degrees. In this paper, hypotheses (1)–(4) are grouped in the section titled 'Breeding habitat requirements', while (5)–(6) are dealt with in the section 'Outside the breeding season'.

Breeding habitat requirements

Habitat loss

Although the extent of woodland cover in Britain doubled during the twentieth century (Peterken 1993), much of it comprised coniferous plantations and woodland outside the geographical range of the Nightingale. This woodland expansion did little to benefit the Nightingale, and has not compensated for the reduction in coppicing that would otherwise have provided large areas of potential habitat. Furthermore, sites with scrubby vegetation – often perceived as 'wasteland' – have been at particular risk of being lost to development. Relative to woodland, areas of scrub tend to

be somewhat undervalued both by the wider public and by conservationists, despite an importance for Nightingales and several other declining bird species, for example Garden Warbler *Sylvia borin*, Willow Warbler *Phylloscopus trochilus* and Bullfinch *Pyrrhula pyrrhula*.

During the second half of the twentieth century, new infrastructure and housing is likely to have contributed to the decline of the Nightingale in England, particularly as the pace of development has been greatest in the southeast, in the species' core range. In addition to direct loss of habitat, residential development may reduce the quality of adjacent Nightingale habitat through factors such as disturbance and predation by cats. Although there is no clear evidence for such indirect effects, the subject is worthy of research.

Changes in habitat quality

Nightingales require vegetation with a dense understorey, both in woodland and in scrub (Fuller & Henderson 1992; Fuller *et al.* 1999; Wilson *et al.* 2005). In predominantly mature woodland, suitable habitat for Nightingales is usually confined to the edges or to patches of younger regeneration. Various types of scrub habitats are used, including dry scrub adjacent to former mineral quarry workings, heathland on the Suffolk coast and more riparian shrub vegetation in the Fens and along a number of river valleys.

In 1999, the proportion of the Nightingale population associated with woodland habitat was lower than in previous surveys, whereas there had been a concurrent increase in habitats categorised as scrub (Wilson *et al.* 2002). This apparent shift has been attributed to a reduction in the quality of many woodland sites in lowland England, probably due primarily to reduced management activity in woodland combined with effects of greater browsing pressure from increasing deer populations. The maturation of conifer stands that had been planted into broadleaved woods in the mid twentieth century may also have been relevant. As well as affecting Nightingales, these changes may have contributed to declines of some other bird species in woodland habitats, including Woodcock *Scolopax rusticola*, Dunnock *Prunella modularis*, Garden Warbler and Bullfinch (Fuller *et al.* 2005; Hewson *et al.* 2007).

The deer effect

Populations of Roe *Capreolus capreolus*, Reeves' Muntjac *Muntiacus reevesi* and Fallow Deer *Dama dama* have all risen markedly in recent decades across lowland Britain (Ward 2005; Dolman *et al.* 2010). The effects of more intense browsing pressure have caused increasing concern among woodland managers and ecologists.

Increasing deer populations are likely to have reduced the density of understorey vegetation in woods throughout the English range of the Nightingale (Joys *et al.* 2004; Gill & Fuller 2007). Recent research has shown it to be one of

Rob Fuller

106. A high proportion of the English population of Nightingales now depends on scrub. A modicum of neglect has benefited the Nightingale in contexts as diverse as ancient grazing commons, overgrown Blackthorn *Prunus spinosa* hedges, mineral workings and other industrial sites. This site near Peterborough holds several pairs of Nightingales in a patchy mixture of Hawthorn *Crataegus monogyna* and bramble *Rubus fruticosus* agg. which has grown up on an old gravel working that was filled with rubble over 60 years ago and then topped with fly ash.

the species most vulnerable to the effects of deer-induced habitat modification. At Bradfield Woods in Suffolk, Holt *et al.* (2010) analysed movements of Nightingales and their associated habitat use within the context of a replicated deer-exclusion experiment in coppiced woodland. They showed that seven radio-tracked male Nightingales spent 69% of their time in the 6% of the site protected from deer. Furthermore, during the early 2000s, as the number of singing Nightingales present at the site declined, territories became increasingly concentrated within the fenced areas where deer were excluded. The bulk of song output (and presumably nesting and foraging activity) took place within these exclosures (fig. 5).

Chas Holt

107. A Nightingale nest concealed on the woodland floor, containing chicks ready to fledge. Within coppiced woodland, regrowth from which deer are excluded is preferred to browsed vegetation.

In addition, the results of mist-netting undertaken between May and August over three years showed a similar response in terms of selection of unbrowsed young woodland for several other understorey-dependent birds, including Dunnock and Garden Warbler (Holt *et al.* 2011). Nationally, the Nightingale was one of the two species for which Newson *et al.* (2011) found the strongest correlations between the BBS trend and the change in numbers of deer at the regional level: during 1995–2006, both Nightingale and Willow Tit declined most where deer population increases were greatest.

Scrub maturation

An intensive study by Wilson *et al.* (2005), carried out in the area where the Fens meet Breckland, found that the optimum habitat structure for Nightingales comprised dense,

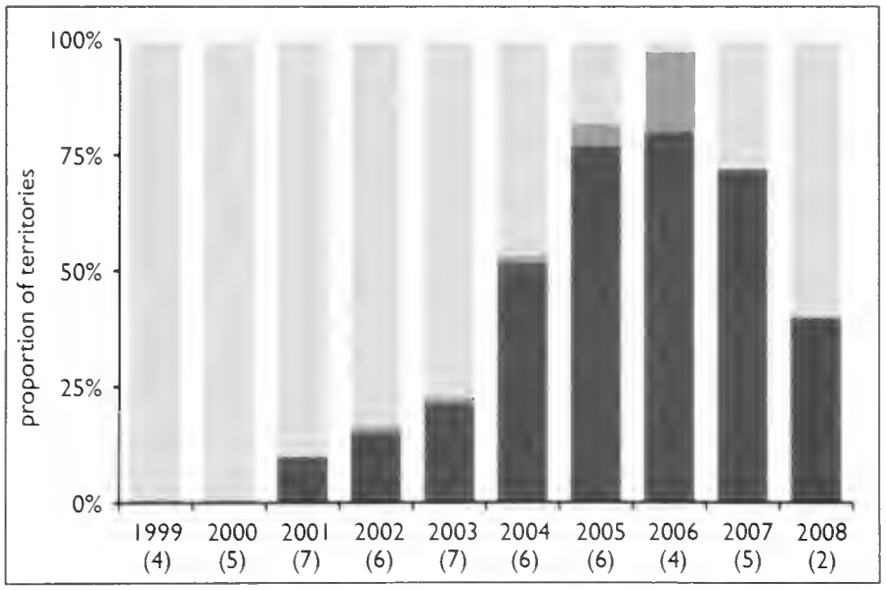

Fig. 5. The area of suitably aged coppice for Nightingales (3–8 years of growth) remained relatively constant at Bradfield Woods, Suffolk, during 1999–2008, but Nightingale territories became increasingly concentrated within deer exclosures (represented by dark blue bars), which were studied as part of long-term monitoring of the effects of deer. The relative distribution of Nightingales in experimental browsed plots (medium blue) and other coppice (pale blue) is also shown. Vegetation within the deer exclusion experiment was of optimum age for Nightingales in 2005–07. The total number of Nightingale territories per year across the site is shown in parentheses. From Holt *et al.* (2010).

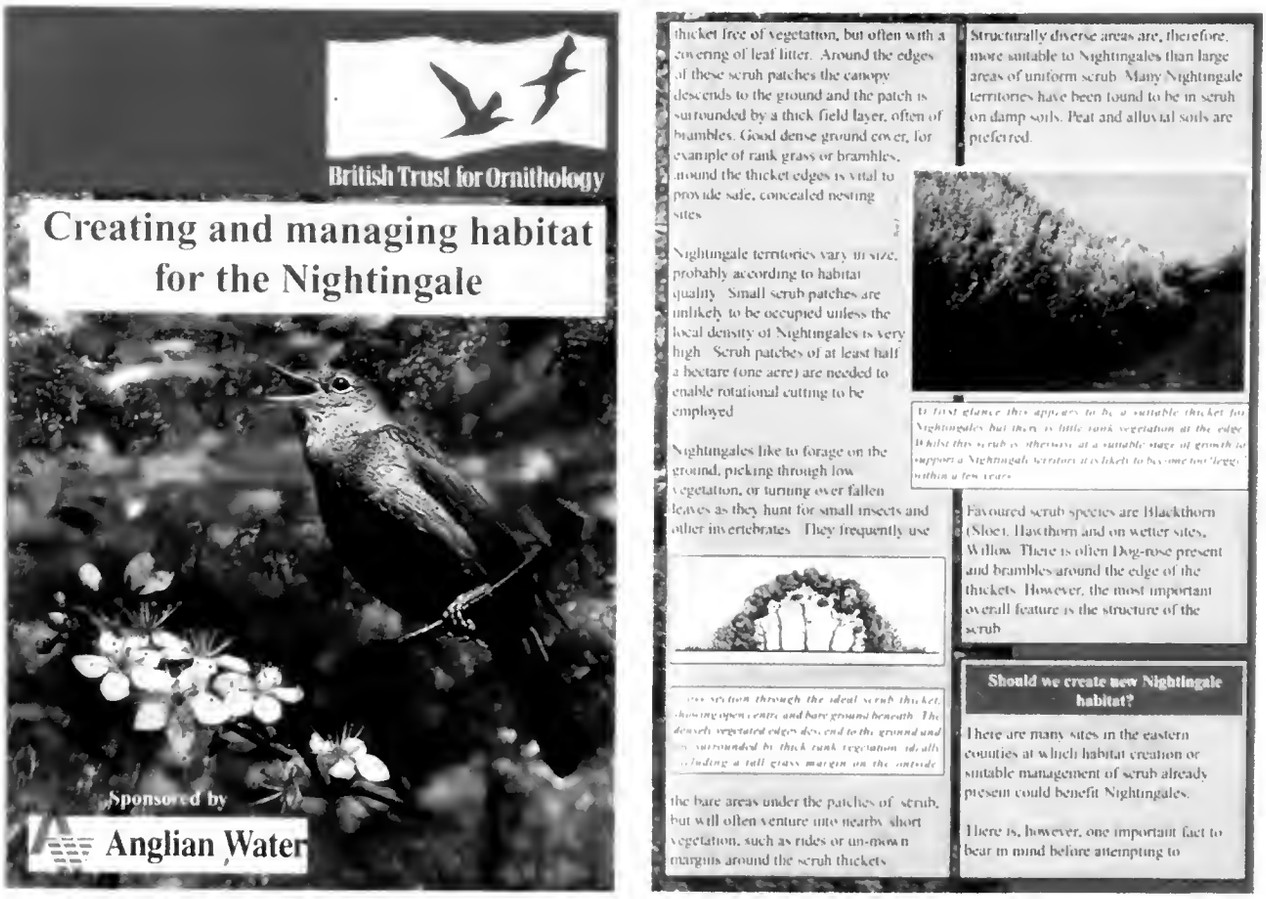

Fig. 6. BTO research has been used to guide the creation and management of habitat for Nightingales.

'dome-like' patches of scrub vegetation. Such areas featured bare ground for foraging beneath the canopy, with a dense curtain of vegetation at the sides that provides suitable nest-sites and cover from predators when the birds were feeding on the ground. Results from that work formed the basis of a management leaflet aimed at guiding conservation practice for Nightingales in scrub (fig. 6).

The process of vegetation succession at such sites can eventually render them unsuitable for Nightingales, meaning that management is necessary to maintain suitability (Fuller *et al.* 1999). Across southern England, cutting, layering and protection from deer are all employed at a number of nature reserves where the Nightingale is often among the list of conservation targets. One example is Paxton Pits Nature Reserve, where the scrub mosaic comprises mainly Blackthorn *Prunus spinosa* and Hawthorn *Crataegus monogyna*, with parts of the site also featuring woodland patches of largely mature willow *Salix*. Although male Nightingales at Paxton sing largely from dry scrub vegetation of 3–4 m in height, radio-tracking in 2009 showed that, when not singing, the birds spend a disproportionate amount of time in adjacent patches of mature trees (Holt *et al.* in prep.). This may have been either in response to availability of nest-sites within nettle beds or due to foraging conditions associated with slightly deeper subsoil in the mature woodland. Whatever the reason, it should be borne in mind that the presence of alternative habitat patches may play a role in habitat selection. Such patches may offer resources not provided by the vegetation from which Nightingales sing and in which birdwatchers generally record them.

As discussed, declines at the edge of the breeding range could be more a reflection of an overall population decrease than of a deterioration of habitat quality. Hewson *et al.* (2005) compared the availability of suitable habitat at sites at the edge of the English range, where the Nightingale has declined most, with that at sites in East Anglia, where it has remained relatively stable. They showed that the quality of scrub habitat did not differ between the two areas, suggesting that scrub maturation is unlikely to have been the cause of the Nightingale's disappearance from sites at the periphery. However, a focus on vegetation structure alone does not take into account any potential regional variation in invertebrate food supplies or predation pressure, nor the likely importance of social factors in determining Nightingale distribution.

The potential importance of social factors

In recent years it has become increasingly apparent that social behaviour is an important component of fine-scale distribution and habitat selection in many bird species (Boulinier *et al.* 2008). The presence of other individuals within the area to attract new settlers may be as important as the availability of suitable habitat per se. Consequently, the loss of Nightingales from a site may be difficult to reverse, even when suitable habitat conditions have been restored.

At the simplest level, the presence of other singing individuals may be used by Nightingales to identify potential habitat: 'conspecific attraction'. Singing male Nightingales are frequently clustered, such that each male is within earshot of one or several others. Females, which arrive later than males, may more readily encounter a chain or cluster of singing males than males which are widely spread, and sites with no, or very few, singing birds may not generate a sufficiently large stimulus for birds to settle (Ahlering & Faaborg 2006). Alternatively, or in addition, such aggregations of Nightingales may operate as 'hidden leks' (Wagner 1997; Fletcher & Miller 2006), thereby facilitating opportunities for extra-pair copulations with neighbouring females. These social factors could result in males tending to settle in (and thereby attracting females to) areas already holding males, which could explain the persistence of isolated populations and the frequently patchy distribution of the Nightingale. It seems very likely that nocturnal song in early spring could facilitate such a process.

In addition, the post-breeding period prior to migration (late June to mid July in Britain) may be a period when male Nightingales that have remained unpaired investigate surrounding areas in search of territory clusters in which to settle the following year. Similar behaviour by a number of other bird species has been documented, for example the Ortolan Bunting *Emberiza hortulana* (Dale *et al.* 2006).

Song patterns and pairing status

Within the last decade, territory establishment, site fidelity and other aspects of Nightingale breeding biology have been the focus of research at the Petite Camargue Alsacienne research station on the French/Swiss/German border. Studies there have focused on the function of song, relationships between song output and the phenotypic quality of males, and mechanisms influencing territory establishment. Findings from Petite Camargue are relevant to people interested in Nightingales across Europe; further detail is available via the website (http://camargue.unibas.ch/). Perhaps of greatest interest to British ornithologists has been the demonstration of clear seasonal patterns in Nightingale song activity (Amrhein *et al.* 2004), and particularly the confirmation that continued nocturnal singing by males through the spring is evidence of males being unpaired (Amrhein *et al.* 2002, 2007). This raises a question as to whether the relative pairing status of Nightingale populations across different parts of Europe can be assessed by examining the differential between diurnal and nocturnal song output. Being at the edge of the Nightingale's range, England may be expected to hold a relatively high proportion of unpaired males – but this requires further study.

In order for the actively breeding population to be estimated, the relative importance of nocturnal versus diurnal song has been taken into account during planning for the 2012 survey of Nightingales in England.

Outside the breeding season

What are the migration routes and wintering areas of British Nightingales?

Fewer than 200 Nightingales are typically ringed in Britain annually (Robinson 2005). Owing to this relatively low (and declining) total, as well as the secretive nature of the species, there has never been a recovery of a British-ringed Nightingale from within the Afrotropics. However, knowledge of the wintering areas of British Nightingales took a great step forward in 2010 as a result of miniature archival light logger (geolocator) technology. During the spring of 2010, a male Nightingale with a prototype geolocator, developed by the Swiss Ornithological Institute, was recaptured in the East Anglian Fens having initially been fitted with the device in the same area in May 2009. The

logger, 'OAD', provided details of its bearer's migration to Africa.

Having left England in late July, the Nightingale passed through France and Iberia, taking a route west of the Sahara to reach Senegambia in mid November. It then moved on to its final wintering location, in southwest Guinea, in mid December. The full track can be viewed at www.bto.org/science/migration/tracking-studies/nightingale-tracking

Although it is impossible to determine latitude from daylength close to the equinoxes, the migratory track indicates that the Nightingale stopped over, probably in southern Portugal, between 1st and 18th September before arriving at the longitude of coastal Western Sahara or the Canary Islands by 20th September. The most likely interpretation of this is that the bird spent 18 days fattening in Portugal before making a SSW-oriented sea crossing flight of >1,000 km during the following 36 hours. This suggests that sites in Portugal may be important for refuelling British Nightingales, as suggested by Bayly *et al.* (2011) for Grasshopper Warblers *Locustella naevia*. The migration track indicates that OAD made a shorter stopover in southwest France prior to this, but the absence of a light stalk (a short stalk protruding from the geolocator, to which the light sensor is attached in order to prevent shading by the wing feathers) on the device and concomitant increase in noise in location estimation made this difficult to confirm.

Further data from Nightingales fitted with geolocators in Britain are required to determine whether the westerly route and stopover locations used by OAD are typical. It is notable, however, that there is a close correspondence between the route and stopovers of this individual and ringing recoveries in Europe (Wernham *et al.* 2002). The identification of migration routes, stopovers and areas in Africa used by Nightingales and other British migrants is important so that research efforts can be focused towards improving our understanding of both the pressures faced outside Britain and the birds' response to climate change. Tracks gathered from Nightingales breeding across other parts of Europe, part of a large-scale project co-ordinated by the Swiss Ornithological Institute, will provide a better understanding of migratory connectivity at a wider European scale.

Chas Holt

108. A Nightingale fitted with a miniature archival light logger. A small sample of birds studied in the East Anglian Fens in 2009/10 represented the first use of geolocators on a passerine species in Britain.

Focused research in Africa

The results above show that the Nightingale is one of a suite of migratory species that utilises the arid and semi-arid Sahel or Sudan savannah zones after crossing the Sahara, before continuing south to the Guinea and 'derived' savannahs as the dry season progresses (Jones 1995). The main arrival of Nightingales in the humid tropics takes place from late October through to December. Nightingales are considered to be generally sedentary

once they settle there, and males are thought to occupy small territories during winter (Cramp 1988). There is little information on between-winter site fidelity (Wernham *et al.* 2002), apart from a recurrence rate between winters of 31% in Gambia estimated by King & Hutchinson (2001).

A study in Italy (Boano *et al.* 2004) found reduced overwinter survival of Nightingales following years with low rainfall in the Sahel, something which has been demonstrated for several other species (e.g. Peach *et al.* 1991). Notably, the period of steepest decline by the British Nightingale population coincided with crashes in populations of more or less obligate Sahelian migrants, such as Common Whitethroat *Sylvia communis* (Hewson & Noble 2009). Further data from geolocators will help us to understand the timing of movements of individual Nightingales more clearly, and should help to clarify their dependence on temporary territories in the Sahel or Sudan savannah zones. Our understanding of the effects of environmental conditions encountered in those areas, for example on subsequent territory acquisition at final wintering locations, will also be improved.

Habitat loss or degradation in western Africa may be affecting wintering Nightingales. In central Ghana, local observers have reported a decline in the availability of fallow farmland sufficiently mature to be covered in dense scrub and secondary woodland (both habitats favoured by Nightingales), and the effects of agricultural intensification and increasing population pressure are likely to have an increasing impact on this and other migrants (Hewson & Noble 2009). In winter 2011/12, a study of Nightingales began at a site in Ghana, to examine the species' winter ecology and to improve understanding of the pressures being faced. Radio-tracking will shed light on habitat use, home-range size and the spatial relationships of sex and age classes, while the collection of faecal samples for dietary analysis and blood samples to examine stress levels will increase our understanding of winter ecology. Beyond the fact that at least some male Nightingales are apparently territorial, the social system of the species in winter is poorly understood and it is not clear whether habitat segregation takes place between sexes or age groups (as demonstrated for Neotropical migrants, e.g. Marra 2000). Potentially, this could influence overwinter survival and/or affect subsequent breeding output (Marra & Holmes 2001; Studds & Marra 2005). The causes of the male-biased sex ratio in Europe during the breeding season, which necessarily limits the reproductive output of the species, remain unknown. Furthermore, it should be stressed that there is uncertainty as to whether conditions and pressures in Ghana are necessarily the same as those faced by Nightingales of

Birgitta Büche

109. A Nightingale being processed in Ghana. A visible moult limit in the greater coverts indicates that this is a first-winter individual; potential differences in winter habitat use between ages and sexes, as shown in some Neotropical migrants, is one of the focuses of new BTO research.

Birgitta Büche

110. A Nightingale in Ghana fitted with a radio tag; the antenna is just visible, protruding beyond the tail. Radio-tracking studies both in lowland England (during the breeding season) and in Africa (during the winter) help to develop knowledge of the species' habitat requirements through the annual cycle.

Chris Orsman

111. Capacity building in Africa includes the transfer of ecological survey skills to local scientists. Here, a Ghana Wildlife Society field assistant is learning the art of radio telemetry.

British origin, which, as suggested by the track of OAD, probably winter farther west. The need to improve our understanding of migratory connectivity provides further justification for investing effort in obtaining further migratory tracks from British-breeding Nightingales.

The limited knowledge of the wintering ecology of Nightingales (and other migrants) represents a significant gap that must be filled if holistic conservation initiatives for Palearctic migrants are to be developed. A feature of European-led fieldwork in Africa, such as that being undertaken jointly by BTO and RSPB as part of the *Migrants in Africa* research project, is to build capacity in areas where little or no monitoring and research activities currently occur. Developing such knowledge and expertise locally within western Africa may prove important in enabling the continuation of Palearctic migrant research in the future.

Strategy for conservation of Nightingales in Britain

Work undertaken since the survey of Nightingales in 1999 has improved our knowledge of the species' ecology and pressures it faces. The following list summarises suggestions for conservation management that may help to reverse, or at least halt, the decline of the species in Britain. Research priorities to further explore the reasons behind that decline are included.

1. Increase understorey within woodland in lowland England

Promotion of traditional coppice management should be encouraged where possible, thus at least maintaining the amount of available suitable habitat for birds that are dependent on a narrow age range of woodland regrowth. The Government's *Woodfuel Strategy for England* could potentially provide a stimulus for coppice expansion but it is far from certain that suitable habitat structure for Nightingales will be created on a large scale (Fuller & Rothery 2010). In addition, to facilitate the regeneration of young, dense vegetation, it may be necessary to implement a wider programme of either deer fencing or culling in woods across lowland England (Dolman *et al.* 2010).

2. Undertake appropriate management of scrub

Owing to the ephemeral nature of scrub, to maintain continuity of suitable habitat it is necessary to undertake cutting and/or layering on a rotational basis (Fuller *et al.* 1999). Because social factors may be very important in habitat selection and continued site use by Nightingales, maintaining the continuity of suitable habitat is likely to be critical for the persistence of local populations. Where scrub occurs on nature reserves, sometimes it can be regarded as conflicting with other conservation objectives, especially for some plants and invertebrates. In such cases, suitable mitigation or habitat compensation plans should be considered.

3. Produce inventory of sites, incorporating results of management

There are several sites in lowland England that support significant numbers of singing Nightingales and where vegetation is managed specifically with this species in mind. There is currently no strategic co-ordination of this management and the results are not available to guide practice at other sites. An up-to-date inventory of key sites for Nightingales, incorporating the results of conservation management, would be valuable, and should ideally be developed following the national survey in spring 2012.

4. Provide new habitat adjacent to existing Nightingale 'hotspots'

A list of Nightingale hotspots could be used as a means of targeting the provision of new habitat for the species. This would help to ensure that habitat is provided within parts of the range where the probability of colonisation is highest, and would also facilitate the settling of Nightingales through conspecific attraction (see above).

5. Improve understanding of Nightingale breeding biology in Britain

All male Nightingales tend to sing around dawn, irrespective of their status, but studies have shown that it is generally unpaired males that persist in singing at night, presumably in an attempt to attract migrating females. In the Fens, approximately one-third of male Nightingales remain unpaired (C. Hewson & C. Holt unpubl. data), but it is unclear whether these figures are typical of other sites in Britain. To focus conservation effort, there is a need to understand what proportion of the English population of Nightingales is paired and whether this varies geographically and with habitat type.

6. Identify areas used by Nightingales on migration and in winter

Future technological advances (more use of geolocators and the potential use of sufficiently small GPS technology) will generate better understanding of the wintering range, migration strategies and non-breeding ecology of British Nightingales and other migrants. This should allow conservation scientists to focus effort in the most relevant parts of Africa. Remote tracking of birds will also enable the identification of stopover sites used during migration, which may be critical in enabling the successful completion of annual cycles. The consequences of variation in environmental conditions at wintering and stopover sites (for migration phenology, winter and breeding territory acquisition, pairing success and, ultimately, demographic parameters such as survival and breeding success) requires assessment. This will facilitate a comprehensive understanding of population changes of the Nightingale.

While it may be unrealistic to expect all this knowledge to be acquired in the near future, it is important that scientists work closely with conservation agencies to promote the protection and restoration of suitable habitat based on the best available information.

Conclusion

The issues raised in this paper need to be addressed with some urgency. Results from Bird Atlas 2007–11 and a national survey in spring 2012 are likely to confirm a distribution with further evidence of losses, both at the edge and within the core of the English range. Without a change in its fortunes, the Nightingale, along with some other trans-Saharan migrants, could be lost from the British landscape. It is a sobering fact that the Nightingale population of our country is declining steadily at a time when it should be gaining ground because of climate change. Something is seriously wrong.

Acknowledgments

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Can you help?

If you can help with the survey this spring, please visit http://www.bto.org/volunteer-surveys/nightingale-survey, or contact Greg Conway (greg.conway@bto.org) or John Marchant (john.marchant@bto.org) at BTO HQ (tel. 01842 750050). To contribute financially to research into long-distance migrants, please visit the BTO website (www.bto.org/support-us/donate).

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The Great Bustard in Hungary

Gergely Károly Kovács

Richard Allen

Abstract Until the early part of the twentieth century the Great Bustard *Otis tarda* was fairly widespread in Hungary but hunting and modern farming practices have led to a dramatic contraction in its range. It is now restricted to just ten sites throughout the country, where it receives some degree of protection. Hungary currently supports about 1,600 Great Bustards, making it the most important country in Europe for this species after Spain and Russia. Human activity, in particular in relation to agriculture, is a crucial factor in relation to the species' long-term survival. With careful management, some recovery of the Great Bustard population in Hungary is possible.

The early history of the Great Bustard in the Carpathian Basin

Skeletal remains of Great Bustards *Otis tarda* have been found at Neolithic and Bronze Age sites (Fodor *et al.* 1971), which suggests that the species was widespread throughout the modern country of Hungary in prehistoric times. From the ninth century, Hungarians grazed cattle, horses and sheep on pastures and the steppe grasslands (puszta) from spring to late autumn, while during the winter months the herds were driven to forests or marshlands. Those early settlers cultivated the most fertile regions but farming was centred on animal husbandry; the impact of agriculture on the puszta was limited and it seems reasonable to conclude that the Great Bustard was able to thrive.

By the eighteenth and nineteenth centuries, Hungary had become an important agricultural exporter, notably of beef, pork and wheat. New crops were cultivated, including forage crops such as alfalfa for the expanding livestock industry and 'industrial crops' such

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112. The puszta, the traditional home of the Great Bustard *Otis tarda* in Hungary; Nagyiván, June 2009. Grazing is a key component in the maintenance of these almost treeless, alkaline steppe grasslands.

as winter rape (*Brassica napus*), which resulted in large-scale ploughing of the steppe for cultivation. Huge areas of wetlands and marshes were drained and meandering rivers straightened to create new agricultural land. Great Bustards seemed well able to adapt to these new conditions. Undisturbed grasslands remained important for display and nesting sites, but cereal crops, alfalfa, clover and semi-natural grasslands formed a mixture that perhaps suited the bustards better than the original puszta did. Alfalfa and clover crops in particular supported a rich insect fauna, enabling females and chicks to find sufficient food during the breeding season, while winter rape became the most important food source in winter. Agriculture remained at a low intensity, at least compared with modern methods, and bustards continued to thrive. The population in Hungary at the turn of the twentieth century was thought to be in the region of 12,000 birds (Faragó 1987).

The decline of the Great Bustard in the twentieth century

In the early decades of the twentieth century, there were still huge areas of suitable habitat for Great Bustards in the Carpathian Basin and in 1941 the population was estimated to be around 8,557 individuals (Fodor *et al.* 1971; Kovács & Kapocsi 2004). But from the 1950s onwards, the modernisation of both farming and hunting led to a rapid decline in the Great Bustard population, followed by population fragmentation. Isolated populations were increasingly affected by factors such as the construction of highways and installation of overhead power cables, while inbreeding and loss of genetic diversity in fragmented populations may have accelerated their decline. By 1969, the number of bustards had fallen to 2,765 individuals (Fodor *et al.* 1971).

The Great Bustard was afforded legal protection from hunting in Hungary in 1970. By that time, agriculture was becoming increasingly efficient and previously unproductive land was being developed. The need to preserve areas of unploughed puszta and implement conservation measures was outweighed by a desire for increased yields and profits. Measures to protect the dwindling bustard population, such as habitat preservation, maintaining areas of low-intensity agriculture and controlling the timing of mowing, proved impossible to implement.

In response to the worsening situation, a centre for captive breeding was established at Dévaványa in 1978. Great Bustard eggs that would otherwise have been destroyed were collected with the goal of establishing a captive breeding population. Initially, the success rate was low. For example, during 1979–83, 836 eggs (and 100 small chicks) were rescued from endangered nests. The hatching success of rescued eggs was 46% and in total 320 individuals were reared (Faragó 1984). However, there were great

problems in releasing the young bustards back into the wild – the captive birds appeared to be terrified of wild-bred bustards and a large proportion were taken by Red Foxes *Vulpes vulpes* and other predators. The centre has gradually gained experience in rearing and releasing Great Bustards (for example, 400 ha of puszta around the station was sealed off with mammal-proof fencing in 2002 (Kalotás 2008), so that captive-reared and wild-bred bustards can interact) and has played an important role in maintaining the wild population. Nonetheless, fewer eggs are hatched in Dévaványa nowadays because of a greater emphasis on in situ protection.

Other factors combined with rural development to affect Hungary's Great Bustards. The long and exceptionally cold winter of 1986/87 followed an extremely dry autumn, when the winter rape crop failed to germinate, which in turn led to a greatly depleted food supply for bustards. Plummeting temperatures and deep snow in early 1987 forced many bustards to disperse southwards, some reaching the Balkan states and Italy. Mortality was high, chiefly from starvation but also from collisions and illegal hunting, particularly outside Hungary. By the spring of 1987, numbers in Hungary were down by more than 1,000 individuals on the c. 2,300 present in 1986 (Sterbetz 1998).

The population losses in the winter of 1986/87 proved to be a watershed, and precipitated renewed action to protect the remaining bustards. Since 1987, using a combination of subsidised winter rape production and food supplements (cabbages) if the winter rape crop is insufficient, a variety of Hungarian conservation-minded organisations and individuals have been able to sustain winter feeding throughout the harshest winters and prevent losses through migration.

In the early 1990s, the collapse of the Soviet Union and subsequent privatisation of large co-operative farms was something else for the bustard population to contend with. The co-operative farms were divided into much smaller units, which resulted in a massive increase in disturbance, and the Hungarian Great Bustard population decreased further in the last decade of the twentieth century, to about 1,000–1,200 individuals.

The Great Bustard in Hungary today

Since 2000, Great Bustard numbers in Hungary have stabilised, albeit at a fraction of

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113. Hungarian Grey Cattle in the Hortobágy National Park, September 2008. This beautiful and ancient breed almost disappeared during the modernisation of agriculture in the 1960s, but it has made a comeback thanks to sympathetic farmers. Traditional cattle pastures provide safe nesting habitat for Great Bustards.

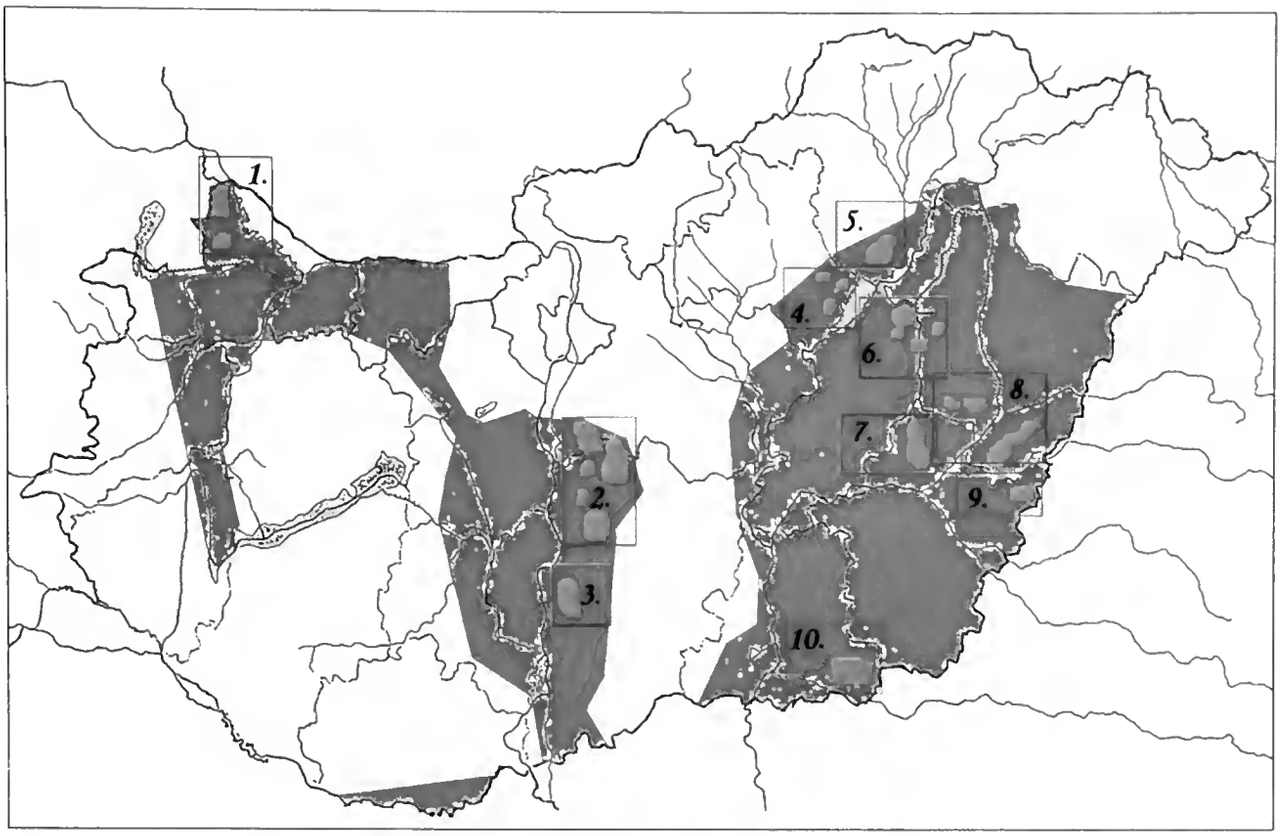

Fig. 1. Distribution of the Great Bustard in Hungary, in about 1900 (in red, after Faragó 1987) and in 2011 (in green). At the beginning of the twentieth century there were thought to be c. 12,000 Great Bustards in Hungary. Today, just ten breeding populations remain, numbering approximately 1,600 birds.

their former level, and have more recently shown signs of a slow recovery. Current estimates put the population at c. 1,600 individuals. These estimates are derived from co-ordinated counts undertaken twice a year, in January and April. The January counts are usually more accurate since males, females and young birds form large, often mixed flocks at this time in winter rape fields. They are often fairly straightforward to count, although counts can be disrupted by weather conditions and, on occasion, by disturbance caused by eagles flying overhead. Moreover, some birds from the Mosoni Plain population, close to the Austrian and Slovakian borders, may cross the border to find new supplies of winter rape. In April, birds are counted at display sites, which accounts for many adults, but a lower proportion of the immatures, which tend to stay away. Although April counts always reveal fewer birds, they are extremely useful in monitoring the numbers of displaying adult males year on year.

Great Bustards in Hungary are currently restricted to the following ten breeding populations (Práger 2005; Faragó & Kalmár 2006) (numbers in parentheses correspond with labelling in fig. 1):

Mosoni Plain (area 1, population 90–100 individuals) lies in extreme northwest Hungary and has a healthy and increasing population. Here, set-aside and agricultural fields provide 'artificial' bustard habitat (no puszta remains). Particular emphasis is placed on predator control (including the removal of Red Foxes, Hooded Crows *Corvus cornix*, and feral dogs). This population is close to neighbouring populations in Austria and Slovakia, and there is substantial interchange among the three countries.

Kiskunság (2, c. 550 birds) holds the largest number of Great Bustards remaining in Hungary, and is home to approximately one-third of the national population. Bustards frequent puszta and ploughed lands in the Pest and Bács-Kiskun Counties, within the Kiskunság National Park. Some birds breed in the surrounding agricultural fields, where they are more at risk from modern farming methods.

Solti Plain (3, 20–30 birds) once formed part of the extensive breeding range that stretched from the River Danube to Tisza. All that now remains is an isolated population south of Kiskunság. These birds frequent remnant puszta, while nearby crop fields

provide a mosaic of suitable nesting habitat.

Hevesi Plain (4, 10–15 birds) and Borsodi Mezőség (5, 25–30 birds) represent vulnerable, somewhat isolated populations on the western bank of the River Tisza, where the alkaline soil has deterred ploughing of the puszta. Despite the presence of semi-natural grasslands and low-intensity agriculture in the surrounding areas, the bustards here are in decline, especially on the Hevesi Plain. Birds have been recorded moving between these sites and others on the eastern bank of the River Tisza.

Hortobágy-Nagykunság (6, c. 150 birds). Hungary's first national park (Hortobágy) supports the most extensive area of puszta remaining in central Europe. This population of Great Bustards has been stable for many years but, despite being strictly protected, has not shown any significant increase (Kovács 2005).

Dévaványai Plain (7, c. 500 birds) is situated just to the south of the Hortobágy National Park and holds the second-largest population of Great Bustards in Hungary. In winter, bustards from both sites may flock here. One of the most traditional lekking sites lies in the strictly protected area of the Körös-Maros National Park, which is also the site of the captive-breeding centre.

Bihari Plain (8, 175–180 birds) forms a characteristic mosaic of grasslands and fields surrounded by intensively cultivated farmland. The remnant puszta and areas of low-intensity agriculture which the bustards frequent are partly protected. The populations from sites 6, 7 and 8 form a metapopulation.

Kis-Sárrét (9, c. 40 birds) and Csanádi puszta (10, c. 20 birds) are home to small but stable populations. These sites are situated close to the Romanian border, and Kis-Sárrét is important to the bustard populations of both countries.

Factors affecting Great Bustard populations and potential solutions

Weather

As described above, harsh winter weather and deep snow may have a major impact on

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114. Old wells on the puszta in winter, Nagyiván, February 2008. The Carpathian Basin can be affected by both Mediterranean and continental climate patterns, but if sufficient food is available, Great Bustards are able to endure even the most severe winters. Wind can often clear snow from relatively large areas of grassland and crops, thus providing access to food for bustards and other wintering wildlife.

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115. Great Bustards in flight over a winter rape field, Nagyiván, January 2009. Note the top of winter rape leaves emerging from the snow. The fields in this condition provide sufficient food for bustards and Roe Deer *Capreolus capreolus*, and the use of a snow-plough is unnecessary.

bustards if access to food supplies is not maintained. Weather can also affect the critical winter rape crop – drought may prevent the crop from germinating, while rains affect the working of the land. The key aspect of weather-related factors is maintaining food supply, and in winter this is critical to prevent populations being forced to move to new areas where they may face other threats. The initial evidence from the extremely cold winter weather of January–February 2012 suggests that Great Bustards have been able to survive in Hungary without being forced to migrate to warmer regions. For example, in the Hortobágy region, wind cleared enough of the snow for the birds to remain on the rape fields, while on the Dévaványai Plain a combination of clearing field strips with a snow plough and supplementary feeding with cabbages also kept the bustards in their traditional winter areas.

Predators and competitors

An adult Great Bustard has few natural enemies, although large raptors, including White-tailed *Haliaeetus albicilla* and Eastern Imperial Eagles *Aquila heliaca*, can disrupt feeding behaviour and in some cases may force bustards to leave preferred sites. During the breeding season, bustard eggs may be taken by corvids and raptors, while both eggs and chicks can be taken by Red Foxes, Badgers *Meles meles*, and feral dogs and cats. However, it is difficult to estimate the impact of such predators on bustard numbers, and the wholesale removal of corvids (especially Hooded Crows) may have deleterious effects on other wildlife (for example, Red-footed Falcons *Falco vespertinus*, Hobbies *F. subbuteo* and Long-eared Owls *Asio otus* breed in abandoned corvid nests).

The Roe Deer *Capreolus capreolus* is the most common large mammal of the Great Hungarian Plain and frequents similar areas to those in which bustards occur. Although the two species usually live in harmony, severe weather and a lack of food can result in competition between them for rape crops. In autumn, thousands of White-fronted Geese *Anser albifrons* arrive from the north to graze on maize stubbles, grasslands and winter cereals, although in some autumns they prefer winter rape (Kovács 1998, 2006). If numbers are sufficiently high, the winter rape grown to feed Great Bustards can be severely depleted by geese. Scaring the geese

is one option but is difficult to implement because it also causes disturbance to the bustards – these shy birds are more likely to depart before and return after the geese. Furthermore, the goose flocks may contain endangered and strictly protected species, including Red-breasted *Branta ruficollis* or Lesser White-fronted Geese *A. erythropus*; here again, a balance in the management is necessary.

Effects of agriculture and industry

Agricultural land is critically important for Great Bustards. In Hungary, the success or failure of the Great Bustard protection project relies heavily on the availability of three principal crops – wheat, alfalfa and winter rape – in addition to the remnant puszta. This situation is not unique to Hungary and agricultural land is important for Great Bustard populations throughout their range. However, agricultural management does bring with it some problems for bustards, including the uncontrolled use of pesticides and herbicides; early harvesting, which can result in the destruction of eggs and chicks; and temporary disturbance from farm vehicles and farm workers

Industrial and commercial developments can also cause problems including losses due to collisions with structures such as overhead power cables. The most effective solution to this problem is to bury the cables underground; however, this is expensive and the use of reflective markers on wires is an alternative, cheaper measure to help to reduce collisions. The encroachment of human settlements and the busy highways connecting them can increase levels of disturbance to this sensitive species.

The breeding season and initiatives to minimise nest losses

Great Bustards leave their wintering sites in the rape and cereal fields in mid/late March and return to grassland breeding sites, where the males commence their elaborate display at traditional lekking sites. These display areas are usually in short grassland habitats, often where mowing or grazing has occurred, and where the short vegetation enables females to see displaying males across vast distances. Display activity reaches a peak in April but continues throughout May and sometimes into early June. After mating, the females become solitary, nesting in the crops and grasslands, where they rely on camouflage and stealth to avoid predators during incubation. If losses occur early in the season, females will often attempt to lay a replacement clutch.

In Hungary, most nests are located in wheat and alfalfa crops, although a number of birds still breed in grasslands. Wheat provides a relatively secure habitat, in which the majority of chicks hatch before the harvest in

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116. Roe Deer feeding on winter rape at Nagyiván, with White-fronted Geese *Anser albifrons* in the background, December 2007. Roe Deer and White-fronted Geese commonly feed alongside Great Bustards in the autumn and winter. Roe Deer often dig winter rape from the snow, which enables bustards to reach an otherwise inaccessible crop. If the snow is particularly deep, snow ploughs are used to clear it from the fields.

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117. Great Bustards feeding on winter rape, Nagyiván, December 2008. Bustards usually avoid forests (the trees visible here appear deceptively close), and afforestation can fragment the puszta. However, some females have occasionally been recorded breeding in surprisingly wooded habitats, far from lekking sites.

July. Nest losses are highest in alfalfa and semi-natural grasslands, which are often cut for hay in May and June. In an attempt to minimise nest losses, numerous projects to encourage bustard-friendly management have been launched in Hungary, the key elements of which include: postponing mowing until after the hatching period; the use of an alarm on the harvester to scare the adults and chicks (this involves hanging chains in front of the mower, which frighten animals by moving the grass); and cultivating a higher proportion of the crops preferred by bustards. Fortunately, many Hungarian farmers value bustards and realise the importance of implementing these measures. Grassland management using herbivores such as cattle and sheep, rather than mowing, provides an environmentally friendly means of minimising nest losses. In national parks, traditional Hungarian breeds are often used for this purpose, thus maintaining breed viability and minimising habitat disturbance and nest losses (plate 113).

Once incubation commences, bustards are rarely seen until late summer. Males cease displaying while females and surviving chicks remain hidden in crops and grasslands. By late August and September, as the winter rape crop is sown, bustards begin to gather at traditional winter feeding sites.

The future for Hungarian bustards

The conservation initiatives currently being promoted in Hungary help to protect its Great Bustard population, which remains especially popular with visiting birdwatchers. This is a shy species, easily disturbed by birdwatchers throughout the annual cycle, and it is vitally important to respect the efforts of local conservationists who are striving to preserve the population. However, low-impact ecotourism can also benefit bustard conservation, as well as supporting the local economy.

Despite recent successes, we should not be complacent, and also be alert to opportunities, new methods and techniques to reduce mortality and increase breeding success. If the Great Bustard is to flourish, everyone must see a benefit, be it economic or

aesthetic, for retaining bustards. With encouragement and goodwill, the outlook for the Great Bustard in Hungary can be bright.

Acknowledgments

I would like to thank my father, Dr Gábor Kovács, ornithologist and nature conservation ranger at Hortobágy National Park for his advice, beautiful photographs and his knowledge of the puszta.

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Gábor Kovács

118. Displaying male Great Bustard, Nagyiván, April 2010. Note the cattle and the herdsman in the background. Great Bustards instinctively trust grazing animals: in winter, bustards occur in the yards of abandoned farms, in times of drought they may drink from a livestock drinking trough. In a cautious and circumspect way, bustards exploit the advantages of human civilisation.

Conservation priority species

Spotted Crakes breeding in Britain and Ireland: a history and evaluation of current status

David Stroud, Ian Francis and Rachel Stroud

Richard Johnson

Abstract The Spotted Crake *Porzana porzana* is a very rare breeding bird in Britain and Ireland, with around 30–80 singing males/pairs recorded annually. Following major declines in the mid nineteenth century, it appears to have increased in the late twentieth century, although there is evidence of a decrease after 2001. The interpretation of trends is, however, greatly confounded by a lack of information about survey effort. Although recording standards and data flows are poor, a comprehensive collation of published and unpublished information showed that, in most years, more than twice the number of singing males was recorded than the official Rare Breeding Birds Panel record suggests. The lack of submission of records is hampering the identification and protection of nationally important sites for Spotted Crakes, and the process to rectify this is time-consuming. Better information is needed urgently to improve our understanding of the ecology and conservation needs of this rare and cryptic species, and it is hoped that the 2012 national survey will improve knowledge and ensure that the species' conservation needs receive greater priority in future.

Introduction

The Spotted Crake *Porzana porzana* is a very rare and poorly known breeding bird in Britain and Ireland, with a widely scattered distribution reflecting the limited availability of suitable wetland habitat. Factors that constrain our knowledge of this species include annual fluctuations in numbers, its cryptic and largely nocturnal breeding habits, as well as the varying distribution and activity of observers. Recent population estimates have ranged from around 30 singing males annually (Rare Breeding Birds Panel data – see below) to 80 singing males based on the British national survey of 1999 (Gilbert 2002 – see below). There have also been rare instances of breeding in Ireland, and possible breeding on the Isle of Man and Jersey.

Most records of 'breeding' Spotted Crakes involve singing males, but the relationship between singing and breeding activity is not clear. Spotted Crakes have an extended singing period, and may give their characteristic, loud, repeated '*whit*' song throughout the night, although English, Polish and Swedish studies show peaks just after dusk and just before dawn (Bengtson 1962; Mallord 1999; Schäffer 1999; Mackenzie 2000). However, birds present at a site may not call every night, making census work problematic, especially on casual visits. The habitats used – wet fens, wet, herb-rich grassland and swamps (Gilbert 2002) – present access problems for nocturnal survey. All these factors make an assessment of the true status of this secretive, nocturnal species difficult, and birds are certainly overlooked in most, if not all years.

The UK Rare Breeding Birds Panel (RBBP) maintains the national archive of records of rare breeding species such as the Spotted Crake and reports annually (e.g. Holling *et al.* 2011). The information gathered comes principally from the UK local bird recording network, together with data from statutory agencies' licensing processes and bird conservation organisations such as the RSPB. Most population estimates of the UK's rare breeding species used by nature conservation agencies and organisations are based on the RBBP's data holdings, unless additional information is available. Such estimates are used for formal species status assessments (e.g. Birds of Conservation

Bob Humphreys

119. Spotted Crake *Porzana porzana*, Norfolk, September 2009. Most Spotted Crakes seen are birds on migration; they are extremely skulking during the breeding season.

Concern: Eaton *et al.* 2009), for notification of Sites of Special Scientific Interest (SSSIs), and for classification of Special Protection Areas (SPAs) under the EU 'Birds' Directive (Stroud *et al.* 2001), many of which are notified for the presence of nationally important numbers of species listed under Annex I of that Directive (such as the Spotted Crake). It is important, therefore, to ensure that information used in national population estimates is as accurate and comprehensive as possible. Unfortunately, there are numerous problems with collating information on rare breeding birds such as this. The Spotted Crake is an example of a species which, though still a very rare breeding bird, is usually more numerous than the official record would suggest, and in part this under-recording is due to poor information flows through the usual recording systems. In this article, we examine these problems and use records gleaned through intensive searching of multiple sources to refine estimates of breeding numbers. We also review what is known about the breeding ecology of the Spotted Crake in Britain and Ireland.

Methods

Evaluation criteria for breeding records

What is meant by a Spotted Crake breeding record? We used the criteria of the European Bird Census Council (EBCC), as adopted by numerous national breeding bird atlases (e.g. Sharrock 1976) and also by the RBBP (table 1). A single record of a bird in habitat judged suitable for breeding, at an appropriate time of year, is considered as 'possibly breeding'. This includes singing males recorded on one occasion only, and most breeding records of Spotted Crakes fall into this category. Repeated territorial behaviour (usually relating to singing over a period longer than one week) is classed as 'probable breeding'. Higher levels of clear and confirmed breeding evidence are rarely recorded for Spotted Crakes. Sightings of young birds judged to have hatched at the site are most frequent, but nest records for this species are extremely rare – the BTO holds no Nest Record Cards for Spotted Crakes and we know of only three nests that have been described in Britain in the past 20 years – all the result of intensive studies for academic projects. (Notwithstanding this, Bibby *et al.* 1990 reported six clutches in 21 seized collections of stolen eggs, although there were no further clutches in 37 large egg collections seized between 1982 and 1999 according to Thomas *et al.* 2001).

We assessed existing records against these criteria, which led to changes to some previously published county or area totals, since not all local bird reports adopt EBCC standards. We made the assumption that the number of singing males is equivalent to that of pairs (Cramp & Simmons 1980). This is discussed further below. We also adopted a cut-off date of 31st July for sightings of unaccompanied, recently fledged young as evidence of confirmed breeding. Such records are relatively frequent and present some problems, since single juvenile Spotted Crakes can occur at localities where breeding has not been known or suspected. We

Duncan Goulder

120. RSPB Loch of Strathbeg reserve, North-east Scotland, September 2009. The large extent and mosaic configuration of fen, wet grassland and shallow water illustrated here typify sites used by Spotted Crakes during the breeding season.

Table 1. Criteria for categorising Spotted Crake breeding evidence in Britain and Ireland. This table builds on the guidelines established by Gilbert *et al.* (1998).

EBCC breeding categories	Interpretation for Spotted Crakes	Rationale
Possible breeding		
1. Species observed in breeding season in possible nesting habitats	Spotted Crake seen in possible nesting habitats between 1st April and 31st July	• Earlier records assumed to be passage migrants • Records after 31st July probably relate to autumn migrants or post-breeders from other sites
2. Singing male(s) present (or breeding calls heard) in breeding season	Singing males between March and August inclusive	• Song heard on fewer occasions than criterion 4, i.e. song heard once or for a total period of less than a week • Records of singing birds from September to February not considered indicative of breeding activity
Probable breeding		
3. Pair observed in suitable nesting habitat in breeding season		• Includes pair *heard* in suitable habitat in breeding season (e.g. female responding to male calling)
4. Permanent territory presumed through registration of territorial behaviour (song, etc. on at least two different days, a week or more apart, at the same place)	Singing males between March and August inclusive	• Song heard on more occasions than criterion 2
5. Courtship and display		
6. Visiting probable nest-site		
7. Agitated behaviour or anxiety calls from adults		
8. Brood patch on adult examined in the hand		
9. Nest-building/excavating nest hole		
C. Confirmed breeding		
10. Distraction-display or injury-feigning		
11. Used nest or eggshells found (occupied/laid in survey period)		
12. Recently fledged young (nidicolous species) or downy young (nidifugous species)	'Recently fledged' should be interpreted as downy or less than full-sized juveniles in care of a parent, seen before 15th September	• Later records of young at wetlands possibly relate to birds moving from breeding areas. Date is an arbitrary cut-off for records in the absence of knowledge of movements of birds from nesting areas. Note: in Sweden there is a high proportion of double-brooding (Bengtson 1962) suggesting that late young may be recently hatched • Criterion relates to recently fledged young as distinct from juveniles as juveniles can be seen on passage in September (and maybe even August)
13. Adults entering or leaving nest-site in circumstances indicating an occupied nest (including those where the contents cannot be seen) or adult seen incubating		
14. Adult carrying faecal sac or food or young		
15. Nest containing eggs		
16. Nest with young seen or heard		

discounted all records of single juveniles after 31st July, although adults with recently fledged young after that date were accepted until 15th September (table 1). For single recently fledged young seen before 31st July, we tried to use other information to judge whether breeding had occurred at a site. There does appear to be some early dispersal of juveniles to 'non-breeding' sites in July, although this aspect of Spotted Crake ecology is poorly known.

Do Van Dijck/Minden Pictures/FLPA

121. Young Spotted Crakes accompanied by adults can be recorded into late August or beyond, and this is unequivocal evidence of confirmed breeding (this adult and youngster were photographed in the Netherlands).

Sources for Spotted Crake records

Using the criteria above, we assembled all breeding records held by the RBBP, the RSPB and statutory agencies, and BTO Atlas data for the first two national breeding bird atlas periods (1968–72, Sharrock 1976; and 1988–91, Gibbons *et al.* 1993). We searched county and regional/country avifaunas (back to the mid nineteenth century), and also as many county and regional bird reports as possible – those held at the Alexander Library (Oxford University) and the RSPB and Natural England libraries. We corresponded with numerous regional contacts. BirdTrack records (which include those submitted to BirdGuides) were incorporated for the period 2001–09, as were records from the 1975–80 Register of Ornithological Sites (Fuller 1982). We assumed that all records published in avifaunas and bird reports had been accepted by local verification systems. In many recording areas, Spotted Crake records require supporting details, though such procedures may not be followed regularly, especially for records of singing birds. Hence, all records may not have been properly verified but we made judgements when assembling additional data and included all bona fide records, while trying to avoid obvious double counts. Nevertheless, our revised record is not error-free, and there were numerous instances where it was not clear whether records from different sources related to the same birds. We have been conservative in including these. Some of these recording issues are discussed further below. We also undertook a questionnaire survey of staff at those National Nature Reserves or RSPB reserves where there had been past breeding records of Spotted Crakes, with the twin aims of locating any unreported records and understanding monitoring protocols at these sites.

The 1999 national survey

Records from the first full national survey of Spotted Crakes in Britain, in 1999 (Gilbert 2002), were incorporated into our dataset. These were extremely useful, being the first systematic attempt to survey suitable breeding areas in the same year, using a standard method. This was the only year when we considered that the annual total was a realistic estimate of the number of potentially breeding birds. Nonetheless, we discovered an additional 11 breeding records from 1999 unknown to Gilbert. Furthermore, numbers of Spotted Crakes in the Lower Derwent Valley (Yorkshire) in 1999, variously reported as 16 by Gilbert (2002) and as 31 by Stroud *et al.* (2001), were revised to 12 by Natural England (Ralston 2005). These changes modify the 1999 total from 73 to 80 singing males.

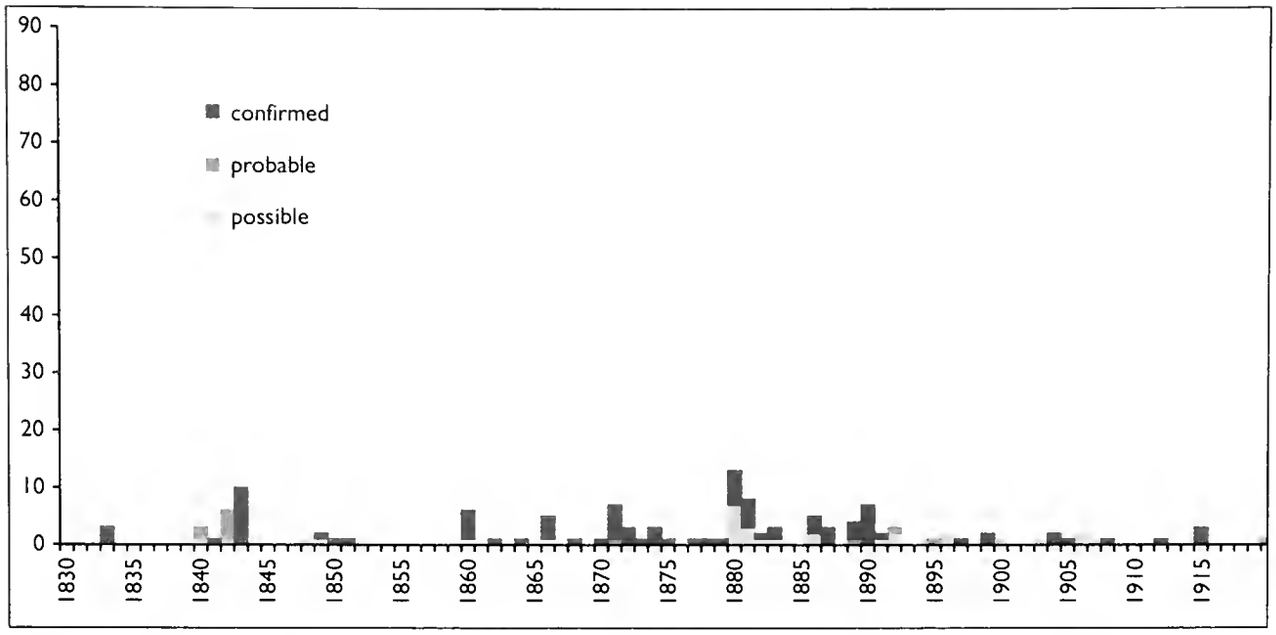


Fig. 1. Spotted Crake *Porzana porzana* breeding records in Britain and Ireland, 1832–2009. Prior to the 1950s, totals do not realistically reflect national status, but are included to indicate the long run of quantitative information available in the literature.

A revised dataset for Britain and Ireland

This extensive range of information sources led to a revised compilation of breeding records, classified by EBCC criteria. This dataset (including full referencing of sources) has been included within the RBBP files, and RBBP now considers this to be the acceptable historical archive of records for the UK, superseding the annual totals published in RBBP annual reports. Since the Spotted Crake is a rare, potentially threatened species, mapping of breeding localities here has been carried out following the same protocols used in previous breeding bird atlases for Britain and Ireland. However, most information on breeding Spotted Crakes has been published elsewhere, and locations of nearly all key sites are in the public domain and published in county reports. A few records judged confidential by the original observers have been excluded from copies of the full dataset that have been lodged in the Alexander, BTO, RSPB and Scottish Ornithologists' Club Libraries. Access to the complete database for conservation purposes, including these records, can be sought from RBBP. However, general summaries of the information presented here, including the graphs and tabulated data, will be available on the RBBP website.

We also gathered records of migrant Spotted Crakes from annual 'Scarce Migrants' reports in *British Birds* (e.g. Fraser & Rogers 2003), plus records of birds in winter (to the end of March) from the same sources listed above.

Results

Long-term records of breeding Spotted Crakes in Britain and Ireland

We amassed a total of 2,820 records of Spotted Crakes in Britain and Ireland between 1774 (the first published record we found; White 1789) and 2009, though non-breeding records

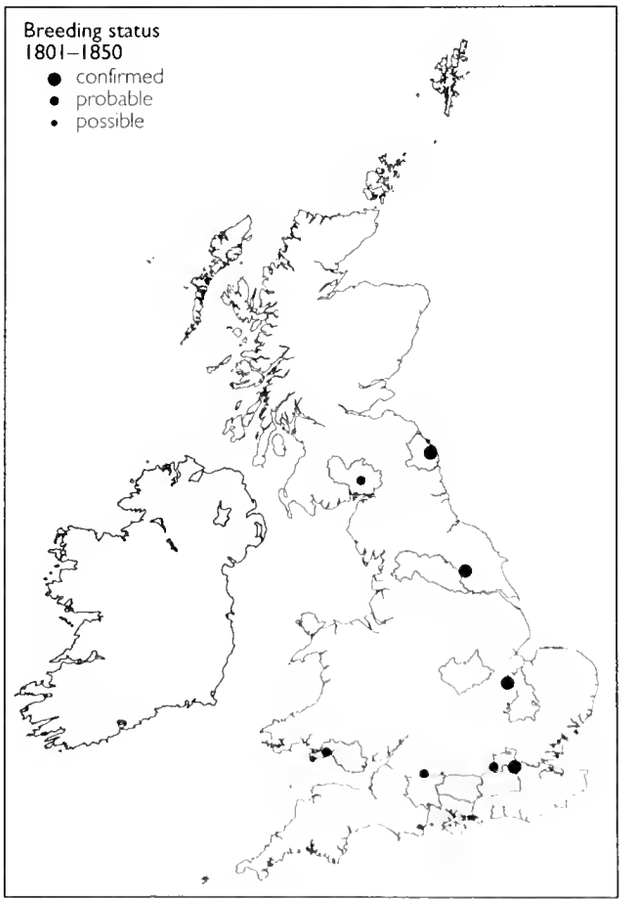


Fig. 2. Distribution of literature records of breeding Spotted Crakes, 1801–1850. Shaded vice-counties denote breeding records not specified to site level.

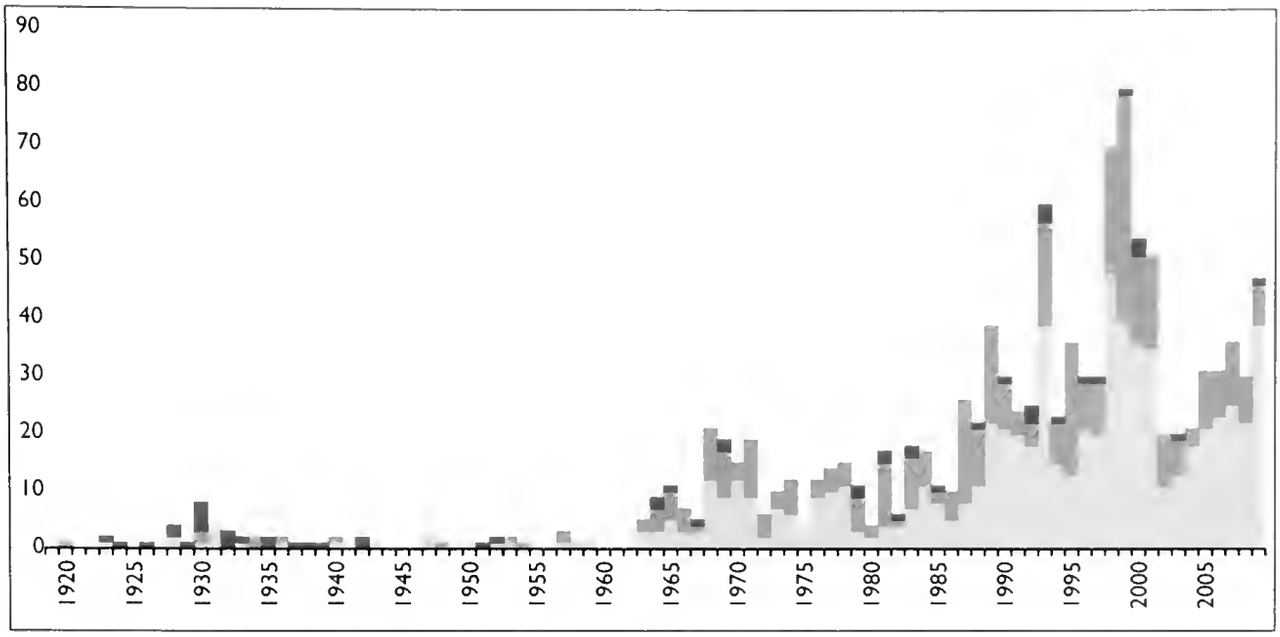


Fig. 1. contd.

were included only up to 2002.

Historical status

Our dataset shows numbers of potentially breeding Spotted Crakes in Britain and Ireland back to 1832 (fig. 1). Although numbers reported annually are always low, owing to the very patchy nature of the historical record and a lack of quantitative assessment, there was undoubtedly considerable under-recording and we have also used written anecdotal evidence to infer past status. Figs. 2–4 illustrate our interpretation of status, based on records, comments and other anecdotal sources in the literature, during 1801–1950.

Since the early nineteenth century at least, the distribution of breeding Spotted Crakes has been restricted to those counties with extensive areas of freshwater wetlands. For

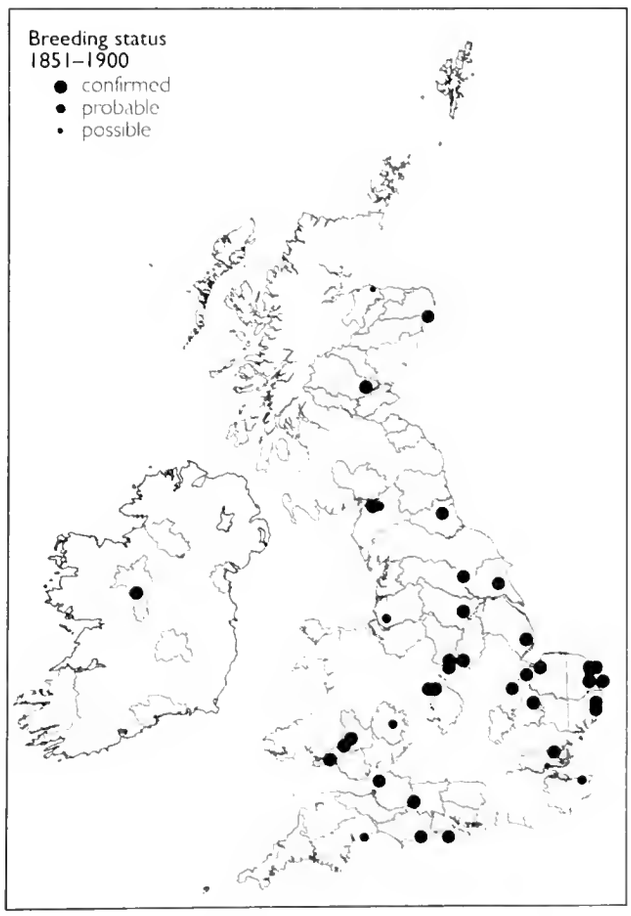


Fig. 3. Distribution of literature records of breeding Spotted Crakes, 1851–1900.

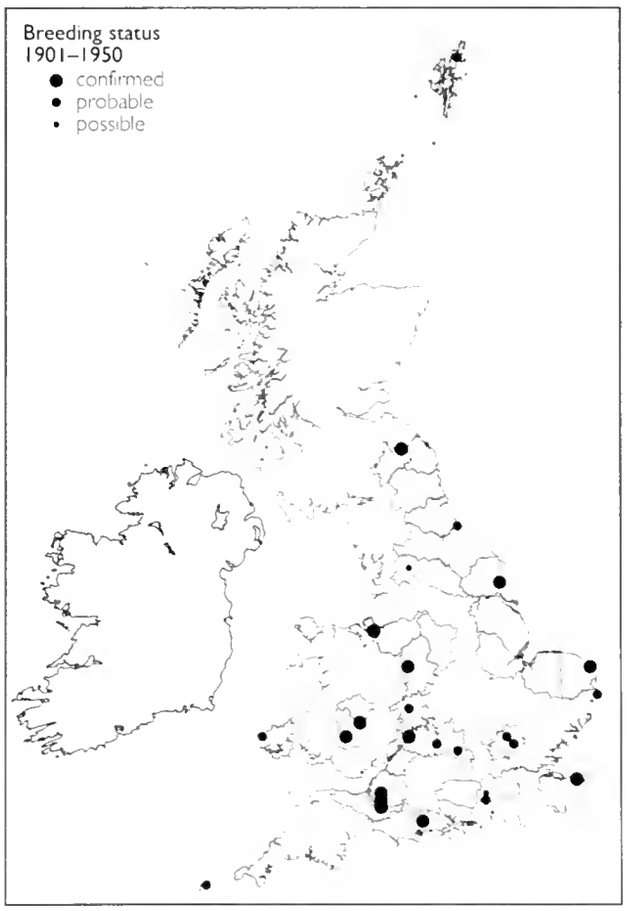


Fig. 4. Distribution of literature records of breeding Spotted Crakes, 1901–1950.

Andy Hay/rspb-images.com

122. The RSPB Ouse Washes reserve in Cambridgeshire is one of the most regular sites for Spotted Crakes and lies within an area of England that has historically been noted for the species.

Andy Hay/rspb-images.com

123. The Nene Washes in Cambridgeshire are also noted for Spotted Crakes and, like the Ouse Washes, are classified as a Special Protection Area under the EU 'Birds' Directive, though not yet explicitly for this species.

example, there are just five records in 177 years for Herefordshire (four taken in the Lugg Valley during 1880–84 (Aplin 1890) and one found dead in 1954), whereas the extensive wetlands of East Anglia have always been important, especially the Nene and Ouse Washes, the former Whittlesey Mere, and the Norfolk and Suffolk Broads.

Based on anecdotal observations in the literature, it seems very likely that Spotted Crakes were once considerably more abundant, and we suspect that the population was probably in the order of at least the upper thousands at the beginning of the nineteenth century. There is evidence that a considerable decline occurred in the middle and later years of that century (Aplin 1890, 1891). However, such numbers are not reflected in recorded counts of the birds (as mapped here), because counts were rarely noted. Two other sources which yielded many records were of birds shot (435, largely in the autumn – fig. 5) and birds killed by striking (telegraph) wires, typically along railway lines (41 during 1875–1989) (Aplin 1890, 1891 and other sources). Again, these suggest greater numbers in many areas in the nineteenth century.

There are very few published records in the first half of the twentieth century – just 62 reported breeding attempts between 1900 and 1950.

The last 50 years

Since the 1960s, records of potentially breeding Spotted Crakes appear to have become gradually more frequent, and the highest numbers were recorded in the late 1990s (fig. 6). However, this increase was associated with the periods of the two national atlases and, in particular, the 1999 national survey. This clearly reflects greater observer effort, which is difficult to separate from any possible underlying increase in breeding numbers. In addition, there is evidence of an increase in the number of passage or non-breeding birds through the 1960s and 1970s and especially from the late 1980s to 2001. This may also reflect increased observer effort; excluding atlas periods and the 1999 national survey, the annual total correlates significantly with the growth of annual membership of the

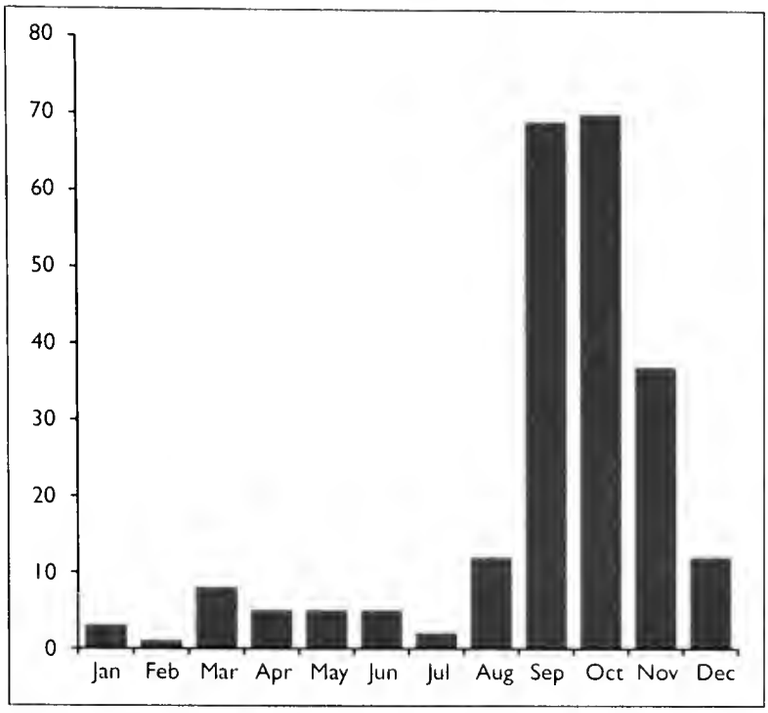


Fig. 5. Seasonal distribution of 229 dated shooting records of Spotted Crakes in Britain and Ireland, 1774–1958.

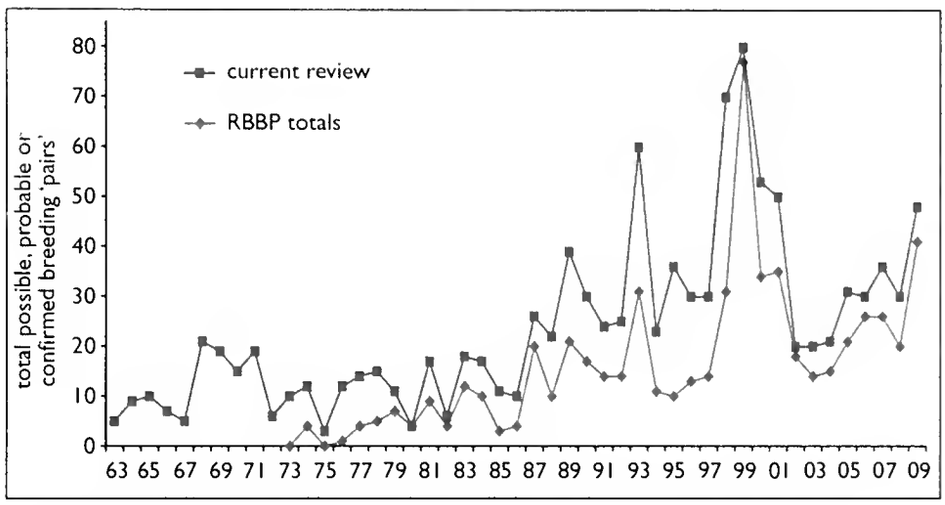


Fig. 6. Comparison of RBBP published totals for breeding Spotted Crakes (blue) with revised figures (red) derived from further information sources. (Note that RBBP data are for the UK only, whereas revised totals are for Britain and Ireland, although since there are so few Irish records the two are effectively comparable.)

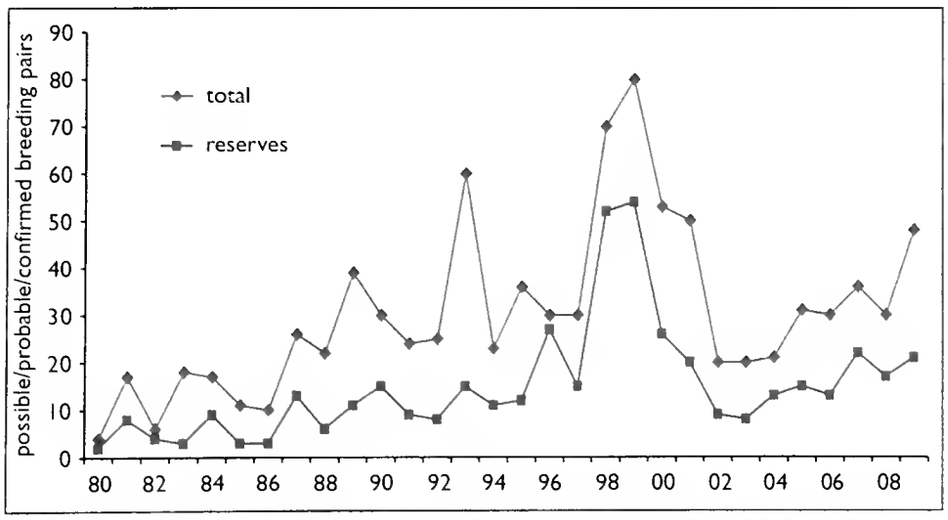


Fig.7. Population trend of Spotted Crakes since 1980 at 19 British nature reserves where monitoring of this species may have been more consistent. The blue line shows the total for all sites.

BTO, which is one possible index of active fieldworkers in Britain and Ireland.

Survey effort at a few regular sites, mostly nature reserves with resident observers, may have been less subject to large variations in effort. The trend since 1980 at 19 nature reserves (fig. 7) shows a pattern similar to that of all records (fig. 6). Across all years, the proportion of annual totals for Britain and Ireland found on these reserves is 46%.

Current British population and status

The figures published by RBBP for breeding Spotted Crakes, together with our revised figures, are shown in table 2 and fig. 6. They show that in most years since 1973 the estimated 'true' number of singing males has been almost double that reported by RBBP and in 1993 and 1998 at least approached the 1999 national survey total. The best estimate of numbers in recent years remains that of the national survey: 73 singing males (Gilbert 2002), revised by us to 80.

From 2002, the number of records of breeding birds declined sharply, to just 20 singing males in 2002–04, rising to 30–36 in 2005–08 and 48 in 2009. Numbers of autumn passage birds dropped substantially in 2002 also. The trend in annual numbers ringed (fig. 8) largely mirrors observational records, but similarly is confounded by the inability to control for effort.

Table 2. Totals of numbers of sites and singing male Spotted Crakes in Britain and Ireland, 1973–2009.

	Published by RBBP (UK only)		This review	
	Total singing males	Total number of sites	Total singing males	Total number of sites
1973	0	0	10	10
1974	4	4	12	10
1975	0	0	3	3
1976	1	1	12	11
1977	4	4	14	8
1978	5	6	15	14
1979	7	3	11	6
1980	4	3	4	3
1981	9	4	17	9
1982	4	2	6	4
1983	12	6	18	11
1984	10	4	17	11
1985	3	2	11	10
1986	4	3	10	9
1987	20	7	26	12
1988	10	6	22	18
1989	21	14	39	31
1990	17	10	30	21
1991	14	7	24	19
1992	14	12	25	20
1993	31	19	60	40
1994	11	5	23	15
1995	10	8	36	18
1996	13	8	30	19
1997	14	13	30	25
1998	31	16	70	29
1999	77	40	80	46
2000	34	22	53	37
2001	35	33	50	36
2002	18	11	20	16
2003	14	10	20	16
2004	15	10	21	15
2005	21	19	31	28
2006	26	22	30	26
2007	26	14	36	22
2008	20	9	30	19
2009	41	21	48	21

Current British and Irish distribution (1998–2009)

The revised dataset allows more complete breeding distribution maps to be produced for different periods. Figs. 9 & 10 show the distribution as mapped by the 1988–91 national atlas, with additional records for these periods – largely drawn from county bird reports.

Ireland

The first reported breeding in Ireland was in 1851 in Co. Roscommon (Aplin 1890) and Johns (1909) subsequently reported a nestling in Kerry. Aplin also quoted Harvey's *Fauna of Cork* as 'said to perhaps be more common than generally supposed' but without clarity as to whether this referred to breeding status. Hutchinson (1989) also refers to suspected breeding in Cos. Fermanagh, Laois and Louth in 'about the same period'. Other than one heard calling on several nights at Co. Waterford in May 1900 (Hartert *et al.* 1912), the next possible breeding record for Ireland appears to be in 1984. From then until 2006, 12 birds were reported at nine sites in Cos. Donegal, Fermanagh, Down, Roscommon, Offaly, Tipperary,

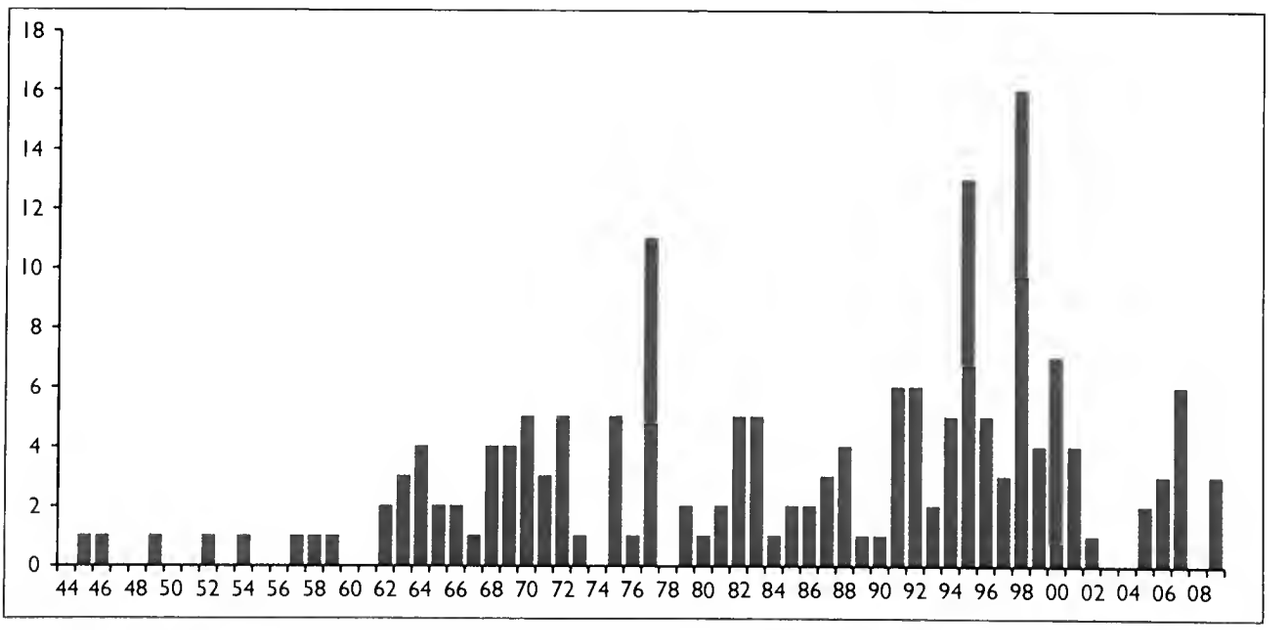
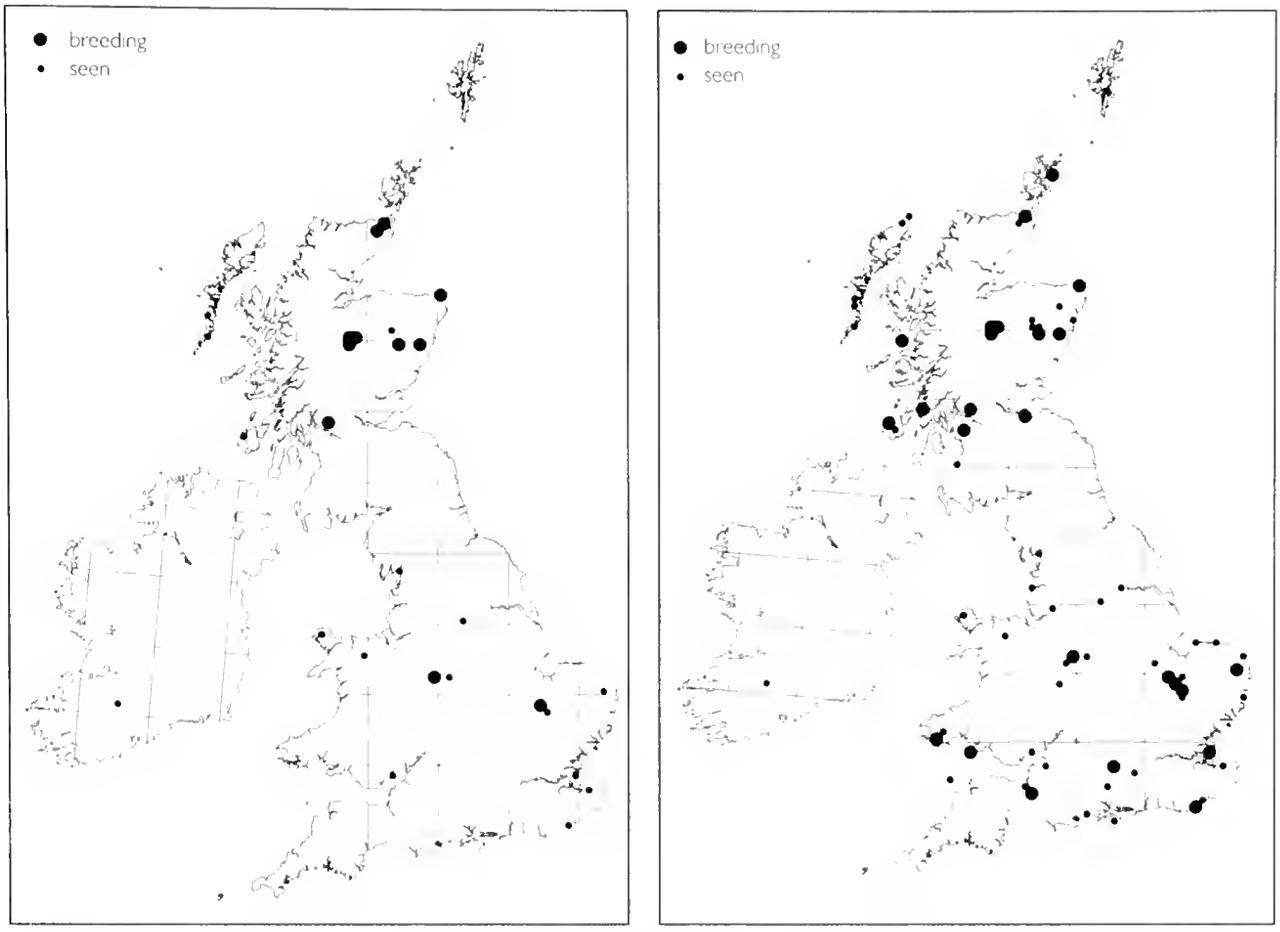


Fig. 8. Annual totals of Spotted Crakes ringed in Britain and Ireland, 1944–2009. Data courtesy of BTO.



Figs. 9 & 10. Distribution of breeding Spotted Crakes as mapped by the 1988–91 Atlas (Gibbons *et al.* 1993; fig. 9), with additional records from the current review shown in fig. 10. Note that in fig. 10, two records in Scotland are shown by 10-km square only.

and Cork. Seven birds recorded calling in June and July at four locations in the callows of the Shannon basin in 1993 indicate a significant influx that year. In general, though, considering the extent of apparently suitable habitat, the Spotted Crake is surprisingly rare as a breeding bird in Ireland.

Isle of Man

A single calling male on 15th May 1990 remains the only record for the island.

Passage and winter records and their relationship to breeding numbers in Britain and Ireland

Fig. 11 shows the number of non-breeding records (autumn passage and winter) reported annually (from sources such as Fraser & Rogers 2003). The relationship between this total and the number of potentially breeding birds in the preceding summer is shown in fig. 12. In contrast to the post-breeding migration, typically very few spring migrants are reported during March and early April. The most records we found in any year was five.

Singing behaviour

From all records we collated, birds were recorded singing in all months of the year (fig. 13), although 67% of 837 records were from May and June. A detailed analysis of singing records from Scotland alone suggested a similar pattern but there was evidence of peaks in mid to late May and early June (Francis & Stroud 2007), slightly later than farther south. Singing continued into July but was largely finished by the middle of that month.

Discussion and conclusions

Singing behaviour and implications for status evaluation

Spotted Crakes apparently form monogamous pair bonds of seasonal duration, and are usually double-brooded. The song is probably used to attract a mate, and may also be uttered by members of a pair in duet. However, one successful pair was recorded as almost silent when breeding (Schäffer 1999). The song may be heard early in the season, then again later, perhaps associated with unpaired birds (Cramp & Simmons 1980);

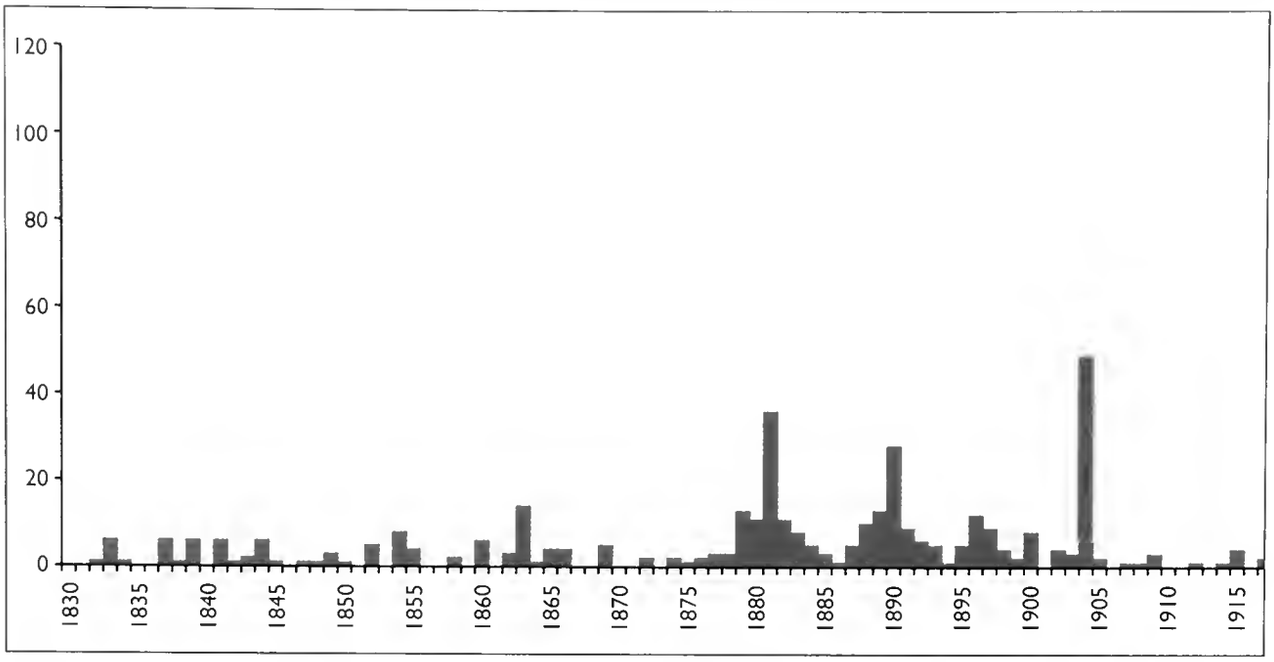


Fig. 11. Annual totals of non-breeding birds recorded in Britain and Ireland, 1832–2002. Prior to the 1950s, totals do not realistically reflect national status, but are included to indicate the long run of quantitative information available in the literature.

Mauro (1994) suggested that singing may stop following mating and that isolated males are less likely to sing. This suggests that, at any given site, the periods of singing might vary through the season, and that potentially it might be possible to visit a site occupied by breeding pairs at certain times and record no singing. It is not known how this might be influenced by playback of song, a method that has rarely been used in Britain. Holmes (1949) described the singing behaviour of a Spotted Crake in Yorkshire over seven days in June, which provides two insights. The bird sang every night during this period, on one occasion almost continuously from one hour after sunset to one and a half hours before sunrise. On another night, it called briefly then remained silent for 30 minutes before starting again. This illustrates that, when territorial birds are present, they may be easy to detect (even at a range of up to a kilometre), but also that a cursory visit to a site may not record the presence of a bird. This individual was thought to be unmated, though this was not proven.

Bengtson (1962) studied the singing behaviour of Spotted Crakes in Sweden, in northeast Scania (56°N 14°15'E), recording the rate of singing of individual males through entire nights. He recorded a pronounced bimodal pattern of singing activity in both May and June. In May, singing intensity was greatest, with an evening peak of 65–70 calls/minute around 22.00 hrs, dropping to 55–60 calls/minute around 01.00 hrs, before peaking again at c. 85 calls/minute around dawn (06.00). In June, the overall pattern was similar, although overall

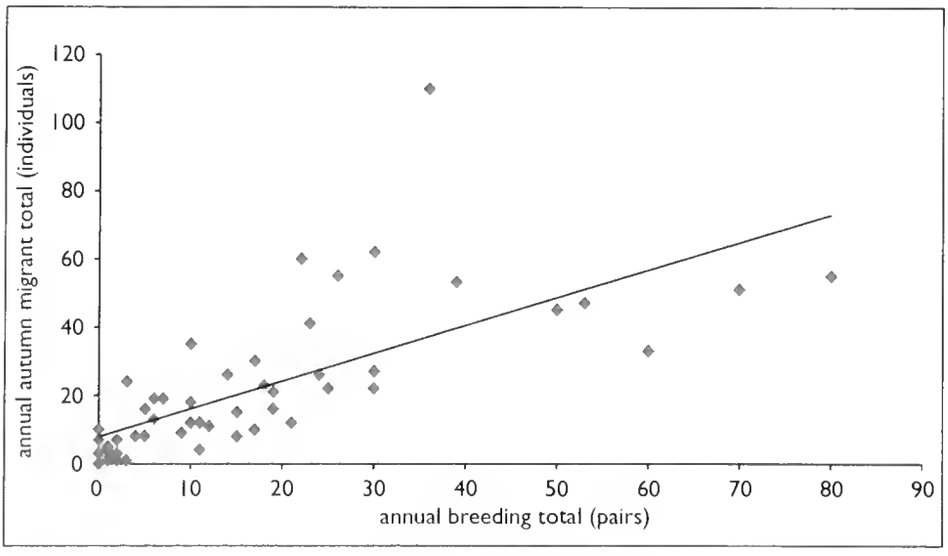


Fig. 12. Numbers of migrant Spotted Crakes in Britain and Ireland in autumn plotted against reported breeding total in the preceding summer season, 1950–2001 (note the outlier in 1995, with 110 migrants). The correlation is significant at $r=0.72$, $p<0.01$).

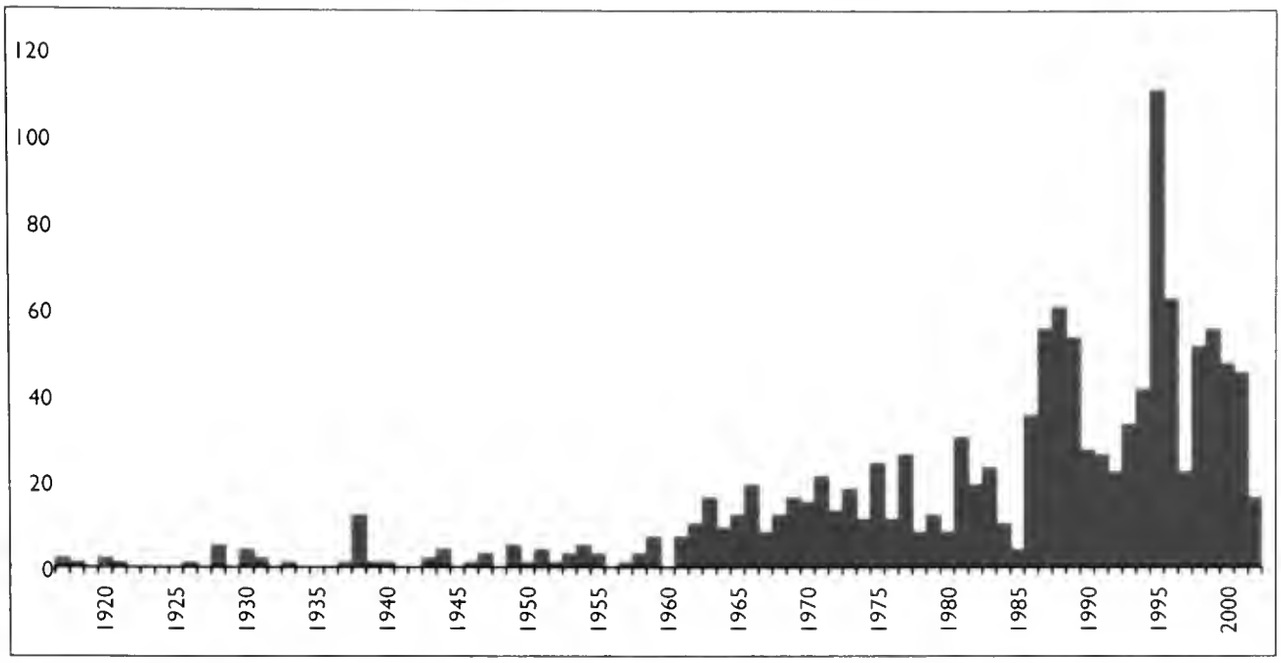


Fig. 11. contd.

singing intensity was less. The evening peak was earlier (21.00), lowest singing activity occurred around 03.00, and peak dawn singing was only about 50 calls/minute at about 05.00. Rain and cold weather tended to inhibit song output. Increased daytime singing was noted late in the season, and Bengtson suggested that this might be due to unpaired males attempting to find partners. He noted that two clutches are probably typical. In Mauro's (1994) study in Flanders, Belgium, the number of singing birds increased sharply from May into June, and peak singing activity was between 02.00 and 04.00. There is little similar information from British sites (though see Mallord 1999, summarised below).

The recorded dates of singing during the British national survey were summarised by Gilbert (2002), showing most activity between mid April and mid June, with peaks in early and late May. July was not covered in detail in the 1999 survey but our records indicate that singing continues well into this month (fig. 13).

These observations make it clear that repeated survey visits of sufficiently long duration (similar to the methods used by Gilbert 2002) are necessary to provide the best chance of establishing presence. The recorded pattern of singing through the season also suggests that the whole of May through to at least mid June should be the target period.

Influence of observer effort

The need for regular and sustained monitoring effort suggests that records from casual recording may be distorted by effort levels (Francis & Thorpe 1999). The relationship between number of breeding records, the growth in the numbers of observers and effects of intensive fieldwork in national atlases and surveys makes it clear that regular and systematic survey effort following standard methods is the only way of assessing the fluctuation in numbers effectively. Conclusions about numbers, changing status and the representation of birds within a network of protected sites can only be based on such protocols, although ad hoc records can usefully guide further survey.

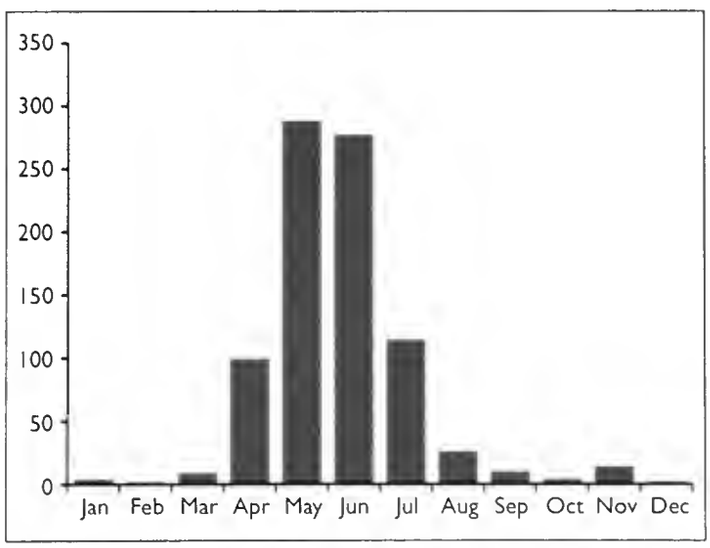


Fig. 13. Seasonal distribution of 837 records of singing Spotted Crakes in Britain and Ireland, 1900–2009.

The historical record

For a species that is currently rare, we know a significant amount about its historical distribution and abundance – largely thanks to Aplin's (1890, 1891) obsessively thorough collation of records up to the late 1880s. This shows the species to have been formerly widespread, although always seemingly restricted to very moist wetlands and with a population size no doubt related to the extent of these areas.

Adjectives used by Aplin's correspondents and others to describe the local status of the species between 1800 and 1850 include the words 'frequent', 'many', 'common', 'abundant', and 'invariably found' or 'found each year' – although always used in the context of limitation by extent of suitable wetlands. Some anecdotes suggest that the species was not difficult to locate in appropriate habitat. For example, 'Lord Lilford in *Birds of Northamptonshire* tells how Hancock of Newcastle in 1843, when collecting eggs at Whittlesey Mere and Yaxley, took almost as many eggs of this bird as the water-rail' (Aplin 1890).

After the 1860s, adjectives describing the bird's abundance change, with the species increasingly being described as 'local' or 'very local', 'scarce' or 'rarely seen'. Indeed, the inference of the significant reporting of dead birds from the mid 1800s is that they were unusual enough at the time for those finding them to recognise that they were out of the ordinary and so pass carcases to local naturalists for identification.

As is currently the situation in the Lower Derwent Valley, floodplain wetlands seem to have been historically important breeding areas. Aplin's correspondents repeatedly refer to the species as breeding in these areas:

- Yorkshire: 'A few nesting regularly on the sedgy banks of the Hull near Beverley.'
- Nottinghamshire: 'A low-lying, boggy tract of ground close to the town of Nottingham, adjoining the River Trent. It has been formed by subsidence of the ground, consequent upon mining operations.'
- Berkshire: 'The low-lying belt of marshy land along the Kennet valley between Kintbury and Newbury... is an extremely likely breeding place for the Spotted Crake, a good deal of the ground being covered with beds of reed and willow, intersected by ditches, and must be very wet at all seasons.'
- Hampshire: 'Having two rivers, consequently there are many places suitable for this bird.'
- Norfolk: 'The small chain of fens on the river Thet... was also frequented.'

The fens of East Anglia seem always to have been prime breeding areas, and their drainage greatly reduced the available habitat, from 3,380 km^2 in 1637 to just 100 km^2 by 1934 (and to 10 km^2 by 1984; Thomas *et al.* 1983). As well as landscape-scale drainage projects, the latter half of the nineteenth century saw relatively widespread intensive drainage for agriculture, part of the so-called era of 'high farming' and more general post-industrial agricultural revolution (Robinson 1990). Separate efforts to regulate and embank river systems in England and Wales for purposes of navigation from the late eighteenth to mid nineteenth century (Fleure 1951) would have further reduced the extent of riverine wetlands. As Johns (1909) noted: 'The drainage and improving of waste lands has driven this crake away.'

Holloway's (1996) analysis is that land drainage and wetland conversion meant that the species was probably breeding very locally at the end of the nineteenth century and that shooting of calling birds may have been significant. However, most kills reported, by Aplin (1890, 1891) at least, were in September and October (fig. 5), outwith the breeding season, and were usually taken during autumn shooting of Common Snipe *Gallinago gallinago* or other walked-up game, so there is little evidence that hunting in the breeding season was ever significant.

In Scotland, we found relatively few additional records in the literature, and the Spotted Crake appears to have been less common in the past than farther south. However, the decline noted by Holloway (1996) probably applied there too. Despite the species being recorded as a rare breeder in several parts of Scotland in the nineteenth century, such records were nonetheless quite widespread. There were few records from 1900 until the 1960s (Francis & Stroud

2007), after which numbers apparently increased, with the pattern reflecting that elsewhere in Britain and Ireland.

Ian Francis

124. This site in North-east Scotland, photographed in March 2012, illustrates the high water levels often present at Spotted Crake sites. These, together with accessibility problems in remote areas, make monitoring this cryptic, nocturnal species challenging.

Contemporary assessment

Without further interpretation, reported numbers of breeding birds show no apparent trend from the early 1960s to about 1986, then a significant increase to 1999, followed by a sharp decline and then a recovery, although not back to 1999 levels (fig. 6). Records of migrant birds in spring during 1968–2000 (*Scottish Bird Reports*; Francis & Stroud 2007) show no clear trend, with annual totals of 1–5 birds. In autumn, however, the trend broadly follows that of breeding totals (compare figs. 1 & 11).

Our overall assessment of these trends is that habitat loss through the nineteenth century, combined with local shooting mortality, resulted in a major decline in numbers and distribution to the early part of the twentieth century. There are then very few records until the 1950s, but accounts such as those of Meeson (1930) and Lewis (1955) for Somerset, and Dixon (2007) for Breconshire suggest local abundance at least in some areas. The small number of active ornithologists and the distractions of two World Wars suggest that this highly cryptic breeder could easily have remained undetected and/or unreported in large wetlands.

Since the 1960s, numbers reported have increased, as have numbers of birdwatchers. The marked increase in records during the periods of the two national atlases suggests that this trend may be more apparent than real given the effects of greater survey effort. Numbers from the 1970s to late 1990s were probably significantly larger than records suggest, but

Jill Matthews

125. Insh Marshes RSPB reserve, Highland, is the only site currently classified as a Special Protection Area for Spotted Crakes in the UK. This photograph shows only one part of the extensive floodplain wetlands used, illustrating the effort needed to undertake comprehensive and regular nocturnal surveys with listening from multiple vantage points.

the upward trend over the latter part of that period probably reflects more enhanced detection and reporting than a growth in population size.

It is hard to interpret the fall in reported numbers since 2000, but other lines of evidence, such as the small numbers caught and ringed (fig. 8), suggest that it represents a real decline in abundance.

International status and trends

The most recent European population estimate for Spotted Crake (excluding Russia) is c.70,000–110,000 pairs – based on (sometimes poor-quality) national assessments (BirdLife International 2004). This most recent (1990–2000) compilation of data is significantly poorer in quality than earlier (1970–1990) BirdLife assessments. Spotted Crakes are thinly distributed across western Europe but much more strongly concentrated in the east, with larger populations suggested for Russia and Ukraine. Had there been a genuine increase in British numbers to the end of the 1990s, it would have been contrary to a picture of general decline in Europe as a whole during the same period. Tucker & Heath (1994) reported national assessments in the late 1980s and early 1990s which indicated that, in countries where trends were known, about a quarter of the European population declined between 1970 and 1990. Elsewhere, population trends were largely unknown. Declines, some rapid, were reported in 12 of 15 countries, including a marked and well-authenticated decrease in the large Ukrainian population. The more recent (late 1990s) European assessments of Koskimies & Dvorak (1997) and BirdLife International/EBCC (2000) found decreases in 12 of 28 countries. Preparatory work in 2009 for the next pan-European bird assessment indicated unfavourable and deteriorating conservation status in ten Member States (European Commission unpubl.). The full *Birds in Europe 3* assessment, due in 2014, will update knowledge but is unlikely to report anything other than urgent conservation needs.

Identification of important sites

The EU Birds Directive requires the classification of SPAs for Annex I species such as Spotted Crake. In 2001, Stroud *et al.* published an assessment identifying four SPAs which together included 84% of what was then thought to be the total UK population (results of the 1999 national survey were not then available). Subsequent revision of both the population estimate and the numbers in the Lower Derwent Valley (see p. 201) showed that these four sites actually held just 29% of the 1999 total (table 3). Of these sites, only the Spey–Insh Marshes has been formally classified for the species (covering just 3.7% of the national population).

Between 2002 and 2005, the identification of further important sites was the subject of repeated discussion by Defra's SPA Scientific Working Group (leading to the initiation of this review). Their main conclusion was that patchy, poor-quality data constrains the

Table 3. The extent of the UK's SPA suite for Spotted Crakes in the late 1990s, based on knowledge at that time. Most figures relate to singing males.

	As published in 2001 SPA Review	Now known to have been present in 1999	Classified SPA suite reported to European Commission (February 2012)
National population size estimate	50	80	80
Numbers in SPAs:			
Lower Derwent Valley	31	12	
Nene Washes	5	5	
Ouse Washes	3	3	
River Spey–Insh Marshes	3	3	3
Total within SPA suite	42	23	3
Proportion of national population within SPA suite	84%	29%	3.7%

ability to establish a strong case for further SPA classifications. The data from this review will, however, be used in JNCC's current SPA network review.

Beyond SPAs, Spotted Crakes widely occur in protected wetlands (SPAs classified for other species, SSSIs, National Nature Reserves and/or reserves managed by conservation NGOs). Unlike the case with SPAs, it is unlikely that management of these areas is directed to the needs of Spotted Crakes. Indeed, those ecological requirements remain poorly understood, with the studies of Mallord (1999), Mackenzie (2000) and Gilbert (2002) being the only significant research carried out in Britain and Ireland (see below).

The lack of prioritised conservation actions for the Spotted Crake compares starkly with significant spending on the needs of other rare, Annex I wetland species with similarly small national populations (such as Eurasian Bittern *Botaurus stellaris* and Corn Crake *Crex crex*). Indeed, our questionnaire survey showed that even on some reserves where the species breeds there may be no targeted annual monitoring programme. This perceived lack of priority may stem partly from a view that the species is somehow 'accidental'; the records presented here, back to the start of ornithological recording in Britain, clearly refute that. It may also be because the types of wetland used (Gilbert 2002) do not easily fit against current classifications used in UK conservation planning: a species of neither reedbeds nor wet grasslands, the Spotted Crake uses a mosaic of drier vegetation within areas of shallow, standing freshwater and wet fen habitats in floodplain-type landscapes – conditions which can be difficult to recreate in artificially managed systems (Gilbert *in litt.*). However, since the favourability of some key sites may currently be declining as a result of successional vegetation change (Francis 2011; plates 126 & 127), this highlights an urgent need to understand Spotted Crake habitat management requirements.

Passage, movements and winter records

In Scotland, spring migration and arrival can begin as early as February, but during

Ian Francis

Ian Francis

126 & 127. This formerly occupied Spotted Crake site in North-east Scotland has become much more overgrown, ranker, drier and more scrub-covered, with much less open water, in the time between these two photographs taken in April 1993 and March 2011, from the same viewpoint.

1968–2000, 60% of (presumed) migrants occurred in the first half of May. Arrival appears complete by late May, and the song output of Scottish birds continues from then to the second week of July (although some may sing as early as mid April; Francis & Stroud 2007).

European Spotted Crakes can move south as early as July, though late birds may remain in nesting areas until September or October (Toms 2002). Birds considered migrants have been recorded at Scottish sites from mid July to mid December, but 75% of the 1968–2000 records fell between early August and mid October, with evidence of an initial peak in August and early September, then a larger peak from mid September to mid October. This may reflect different ages or origins of birds (the breeding range in Scandinavia extends well to the north of Scotland). The number of migrants is usually two or three times higher in autumn than in spring.

We found a positive correlation between numbers seen in autumn and the apparent size of the breeding population in the same year (fig. 12), suggesting that autumn migrants derive from the British population rather than other areas – chiefly Scandinavia. However, an unexpectedly large total of autumn migrants (110) was seen in 1995 in relation to the size of the breeding population that year (perhaps 30 might have been expected), and large numbers were also ringed that year (fig. 8), all of which points to an influx into Britain in 1995.

There have been only four ringing recoveries of Spotted Crakes in Britain, three of birds ringed on Fair Isle and recovered locally a short time later. However, evidence for movement of potentially breeding birds between sites comes from the fascinating recovery of a radio-tagged male ringed at Insh Marshes in May 2000 and found dead two years later (June 2002) in Wester Ross (BTO data). This supports previous suggestions of the potentially 'nomadic' choice of breeding site by Spotted Crakes; Mackenzie (2000) showed that the annual number of singing males at Insh was positively related to June water levels, suggesting that local conditions in each season are important in influencing site occupancy.

Aplin (1890) concluded that: 'in some parts, chiefly the west and south of England (e.g. Cumberland, Lancashire, Hampshire and Cornwall), it frequently if not habitually remains during the whole winter.' We found 50 nineteenth-century records of birds reported shot between November and January (fig. 5). The 1981–84 winter atlas

Andy Knight

128. In the Northern Isles, extensive fen habitats, which are much more open and windswept than sites on the mainland, are sometimes occupied by Spotted Crakes. This photograph, taken in July 2007, typifies habitat used regularly on Egilsay, Orkney.

David Wootton/rspb-images.com

129. The Dee estuary, North Wales/England. Large wetlands, riverine floodplains and brackish intertidal sites such as this are often used by Spotted Crakes on passage, mainly in autumn.

(Lack 1986) reported 16 winter records which, other than one in Morecambe Bay, were all south of a line between the Severn and Humber estuaries. Of 1,887 records from BirdTrack (2001–11), 12 were from November. These are from a range of locations, from southern or western sites such as Tacumshin (Co. Wexford), Tresco (Scilly), Marazion (Cornwall) and the Wirral, but also from Gibraltar Point (Lincolnshire) on the east coast. Thus it appears that small numbers of Spotted Crakes stay late in the autumn and may overwinter.

Key relevant findings from recent studies of breeding biology/behaviour

The habitat characteristics of British sites holding breeding Spotted Crakes were summarised in Gilbert (2002). Features selected within sites were the presence of relatively short, wet herb, reed and grass vegetation mosaics, with a preference for wetter conditions and areas more distant from scrub. Conditions suitable for Spotted Crakes might be influenced by vegetation succession; if unmanaged, some sites may become ranker, drier and more scrub-dominated, leading to lower occupation by the birds. This trend is apparent in some sites in Scotland (Francis 2011) and may be one reason why numbers have declined within them.

Bengtson (1962) located nine nests in his Swedish study area. Most clutches were of 8–10 eggs, with egg-laying beginning around

John Malloy

130. A Spotted Crake at Marazion Marsh, Cornwall. Marazion is an important staging post for passage migrants. This colour-ringed bird stayed for at least 17 days from 29th September 2007 – rare evidence of length of stay at a given site for an individual.

Chris Donald

131. Very few Spotted Crake nests are found in Britain and Ireland. This one, at Insh Marshes in 2000, was located using a radio-tagged male bird in Iain Mackenzie's study.

20th May and the female taking three days to lay two eggs. Brooding started before completion of the clutch. The interval between laying the last egg and hatching of the last chick was 19 days, with the hatching period lasting up to 72 hours. Both sexes incubated, for roughly equal durations. The chicks stayed in the nest until at least 12 hours after the last egg had hatched, and were brooded continuously by the parents.

Schäffer (1999) studied Spotted Crakes and Corn Crakes in the Biebrza Marshes, northeast Poland. Telemetry work showed that Spotted Crakes were socially monogamous, with the male and female staying together for the entire breeding season. He found that males called only until they had attracted a mate, after which they kept silent for the rest of the breeding season. Most pairs produced two clutches. Both parents cared for the chicks, with young able to fly about 35 days after hatching. The highest densities were found in wetland habitats that were (ecologically) least productive, where they fed mainly on small gastropods, insects (Coleoptera, Diptera, Heteroptera and Lepidoptera) and a few spiders. Water levels of 10–20 cm at the nest-site and in feeding areas were also key factors affecting successful breeding.

Chris Donald

132. A newly hatched Spotted Crake chick located at Insh Marshes in 2000.

Mackenzie (2000) studied the breeding habitat and behaviour of Spotted Crakes at Insh Marshes, catching and radio-tagging two male birds, leading to the discovery of a nest. The two home ranges were 1.3 and 5.1 ha in extent, centred on wet *Carex* swamps with a mosaic of vegetation density. The nesting male kept within 20–80 m of the nest throughout the incubation period (c. 20th May to 16th June), moving greater distances (up to 160 m) after hatching started. The nest held 17 eggs on 8th June (presumably two females laying). The chicks took five days to hatch and leave the nest.

Little more is known about British-breeding Spotted Crakes other than singing dates. Mallord (1999) studied Spotted Crakes

BOX 1

Research priorities for Spotted Crakes in Britain and Ireland

- Better understanding of the year-to-year occupancy of sites and the singing behaviour of potentially breeding birds (there appears to be considerable annual variation in numbers even at well-recorded sites, probably related to weather during spring migration or breeding site conditions).
- Greater intensity of (annual) monitoring at sites with past records of singing males.
- Location of wintering areas of British-breeding birds.
- Timing and extent of late-summer dispersal of young and post-breeding adults away from nest-sites.
- Duration of stay (turnover) of birds at sites used on spring and autumn migration.
- Clarification of optimal management (of vegetation and hydrology) of breeding sites.

at the Ouse and Nene Washes in 1999. He used four tagged males to locate nests and found that, in contrast to Schäffer's Polish study, males may not cease, or even reduce, calling after they attract a mate. Indeed, in two instances in Britain, when males known to be nesting have been involved, these males have called for a longer period than any other males – until the onset of incubation, a minimum of 2–3 weeks of nightly singing. The core home ranges, encompassing most registrations, of males in this study were small (1.69, 3.67 and 2.93 ha for three birds).

In our search of records, we located some early nest records (Aplin 1890; Meeson 1930; Lewis 1955; Dixon 2007) and have summarised them and placed the information on the RBBP website.

There is almost no information on Spotted Crake behaviour or movements following the cessation of singing. Juveniles are sometimes seen in late July and August, including at 'non-breeding' sites, but their provenance is unknown.

What can we learn from the recording of rare breeding species such as the Spotted Crake?

Aside from showing us the past and current population status of Spotted Crakes, this review has provided insights into the standards and processes of contemporary rare-bird recording and the possibilities for improvement. We have also identified some pressing research needs (Box 1). This review directly stimulated the key recommendations about recording standards published by the RBBP in 2009 (see www.rbbp.org.uk), but other issues need to be addressed, as follows:

- The RBBP is the only body holding full national datasets for many rare breeders, and is the prime source of status information for a range of statutory and other uses. However, its data holdings, while attempting to be complete, are not so. Indeed, some county bird reports contain more records in any given year than are provided to RBBP by county bird recorders for the same year, inevitably leading to incomplete national assessments. In some cases, this may have been because some recorders interpreted early summer records in suitable habitat as late migrants rather than as possible breeders. We hope that the development of elaborated criteria (table 1) will avoid this in future.
- We have no idea how many records are not submitted to any recording scheme, but suspect this happens often, accounting for some of the county discrepancies above, since anecdotal information is sometimes used in local bird reports.
- For submitted records, basic information such as six- or four-figure grid references are lacking, greatly restricting their value. Indeed, the quality of data for many key sites is so poor as to make it impossible to know which parts of these large wetlands are important for the species, or sometimes whether records even relate to the same site.
- Duplicate records of single birds at single sites can be reconciled by creating a composite record for that site. However, for large sites, where different observers have reported different numbers singing on different nights but only as a site total without locational information, it is impossible to determine the exact numbers present. Thus, we had to adopt the largest single count, but this may have underestimated the true total and thus the importance of a site.
- For such a cryptic species, the importance of quantifying observer effort to help interpret records is crucial (Francis & Thorpe 1999; see above). Our survey showed that, while annual monitoring for Spotted Crakes was often routine at some reserves, at other important sites recording of this species was much more opportunistic. Even where routine monitoring did occur, reporting effort levels to RBBP (e.g. 'listening on xx nights in May and June') or of negative results was very rare.
- More generally, lack of information that can distinguish 'negative' records (sites surveyed without birds being apparently present) from null records (sites unsurveyed) is a major problem for interpretation of site-related totals. However, we do acknowledge that there has been more reporting of negative records to RBBP in recent years – a very welcome development!
- Verification of data for such a cryptic

species will always be problematic. Some very large totals that have been reported (occasionally tens of calling birds at the same site) are not biologically impossible, yet do not fit a national pattern. As for all rare-bird recording, it is important that unusual records are subject to local peer review so the importance of such sites can be verified beyond reasonable doubt.

- There is value in elaborating species-specific criteria to help standardise the interpretation and audit of records, and to highlight where knowledge of breeding biology is lacking. We invite comments on the criteria presented in table 1, and the RBBP is progressively developing such criteria for other rare birds (www.rbbp.org.uk/rbbp-species-recording.htm). These should be progressively refined by those with specialist field knowledge of the species concerned.
- During the first two breeding atlases there was no transfer of records from the atlas to the RBBP or county recording processes, or vice versa, which resulted in all these sources holding overlapping but incomplete datasets. Explicit data transfer protocols have been developed to avoid this situation for Bird Atlas 2007–11.
- BTO/RSPB/BirdWatch Ireland/SOC BirdTrack (incorporating records from BirdGuides) has the potential to be an additional source of records, although these should be filtered through the normal county assessment process. The submission of further details (for example, whether birds were singing in the case of summer records) would greatly enhance their value.
- A large number of records exist in county bird reports and avifaunas. Although the RBBP started collating its national archive only in 1973, we compiled plausible annual totals back to the late 1950s from literature sources (fig. 1). This might usefully be undertaken for other rare breeding species.
- Not all counties have submitted records to RBBP each year since 1973. Cross-checking county reports could complete RBBP archives with records from such 'missing' years, a major task that has been tackled in recent years (*Brit. Birds* 105: 165).
- Undertaking this review to establish a more accurate assessment of Spotted Crake population status has been very time-consuming. Learning from these wider lessons will help to avoid the need for a similar process for other rare species.

We appeal strongly for the submission of further records, through local recorders, either those unreported from previous years or those gathered through further listening at likely breeding sites. The value of records is greatly enhanced by simple information such as precise grid references of location and whether or not the bird was singing. Further, reporting that sites were checked but birds not heard would be very useful – negative records from known sites are widely lacking, making the interpretation of site trends problematic. All these data elements are standard 'good practice' in the recording of (rare) breeding species. The forthcoming survey in 2012 will help to clarify these issues for many sites important for Spotted Crakes and we urge full and enthusiastic participation (see Box 2). Only in this way will we be able to understand the true status and conservation requirements of this rare and little-known breeding bird.

BOX 2

National Survey of Spotted Crakes in 2012

RSPB is carrying out a National Spotted Crake Survey in spring 2012, with support from Natural England. This will entail organised coverage of key sites where Spotted Crakes have occurred in recent years, but we suspect that there may be a considerable spread of birds away from such known locations and would encourage observers to check any sites that they think might be suitable. Please help us to get as complete a picture as possible of the breeding population by reporting any calling Spotted Crakes you hear from April to July this year.

Please contact us at porzana@rspb.org.uk or 01767 693690 (RSPB Wildlife Enquiries) with details of date, time, site name and grid reference of your record(s), as soon as possible after making observations.

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Postscript: We owe much of what we know about the Spotted Crake in Britain and Ireland in the nineteenth century to Aplin's 1890 paper in *The Zoologist* – the then journal of ornithological record. In January 1916, *The Zoologist*, which first appeared in 1843, was incorporated with *British Birds*, so there is a natural symmetry to the publication of this review in *BB*. Given the issues highlighted by this review, however, we trust that the next comprehensive review of the status of the Spotted Crake in Britain and Ireland will not take a further 122 years!

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Further species reviews
RBBP is keen to encourage further species reviews using its data archive. Please contact the Secretary at Secretary@rbbp.org.uk for further information.

Gary Thoburn

133. Juvenile Spotted Crake, Isles of Scilly, October 2011. Single juveniles can occur from the end of July at sites where breeding activity has not been recorded, creating difficulties in understanding whether breeding has actually taken place at a site.

Notes

A pair of Eurasian Teals diving in search of food

On 13th April 2011, at Grove Ferry, Kent, I noticed a small duck diving on the lake; when it surfaced, I was surprised to find that it was a female Eurasian Teal *Anas crecca* (hereafter Teal). Shortly afterwards it was joined by a male Teal and it soon became apparent that the birds were paired up.

For about 20 minutes I watched these birds as they patrolled a patch of open water, roughly 40 m × 5 m, near the centre of the lake. During this time the two birds dived individually several times with dive duration of 5–7 seconds, then proceeded to dive synchronously for an extended period. Intervals between dives were approximately 30 seconds, during which both birds rested on the water with wings slightly open and primary feathers resting on the surface. At the start of each of these rest periods, both birds were mandibulating, as if they were processing small objects in their bills (although no food items were observed); then, after a short period of rest, they dived synchronously once again.

It was quite noticeable that both Teals dived with a deliberate open-wing flick, behaviour that I have not noticed previously in dabbling ducks. After some time, the birds flapped vigorously, preened, then flew off to join a group of about 20 Teals feeding in a more conventional way in shallow water.

Diving in response to threats is regularly observed in dabbling ducks but diving in search of food is not mentioned in *BWP*. Bennett (1965) recorded a single Teal diving but makes no mention of the open-wing flick before diving and I can find no other record of synchronous diving in this species.

A search through my notebooks did produce a brief comment concerning a pair of Shovelers *A. clypeata* diving briefly in the same spot on that lake during the previous spring. It seems likely that that area represents a line of somewhat deeper water, associated with a drainage ditch which existed before the site was flooded, and may provide a particular seasonal feeding opportunity.

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Hobbies take advantage of the gravy train

I regularly walk alongside the River Rother, which includes the stretch where the Tenterden steam train crosses the river near Newenden, in Kent. On 24th May 2003, I watched a Hobby *Falco subbuteo* hunting along the ditches beside the railway. Later that year, on 16th August, I watched a Hobby hunting in a similar manner in the same area. On both occasions a train was passing by. It was another three years, on 30th May 2006, before my walk again coincided with the train crossing the bridge, and once again I saw a Hobby there. By now, there was little doubt that the falcon was following the train. I assume that the train flushes dragonflies from the ditches either side of the line and the Hobbies take advantage of an easy meal.

I have now witnessed this feeding habit on 12 occasions with the most recent being on 28th July 2011. In August 2009, a single diesel engine came along the line and I immediately noticed a pair of Hobbies following above and somewhat behind it. One Hobby was then seen to pass a food item to the other, and I felt sure that this was a parent feeding a youngster. The presumed parent then went back to the train and followed it, sweeping from side to side in search of further prey. I think that the slow speed of the train makes this feeding technique possible and unique to this particular site where there are plenty of ditches along the railway line that crosses the marshland.

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Black Guillemots in brackish water

Black Guillemots *Cepphus grylle* are exclusively marine, except for relic populations in the northern Baltic Sea, where water is of such low salinity that it is virtually fresh (*BWP*). Along the coasts of Britain & Ireland there are no published records of Black Guillemots extending upstream into estuaries to where conditions might be brackish. However, observations in recent years along the River Lagan in Belfast show just that. The Lagan weir, completed in 1994 as part of a flood defence system for Belfast, forms a barrier to the sea except at high tide when sea water washes over the weir (and during periods of excessively high tides when the flood defence barriers are raised). As a consequence, upstream of the Lagan weir the water is brackish (typically as low as 9 ‰ prior to sea-water inundation) for 5 km until the Stranmillis weir, above which the water is permanently fresh. In the years after the Lagan weir was completed, Black Guillemots started to nest in the structure of the Albert Bridge, 1 km above the weir; these birds generally breed successfully, and fly downstream to forage. In March 2011, a single Black Guillemot was observed diving and fishing successfully 2.5 km upstream of the Lagan weir (where salinity typically increases to 11‰ at high tide). This appears to be the first published record of feeding and breeding by Black Guillemots in brackish water in Britain & Ireland.

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Unusual interaction between Common Raven and Mountain Hare

On 29th June 2011, at the west end of Rathlin Island, Co. Antrim, we were watching a Common Raven *Corvus corax* (hereafter Raven) flying low over the ground when a Mountain Hare *Lepus timidus hibernicus*, which we had not seen, suddenly leapt up and attempted to 'box' the bird in a typical hare-like manner. There appeared to be some direct contact between the hare and the Raven. The Raven rose and circled, before flying low over the hare, no more than a metre above the ground. The hare immediately gave chase, keeping within a metre of the bird and pursuing it for a considerable distance before both were lost from view. The hare soon returned to its original position and shortly afterwards the Raven reappeared. The whole episode was repeated, with the Raven flying low over the hare and afterwards hugging the ground for some distance, accompanied by the same close pursuit from the hare.

It was difficult to judge the motivation of either the Raven or the hare. The Raven directed no physical contact at the hare and the hare was definitely chasing the Raven. There was no evidence that the hare was protecting young in the encounter, although we could not confirm that. Ravens are renowned for engaging in what could be described as play behaviour (e.g. Moffett 1980, Heinrich & Smolker 1998, Heinrich 1999) and this observation is perhaps another instance of play. Gordon (1938), cited in Ratcliffe (1997), described similar behaviour by a Raven which provoked a dog into chasing it across a field, landing ahead and then taking off before the dog could reach it.

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Puffin predation by Atlantic Cod

On 21st May 2011, an Atlantic Cod *Gadus morhua* weighing 11.8 kg was captured on rod and line by Michael Patton at a depth of approximately 40 m, north of Loppa Island, Finnmark, Norway (70.40°N 21.42°E). When the cod's stomach was opened, a fresh specimen of a Puffin *Fratercula arctica*, weighing approximately 500 g, was discovered (plate 134). Several other cod, weighing up to 24.5 kg, were captured during the same angling trip and many of them were found to have been feeding on Atlantic Herring *Clupea harengus*. Large numbers of Puffins were also observed feeding in the area at the time.

Declan Quigley

134. Puffin *Fratercula arctica* in the stomach of an Atlantic Cod *Gadus morhua* captured north of Loppa Island, Finnmark, Norway, May 2011.

Adult cod are known to be voracious, omnivorous, cannibalistic, opportunistic and indiscriminate predators of many species of marine life, including fish, invertebrates and algae (Cohen *et al.* 1990), as well as a wide range of both natural and anthropogenic objects including stones, white turnip, hare *Lepus* spp., books, keys, candles and Styrofoam cups (Day 1880–84; Kurlansky 1999). Records of avian prey appear to be rare and the current report would appear to be the first documented record of Atlantic Cod predation on a Puffin. Various species of both terrestrial and marine avian prey have previously, albeit rarely, been reported from cod stomachs, including partridge *Perdix* spp. and Black Guillemot *Cepphus grylle* (Day 1880–84), scoter *Melanitta* spp. (Klein-MacPhee 2002; B. Collette pers. comm.) and other unspecified seabirds (Scott & Scott 1988).

Although the overall contribution of marine avian prey to the diet of adult cod would appear to be relatively low and perhaps opportunistic at present, it is possible that it may become increasingly significant, either seasonally and/or geographically, owing to interspecific competition for increasingly scarce food resources.

Acknowledgments

I wish to thank my colleagues, Kevin Barber, John Hederman and Sean Ivory (Sea Fisheries Protection Authority, Killybegs, Co. Donegal), for bringing the current record to my attention, and Dr Bruce Collette (National Museum of Natural History, Washington DC, USA) for confirming details on the incidence of scoters in cod stomachs. I also wish to thank the following people for their help and advice: Dr Robert Barrett (Tromsø University Museum, Norway), Professor Michael P. Harris (University of Aberdeen, Scotland), Dr Jan-Eirik Angell Killie (University of Tromsø, Norway), Dr Tycho Anker-Nilssen (Norwegian Institute for Nature Research, Trondheim, Norway) and Eric Dempsey (www.birdsireland.com).

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Reviews

A Photographic Guide to the Birds of Malta

By Andre F. Raine
Langford Press, 2011
Pbk, 200pp; many colour photographs
ISBN 978-1-9040782-8-9 Subbuteo code M21157
£15.00 *BB* Bookshop price £13.50

Although this slim and inexpensive book may be of little use to those with much experience of birdwatching in Malta, visitors and inexperienced residents will find it extremely useful. Rather than confusing the inexperienced by including every species that has ever occurred in Malta, it covers just those species that occur regularly and a number of important rarities, totalling 130 species in all. For those wishing to check on the other 267 species currently accepted as having occurred at least once in the archipelago, there is a complete list, with notes on status.

Provided for each of the 130 species are its name in six languages, notes on identification and similar species, a list of habitats in which it is found (these habitats being well described in an introductory chapter), details of its status and conservation status both in Malta and internationally. Identification is aided by a good photograph of each species, supplemented as necessary by photographs showing age, sexual or seasonal variations in plumage. Of course, even well-chosen photographs such as these do not always show all the key features and may suggest features that are confusing. Appropriate references to this in the text would have been helpful.

The book begins with descriptions of Maltese habitats, overviews of the avifauna and its conservation and notes on 11 top birding locations. There is a long and important chapter on hunting and trapping on Malta, on which the author is a considerable authority. Although, thanks to the drive of BirdLife Malta and the backing of the European Union, there has been much progress, the extent of hunting and trapping remains intolerable and the behaviour of some hunters is shocking. The government has wriggled persistently to avoid its obligations under EC directives, and the EC has been less than forceful in dealing with this. Policing of the laws is inadequate and even where offenders are successfully prosecuted the punishments are so inadequate that they are back to their evil pursuits within days. Much hunting occurs within reserves, some of which have been deliberately trashed by vengeful hunters – who have also attacked the homes, offices and cars of conservationists. Perhaps a steady flow of people visiting Malta and making it plain that they are there to watch birds will help to persuade the authorities that their current lax attitude harms their tourist industry. But be warned, Maltese hunters are not averse to threatening people who carry binoculars.

Jeremy Greenwood

Thomas Bewick: the complete illustrative work

By Nigel Tattersfield
British Library/Oak Knoll Press, 2011
Hbk, 3 vols, 1,580pp in total; lavishly illustrated in black and white
ISBN 978-0-7123-0686-7 Subbuteo code M21205
£160.00 *BB* Bookshop price £140.00

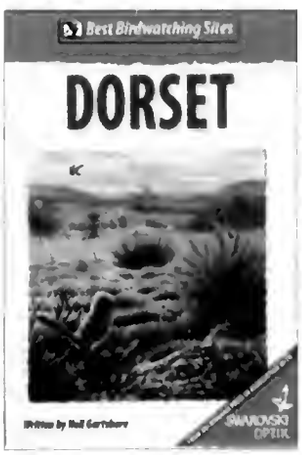
No ornithologist will ever regard Thomas Bewick, known primarily for *The History of British Birds* (1797–1804), as a naturalist of the same standing as contemporaries such as Edward Donovan, John Latham and James Bolton. Equally, no-one has ever read Edward Thornton's *The Temple of Flora* (1799) as a serious work of botany. But both Bewick and Thornton in their different ways defined a certain English Romantic sensibility which persists to this day. Thornton published very large plates of exotic plants and placed them in dramatic settings, while Bewick did almost the

exact opposite – using tiny woodcut vignettes of native birds which he positioned in a naturalistic landscape, while adding tiny humorous vignettes which commented on the world of man.

Bewick was aware that his role was to offer a modest guide to birds that the common man not only could afford but would also want to possess. Nigel Tattersfield, whose three magnificent volumes are a monumental survey of Bewick's full range of work, as artist, craftsman and commercial publisher, focuses his attention on the way in which Bewick's success was largely due to his business instincts. While Donovan's large-format and lavishly illustrated £15 ten-volume edition of hand-coloured plates sold slowly and made little money, Bewick knew that, at a time of war shortages and financial crises, a two-volume book costing a mere guinea (the equivalent of £1.05) was bound to do well. Not only was Bewick's *British Birds* small enough to accompany the nature lover in the field, it was also likely to appeal to those who were more attracted by the artist's commitment to the tradition of British woodblock printing, which he developed to a sublime degree. With such a combination of shrewd business practice and a unique artistic vision (not common among artists and craftsmen, and certainly lacking in Thornton), Bewick could hardly fail. Indeed, *British Birds* proved such a success in his lifetime and beyond that many admiring publishers shamelessly plagiarised his designs. Today, whether on National Trust tea towels or biscuit tins, Bewick's images are immediately recognisable. There is even a swan named after him.

Bewick may not have been a scientist, but he was a perfectionist and having been disappointed in the condition of stuffed specimens available to him, he turned for subjects to 'birds newly shot or brought to me alive'. His task then was to draw and paint in watercolour and afterwards engrave the cuts, with the help of some gifted pupils, like John Anderson and Luke Clennell. Though Bewick was initially keen to research his subject, in the end the letterpress descriptions were entirely the work of his partner Ralph Beilby, who was also no naturalist, but a failed author who took most of his information from printed sources. In the end, though, the text to Bewick's masterpiece becomes almost extraneous. The same cannot be said of Tattersfield's text, which reflects a lifetime of scholarly dedication to his subject.

R. M. Healey



Best Birdwatching Sites: Dorset

By Neil Gartshore
Buckingham Press, 2011
Pbk, 248pp; colour maps, black-and-white illustrations
ISBN 978-0-9569876-0-0 Subbuteo code M21088
£17.95 *BB* Bookshop price £16.00

The latest offering in this popular series covers a total of 65 sites in Dorset, although several of these involve a cluster of birding locations (such as the sections for The Fleet and Portland), so that in reality you get well over 70 birding sites for your money. As is inevitably the case in a coastal county, many of the locations are concentrated along or near the coast, but there is good treatment of inland locations too, including Dorset's newest hotspot – Longham Lakes. Indeed, sites have been chosen to cover the whole range of Dorset's diverse habitats, from coastal cliffs and estuaries to inland woods, chalk grasslands and its precious heaths.

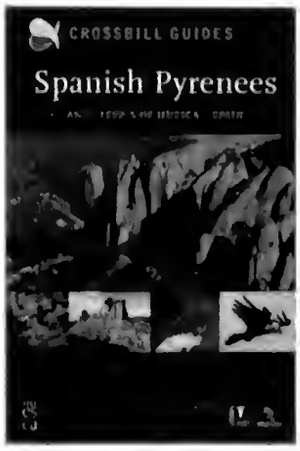
The book starts with some background information about the county and its habitats, along with a section providing a flavour of what to expect in a given month. The site accounts follow, with each location given a brief introduction, followed by a list of target birds and the likelihood of seeing them at that particular site given as a percentage. These figures are obviously subjective but they do give a general feeling for your chances of connecting with a given species at a particular site. The only one that really raised my eyebrows was the 75% chance of seeing a Dipper *Cinclus cinclus* at Lyme Regis. Despite visiting the town several times over the last couple of years, I've yet to see one on the river there, although that's perhaps more a reflection on me as others are generally more successful! Each site is then described in more detail, with interesting background information, suggested routes and that all-important local knowledge – where *exactly* to look for certain species. Clear and concise maps for each location accompany the details of how to get there by both

car and public transport. Much of the birding information has come from the author's visits to the various sites over many years and gives a good representation of what the visitor can realistically expect to see.

Towards the back of the book is the Dorset Bird List, which is impressively up to date, with all 417 species on the county list and even the two potentially new species which are currently pending acceptance (at the time of writing this review). Each species is given a concise status report and in certain cases the key sites within the county are also provided. There is also an entertaining glossary of birding terms followed by a comprehensive list of useful contacts and full details of public transport and the viability of disabled access to each site.

In summary this book provides a wealth of birding-related information about the county and would I'm sure prove invaluable for both holidaying birders and day visitors to this popular county. Even though, as a resident of Dorset, I'm familiar with the majority of the sites treated, reading this book has given me a few ideas of new locations to try out in the coming year.

Kevin Lane



Spanish Pyrenees and Steppes of Huesca

By Dirk Hilbers and Kees Woutersen
Crossbill Guides, 2012
Pbk, 255pp; numerous colour plates
ISBN 978-9050-1138-23 Subbuteo code M21167
£20.95 *BB* Bookshop price £18.75

This is the latest title in the now well-established Crossbill Guides series. The Pyrenees, relatively easy to get to from Britain, has long been a favourite area for British naturalists. To the north, the cooler and wetter French side reveals different habitats and species from the warmer and drier south. In addition to the Pyrenees, this title includes the arid foothills and steppes of Huesca (a province of the region of Aragon, in northern Spain). This area is extremely productive, rugged and similar in some ways to Arizona, USA; it produces many sought-after species.

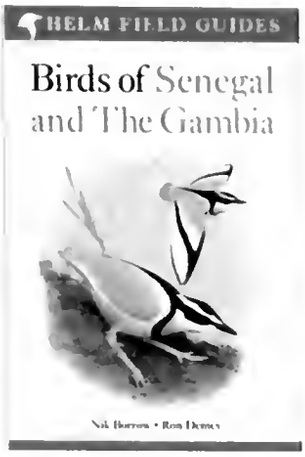
The structure of the book is as before, with substantial sections on the landscape, geology, climate and topography; the fauna and flora of the area; and then an account of 21 different routes which can be taken to maximise the habitats and species seen. The final section has advice and information for visiting this region, details of how to find some of the most interesting bird species and checklists of all species to be looked for. The book is lavishly illustrated with colour maps, diagrams and photographs.

This has long been one of my own favourite haunts and is still as exciting as when I first visited, some 30 years ago. The high Pyrenees with the magnificent Ordesa National Park is an awesome place, complete with raptor-filled skies they include the enigmatic Lammergeier *Gypaetus barbatus* and places where Wallcreepers *Tichodroma muraria* can be found. The alpine meadows of this area also produce some of the most spectacular flora of anywhere in the world, together with butterfly populations to keep anyone happy. As far as the latter is concerned, it might be worth pointing out an essential piece of advice in the book that carrying and using butterfly nets within Aragon is prohibited, with fines equal to those for carrying an unlicensed firearm.

The scenery in the mountains and the foothills is truly breathtaking, whereas the steppes are more of an acquired taste. They are vast, treeless desert tracts with some intensive farming, which is pushing the boundaries of the natural areas back and back. This makes the reserve of El Planeron, near Belchite and run by SEO/BirdLife International, a very important place and especially worth a visit. This area is one of the best to see both Pin-tailed *Pterocles alchata* and Black-bellied Sandgrouse *P. orientalis* as well as providing the opportunity to see up to seven species of larks including the skulking Dupont's Lark *Chersophilus duponti*.

This guide is, I believe, the best in the series so far and has encouraged me to return to the area to visit the sites unknown to me. These guides are a splendid acquisition for any trip.

Derek Moore



Birds of Senegal and The Gambia

By Nik Borrow and Ron Demey
Christopher Helm, 2011
Pbk, 352pp; 143 colour plates, maps
ISBN 978-14081-3469-6 Subbuteo code M21130
£29.99 *BB* Bookshop price £26.99

This is the third spin-off title from the same authors' original *Birds of Western Africa* (Helm 2002). First came a field-guide version with the same title, then *Birds of Ghana*. The current title follows in much the same style as the Ghana guide, and is now the familiar format of colour plates opposite pages of text and maps – very user-friendly.

The first 29 pages are taken up with some excellent introductory sections covering such topics as geography, climate, habitats, IBAs, taxonomy and topography and these are extremely well written and informative. The last 35 pages are taken up with an annotated list for the two countries, a list of unaccepted species, references, and an index.

The illustrations on the plates will be mostly very familiar to users of the previously mentioned titles and are first class, depicting to a high degree of accuracy the various plumages of the species covered. The maps are large and clear. The accompanying species texts are also excellent, providing a wealth of information. In fact, I found it very hard to find any fault at all with this guide!

There has been one previous modern field guide to the region, or at least to The Gambia (*Birds of The Gambia*, Barlow, Wacher & Disley, Pica Press 1997), so some comparisons perhaps need to be made with that. That book also has very good plates, laid out in a user-friendly way opposite (shorter) captions. But in addition it has a text section where each species is dealt with in much greater detail. Of course, Borrow & Demey have already provided this in their original volume but, given the size of that book, few people will consider taking it into the field – or even on an overseas trip. This perhaps gives the Barlow *et al.* guide a slight advantage, but set against that is the fact that the new title is bang up to date on status, taxonomy and current identification thinking. For those visiting Senegal only, this new guide is clearly the one they should use, but for those visiting The Gambia I would suggest taking both – neither is particularly bulky or heavy.

Birds of Senegal and The Gambia can be thoroughly recommended. Which countries will the fourth spin-off cover, I wonder?

David Fisher

Owls

By Chris Mead, updated by Mike Toms
Whittet Books, 2011
Hbk, 138pp; colour and black-and-white illustrations
ISBN 978-1-873580-83-7 Subbuteo code M00917
£12.99 *BB* Bookshop price £11.50

Essentially the same as the first edition (1987) but with (mostly minor) updates to the text. One chapter on 'Breeding for release' has been cut (the technique has proved to be ineffective and is no longer approved of). A short note on the late Chris Mead and his links to the BTO has been added as has a short (eight-page) section of colour photographs by Mark Hancox. Otherwise the whole book has been redesigned to give a neater appearance. Guy Troughton's fine drawings and cartoons are all there and he has provided a new painting for the cover. Like the original reviewer (*Brit. Birds* 81: 288), I am not keen on the cartoons, many of which are dated and somewhat out of character with the rest of the book.

Robin Prytherch

News and comment

Compiled by Adrian Pitches

Opinions expressed in this feature are not necessarily those of *British Birds*

More than half the world's seabirds are in decline

More than any other group of birds, seabirds, including albatrosses and penguins, are in trouble, according to a comprehensive review by BirdLife scientists, who have assessed the fortunes of all 346 species of seabird inhabiting the world's oceans.

The findings show that the status of seabirds has deteriorated rapidly in recent decades and several species are now perilously close to extinction. Nearly half of all seabird species are known or suspected to be experiencing population declines. Ninety-seven seabird species, including 17 albatrosses and 11 penguins, are facing extinction and a further 35 species are nearing this threshold.

Dr Ben Sullivan is a seabird scientist with the RSPB and a co-author of the paper, published in *Bird Conservation International*. He said: 'At sea, hundreds of thousands of seabirds are dying as bycatch by the fishing industry... while on land, introduced rats, mice, cats and goats are destroying habitat or predating seabirds, especially on remote islands where these birds can nest in huge numbers. These factors are taking their toll on species which have inhabited the oceans for millions of years.'

The global assessment shows that New Zealand, with 33 species of seabird nesting nowhere else, is a priority for protecting threatened species, but with eight species of seabird unique to the UK's Overseas Territories (UKOT), the UK is second in the world priority list, ahead of the Galapagos, Australia, Mexico and Japan.

The RSPB and BirdLife are involved with many conservation programmes designed to give seabirds the greatest chance of survival. In the UKOTs, the RSPB is involved with programmes to eradicate non-native species, such as rats on Henderson Island in the Pacific. At sea, BirdLife is working with eight countries (two in Africa and six in South America) to reduce the estimated 300,000 seabirds dying annually in the global longline fishery alone.

'Seabirds are a diverse group of birds and they provide a valuable indicator of the health of our marine environment,' added Professor John Croxall, Chair of BirdLife's Global Seabird Programme, the lead author of the paper, and a co-author of the paper in *BB* last month on South Georgia, one of the most important UKOTs for seabirds.

BirdLife has already identified many Important Bird Areas (IBAs) for seabirds on land and is about to publish the first inventory of marine IBAs in the high seas. It is hoped that these will help to develop a global network of Marine Protected Areas and assist the implementation of new approaches to the management and protection of marine systems. This network should include UK waters, which are home to around 30 species of seabird, including the Critically Endangered Balearic Shearwater *Puffinus mauretanicus*.

Christiaan Giljam

135. King Penguins *Aptenodytes patagonicus* on South Georgia, a UK Overseas Territory, March 2008. Because of the importance of UKOTs for seabirds, the UK has a particular responsibility for globally threatened seabirds.

UK Government finds £200,000 to finish off the Ruddy Duck

The latest report on the Ruddy Duck *Oxyura jamaicensis* eradication programme concludes that there are now fewer than 100 Ruddy Ducks remaining in the UK and confirms that the cull has been extended to finish the job. Since the early 1990s, Ruddy Ducks, probably originating from the large feral population in the UK, had appeared in Spain where they hybridised with the globally threatened White-headed Duck *O. leucocephala* and threatened the native species with extinction. The Spanish Government requested action.

Between 1993 and 2004, the UK Government undertook research to determine the most effective techniques for culling the Ruddy Duck. An initial programme of killing the birds in the breeding season was largely unsuccessful. In September 2005, Defra estimated the Ruddy Duck population to be 4,400 birds and embarked on a comprehensive cull in the breeding season and in winter. According to the annual bulletins from Defra, 3,691 were culled in 2005–07, 1,190 in 2007/08, 1,284 in 2008/09, 738 in 2009/10 and 322 in 2010/11, a total of 7,225 birds, well in excess of the original estimate of 4,400 in September 2005.

The cull has been controversial, particularly since the WWT and the RSPB supported it. The RSPB has lost members because of its support for the cull, but David Hoccom, head of the RSPB's species policy unit, told BBC News: 'It is very sad that such measures are necessary, but we expect the White-headed Duck's future to be more secure as a result. The White-headed Duck had undergone a rapid worldwide decline, making extinction a real possibility.'

Over 7,000 Ruddy Ducks have now been killed at a cost of £5m. That a further £200,000 can be found in these austere times to cull the remaining 100 is an intriguing insight into Government spending priorities.

https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?pageid=244

Proposal to cull Lakeland Canada Geese

The Lake District National Park Authority has ruffled a few feathers with its plan to cull 200 Canada Geese *Branta canadensis* on Windermere. The Windermere Geese Management Group was a little taken aback by the fierce reaction to its proposed cull but on 6th March restated its intention to proceed.

In a statement the group said: 'The group... remains committed to its original course of action to carry out a managed cull of Canada Geese on Windermere for the following reasons: The Lake District National Park is a managed landscape for wildlife, tourism and agriculture. The Canada Goose is an invasive non-native species. The large population on Windermere has a serious negative impact on the economy, the environment, and adds to the pollution within the lake and on surrounding land with the health risks associated with this. These serious negative impacts include damage to shoreline habitats, displacement of native species, farm grazing and crop land spoiled, pollution of public and private recreational land, public health concerns from pathogens, bacteria and parasites.'

A peaceful protest at Windermere by opponents of the cull demanded that the park authority 'give geese a chance'. Local residents were joined by supporters from across the UK as they took part in a peaceful protest organised by Windermere-based pressure group 'Save Windermere Canada Geese'. Kathy Musker, founder of Respect for Wildlife and protest leader, said: 'The protest has gone very well, lots of people came along from all over the country. They're all here because they want to stop this barbaric slaughter.' Celebrities including Bill Oddie and Queen guitarist Brian May have also thrown their weight behind the anti-cull campaign. An online petition had gathered more than 3,400 signatures by 12th March.

Nature Improvement Areas launched

Twelve Nature Improvement Areas (NIAs) have been set up with Government funding of £7.5m over three years to create wildlife havens, restore habitats and encourage local people to get involved with nature. In the wake of the announcement of the areas, selected in a competition from 76 bids across England, wildlife groups called for the move to be the start of a much bigger effort to boost nature throughout the country. The Wildlife Trusts said the concept should be rolled out across England, and that there should be explicit guidance to local authorities, in the controversial changes currently being made to the planning system, to recognise NIAs. But the Government said the scheme should not stifle 'sustainable development' – which ministers have put at the heart of their National Planning Policy Framework planning reforms – and that it was up to local authorities how much weight to give to NIAs.

Announcing the 12 projects, Environment

Secretary Caroline Spelman said: 'Each of these projects has something different to offer. [They] are the result of different organisations working together with a common purpose – to safeguard our wildlife for generations to come.' Paul Wilkinson, Head of Living Landscapes for the Wildlife Trusts, said: 'The concept should be driven forward everywhere across England and given formal recognition through the new planning process and agri-environment grants. We have an urgent need for the restoration and recovery of the natural environment to take place across a much larger area and quickly.'

The NIAs were awarded funding by a panel of experts, led by Prof. Sir John Lawton, and were a key commitment of the Natural Environment White Paper 'The Natural Choice'. Sir John said: 'For more than 40 years I have had the privilege of working on nature-conservation issues in the UK, both as a professional scientist and in the voluntary sector. Never in all that time have I seen the sort of creativity, partnership working and sheer enthusiasm that the NIA competition has released in consortia that want to deliver more effective conservation for England's wonderful wildlife in their area. Choosing 12 winners from 76 bids was an awfully difficult task, but I believe we have 12 outstanding NIAs, each unique in what it is setting out to achieve, for the benefits of people and wildlife.'

Visit the News section of the *BB* website (www.britishbirds.co.uk) to discover the 12 NIAs and their project aims.

Darwin Initiative celebrates 20 years with £8.5m in grants

And Environment Secretary Caroline Spelman has made another pay-out to conservation from the Defra budget. The UK Government is giving £8.5m to a total of 33 new projects under the Darwin Initiative, which has backed wildlife conservation projects in some of the world's poorest countries for the last two decades.

The new projects will provide help for species as diverse as the newly discovered Burmese Snub-nosed Monkey *Rhinopithecus strykeri*, the Chinese Giant Salamander *Andrias davidianus* and the Critically Endangered Bengal Florican *Houbaropsis bengalensis* in India and Nepal. At the same time, local communities will get help to improve their environment and their livelihoods. Since its launch in 1992, the Darwin Initiative has committed £88m to 762 projects in over 150 countries.

Chair of the Darwin Initiative Expert Committee, Prof. David Macdonald, said: 'The Darwin Initiative is hugely important and lies at the cutting edge of conservation worldwide. Internationally it is respected and valued as Britain's flagship for conservation. We are thrilled that the Darwin Initiative goes from strength to strength, combining care for wildlife conservation with human development through the support of the UK Government.' The Darwin Initiative was created 20 years ago at the 1992 Earth Summit in Rio, and has been responsible for a wide range of successful conservation projects around the globe.

Details of the 33 new Darwin Initiative projects and previous projects can be found at http://darwin.defra.gov.uk

Breeding success for Orkney Hen Harriers

Conservationists are hailing the breeding success of Hen Harriers *Circus cyaneus* in Orkney as the population has reached a 20-year high of 100 breeding females producing over 100 chicks – a remarkable recovery for the species, which is facing tough challenges in other parts of the UK.

The resurgence of the Hen Harrier in Orkney follows a period of steep decline on the islands, particularly between 1980 and the late 1990s, when populations reached their lowest level since detailed records began in 1953. A study to determine the cause of decline, funded by RSPB Scotland, Scottish Natural Heritage and the University of Aberdeen, has revealed the direct link between the number of sheep grazed on land favoured by hunting Hen Harriers and the success of the raptors.

Food shortage was determined to be the primary cause of the decline in numbers, especially at the start of the breeding season when the males hunt for both themselves and the females in order to bring them into good breeding condition. Researchers found that the number of sheep grazing on moorland fringes, in the rough grasslands in which Hen Harriers hunt, doubled during the period of decline resulting in habitat degradation and a shortage of prey.

Following a shift in agricultural support payments, the number of sheep was reduced by 20% between 1998 and 2008 and the fortunes of the Hen Harrier improved significantly as their preferred hunting areas were allowed to regenerate. The RSPB's Eric Meek said: 'Although nearly all Hen Harrier breeding sites on Orkney are protected SSSIs, SPAs or are RSPB reserves, the males range widely outside these areas while hunting,

leaving them vulnerable to grazing regimes and habitat destruction. It is fantastic to see the Orkney population thriving after so many years of decline and demonstrates their ability to bounce back if given the opportunity. The story here, in effect, is that if the habitat is in good condition and the weather is not too awful and there is no illegal persecution, then Hen Harriers will thrive.'

Egg-collector banned from visiting Scotland for a decade

Serial egg-collector Matthew Gonshaw, of Bow in east London, has become the first person in England to receive an ASBO for crimes against nature. The 49-year-old is also believed to be the first person to receive an ASBO restricting him from visiting Scotland.

The ASBO was imposed because of the damage Gonshaw, who was also jailed last December, has wreaked on rare birds by stealing their eggs. For the next ten years, the maximum ASBO term, he is banned from travelling to Scotland during the breeding season (between 1st February and 31st August) because of his repeated previous trips to take the eggs of species like the Golden Eagle *Aquila chrysaetos* and Osprey *Pandion haliaetus*. He is further prevented from visiting all RSPB and Wildlife Trust land for the next ten years.

The ASBO, delivered at Stratford Magistrates Court, also strengthens the penalties for any future wildlife crimes. Instead of the £5,000 maximum fine and six months' imprisonment that can be imposed under the Wildlife and Countryside Act, Gonshaw could receive a £20,000 fine and a five-year jail term for breaking the conditions of the ASBO.

The RSPB's Mark Thomas was in court to hear the announcement. He said: 'Matthew Gonshaw has become a serial menace to birds, targeting the eggs of some of our rarest birds. We're delighted at today's announcement. If Gonshaw breaks the ASBO's terms, then he could return to prison for up to five years. Already being the only man in England to be denied the joy of visiting our nature reserves, he must surely realise that it's now time to give it up and leave the birds alone.'

Gonshaw is currently serving his fourth prison sentence for egg-collecting and currently holds the record in the UK for the person who has spent the most time in prison for these crimes.

Bush crows live in a climate bubble

Why would a smart and adaptable bird that eats almost anything and can survive happily in even the most heavily degraded habitats have a world range so small that it would fit comfortably inside Norfolk? That question has baffled and confused scientists ever since the Stresemann's Bush Crow's *Zavattariornis stresemanni* peculiarly restricted distribution in southern Ethiopia was discovered back in the 1930s.

But now, after researching the exact location of the birds and their nests in southern Ethiopia, a team of problem-solving, Sherlock Holmes-style scientists have unravelled the mystery. And the answer is *elementary*. A new study published in the *Journal of Ornithology* shows that this globally threatened bird's range follows exactly the edge of a unique bubble of cool, dry climate.

Lead author of the study and RSPB conservation scientist Dr Paul Donald is delighted that he finally has some answers. He said: 'The mystery surrounding this bird and its odd behaviour has stumped scientists for decades – many have looked and failed to find an answer. But the reason they failed, we now believe, is that they were looking for a barrier invisible to the human eye, like a glass wall.

'Inside the "climate bubble", where the average temperature is less than 20°C, the bush crow is almost everywhere. Outside, where the average temperature hits 20°C or more, there are no bush crows at all. A cool bird, that appears to like staying that way.'

The reason this species is so completely trapped inside its little bubble is as yet unknown, but it seems likely that it is physically limited by temperature – either the adults or, more likely, its chicks simply cannot survive outside the bubble, even though there are thousands of square kilometres of identical habitat all around.

BirdLife International's Dr Nigel Collar, a co-author of the study, added: 'Whatever the reason this bird is confined to a bubble, alarm bells are now ringing loudly. The storm of climate change threatens to swamp the bush crow's little climatic lifeboat – and once it's gone, it's gone for good.'

The Stresemann's Bush Crow is listed as Endangered, with fewer than 9,000 individuals existing in the wild, and could be the most vulnerable species to climate change in the world. Scientists are now planning to start a monitoring programme on the temperature of the birds' nests to see if it can unlock the answer to the next question: why are they so sensitive to climate?

Recent reports

Compiled by Barry Nightingale and Harry Hussey

This summary of unchecked reports covers early February to early March 2012.

Headlines A Common Yellowthroat in Wales was part of a tantalising assortment of wintering Nearctic birds, including Dark-eyed Junco and Northern Waterthrush, plus a good spread of Nearctic ducks and waders (including both Greater and Lesser Yellowlegs, Wilson's Snipe, a scatter of Long-billed Dowitchers and Spotted Sandpipers) and up to six Bonaparte's Gulls. A White-tailed Eagle teased inland birders, as did a Two-barred Crossbill in Norfolk and a Short-toed Treecreeper in Kent, while record-breaking flocks of Iceland Gulls were still in the Northern Isles.

Lesser White-fronted Goose *Anser erythropus* Long-stayer, Buckenham/Cantley Marshes (Norfolk), to 17th February. Ross's Goose *Anser rossii* In Norfolk, up to four long-stayers to 12th February, one to 29th; Newton Marsh (Cumbria), 12th February, presumably same Caerlaverock, 15th–25th February, Mersehead (both Dumfries & Galloway), 6th March; South Ronaldsay (Orkney), 12th February; East Chevington, 25th–26th February and Budle Bay (both Northumberland), 11th March. Cackling Goose *Branta hutchinsii* Long-stayers on Islay (Argyll), two to 25th February, one to 2nd March and two others reported in mid month, at Lissadell (Co. Sligo), three to at least 1st March, and Torr Resr (Somerset), to 11th March; Blair Drummond (Forth), 13th February. Red-breasted Goose *Branta ruficollis* Long-stayers in Essex (various localities until 24th February, then again 11th March) and in Devon to 19th February, same bird then seen at various sites in Hampshire to 11th March; elsewhere, Felixstowe Ferry area (Suffolk), 10th February to 9th March; Carsethorn/Southerness Point (Dumfries & Galloway), 12th February to 8th March.

American Wigeon *Anas americana* Long-stayers in Devon to 11th March, Dumfries & Galloway from 23rd February to 11th March, Co. Galway to at least 11th March, Herefordshire on 15th February only and Yorkshire to 11th March; elsewhere, Loch of Strathbeg (North-east Scotland), 10th February, Bay of Suckquoy (Orkney), 19th February to 10th March, and Marlingford (Norfolk), 1st–9th March. Black Duck *Anas rubripes* Sruhill Lough, Achill (Co. Mayo), long-stayer to at least 13th February. Blue-winged Teal *Anas discors* Long-stayers at St Mary's (Scilly) to 4th March and Threave (Dumfries & Galloway) to 14th February.

Ferruginous Duck *Aythya nyroca* Long-stayers, Somerset to 12th February, Berkshire to 23rd February; also at Blashford Lakes (Hampshire), again 27th February, and Linford (Buckinghamshire), 11th March. Lesser Scaup *Aythya affinis* Long-stayers at Siblyback Resr (Cornwall) to 17th February, Cosmeston Lakes (East Glamorgan) to 10th March, Slimbridge (Gloucestershire) to 9th March, and Lough Gill (Co. Kerry) to at least 17th February; Belturbet (Co. Cavan), 19th February; Newquay (Cornwall), 19th–21st February, then Chew Valley Lake (Avon), 23rd February and 11th March; St John's Loch (Highland), 21st–25th February. King Eider *Somateria spectabilis* Annagh Head (Co. Mayo), 1st March; Burghead (Moray &

Ian Fisher

136. Adult Red-breasted Goose *Branta ruficollis* (with Barnacle Geese *B. leucopsis*), Dumfries & Galloway, February 2012.

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Nairn), 1st March. Surf Scoter *Melanitta perspicillata* Long-stayers in Caernarfonshire, Co. Cork, Cornwall, Denbighshire (up to three, at Colwyn Bay/Llanddulas), Devon, Fife and Co. Kerry (where three in total, one at Fermoyle and two in Brandon Bay). Bufflehead *Bucephala albeala* Long-stayer Helston Loe Pool, to 4th March, also at Trelusback (both Cornwall), 4th March.

White-billed Diver *Gavia adamsii* Fetlar (Shetland), 18th February. Black-browed Albatross *Thalassarche melanaphris* One, 300 km southwest of Mizen Head (Co. Cork), 29th February.

Cattle Egret *Bubulcus ibis* Long-stayers at Hillsborough (Co. Down) to at least 19th February and Warblington to 11th February, presumed same Hayling Island (both Hampshire), 12th February; Lydney (Gloucestershire), 13th February; Brading (Isle of Wight), 5th March; Frinton (Essex), 11th March; Kingston Maurward (Dorset), 11th March. Great White Egret *Ardea alba* Records from Breconshire, Carmarthenshire, Cheshire & Wirral, Cumbria, Essex, Gower, Greater London, Co. Louth, Greater Manchester, Hampshire, Kent, Lancashire & N Merseyside, Norfolk, Northamptonshire, Somerset, Suffolk, Sussex, Co. Wexford and Wiltshire. Glossy Ibis *Plegadis falcinellus* With dispersing individuals and presumably some new arrivals, records were widespread, and came from the following areas: Anglesey, Bedfordshire (county first), Breconshire, Cambridgeshire, Ceredigion, Cleveland, Co. Cork, Devon, Dorset (two), East Glamorgan, Essex, Highland (five), Kent (two), Lancashire & N Merseyside, Lincolnshire (three), Norfolk (five), Pembrokeshire (up to 16), Somerset, Suffolk, Sussex and Co. Wicklow.

White-tailed Eagle *Haliaeetus albicilla* Batsford (Hertfordshire), then East Hyde (Bedfordshire), 10th February, Rye Meads (Hertfordshire), 11th February, various localities in Kent, 11th–19th February, and presumed same Ormesby St Margaret, 21st–22nd February, then Stalham (both Norfolk), 22nd February. Pallid Harrier *Circus macraurus* Lough Corrib (Co. Galway), long-stayer to at least 11th March. Gyr Falcon *Falco rusticalus* North Uist (Outer Hebrides), 27th February.

American Golden Plover *Pluvialis daminica* Davidstow, 17th February, then Crowdy Resr (both Cornwall), 19th February. Wilson's Snipe *Gallinaga delicata* St Mary's, long-stayer, seen again on 25th February. Long-billed Dowitcher *Limnadromus scalapaceus* Long-stayers at Kidwelly Quay (Carmarthenshire) to 10th March, Lodmoor (Dorset) on 5th March, Wigtown (Dumfries & Galloway) on 7th March, and The Cull (Co. Wexford), two until at least 10th March; also, Bannow Bay (Co. Wexford), 3rd March. Spotted Sandpiper *Actitis macularius* Long-stayers at Chew Valley Lake (Avon), to 10th February, again 3rd–10th March, Plym Estuary (Devon) to 16th February, and Christchurch Harbour/Stanpit Marsh (Dorset), to 4th March. Greater Yellowlegs *Tringa melanaleuca* Dornoch (Highland), long-stayer again 20th February, then Loch of Strathbeg, 3rd March, 9th–11th March. Lesser Yellowlegs *Tringa flavipes* Kingsmill Lake (Cornwall), from December 2011 to 11th March.

Iceland Gull *Larus glaucoides* Following the large influx in the early weeks of the year, there were peak counts of 70 Marwick (Orkney), 19th February, 60 Lerwick (Shetland), 19th February and 7th March, and 88 Stornoway (Outer Hebrides), 9th March. Bonaparte's Gull *Chraicacephalus philadelphia* Long-stayer at Ballygally (Co. Antrim), to at least 9th March; also Cardiff Bay (East Glamorgan), up to two from 15th February to 10th March; Castletown (Highland), 25th–26th February; Newbiggin-by-the-Sea (Northumberland), 5th March; Lewis (Outer Hebrides), 10th March. Forster's Tern

Paul & Andrea Kelly

137. Female Siberian Stonechat *Saxicola maurus*, South Slob, Co. Wexford, March 2012.

Gary Jenkins

138. Male Spanish Sparrow *Passer hispaniolensis*, Calshot, Hampshire, February 2012.

Sterna forsteri Long-stayer in Galway Bay area (Co. Galway), to at least 25th February.

Snowy Owl *Bubo scandiacus* Altikeeragh (Co. Derry), 10th–13th February; Ballycastle (Co. Mayo), 13th February. House Crow *Corvus splendens* Cobh (Co. Cork), long-stayer to at least 18th February.

Penduline Tit *Remiz pendulinus* Leighton Moss (Lancashire & N Merseyside), 11th February; Dungeness (Kent), 20th and 29th February to 1st March. 'Northern' Long-tailed Tit *Aegithalos c. caudatus* Long-stayers at Luddenden Dean (Yorkshire), with two to 13th February, one to 20th. Hume's Warbler *Phylloscopus humei* Wyke Regis (Dorset), long-stayer to 14th February, then again on 11th March. Dusky Warbler *Phylloscopus fuscatus* St Mary's, at least one long-stayer to 13th February, Tresco (also Scilly), 12th February. Paddyfield Warbler *Acrocephalus agricola* Pagham Harbour (Sussex), long-stayer to 11th March. Short-toed Treecreeper *Certhia brachydactyla* Samphire Hoe (Kent), 10th March. Rose-coloured Starling *Pastor roseus* Muirhead (Ayrshire), long-stayer again, 26th February to 11th March; Braiseworth (Suffolk), 24th February; Holyhead (Anglesey), 25th February to 11th March; Hordle (Hampshire), 29th February to 11th March. Siberian Stonechat *Saxicola maurus* South Slob (Co. Wexford), 5th–11th March.

Spanish Sparrow *Passer hispaniolensis* Calshot (Hampshire), long-stayer to 11th March. Arctic Redpoll *Carduelis hornemanni* Long-stayers in Norfolk, at Kelling to 26th February and Titchwell to 11th March; Woodwalton Fen (Cambridgeshire), 19th February; Santon Downham (Norfolk), 4th March. Two-barred Crossbill *Loxia leucoptera* Lynford (Norfolk), 19th February. Parrot Crossbill *Loxia pytyopsittacus* Black Down (Sussex), long-stayer to 18th February. Dark-eyed Junco *Junco hyemalis* Hawkhill Inclosure (Hampshire), long-stayer to 11th March. Northern Waterthrush *Parkesia noveboracensis* Long-stayer, St Mary's, to 7th March. Common Yellowthroat *Geothlypis trichas* Rhiwderin (Gwent), 10th February to 11th March.

Richard Stonier

139. First-winter male Common Yellowthroat *Geothlypis trichas*, Rhiwderin (Gwent), February 2012.

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