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Population estimates of birds in
Great Britain and the UK

Water Rails in the UK

Lead ammunition – an update



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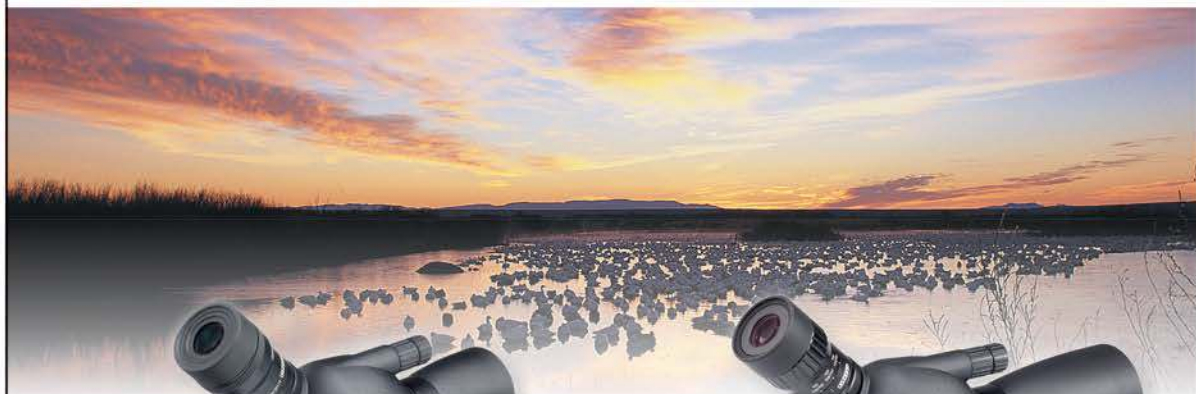
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Front-cover photograph: Little Egret *Egretta garzetta*, Norfolk, July 2011. The Little Egret is a good example of a wetland species with a rapidly expanding population in the UK (see the *APEP* 4 report on pp. 69–104 in this issue).

Richard Chandler

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Seeing beyond



British Birds

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Many readers will have played some part, however small, in the vast data-gathering exercise that has culminated in the fourth report from the Avian Population Estimates Panel (see pp. 69–104). The fact that there are so many birdwatchers in the UK, or rather so many who take part in the core survey work that underpins many of these estimates, is an optimistic counterpoint to this winter's general environmental gloom. Inevitably, the estimate quality is patchy; there are some species which are that much better known than others. The report highlights the desperate need for better information on national seabird populations, with various species estimates still anchored by the counts from *Seabird 2000*. It seems a very long time since I was squeezing myself into a drysuit for another Zodiac trip to count Shetland's Fulmars for that survey. It's even more disconcerting to find that estimates for a handful of familiar winter passerines are still based on data from the *Winter Atlas*, for which fieldwork was carried out in the mid 1980s. However, at least we know where the weak points are, and it would be unrealistic to expect uniformly excellent coverage. Survey participation is surely one of our national strengths, and if there is any slack in your birding diary, there may be something worthwhile to fill it – visit www.bto.org/how-you-can-help/take-part-project for ideas. There are lots of vacancies for the Heronries Census – and there must be a realistic chance of Little Egret or something even better lurking unrecorded in some of our neglected heronries.

Roger Riddington



British Birds aims to: ❖ provide an up-to-date magazine for everyone interested in the birds of the Western Palearctic; ❖ publish a range of material on behaviour, conservation, distribution, ecology, identification, movements, status and taxonomy as well as the latest ornithological news and book reviews; ❖ maintain its position as the journal of record; and ❖ interpret scientific research on birds in an easily accessible way.

New Networks for Nature

In November 2019, I arrived at St Peter's School in York and, still in the lobby and with the hood of my very wet coat over my head, was pounced upon by Tim Birkhead, the outgoing Chair of New Networks for Nature, who asked me if I would be prepared to join its Steering Committee. Only when I had reached the sanctuary of the cloakroom did it occur to me that Tim may have spent the morning accosting everyone who walked through that door, and that I had been the first to say yes. By the end of that year's three-day event, he had given me my first job to do – writing this editorial.

One reason for being unable to refuse either request is that year after year the New Networks for Nature gathering is an unfailing wellspring of inspiration and optimism. In my professional sector, wildlife conservation, some years can reach their close with reserves of inspiration and optimism stretched, with just enough in the tank to keep alive faith in the success that is forever round the next corner. It felt like just such a year in 2019.

I had been to a few of the 11 annual events that have taken place to date and realised how well 'New Networks for Nature' encapsulates what the organisation is. Foremost, it is *for* nature. It is not *a* network, but many. New networks. They were new in

2008 and are getting newer every year.

New Networks grew out of a series of occasional collaborations between artists and scientists that John Fanshawe had been organising at BirdLife International, in Cambridge. Some of the speakers and audience members, people like Tim Birkhead, Mark Cocker and Jeremy Mynott, would keep the discussions going well after the events had officially ended. Gradually, an idea crystallised around their shared sense that, as Mynott put it, 'wildlife had a far richer role to play in the human experience than that defined by science or economics alone.' Could they rope in a wider group of people to explore the implications of that idea?

In December 2009, the idea had turned into a one-day event in Oxford's School of Geography and the Environment, which was attended by 44 participants. The majority were, like the original founders, ornithologists or bird-inspired artists. Before the day ended, there was a unanimous wish to do it again the following year, and by 2011 it had become an organisation with a name and a logo (designed by artist and early collaborator Carry Ackroyd). New Networks has always run on the voluntary efforts of its small team, but the BTO's Chief Executive, Andy Clements, readily saw a case for

assigning some BTO staff time – in the shape of Mike Toms – to provide organising capacity and technical support.

Over the following years, New Networks expanded into its now-familiar three-day format, grew its audience to over 150, extended its themes to include all wildlife and to tackling conservation issues with a sharper political edge to them. The most marked expansion, though, has been in the range of ways its contributors engage with the natural world and then share

Cheryl-Samantha Owen



22. Sir David Attenborough was an inspirational Keynote Speaker at New Networks for Nature 2016.

their love for it. This is helped by – in 2019 especially – good gender balance and improving general diversity. There is now no awkwardness in programmes that might have a poetry reading immediately after a presentation of cutting-edge science, to be followed in turn by a panel discussion on children's literature or a real-time bulletin from the Extinction Rebellion front line. For three days, the boundaries between disciplines are abolished by tacit consensus.

But a comfortable retreat from the heat and thrust of fiery debate it is not. Many regulars point to a session titled 'The Value of Nature' in 2015 as an all-time highlight, in which Tony Juniper and George Monbiot matched each other's arguments and passion in a heavyweight bout that was eventually declared a draw after 12 rounds.

The event has been going long enough for a few traditions to have emerged. The speakers and performers who open and close the events are often drawn from celebrity ranks, and have included venerable figures like Ronald Blythe and Richard Mabey, high-profile naturalists/conservationists such as Adam Nicolson, Chris Packham and Tim Smit, and entertainment-industry stars with a passion for nature such as Germaine Greer and, most recently, Feargal Sharkey. Memorably in 2016, Sir David Attenborough's passionate and moving address was a highlight for all.

There are as many reasons to take part, whether from the stage or in the audience, as there are attendees. Jeremy Mynott again: 'We need to defend and celebrate nature as a crucial part of our identity and cultural heritage. We continue to affirm that nature is at the

heart of human flourishing and that the distinctive blend of art and science we have encouraged is the best and perhaps only way to appreciate its full richness and complexity.' Well said, and if re-expressed from my own professional perspective, then understanding the cultural underpinning of our relationship with the rest of nature is the only way to overcome the cultural blockages standing in the way of our planet's survival. Our conventional conservation model, built around technocratic components of law, policy, science and management practice, contains ingredients that are necessary for success but have proved insufficient in themselves. New Networks is part of the search for cultural renaissance – a complex new ecology, an internet of all living things, in which humanity and the rest of nature are restored to a mutually beneficial coexistence.

For more information on New Networks for Nature, including previous and forthcoming events and details of past presenters, see our website: newnetworksfornature.org.uk You can also sign up there for our newsletter and to receive details of events. Find us on Twitter [@networks4nature](https://twitter.com/networks4nature)

Laurence Rose

Laurence Rose has been birding for over 50 years, has worked for the RSPB since 1983, and is an author, composer and artistic collaborator. [@LaurenceR_write](https://twitter.com/LaurenceR_write)



23. ATM Street Art at New Networks for Nature 2019.

Robert Fuller

News and comment

Compiled by Adrian Pitches

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

Scottish grouse moor management report published

RSPB Scotland has given a cautious welcome to the publication of a long-awaited report by the Scottish Government's Independent Grouse Moor Review Group, chaired by Prof. Alan Werritty.

It was commissioned by the Scottish Cabinet Secretary for the Environment, Roseanna Cunningham MSP, in May 2017, following the publication of a Government-commissioned report examining the fates of satellite-tagged Golden Eagles *Aquila chrysaetos*. This report showed that of 131 birds tracked during 2004–16, 41 had disappeared in 'suspicious circumstances', primarily on land managed as driven grouse moors. This was the latest in a succession of scientific reports that have conclusively demonstrated the harm that grouse-moor management is causing to various raptors and to Mountain Hare *Lepus timidus* populations. Scientific reports have also confirmed the damage caused by muirburn (burning of heather on open moor) to Scotland's peat soils – which act as vital carbon storage, critical for combating climate change. The key recommendation of the 'Werritty Report' <https://bit.ly/2FBh6zE> is that there should be a licensing

scheme for grouse shooting in Scotland but only after a five-year moratorium.

RSPB Scotland said: 'We support the recommendations relating to regulation of muirburn and better safeguards for Mountain Hare populations [but] regret that the review group has not been bold enough to recommend the immediate licensing of driven grouse moors.'

'Previously Scottish Government Ministers have publicly stated that driven-grouse-moor owners are "in the last chance saloon" and we now expect these commitments to be honoured.'

'Given the overwhelming evidence of serious organised crimes perpetrated against our birds of prey, as well as the harm caused to upland habitats and species by grouse-moor management practices, we will be asking the Cabinet Secretary to consider the "wider societal views" mentioned by Professor Werritty and make the necessary "step change" to grouse-moor licensing, conditional on legal and sustainable practices, and to ensure that this is done as soon as possible. A licensing framework would, in our view, set a new direction for the legal and



Jules Cox/FLPA

24. Mountain Hare *Lepus timidus*, Cairngorm, Scotland, February 2013.

sustainable management for large areas of our upland landscapes, as well as providing a meaningful deterrent to wildlife crime.'

Duncan Orr-Ewing, Head of Species and Land Management at RSPB Scotland, added: 'It is very important to remember that the background to this review was the overwhelming evidence base of the link between serious organised wildlife crime and grouse-moor management; the ever-intensifying

management of this land to produce excessive grouse bags leading to the killing of protected wildlife; as well as public concerns about huge culls of Mountain Hares; and burning of heather on deep peatland soils. Addressing these issues is now even more essential to combat both the climate emergency and the nature crisis, which were confirmed as priorities by First Minister Nicola Sturgeon earlier this year.'

First successful breeding of Slimbridge Spoon-billed Sandpipers

The Wildfowl and Wetland Trust's experimental captive-breeding programme for the Critically Endangered Spoon-billed Sandpiper *Calidris pygmaea* has finally produced viable young birds – two chicks were fledged at WWT Slimbridge, in Gloucestershire, in late 2019.

The only captive flock in the world was established in 2011 as the wild population plummeted to an estimated 200 breeding pairs in the Russian Far East. After eight years of trying to coax the 'Spoonies' to breed, the WWT team finally achieved success by manipulating the artificial light levels in the birds' aviary to recreate the changes that the waders would experience along their migration route to and from their wintering grounds in southeast Asia.

WWT announced the news at the end of December, although it's not clear when the birds hatched and fledged. WWT Conservation Breeding Manager Nigel Jarrett said: 'Playing Cupid has finally paid off... [and] we're delighted to have hatched two chicks. They have now acquired their juvenile plumage and continue to thrive. This is a huge breakthrough.'

The Spoon-billed Sandpiper conservation programme has been a multinational collaboration between WWT, Birds Russia, BirdLife, the RSPB and Moscow Zoo. Eggs taken from nests in Chukotka in 2011 and 2012 were flown in incubators to the UK, where they hatched and a captive flock of 'Spoonies' was built up of around 30 birds. Previous breeding attempts have seen just five eggs hatch at Slimbridge prior to 2019 and all of those chicks died. So the survival of the 2019 birds is a major step forward.

Nigel Jarrett added: 'In the wild they migrate from tropical Asia to Arctic Russia to breed, experiencing huge differences in temperature, habitats and daylight along their 8,000-km route. Each of those factors could play a part in getting the birds' hormones surging, so we've done our best to recreate that experience in aviaries in Gloucestershire. I'm glad to say that, with the help of special light bulbs and timer switches, along with a lot of sand and netting, we seem to have finally pulled it off'

Establishing the Slimbridge captive breeding programme was just one part of the conservation strategy for the Spoon-billed Sandpiper. Monitoring the birds along their migration route and identifying factors that had contributed to their precipitous decline was also crucial. The large-scale reclamation of mudflats around the Yellow Sea used by several East Asian wader species as vital refuelling stops, particularly in South Korea and China, has severely affected Spoon-billed Sandpipers. Hunting pressure in Myanmar and Bangladesh was another, previously unknown, threat.

Back in Russia, hands-on conservation work every summer is also yielding results. WWT teams have been 'headstarting' young Spoonies – taking the first clutches of eggs from wild birds' nests to hatch and rear the young in the safety of aviaries protected from any potential predators before releasing them. This technique has boosted the number of young birds that successfully fledge each year in the wild by 25%. Many of these headstarted birds, marked with coloured leg flags, have now been logged on the wintering grounds in Thailand, Myanmar and Bangladesh.

Marine heatwave kills one million Guillemots in the North Pacific

Globally, seabird numbers have halved since the 1970s, for a multitude of causes. Between the summer of 2015 and spring of 2016, Common Guillemots *Uria aalge* in the North Pacific suffered unprecedented mortality. Surveys recorded a total of 62,000 corpses on the shores between southern California and the Gulf of Alaska, most of which had died of starvation. Given that not all birds that die at sea are found, the total mortality was estimated to be in the order of one million birds. Subsequent monitoring revealed that breeding populations in the area suffered a 10–20% decrease in numbers. In addition, during the breeding seasons of 2015, 2016 and 2017, complete breeding failure was reported at 22 regularly monitored colonies in Alaska.

The cause of this environmental disaster was a marine heatwave of greater magnitude and duration than ever previously recorded (since 1870). The 1–2°C increase in sea

surface temperatures caused a massive disruption of the marine ecosystem, which included the loss of the fish on which Common Guillemots normally feed. (See Piatt, J. F., *et al.* 2020. Extreme mortality and reproductive failure of Common Murres resulting from the northeast Pacific marine heatwave of 2014–2016. *PLoS ONE* 15(1): e0226087. <https://doi.org/10.1371/journal.pone.0226087>)

‘Wrecks’ or die-offs in which alcids die of starvation are infrequent but far from unknown, and are usually caused by prolonged stormy conditions. The most recent wreck in the UK occurred in 2015, when around 30,000 Puffins *Fratercula arctica* and 16,000 Guillemots died. Since the frequency of extreme climatic events (such as storms and marine heatwaves) are increasing, the prospects for seabirds continue to be a major cause for concern and illustrate the necessity of continued, careful monitoring.

Mice filmed attacking adult albatrosses on Gough Island

The shocking revelation that albatross chicks are being eaten alive in their nests by ‘super-sized’ House Mice *Mus musculus* on Gough Island, in the South Atlantic, was the spur for an ambitious eradication programme that gets under way later this year. But new video evidence shows that *adult* albatrosses roosting on the island overnight are also being attacked. Direct attacks on the adults, which can produce dozens of chicks in their lifetime, could be devastating for the population dynamics of this long-lived species.

Seabird researchers have estimated that the mice are responsible for there being over two million fewer seabird chicks and eggs on Gough Island each year. The mice were accidentally introduced by sailors in the 1800s. A century later the mice had learnt to exploit a new food source, preying on the eggs and chicks of as many as 19 different seabird species. The mice can attack chicks up to 300 times their own weight.

Gough Island, a UK Overseas Territory and World Heritage Site, is one of the most important seabird colonies in the world,

supporting more than ten million birds and 99% of the world’s Critically Endangered Tristan Albatross *Diomedea dabbenena* and Atlantic Petrel *Pterodroma incerta* populations – two species especially vulnerable to mouse predation because their chicks are left alone in winter. Tristan Albatross was given full species status only in 1998 – and now just 2,000 pairs remain.

Video cameras placed alongside nests have revealed what happens. The mice, in groups of up to nine, attack the birds and in the case of chicks can eat them alive. Albatrosses mate for life, producing just one egg every other year. The loss of adult albatrosses will accelerate declines caused by the deaths of birds on the hooks of long-line fishing fleets.

The RSPB, Tristan da Cunha Government and other international partners have developed The Gough Island Restoration Programme. It will cost £9m to eradicate mice from Gough Island in 2020. A further £3m is still needed to fully fund the project. www.goughisland.com



Kit Day

25. Glossy Ibis *Plegadis falcinellus*, Minsmere RSPB, Suffolk, February 2018.

The changing status of the Glossy Ibis in Britain

Go back two or three decades and Glossy Ibis *Plegadis falcinellus* was an exceptional rarity in Britain. A trip to see one or other of the famous long-stayers in the Stour Valley in Kent was a pilgrimage that many *BB* readers will have made in the 1970s and 80s.

Since the mid 2000s, though, the number of Glossy Ibises recorded in Britain has increased dramatically, mirroring the increase in the species' breeding population

in southwest Europe, especially in Doñana (south Spain). As yet, however, there have been only two nesting attempts in Britain, although more regular breeding seems likely in the years ahead. A recent paper on the bird's status in Britain, which has used statistics from BBRC and the Scarce Migrants reports published annually in *BB*, will be of interest to many readers and is available online at <http://bit.ly/2sgSkle>

Hundreds of Gyr Falcons released into the Scottish countryside

Mark Avery has highlighted a hitherto unpublicised commercial practice licensed by Scottish Natural Heritage – the 'wild hacking' of hundreds of Gyr Falcons *Falco rusticolus* and a variety of hybrid large falcons in the Morayshire countryside.

Falconers release the captive-bred birds into the wild to improve their fitness and hunting skills before they're recaptured and sold to Middle East buyers.

When Mark Avery queried the reports he'd received in 2018 of the concentrated release of so many alien predators to prey on native wildlife – and compete with native, wild, raptors – SNH told him: 'The practice of

releasing large numbers of birds with the intention of gathering them after a period of days or weeks, sometimes referred to as wild hacking, will require a licence if it involves non-native birds. There have been no licences applied for, issued or refused for wild hacking since the Wildlife and Natural Environment (Scotland) Act came into force in 2011.'

However, in summer 2019, SNH issued a licence under the Act for 'no more than 150 Gyr Falcons to be released between 1st June and 15th September, with no more than 40 to be released at any given time.' A condition of the licence was that all birds had to be fitted with GPS devices and radio transmitters, and

that SNH should be notified immediately if any birds moved more than 2 km from the release location for longer than 12–36 hours.

As well as pure Gyrs, falcons previously released in Moray include hybrids between Gyr and Saker Falcon *F. cherrug* and between Gyr and Peregrine Falcon *F. peregrinus*. The hacking

period for each young falcon is three weeks.

Up to 40 large, non-native falcons released in a limited area at any one time must have a significant impact on local wildlife. But it's unclear how rigorous the environmental impact assessment has been. Local people have now called for an urgent meeting with SNH.

Short-eared Owl tracked from Scotland to Morocco

A female Short-eared Owl *Asio flammeus*, fitted with a satellite tag while nesting in Scotland, has been tracked to Morocco – the first time this journey has been recorded for an adult bird. Researchers from BTO Scotland have been working to improve our understanding of this relatively poorly known species and the aim is to track 20 individuals from sites across their UK breeding range. This bird, which headed south into Africa, has provided the most intriguing result so far.

The bird, an adult female, was tagged at the nest site on Arran on 11th June 2019 and is wintering near Oualidia in Morocco. The bird left Arran to visit Bute and Kintyre in mid July, returning to Arran for ten days and then moving to mainland Ayrshire on 27th July, where it remained until the end of October. The bird was logged in Devon on

8th November, and left the UK the following evening. With the help of a strong tailwind, she travelled 495 km into France in just six hours. She then continued south, crossing the Pyrenees on 13th November; and then the Strait of Gibraltar on 24th November. BTO's John Calladine, who is leading the project, commented: 'This is only the second UK Short-eared Owl to be reported from Morocco, and what makes this record all the more amazing is that it involves a breeding female. The previous record was of a young bird, which may have been dispersing from its natal area to settle somewhere else.' BTO has tracked nine Short-eared Owls in Scotland since 2017 and plans to track at least ten more birds in the next two years but more funding is needed to enable the project to continue. See http://bit.ly/BTO_shorties

New county recorders

Highland John Poyner, e-mail highlandrecorder@yahoo.com

Avon Rupert J. Higgins, e-mail avonbirdrecorder@outlook.com

BBRC new member 2020

As in most years, BBRC will be looking for a new member this summer, to replace our longest-serving member (this year it's Nic Hallam). The formal request for candidates will go out in late spring, but if anyone is interested in serving on BBRC, or knows someone who they think would be suitable, and would like more information, please do get in touch with me at the e-mail address below. The Committee traditionally makes a nomination for the vacancy for the simple reason that it is important to have someone to fill the vacancy and who we know is capable of doing the job. However, we recognise that this may deter some potential candidates from

putting themselves forward. Hopefully, this early call may flush out a few more names and give county records committees food for thought on whether they have members who might be suitable. In the event that there is more than one candidate, there will be an election, as per our constitution, so anyone interested should be prepared for that possibility. All enquiries will be treated in confidence.

Paul French chair@bbrc.org.uk



BBRC
British Birds Rareities Committee



Population estimates of birds in Great Britain and the United Kingdom

Ian Woodward, Nicholas Aebischer, Daisy Burnell,
Mark Eaton, Teresa Frost, Colette Hall,
David Stroud and David Noble



Dan Powell

Northern Lapwing *Vanellus vanellus*

Abstract Population estimates of birds have many applications in conservation and ecological research, as well as being of significant public interest. This is the fourth report by the Avian Population Estimates Panel, following those in 1997, 2006 and 2013, presenting population estimates of birds in Great Britain and the United Kingdom. Overall, there are thought to be about 84 million breeding pairs of birds in the UK, similar to the total in APEP 3. The Wren *Troglodytes troglodytes* continues to be the most common species, with a current estimate of 11 million pairs, which has increased since APEP 3. There are more than one million pairs of 20 species (23 in APEP 3) and these 20 species contribute 77% of the total (58% of the total is accounted for by the ten commonest species alone). Population estimates originate from a wide variety of sources, many involving extrapolation of previous estimates by recognised trend measures. Despite the often exceptionally detailed information available on bird numbers, there remain many gaps in our knowledge. Recommendations are made to improve our understanding of bird numbers nationally.

Introduction

Knowing the absolute number of birds in a population is important to those who make decisions about conservation policy and engage in site conservation management, but is also of public interest. However, it can be difficult to produce robust estimates of bird population size. First, numbers fluctuate from year to year and even from month to month as individuals breed, die and migrate (Newton 1998). Second, for all but the scarcest species, it is usually impossible to carry out a full census (i.e. count every individual), and hence population estimates are based on surveys that provide information for a sample of sites and use statistical techniques and assumptions about behaviour, detectability and representativeness in order to turn counts into population estimates. This raises inevitable uncertainties about the accuracy of population estimates (Hewson *et al.* 2018).

Although trends over time are particularly valuable for assessing the status of species and biodiversity for many conservation purposes, knowledge of the absolute size of an animal population is also needed to fully understand threats to that species, to evaluate the risk of extinction and to make decisions about how to protect it. One of the most

important uses of national and international population estimates in conservation is to enable sites to be designated and hence protected on the basis that they support an important part of a species' population, usually 1% of the international or national population (Ramsar Convention 2012; Drewitt *et al.* 2015; IUCN 2016). Absolute population estimates are also important in assessing extinction risk: species with a small population are more likely to be at risk of extinction, particularly if a large proportion of that population is found at a small number of sites.

Population size estimates are therefore a key conservation tool alongside population trends and other information. The European Union (EU) Directive on the conservation of wild birds (2009/147/EC) requires Member States to report on the status of native bird species every six years. This report under Article 12 includes an assessment of species population status (population sizes and distributions, and changes in these parameters over time). EU reporting under Article 12 was added to information collated in parallel from non-EU countries in order to update the European Birds of Conservation Concern (Staneva & Burfield 2017), which followed



David Tipling

26. The UK's breeding population of Turtle Doves *Streptopelia turtur* is declining rapidly. The first APEP report (in 1997) put the population at 75,000 pairs, which compares with the current estimate of just 3,600 pairs in 2016 (and even that may now be too high); UK, April 2009.



Mark Lewis

27. Arctic Skua *Stercorarius parasiticus*, Sanday, Orkney, May 2017. The population estimate for Arctic Skua, and seven other seabirds, has been extrapolated from trends since the last complete national survey, *Seabird 2000*, which ran from 1998 to 2002. The current national census, *Seabirds Count*, is expected to be complete in 2020 and new counts for all species should be available soon.

on from previous Birds in Europe publications (e.g. BirdLife International 2004).

The Avian Population Estimates Panel (APEP) is a collaboration between the UK statutory conservation agencies and relevant non-governmental organisations. The role of APEP is to collate the best estimates of breeding and non-breeding bird population size and present a consensus view on the most appropriate estimates for relevant conservation applications, such as defining thresholds for statutory site designations. The APEP process was endorsed in 2002 by the Joint Nature Conservation Committee (JNCC), which acknowledged the value to the conservation agencies of a single, quality-assured source of population estimates for statutory conservation purposes (Stroud *et al.* 2002). Three previous APEP assessments have been published in *British Birds: APEP 1* (Stone *et al.* 1997), *APEP 2* (Baker *et al.* 2006) and *APEP 3* (Musgrove *et al.* 2013).

This report (*APEP 4*) presents the most recent estimates for both Great Britain (GB) and the United Kingdom (UK). Most of these estimates were submitted, together with other data and information, as part of the UK's Article 12 report to the EU in September 2019 (JNCC 2019).

Methods

Taxonomic scope: species, subspecies and biogeographic populations

All species in Categories A and C of the British List (BOU 2017) were considered for inclusion in the main species table (table 1); other non-native species were not listed in previous APEP reports but, for completeness, all non-natives for which breeding has been confirmed since 2011 are listed here in table 3. Population estimates were sought mainly at species level, but for 18 species it was possible to give estimates for some subspecies or geographical populations (table 2). This is of particular significance where the subspecies has a distinct legal status or is endemic. It was not possible to give estimates for three currently recognised endemic subspecies owing to a lack of knowledge about their distribution: Meadow Pipit *Anthus pratensis whistleri*, Linnet *Linaria cannabina autochthona* and Yellowhammer *Emberiza citrinella caliginosa* (Parkin & Knox 2010).

In addition, for some waterbirds it is well-established practice to base conservation policy on separately delineated biogeographic populations; we follow the treatment used by Frost *et al.* (2019b) in this regard.

Population estimates are presented for 249



28. Breeding Eurasian Spoonbills *Platalea leucorodia* (with juvenile Grey Herons *Ardea cinerea* to the left), Holkham, Norfolk, May 2011. The Spoonbill is one of several wetland bird species presently colonising the UK.

species during the breeding season, 113 species during winter and for one species during passage. The estimates for 18 species are broken down into subspecies for either the breeding season or winter (or both), and are presented for a total of 29 breeding and 12 wintering subspecies.

Seasonal scope: breeding, wintering and passage populations

Most estimates are for the breeding season. Breeding estimates are presented for all species included in *APEP 3* and for additional species (including non-natives) with at least one case of proven breeding from 2011 onwards.

The precise definition of the non-breeding season varies according to species and estimation technique (as set out in this paper and in sources referenced). In general, non-breeding estimates have been omitted for largely resident species, except for waterbirds where statutory site protection and reporting is based around non-breeding estimates; this repeats the approach used for *APEP 3*. Apart from waterbirds, winter estimates have been produced only for the small number of wintering species included in *APEP 3*. For some other species (such as Common Chaffinch *Fringilla coelebs* and Blackbird *Turdus merula*), estimates of non-breeding numbers

have again not been attempted owing to lack of suitable data sources, even though it is known that resident populations are supplemented in winter by large-scale arrivals.

Estimates of passage numbers have been excluded, with the exception of the globally threatened Aquatic Warbler *Acrocephalus paludicola*.

Geographic scope

As far as possible, separate estimates have been produced for the geographical entities of Great Britain and the UK (although the two estimates are sometimes identical following rounding; see below). All estimates exclude the Channel Islands. The Isle of Man (IoM) is not part of GB nor the UK but given the available data sources and methods, its exclusion from most estimates is generally not straightforward, and thus most estimates are actually those for GB+IoM and UK+IoM. For most species this makes little difference but in cases where the IoM contributes a significant and calculable proportion of the GB or UK total, separate IoM estimates are presented (and in those cases, strict GB and UK estimates are also given): IoM estimates are given in table 4 for Ringed Plover *Charadrius hiaticula*, Herring Gull *Larus argentatus*, Little Tern *Sternula albifrons*, Hen Harrier

Circus cyaneus, Peregrine Falcon *Falco peregrinus* and Red-billed Chough *Pyrrhocorax pyrrhocorax*.

For many conservation purposes, an estimate for the UK – i.e. GB plus Northern Ireland (NI) – is required. However, for Special Protection Area (SPA) and Sites of Special Scientific Interest (SSSI) selection, the geographical framework is either GB or All-Ireland (in the case of site Areas of Special Scientific Interest selection in Northern Ireland). If separate estimates for GB and the UK were available from the original source, these are presented. However, many original estimates, in particular those in *Breeding Atlas 1988–91* (Gibbons *et al.* 1993), were for GB or for All-Ireland. In some cases, such as many wintering waterbirds, estimates from NI were also available, and were added to the GB estimate to produce a UK estimate. Where the original source estimate was a UK figure, such as in the Rare Breeding Birds Panel report (RBBP; Holling *et al.* 2019), a NI estimate has been subtracted to produce the GB estimate. If NI-specific estimates were not available, then the UK estimates have been derived from extrapolated GB estimates using Atlas data, as described below.

Offshore wintering populations

Frost *et al.* (2019b) incorporated aerial and boat-based survey data from British waters into the wintering estimates for some marine

species. British marine waters extend up to 200 nautical miles (370.4 km) or to an international boundary, if closer. In practice, there have been relatively few such surveys and many are commercial surveys from which data are not in the public domain. Consequently, most estimates exclude offshore areas out of sight of land. For 17 species that were suspected or known to have significant offshore distributions, the figures presented are marked as known underestimates in table 1 and include mostly birds in the near-shore environment only. Limited offshore data were included in previous estimates for Common Scoter *Melanitta nigra* and Red-throated Diver *Gavia stellata*, but more aerial survey data have become available subsequently for these species (Frost *et al.* 2019b). Although some of these data were used, the totals are still considered an underestimate for British waters.

Timescale and extrapolation

For each combination of species, geographical area and season, the Panel sought the most recent published estimate, along with its confidence limits (if any), units, date (or date range), method of derivation and reference. The aim has been to collate the most recently published estimates. Typically, these relate approximately to the period 2013–17 (for breeding estimates) or 2012/13–2016/17 (for winter). However, as in previous APEP



Richard Chandler

29. The Wren *Troglodytes troglodytes* remains the species with the highest population estimate in the UK, with a new estimate of 11 million pairs; Norfolk, May 2015.



30. Oystercatchers *Haematopus ostralegus* piping at their territorial boundary (left two birds are one pair; the right two birds are the other pair; far left and far right are males, centre birds both females); Snettisham, Norfolk, March 2012. The Oystercatcher and Northern Lapwing *Vanellus vanellus* are two declining species of breeding wader for which population estimates have dropped below 100,000 pairs for the first time in this report.

reports, many of the breeding estimates are based on extrapolation of previously published estimates using breeding trend data. In these cases, breeding-season estimates have generally been extrapolated from given baselines to 2016 (as described below). In addition, for older estimates (from 2012 or earlier) the possibility of extrapolating estimates forward in time was investigated. In some cases, more than one estimate was available for a given species/region/season combination; as in previous APEP reports, the Panel discussed the reasons behind such discrepancies and came to a collective view on the most appropriate estimate.

The methodology for extrapolating from estimates from 2012 or earlier was described in detail in APEP 3 and is not repeated fully here. For most species for which this method of extrapolation was used, the UK estimate was derived from a GB estimate using data from *Bird Atlas 2007–11* (Balmer *et al.* 2013) in the same way as in APEP 3. The extrapolation used was a combination of two factors. First, the ratio of numbers of 10-km squares with possible, probable or confirmed breeding evidence in GB and UK was calculated. Second, a measure of average density in both GB and Ireland was derived by comparing results of *Bird Atlas 2007–11* timed tetrad visits (first hour only, and adjusted to account for differing levels of coverage in different areas).

For a small number of species for which the UK estimate was derived from the GB estimate in APEP 3, a more recent NI estimate was available for APEP 4, either from a species survey in NI or from the Irish Rare Breeding Birds Panel (IRBBP) reports covering 2012–16 (Perry 2013; Perry & Newton 2014; Newton 2015, 2016). For these species, the GB estimate is based on extrapolation from *Breeding Atlas 1988–91* (as before), and the NI estimate has been added to produce a UK figure. In the case of Northern Lapwing *Vanellus vanellus*, Eurasian Curlew *Numenius arquata* and Common Snipe *Gallinago gallinago*, the UK estimates in table 1 include figures from the breeding wader survey in 2013 (Colhoun *et al.* 2015). For other breeding species for which a NI estimate was available, the NI population was negligible. The source for each NI estimate (usually IRBBP) is listed in the table wherever it has been used to produce raw (unrounded) UK estimates, even if the rounded GB and UK estimates remain the same.

As in APEP 3, extrapolations use unrounded estimates whenever they are available in order to avoid the risk of unnecessary multiple rounding (i.e. taking a rounded estimate, extrapolating by a rounded trend, and then rounding the final answer again). In addition, all estimates presented here have been recalculated from original source estimates, rather than extrapolating from 2009

estimates presented in *APEP 3*. This is to avoid introducing potential errors from subsequent changes to the 2009 smoothed trend, caused by inclusion of additional BBS data that were not available when the *APEP 3* estimates were calculated.

Data sources and derivation methods

For most species, the data sources and derivation methods are the same as those used in *APEP 3*; see Musgrove *et al.* (2013). In a small number of cases they have changed, usually because data from a new single-species survey or new analyses of existing data have become available.

Summary details of each data source and derivation method are provided below to enable interpretation of the estimates presented in the tables and to highlight minor differences from the previous methods where appropriate. The numbers for each section are the same as those used to reference the derivation method in the tables.

1. Common breeding species: extrapolation from *Breeding Atlas 1988–91*

For many common species, the original GB estimates from 1988–91 have been extrapolated forward using exactly the same methodology as described above, and using the same trend measures. The extrapolation uses the most appropriate trend information available, usually a joint Common Birds Census (CBC)/Breeding Bird Survey (BBS) trend (Woodward *et al.* 2018) for estimates made prior to 1995, or a smoothed BBS-only trend (Harris *et al.* 2019) for estimates made since 1995 (BBS started in 1994). For a few species favouring waterways, the extrapolation uses a smoothed UK joint trend calculated from the Waterways Bird Survey (WBS, running from 1974 to 2007; Woodward *et al.* 2018) combined with the Waterways Breeding Bird Survey (WBBS, from 1998 onwards; Harris *et al.* 2019). Although *Bird Atlas 2007–11* has been published since *APEP 3*, new population estimates were not produced for that work and the 1988–91 estimates remain the most recent GB original source reference for many species. As UK estimates are derived from the extrapolated 2016 GB figure, the adjustments make use of the more concurrent *Bird Atlas*

2007–11 timed count data, which present a robust measure of relative abundance between GB and NI.

As previously, there are a small number of species for which a robust CBC/BBS (or equivalent WBS/WBBS) trend could not be calculated. Extrapolated estimates for these species use the BBS trend from 1995 and hence make the assumption that there was no population change between 1988–91 and 1995. An exception is Red Grouse *Lagopus lagopus*, for which the estimate from *Breeding Atlas 1988–91* was extrapolated to 1995 by means of the Game & Wildlife Conservation Trust's National Gamebag Census trend (Aebischer 2019), recalibrated to density as per *APEP 2*, and then from 1995 to 2016 by the BBS trend. For one species, Rock Pipit *Anthus petrosus*, the estimate given in *Breeding Atlas 1988–91* has again been repeated as no suitable trend was identified to extrapolate it to 2016.

2. Distance-sampled BBS density-based estimates

For 24 common species, the population estimates in *APEP 3* were extrapolated from those produced by Newson *et al.* (2008), which used 2006 data from distance bands in BBS to infer the proportion of birds undetected by observers, and hence estimate how many birds were present in total. The method is computationally intensive so has not been repeated subsequently; and the estimates for 2006 have been extrapolated to 2016 using the BBS smoothed trend. As discussed fully in *APEP 3*, BBS density-based estimates work better for some species than others, depending on (for example) the relative detectability of males and females and the number of non-breeding birds present. The Panel carefully considered estimates from Newson *et al.* (2008) for *APEP 3* on a case-by-case basis, and used only those where there was clear evidence that the distance-based estimate was likely to be more accurate. This report uses this method for the same 24 species as *APEP 3*.

3. Rare breeding birds

The annual RBBP report publishes a population estimate for many scarce breeders to help monitor breeding trends, based on the mean

maximum reported population size over the most recent period for which data are available. For most species, the population estimates given here are the five-year means from the 2017 RBBP report (Holling *et al.* 2019), covering the period 2013–17; these are adjusted to exclude breeding records from the Channel Islands and IoM and also exclude mixed pairs. A five-year mean is preferred to data for a single year as it accounts for variation in reporting and detection. The population estimates presented here are thus equivalent to the maximum (higher) figure where a range was reported for rare breeding birds in APEP 3 (minimum and maximum five-year mean estimates). Five-year means for non-native breeders have been calculated for the most recent five-year period for which data were available (2010–14). Where the mean maximum figure would round down to zero pairs, a range of 0–1 pairs is given.

For five species (Eurasian Spoonbill *Platalea leucorodia*, Eurasian Bittern *Botaurus stellaris*, Cattle Egret *Bubulcus ibis*, Great White Egret *Ardea alba* and White-tailed Eagle *Haliaeetus albicilla*), it was considered that recent increases seem likely to be sustained, and consequently that data from the

most recent year is a more realistic assessment of the population than a five-year mean. Similarly, for the non-native Lady Amherst's Pheasant *Chrysolophus amherstiae*, the most recent information (Holling *et al.* 2018) suggests that this species is now extinct as a UK breeding species.

In isolated cases, older data are considered more reliable than the most recent figures. The APEP 3 estimate for Common Goldeneye *Bucephala clangula*, covering the period 2006–10, is repeated here as there has been a reduction in monitoring intensity since 2011.

The estimates for Gadwall *Mareca strepera* and Red Kite *Milvus milvus* were based on RBBP data in APEP 3 but both have since been dropped as RBBP species as they have become more abundant. The GB estimates in APEP 3 for these species have been updated by extrapolation using BBS trends as described above. Both species are still covered by the IRBBP, and the NI mean total for the most recent five-year period was added to GB estimates to produce UK totals. Cetti's Warbler *Cettia cetti* was dropped from the RBBP list after 2016 and hence the 2016 RBBP estimate is used.



31. The Black Grouse *Lyrurus tetrix* is an example of a species for which a bespoke estimate was produced specifically for APEP 4; UK, April 2014.



Richard Chandler

32. Wintering populations of wildfowl, such as these Tufted Ducks *Aythya fuligula* in Northamptonshire in December 2011, are relatively well monitored by the Wetland Bird Survey (WeBS). More broadly, the populations of many other wintering species remain poorly understood.

4. Breeding seabirds

The estimates of numbers of breeding seabirds were based on *Seabird 2000*, carried out between 1998 and 2002 (Mitchell *et al.* 2004). The next national census (*Seabirds Count 2015–2020*) is not yet complete and hence the estimates for some species are the same as in APEP 3. These include Herring and Lesser Black-backed Gulls *Larus fuscus*, which increasingly nest in urban areas and for which traditional census techniques have become difficult.

Annual monitoring of some seabird colonies takes place under the Seabird Monitoring Programme (SMP) (<https://jncc.gov.uk/our-work/seabird-monitoring-programme/>) and thus some *Seabird 2000* population estimates have been extrapolated to 2015 using SMP trends. These were calculated using the long-term Thomas trend index (Thomas 1993; JNCC 2016) from 1986–2015 (using counts from a sample of colonies monitored by SMP), anchored to the *Seabird 2000* census count. Owing to concerns about how representative the colonies monitored by SMP are, updated estimates are presented here for only those eight species for which trends are considered a robust measure for the whole population. To test the robustness of the Thomas trend, an estimation of the *Seabird 2000* population was produced using the trend index between 1986 and 2000 and anchored to the 1986 Seabird Colony Register (SCR) census population for the species. If this estimate had a variance of 30% (or more) from the actual *Seabird 2000*

population, the method was not used and the *Seabird 2000* census figure is repeated instead. All seabird estimates in table 1 are strict GB or UK estimates and exclude the IoM.

For four species, alternative estimates are used: Northern Gannet *Morus bassanus*, for which a full survey was carried out in 2013–14 (JNCC 2016); and Mediterranean Gull *Ichthyophaga melanocephalus*, Little Tern and Roseate Tern *Sterna dougallii*, for which annual data of sufficient quality are available via the RBBP.

5. Breeding estimates based on single-species surveys and bespoke analyses

As in previous APEP reports, breeding estimates have been sourced from the literature and include single-species surveys carried out under the SCARABBS programme (Statutory Conservation Agency and RSPB Annual Breeding Bird Scheme), as well as other dedicated surveys. Where possible, older published estimates have been extrapolated to 2016 as described above. For species where no suitable trend was available for extrapolation, the estimate relates to an earlier date, which is stated in the tables. For Grey Heron *Ardea cinerea*, estimates of the breeding population are derived annually from the BTO's long-running Heronries Census.

For five resident wildfowl species – Greylag Goose *Anser anser*, Canada Goose *Branta canadensis*, naturalised Barnacle Goose *B. leucopsis*, Egyptian Goose *Alopochen aegyptiaca* and Mandarin Duck *Aix galericulata*



33. The Red Kite *Milvus milvus* is an example of a former RBBP (Rare Breeding Birds Panel) species that is now too numerous to be covered by RBBP but which can now be monitored by BBS (Breeding Bird Survey), which has enabled the last RBBP population estimate to be updated; UK, June 2011.

– breeding population estimates were derived in the same way as for APEP 3, by dividing the most recent winter estimate by a standard value of three (Meininger *et al.* 1995).

For a small number of other species, novel analyses or compilations were undertaken for APEP 4; these are described in the footnotes in table 1. Since more recent data were not available for Tawny *Strix aluco*, Long-eared *Asio otus* and Short-eared Owls *A. flammeus*, the APEP 3 estimates have been repeated for these species. The GB breeding estimate for Common Eider *Somateria mollissima* has been updated using the same method used for APEP 3; and new bespoke estimates for two further species, Black Grouse *Lyrurus tetrix* and Barn Owl *Tyto alba*, are described in table footnotes.

6. Wintering populations of waterbirds

Estimates of wintering waterbirds in GB were taken from Frost *et al.* (2019b). These were based on a variety of data sources, including the Wetland Bird Survey (WeBS), Goose & Swan Monitoring Programme (GSMP), Non-estuarine Coastal Waterbird Survey (NEWS), Winter Gull Roost Survey (WinGS), county

bird reports, and for Mandarin Duck a novel analysis based on *Bird Atlas 2007–11* data. For full details see Frost *et al.* (2019b). Note that estimation methods have changed for many species and thus not all estimates are directly comparable with APEP 3. Most of these estimates relate to the period 2012/13 to 2016/17 (for estimates derived from WeBS or NEWS) or to 2011/12 to 2014/15 (for estimates derived from county reports).

UK estimates were produced by summing GB and NI estimates, the latter mostly from Burke *et al.* (2018) and generally relating to the period 2011/12 to 2015/16. However, estimates for several (mostly naturalised and scarcer) species were not published in Burke *et al.*, and for these species, NI estimates have been taken from other sources. Where no suitable source was found, the NI estimate is based on BirdTrack/BirdGuides/BTO survey data (see method 7). Details of the derivation are shown in the sources.

7. Wintering population estimates for scarce winter visitors based on BirdTrack/BirdGuides

Winter estimates are presented for a small

number of scarce non-breeding species that now winter annually in small numbers. The Panel developed a standardised approach to generate the *APEP 3* estimates for these species, to enable changes in status to be tracked in the future. The same method was used to produce *APEP 4* estimates. Records are extracted from the BirdTrack database, which also includes all records from the bird information service BirdGuides, and the highest count in each 10-km square was used to estimate GB and UK totals per month/year to calculate peak monthly totals each winter. For more details see Musgrove *et al.* (2013).

8. Estimates from *Winter Atlas 1981–84*

APEP 3 presented winter estimates for five species dating back to *Winter Atlas 1981–84* (Lack 1986); the same estimates for these species are included in this report given the absence of more recent assessments. These are: Fieldfare *Turdus pilaris*, Redwing *T. iliacus*, Black Redstart *Phoenicurus ochruros*, Brambling *Fringilla montifringilla* and Snow Bunting *Plectrophenax nivalis*.

9. Miscellaneous passage estimates

An estimate of passage numbers is presented only for Aquatic Warbler, which is included in view of its globally threatened status and its Birds Directive Annex I status requiring the classification of Special Protection Areas (of which there are four). The estimate is taken from Holt *et al.* (2018).

Assessing reliability of estimates

As with the two previous *APEP* reports, the Panel gave a broad reliability score to each estimate, ranging from 1 (for good) to 3 (for poor) for the date (or date range) indicated. In producing these scores, both the means of derivation of the original estimates and any methods used to extrapolate those original estimates were considered. As a general rule, estimates with a reliability score of 1 are based on direct counts with a minimum of extrapolation; those with a reliability score of 2 have been arrived at through extrapolation from reliable figures, or have a small amount of uncertainty around the estimate; and those with a reliability score of 3 were based on assumptions and opinion in place of actual fieldwork. Importantly, estimates scored as

having poor reliability are still considered the best estimates available at present and are, in most cases, priorities for future work.

The reliability scores depend heavily on the means of derivation. For example, estimates of many common breeding passerines are based on trend-based extrapolation of estimates presented in *Breeding Atlas 1988–91*, which were themselves largely based on density measures derived from 1982 CBC data. Such estimates (indicated as ‘1–CBC/BBS’ in the tables) are based on a foundation of sound data but have involved a large degree of extrapolation; consequently, most estimates derived by this method are given a reliability score of 2.

It is important to note that the reliability scores state how reliable the estimate was considered to be *for the date/period that it relates to*. In a number of cases, the estimates presented are now known to be either too high or too low *for the current population*, but suitable data sources were not available for satisfactory population updates. For example, the breeding estimate for Puffin *Fratercula arctica* has a reliability score of 1, since it is a good estimate of the population size for the period 1998–2002, when it was produced, but it is now believed to overestimate the size of the current population (Harris & Wanless 2011). In cases where an estimate is known to be too low (but where there is no basis of a more precise, larger estimate) it is marked ‘+’, whereas an estimate known to be too high is marked ‘-’.

Results and Discussion

Population estimates for species of GB and UK birds are presented in table 1. Population estimates for selected subspecies or biogeographical populations are presented in table 2. Within the breeding season, the units are mostly ‘pairs’ or ‘territories’, depending on the survey methodology used (and for most purposes the two terms can be used interchangeably), while outside the breeding season all estimates relate to individuals. For some species, population size is more meaningfully estimated in other units, as set out in table 1. Estimates are rounded to two-and-a-half significant figures (i.e. rounded to three significant figures, with the third figure rounded to either five or a zero); thus a raw

estimate of 52,651 is rounded to 52,500 and one of 52,751 is rounded to 53,000. Estimates in previous APEP papers were rounded to two significant figures. The difference between UK and GB populations is the population size in Northern Ireland; readers should note that rounding may exaggerate this in some instances and reduce it in others.

In order to document the derivation of each estimate, the section number of the Methods (1, 2, etc.) is given against each estimate. For those estimates that involved forward extrapolation, the trend-measure used is also given; for example, '1-BBS' means extrapolation from a *Breeding Atlas 1988–91* estimate using the BBS trend (see table 1 key for other trend measures).

Footnotes are provided for estimates that require further explanation beyond that provided above, in particular where estimates were judged of lower reliability. References are given to document original sources. To avoid confusion, users of population estimates are strongly encouraged to cite the original published source of an estimate, other than for those calculated specifically for this paper.

The population estimates presented here indicate that there are now thought to be about 84 million breeding pairs of birds in the UK, similar to the number estimated by APEP 3. The Wren *Troglodytes troglodytes*

continues to be the most common species and has increased slightly since APEP 3, with the current estimate of 11 million pairs making up about one in eight of our breeding birds. Out of a total of 249 breeding species, 20 species have estimates exceeding one million pairs (compared with 23 species in APEP 3) and these 20 contribute 77% of the total, with 58% provided by the ten commonest species alone. Although the total number of breeding pairs has fallen, the changes for individual species were mixed and showed slightly more increases than decreases.

The vast majority of these increases and decreases relate to genuine population changes measured by long-term monitoring schemes such as BBS for many of the commoner species, or by single-species surveys or RBBP data for scarcer species. However, some changes to estimates are the result of new species surveys or a change in the estimation method, particularly for wintering estimates (see Frost *et al.* 2019b), while some increases or decreases since APEP 3 may represent better understanding of a species' abundance rather than genuine population change. For example, our breeding estimate for the non-native Canada Goose population is based on the winter population estimate, which has decreased in GB from 190,000 to 160,000 individuals as a result of methodological



Chris Knights/BTO

34. Golden Eagles *Aquila chrysaetos*, Scotland, May 2013. The Golden Eagle is one species for which a new population estimate has been produced using a single-species survey (Hayhow *et al.* 2017), and for the first time the UK population has gone above 500 pairs.

change (Musgrove *et al.* 2011; Frost *et al.* 2019b), yet the ten-year winter population trend for Canada Goose (2006/07 to 2016/17) is +10% (Frost *et al.* 2019a).

There have been relatively few such changes since *APEP* 3 for the breeding season, with around 10% of breeding estimates being based on a change of method. In one case (Snow Bunting), the estimate of 60 pairs given here, following a national survey (Hayhow *et al.* 2018a), is coincidentally exactly the same as in *APEP* 3, but our confidence in the accuracy of the new estimate is markedly higher, since the previous figure was based on a tentative estimate published in *Birds of Scotland* (Forrester *et al.* 2007). Of the 10% of species for which a method change has occurred, around half update the previous estimates using trend data from BBS or SMP, and in most other cases the direction of change since *APEP* 3 matches independent knowledge about the species trend. Canada Goose (see above) is the only species for which we can be fairly certain that the direction of change since *APEP* 3 does not represent a genuine population change, although there is uncertainty in a handful of other cases.

There have been a larger number of method changes for the new GB wintering waterbird population estimates, but a comparison of species for which methodological changes did not occur suggests that numbers of many (but not all) geese have increased and the numbers of many (but not all) waders have decreased since *APEP* 3 (Frost *et al.* 2019b). Of the other scarcer wintering species included in *APEP* for which new estimates have been produced, the population estimates have increased for ten species and decreased for six. Passage estimates are pro-

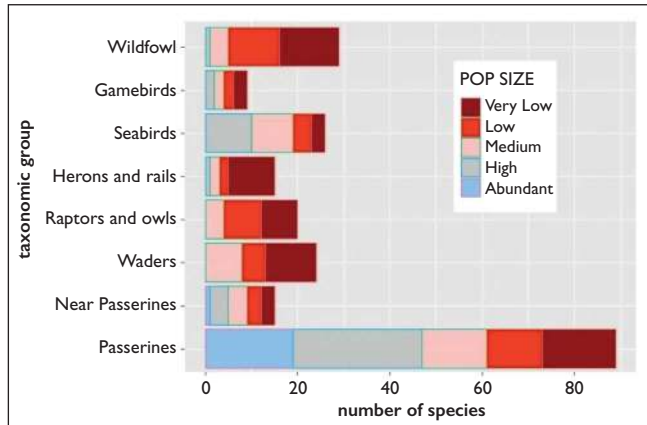


Fig. 1. Number of species in different taxonomic groups for which the breeding population estimates presented in this paper are: Very Low (<1,000 pairs), Low (1,000–9,999), Medium (10,000–99,999), High (100,000–999,999) and Abundant (1,000,000+).

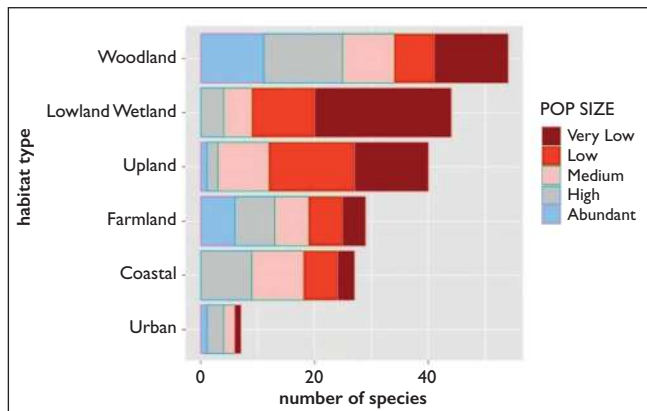


Fig. 2. Number of species using different preferred habitats for which the breeding population estimates presented in this paper are: Very Low (<1,000 pairs), Low (1,000–9,999), Medium (10,000–99,999), High (100,000–999,999) and Abundant (1,000,000+). Habitat types from Gibbons *et al.* 1993, with recent colonists (e.g. Little Egret *Egretta garzetta*) added to the most appropriate category.

duced only for the Aquatic Warbler: estimates for this species have decreased in each of the four *APEP* reports, from a high of 40 individuals in *APEP* 1 (relating to 1987–92) to three here.

Analysing the *APEP* 4 breeding population estimates by taxonomic group (fig. 1) shows that the vast majority of species with populations greater than 100,000 breeding pairs are passerines, and all but one of the 20 species with more than a million pairs are passerines (the exception being Wood Pigeon *Columba palumbus*). This partly reflects the fact that most species found in the UK are passerines,

and that this group includes many ecological 'generalists', able to make use of widespread habitats across the UK, including woodland and gardens. Also, most passerines are small-bodied and exhibit particular ecological traits such as smaller territories and higher densities (Peters 1983).

The UK's coastline is important for breeding seabirds, with populations of international importance for some species (Mitchell *et al.* 2004). The seabirds include a notable proportion of species with a breeding population estimate of greater than 100,000 pairs, with the population estimate for Common Guillemot *Uria aalge* falling just under a million pairs (950,000).

Among the other groups, it is unsurprising that the breeding population estimates for raptors and owls are all below 100,000 pairs, since these species are apex predators and occur naturally in much lower numbers than their prey species. The UK is important for many wintering waders and wildfowl, the majority of which breed farther north, meaning that UK breeding populations for this group are less significant. However, for some species the UK breeding populations are important and are also in decline: although the current breeding population estimates for all wader species are below 100,000, those for Lapwing and Oystercatcher *Haematopus ostralegus* were both above this threshold in APEP 3, as was that for Curlew in APEP 2.

The breeding population sizes can also be compared across species habitat preferences (fig. 2). For this, we used the habitat-preference categories in Gibbons *et al.* (1993), excluding species not classified there but adding recent colonists to the most appropriate category if they show an obvious habitat preference. Note that each species is assigned to the preferred habitat rather than to all habitats in which it may occur; hence mildly woodland-preferring species such as Dunnock *Prunella modularis* may occur in overall larger numbers in farmland, which covers more than 70% of the UK's land surface.

Fig. 2 confirms that a mix of species with low and high population estimates can be found across all habitat types as predicted by ecological theory (e.g. Gaston & Blackburn

2000). Most species with breeding estimates of more than a million pairs are associated with woodland or lowland farmland. This reflects the ubiquity of these habitats, particularly farmland, in the UK. Moreover, some of the species categorised as woodland may be ecological generalists or occupy wooded features in other habitats such as hedgerows in farmland and gardens in urban areas.

Urban habitats are an exception to the pattern. Of the nine species found predominantly in urban habitats, only the Black Redstart has a UK population estimate of less than 10,000 breeding pairs. Most other species using urban habitats are generalists, abundant in other habitats.

Both upland and lowland wetland habitats support a larger proportion of species with fewer than 10,000 breeding pairs than other habitats. In the case of lowland wetlands, this may reflect the relative scarcity of certain wetland habitat such as reedbeds, and also that many recent colonists are found in lowland wetlands. In the uplands, the explanation for species with small population sizes includes generally low bird densities, combined with the relative scarcity of some upland habitats such as high mountains.

Recommendations

Progress since APEP 3

APEP 3 included 12 recommendations for improving avian population estimates, with the stated aim of encouraging efforts to improve reliability and have 'fewer 3s and more 1s in the next APEP report'. This aim has not been achieved. There are slightly fewer '1s' in this assessment, in part because some seabird population estimates are now based on extrapolation rather than census data. The reliability score for these species should improve in the near future with the completion of the 2015–20 seabird census. Although the levels of reliability have not changed substantially for non-seabirds, some progress has been made on some of the recommendations made in APEP 3. These should lead to further improvements in the quality of estimates in future, although this will need continued investment:

- The option to record the method of detection (song/call/visual) was introduced in BBS in 2014 and is now recorded by 79%

of BBS surveyors (Harris *et al.* 2019). This may enable distance-based population estimates (Method 2) to be refined in future, to account for differences in detectability of males and females for some species and thus allow improved estimates for additional species.

- BBS has also encouraged the surveying of additional upland squares by introducing the option to carry out one-off BBS surveys in remote squares ('Upland Rovers'). This should improve knowledge of population trends for upland species, enable trends for additional species to be reported and, in time and if sufficient squares are covered, may also enable population estimates to be calculated or improved for some species using distance sampling.
- Several papers about local population studies have been published, including on Firecrest *Regulus ignicapilla* (Clements *et al.* 2017) and Hobby *Falco subbuteo* (Clements *et al.* 2016), which have proposed national population estimates based on the local population densities. Although these estimates are not used in APEP 4, further work on these and other species is encouraged. Hewson *et al.* (2018) discussed some of the difficulties in using surveys of localised species to produce

national population estimates. The Panel is considering providing guidance for local, single-species surveys, accounting for representativeness and how they can most usefully contribute towards national estimates. Additional local studies will also help to refine local density estimates that may help calibrate Atlas data.

- Work has been undertaken to improve the wintering population estimates for widely dispersed waterbirds such as Eurasian Teal *Anas crecca*, Mallard *A. platyrhynchos* and Moorhen *Gallinula chloropus*, for which a large proportion of the population is not counted by WeBS (Méndez *et al.* 2015). Frost *et al.* (2019b) took this into account when producing estimates for seven species.
- National winter bird surveys following a BBS-type methodology were carried out for the first time in 2018/19. The aim of this project was to assess usage of farmland habitats in England but there are currently no plans for ongoing monitoring. If resources become available, future monitoring of this sort on a wide scale could help achieve one of the APEP 3 recommendations and improve our knowledge of the population of widely dispersed non-waterbird species during winter, which is currently poor.



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35. The Black Redstart *Phoenicurus ochruros* remains the UK's only scarce breeding species that is found predominantly in urban areas (see fig. 2); Bedfordshire, February 2018.

Additional recommendations

Although progress has been made for some of the recommendations made in APEP 3, more work is required. The following list, which is not exhaustive, includes some recommendations repeated from APEP 3 on which little or no progress has been made but which we still consider important.

- In recent years, repeat surveys for a number of scarcer species have not been conducted owing to lack of funding, including European Nightjar *Caprimulgus europaeus*, Dartford Warbler *Sylvia undata*, and Red-throated and Black-throated Divers *Gavia arctica*. Without repeat surveys we are reliant on ageing estimates for APEP and, more importantly, we do not have robust information to inform conservation prioritisation and (if required) conservation action for these species.
- Data on the breeding populations of a number of ducks remains poor and bespoke surveys are required for species including Common Shelduck *Tadorna tadorna*, Mandarin Duck, Gadwall, Teal, Eider, Red-breasted Merganser *Mergus serrator* and Goosander *M. merganser*.
- Targeted, species-specific surveys would also provide more robust estimates for other species for which current knowledge remains poor, including non-breeding Jack Snipe *Lymnocyptes minimus*, Hen Harrier and Merlin *Falco columbarius*; breeding and non-breeding Water Rail *Rallus aquaticus* and Common Snipe; and breeding Ptarmigan *Lagopus muta*, Common Swift *Apus apus*, Common Kingfisher *Alcedo atthis*, Sand Martin *Riparia riparia* and Rock Pipit.
- Information on the numbers of seabirds and other marine waterbirds using British waters outside the breeding season are still poorly known. As highlighted by Frost *et al.* (2019b), commercial data do exist for some locations but were not available to incorporate into population estimates; a clear mechanism is required to ensure that such data can be used.
- The UK holds internationally important wintering numbers of several gull species, and robust annual monitoring of wintering gulls at key sites, augmented by

more comprehensive roost-site counts every few years, would improve understanding of population changes.

- Estimating the breeding populations of some seabirds is complicated by the increased use of other habitats such as urban areas. Work under way on urban gulls may help but this is also important for Great Cormorant *Phalacrocorax carbo* and some terns.

At the time of writing, the UK is scheduled to leave the EU, which means that the existing Article 12 reporting process to the EU will no longer apply. It is anticipated that directive obligations will be translated into domestic policy where there is an obligation to produce country environmental reports via JNCC; however, it will be important to ensure that any future changes to the reporting protocols are considered carefully and continue to be coordinated at a UK level. This should ensure that the UK can continue to meet other international obligations that require population estimates, and can continue to feed into BirdLife International's six-year assessment of the state of Europe's birds (which necessarily incorporates data from non-EU as well as EU countries). It will also be important that we continue to understand the status of bird populations in the UK in order to inform national conservation policy, and prioritise and undertake any necessary conservation actions. We thus anticipate that APEP updates on population size assessments will continue on a six-year cycle.

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[83] IRBBP reports 2012–16 (Perry 2013; Perry & Newton 2014; Newton 2015, 2016);
[84] BirdTrack database;
[85] www.projectparakeet.co.uk;
[86] Hugh Thurgate in litt.;
[87] bespoke calculation by N. J. Aebischer.

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Table 1. Population estimates of full species in categories A–C of the British List.

Key: **Season:** B = Breeding; P = Passage; W = Wintering. **Unit:** AOS = Apparently Occupied Sites; F = females; I = individuals; M = males; N = nests; P = pairs; T = territories. **Estimates:** a single figure or a range is given, but in some cases a mean with 95% confidence intervals in parentheses. **+/-:** population known to be larger (+) or smaller (-) than the estimate listed, but no better estimate available. **Der (Derivation):** Numbers correspond to the appropriate section under Derivation in the text; additional text indicates that the original source estimate has been extrapolated as described in the text; using one or more of the following trends (see text for further details): BBS = Breeding Bird Survey; CBC = Common Birds Census; NGC/BBS = National Gamebag Census; SMP = Seabird Monitoring Programme; WBS/WBBS = Waterways Bird Survey/Waterways Breeding Bird Survey. * indicates that a change since APEP 3 may relate partly or wholly to the use of a different estimation method or improved knowledge rather than being a genuine change. **Rel (Reliability):** 1 (good) to 3 (poor); see text for further details. **Note:** Numbers refer to the footnotes of the table. **Reference:** Numbers correspond to those given in the References section.

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Capercaillie <i>Tetrao urogallus</i>	W	I	1,100	1,100		2015/16	5	1		76
Black Grouse <i>Lyrurus tetrix</i>	B	M	4,850	4,850		2016	5	1	1	87
Partridge <i>Lagopus muta</i>	B	P	2,000–15,000	2,000–15,000		2007	5	2		23
Red Grouse <i>Lagopus lagopus</i>	B	P	265,000	265,000		2016	1–NGC/BBS	3		27, 1
Red-legged Partridge <i>Alectoris rufa</i>	B	T	72,500	72,500		2016	1–CBC/BBS	2		27
Grey Partridge <i>Perdix perdix</i>	B	T	37,000	37,000		2016	1–CBC/BBS	2		27, 83
Common Quail <i>Coturnix coturnix</i>	B	M	350	355		2013–17	3	2		82
Common Pheasant <i>Phasianus colchicus</i>	B	F	2,300,000	2,350,000		2016	1–CBC/BBS	2		70
Golden Pheasant <i>Chrysolophus pictus</i>	B	M	15	15		2010–14	3	3	2	44
Lady Amherst's Pheasant <i>Chrysolophus amherstiae</i>	B	M	0	0		2016	3	1	3	46
Brent Goose <i>Branta bernicla</i>	W	I	105,000	135,000		2012/13–2016/17	6	1		26, 9
Canada Goose <i>Branta canadensis</i>	B	P	54,000	54,500		2013–17	5*	3	4, 5	26, 84
	W	I	160,000	165,000		2012/13–2016/17	6*	2		26, 84
Barnacle Goose <i>Branta leucopsis</i>	B	P	1,450	1,550		2012–15	5	3	4, 6	26, 86
	W	I	105,000	105,000		–	6	1	7	26, 9
Snow Goose <i>Anser caerulescens</i>	B	P	2	2	+	2010–14	3	3		44
	W	I	75	75		2011/12–2015/16	6	2		26
Greylag Goose <i>Anser anser</i>	B	P	47,000	47,000		2013–17	5	3	4, 8	26, 7
	W	I	230,000	230,000		2012/13–2016/17	6	2		26, 9
Taiga Bean Goose <i>Anser fabalis</i>	W	I	230	230		2016/17–2017/18	6	1		26
Pink-footed Goose <i>Anser brachyrhynchus</i>	W	I	510,000	510,000	-	2015–16	6	1		59, 60, 26
Tundra Bean Goose <i>Anser serrinotris</i>	W	I	300	300		2011/12–2014/15	6	1		26

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
White-fronted Goose <i>Anser albifrons</i>	B	P	0-1	0-1		2013-17	3	1	9	47
	W	I	13,500	14,000		—	6	1	7	26, 9
Mute Swan <i>Cygnus olor</i>	B	P	6,500 (5,850-7,100)	7,000 (6,300-7,600)		2016	5-BBS	2	75	26, 9
	W	I	50,500	52,500		2012/13-2016/17	6*	2	26, 9	
Bewick's Swan <i>Cygnus columbianus</i>	W	I	4,350	4,350		2015	6	1	26, 9	
Whooper Swan <i>Cygnus cygnus</i>	B	P	24	28		2013-17	3	1	82	
	W	I	16,000	19,500		2015	6	1	30, 26, 9	
Egyptian Goose <i>Alopochen aegyptiaca</i>	B	P	1,850	1,850		2013-17	5*	3	4	26
	W	I	5,600	5,600		2012/13-2016/17	6*	2	26	
Common Shelduck <i>Tadorna tadorna</i>	B	P	7,600	7,850	+	2016	1-CBC/BBBS*	3	10	27
	W	I	47,000	51,000		2012/13-2016/17	6	1	26, 9	
Mandarin Duck <i>Aix galericulata</i>	B	P	4,400	4,400	+	2007-11	5*	3	4	26, 83
	W	I	13,500	13,500		2007-11	6*	3	26	
Garganey <i>Spatula querquedula</i>	B	P	105	105		2013-17	3	2	47	
Shoveler <i>Spatula clypeata</i>	B	P	1,100	1,100		2013-17	3	2	47	
	W	I	19,000	19,500		2012/13-2016/17	6	1	26, 9	
Gadwall <i>Mareca strepera</i>	B	P	1,250-3,150	1,250-3,200	+	2016	3-BBS	2	11	41, 83
	W	I	31,000	31,000		2012/13-2016/17	6	1	26, 9	
Eurasian Wigeon <i>Mareca penelope</i>	B	P	200	200	+	2013-17	3*	3	12	47
	W	I	445,000	450,000		2012/13-2016/17	6*	1	26, 9	
American Wigeon <i>Mareca americana</i>	W	I	17	18		2012/13-2016/17	7	3	84	
	B	P	59,000-140,000	61,000-145,000	+	2016	5-CBC/BBBS	3	3	26, 9
Mallard <i>Anas platyrhynchos</i>	W	I	665,000	675,000		2012/13-2016/17	6	3	26, 9	
Pintail <i>Anas acuta</i>	B	P	27	27		2013-17	3	1	47	
	W	I	19,500	20,000		2012/13-2016/17	6	1	26, 9	
Eurasian Teal <i>Anas crecca</i>	B	P	2,700-4,750	2,700-4,750		2016	1-CBC/BBBS	3	27	26, 9
	W	I	430,000	435,000		2012/13-2016/17	6*	2	26, 9	
Green-winged Teal <i>Anas carolinensis</i>	W	I	32	34		2012/13-2016/17	7	3	84	
Red-crested Pochard <i>Netta rufina</i>	B	P	39 (20-47)	39 (20-47)	+	2010-14	3	3	13	44
	W	I	570	570		2012/13-2016/17	6	1	26	
Common Pochard <i>Aythya ferina</i>	B	P	695	720		2013-17	3	2	82	
	W	I	23,000	29,000		2012/13-2016/17	6	1	26, 9	
Ferruginous Duck <i>Aythya nyroca</i>	W	I	8	9		2012/13-2016/17	7	3	84	

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Ring-necked Duck <i>Aythya collaris</i>	W	I	16	18		2012/13–2016/17	7	3		84
Tufted Duck <i>Aythya fuligula</i>	B	P	16,000–18,000	16,500–19,000		2016	1–CBC/BBS	3		69
	W	I	130,000	140,000		2012/13–2016/17	6*	1		26, 9
Greater Scaup <i>Aythya marila</i>	B	P	(0–1)	(0–1)		2013–17	3	2	14	82
	W	I	3,900	6,400	+	2011/12–2014/15	6	2		26, 9
Common Eider <i>Somateria mollissima</i>	B	P	36,000	37,000		2012–15	5*	2	15	26, 56
	W	I	81,500	86,000		2011/12–2014/15	6*	2		26, 9
Surf Scoter <i>Melanitta perspicillata</i>	W	I	23	24		2012/13–2016/17	7	3		84
Velvet Scoter <i>Melanitta fusca</i>	W	I	3,350	3,350	+	2011/12–2014/15	6*	2		26, 84
Common Scoter <i>Melanitta nigra</i>	B	P	52	52		2007	5	1	21	21
	W	I	135,000	135,000	+	2011/12–2014/15	6*	3		26, 9
Long-tailed Duck <i>Clangula hyemalis</i>	W	I	13,500	13,500	+	2011/12–2014/15	6*	2		26, 84
Common Goldeneye <i>Bucephala clangula</i>	B	F	200	200		2006–10	3	2	16	41
	W	I	18,500	21,000		2012/13–2016/17	6*	2		26, 9
Snew <i>Mergellus albellus</i>	W	I	125	125		2012/13–2016/17	6	1		26
Goosander <i>Mergus merganser</i>	B	P	4,800 (4,250–5,250)	4,800 (4,250–5,250)	+	2016	5–WBBS/WBBS	2		29, 83
	W	I	14,500	14,500		2012/13–2016/17	6*	2		26, 84
Red-breasted Merganser <i>Mergus serrator</i>	B	P	1,550 (1,350–1,750)	1,650	+	2008–11	5*	3	17	49, 4
	W	I	10,500	11,000		2012/13–2016/17	6*	2		26, 9
Ruddy Duck <i>Oxyura jamaicensis</i>	B	P	2–3	2–3		2017	5	1		36
	W	I	23	23		2016	5	1		36
European Nightjar <i>Caprimulgus europaeus</i>	B	M	4,600 (3,700–5,500)	4,600 (3,700–5,500)		2004	5	1		14
Common Swift <i>Apus apus</i>	B	P	59,000 (43,000–75,000)	59,000 (43,000–75,000)	+	2016	2–BBS	3		65
Great Bustard <i>Otis tarda</i>	B	P	4	4		2013–17	3	1	18	47
Common Cuckoo <i>Cuculus canorus</i>	B	P	17,000 (8,950–24,500)	18,000 (9,800–26,000)	+	2016	2–BBS	3		65
Rock Dove <i>Columba livia</i>	B	P	460,000 (375,000–545,000)	465,000 (380,000–550,000)		2016	2–BBS	2		65
Stock Dove <i>Columba oenas</i>	B	T	320,000	320,000		2016	1–CBC/BBS	2		27
Wood Pigeon <i>Columba palumbus</i>	B	P	5,050,000 (4,75–5,35m)	5,150,000 (4.85–5.45m)		2016	2–BBS	2		65
Turtle Dove <i>Streptopelia turtur</i>	B	T	3,600	3,600		2016	1–CBC/BBS	2		27
Collared Dove <i>Streptopelia decaocto</i>	B	P	795,000 (715,000–875,000)	810,000 (730,000–890,000)		2016	2–BBS	2		65

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Water Rail <i>Rallus aquaticus</i>	B	T	3,900	3,900	+	2016-17	5	2	19	24
Corn Crane <i>Crex crex</i>	B	M	1,100	1,100		2013-17	3	1		47
Baillon's Crane <i>Porzana pusilla</i>	B	M	0-6	0-6		2012	5	3	20	43
Spotted Crane <i>Porzana porzana</i>	B	M	27	27		2013-17	5	1	21	47
Moorhen <i>Gallinula chloropus</i>	B	T	200,000	210,000		2016	1-CBC/BBS	2	22	27
	W	I	300,000	305,000		2012/13-2016/17	6	3		26, 63
Common Coot <i>Fulica atra</i>	B	P	25,500	26,000	+	2016	1-CBC/BBS	3	27	27
	W	I	200,000	205,000		2012/13-2016/17	6*	1		26, 9
Common Crane <i>Grus grus</i>	B	P	31	31		2013-17	3	1	47	47
	W	I	175	175		2017/18	6	2		26
Little Grebe <i>Tachybaptus truficollis</i>	B	P	3,300-6,650	3,650-7,300		2016	1-WBS/WBBS	2	27	27
	W	I	15,000	15,500		2012/13-2016/17	6	2		26, 9
Red-necked Grebe <i>Podiceps grisegena</i>	B	P	(0-1)	(0-1)		2013-17	3	1	82	82
	W	I	59	60		2011/12-2014/15	6	2		26, 84
Great Crested Grebe <i>Podiceps cristatus</i>	B	P	4,300	4,900	+	2016	1-BBS	2	27	27
	W	I	16,500	18,000		2012/13-2016/17	6*	1		26, 9
Slavonian Grebe <i>Podiceps auritus</i>	B	P	28	28		2013-17	3	1	47	47
	W	I	920	995		2011/12-2014/15	6	2		26, 84
Black-necked Grebe <i>Podiceps nigricollis</i>	B	P	55	55		2013-17	3	1	47	47
	W	I	115	115		2012/13-2016/17	6	1		26
Stone-curlew <i>Burhinus oedinenus</i>	B	P	365	365	+	2013-17	3	1	47	47
Oystercatcher <i>Haematopus ostralegus</i>	B	P	92,500	95,500		2016	5-BBS	2	67	67
	W	I	285,000	305,000		2012/13-2016/17	6	1		26, 9
Black-winged Stilt <i>Himantopus himantopus</i>	B	P	3 (0-6)	3 (0-6)		2013-17	3	1	82, 2	82, 2
Avocet <i>Recurvirostra avosetta</i>	B	P	1,950	1,950		2013-17	3	1	47	47
	W	I	8,700	8,700		2012/13-2016/17	6	1		26
Northern Lapwing <i>Vanellus vanellus</i>	B	P	96,500	97,500		2016	5-BBS	2	23	67, 13
	W	I	620,000	635,000		2006/07	6	2		28, 9
European Golden Plover <i>Pluvialis apricaria</i>	B	P	32,500-50,500	32,500-50,500		2016	5-BBS	2	24	73
	W	I	400,000	410,000		2006/07	6	2		28, 9
Grey Plover <i>Pluvialis squatarola</i>	W	I	33,500	33,500		2012/13-2016/17	6	1	26, 9	26, 9
Ringed Plover <i>Charadrius hiaticula</i>	B	P	5,300 (5,100-5,500)	5,450 (5,250-5,600)		2007	5	1	16	16
	W	I	41,500	42,500		2012/13-2016/17	6*	1		26, 9

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Little Ringed Plover <i>Charadrius dubius</i>	B	P	1,250 (1,200–1,300)	1,250 (1,200–1,300)		2007	5	1		16
Dotterel <i>Charadrius morinellus</i>	B	M	425 (280–645)	425 (280–645)		2011	5	2		32
Whimbrel <i>Numenius phaeopus</i>	B	P	310	310		2009	5	1		51
	W	I	38	41		2012/13–2016/17	6	1		26, 84
Eurasian Curlew <i>Numenius arquata</i>	B	P	58,000	58,000		2016	5-BBS	2	23	67, 13
	W	I	120,000	125,000		2012/13–2016/17	6	1		26, 9
Bar-tailed Godwit <i>Limosa lapponica</i>	W	I	50,500	53,500		2012/13–2016/17	6*	1		26, 9
Black-tailed Godwit <i>Limosa limosa</i>	B	P	53	53		2013–17	3	1		47
	W	I	39,000	41,000		2012/13–2016/17	6*	1		26, 9
Turnstone <i>Arenaria interpres</i>	W	I	40,000	43,000		2012/13–2016/17	6	1		26, 9
Red Knot <i>Calidris canutus</i>	W	I	265,000	265,000		2012/13–2016/17	6	1		26, 9
Ruff <i>Calidris pugnax</i>	B	F	13	13		2013–17	3	1		47
	W	I	895	920		2012/13–2016/17	6	1		26, 84
Temminck's Stint <i>Calidris temminckii</i>	B	P	0	0		2013–17	3	1		82
Sanderling <i>Calidris alba</i>	W	I	20,000	20,500		2012/13–2016/17	6	1		26, 9
Dunlin <i>Calidris alpina</i>	B	P	8,600–10,500	8,600–10,500		2005–07	5	2		23, 8, 54
	W	I	345,000	350,000		2012/13–2016/17	6	1		26, 9
Purple Sandpiper <i>Calidris maritima</i>	B	P	1	1		2013–17	3	1		47
	W	I	9,700	9,900		2012/13–2016/17	6	2		26, 9
Little Stint <i>Calidris minuta</i>	W	I	8	8		2012/13–2016/17	6	1		26
Woodcock <i>Scolopax rusticola</i>	B	M	55,000 (42,000–69,000)	57,000 (43,000–71,000)		2016	5	1	25	38
	W	I	1,400,000	1,400,000		2003/04	6	3		62, 63, 26
Jack Snipe <i>Lymnocryptes minimus</i>	W	I	100,000	110,000		2004/5	6	3		62, 63, 26
Common Snipe <i>Gallinago gallinago</i>	B	P	64,500	66,500		2016	5-BBS	3	23	67, 13
	W	I	1,000,000	1,100,000		2004/5	6	3		62, 63, 26
Red-necked Phalarope <i>Phalaropus lobatus</i>	B	M	64	64		2013–17	3	1		47
Common Sandpiper <i>Actitis hypoleucos</i>	B	P	13,000	13,000		2016	5-WBS/WBBS	2		19
	W	I	52	52		2012/13–2016/17	6*	1		26
Green Sandpiper <i>Tringa ochropus</i>	B	P	2	2		2013–17	3	1		47
	W	I	290	290		2011/12–2014/15	6*	3		26, 84
Common Redshank <i>Tringa totanus</i>	B	P	22,000	22,000		2016	5-BBS	2	23	67, 13
	W	I	94,500	100,000		2012/13–2016/17	6	1		26, 9

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Wood Sandpiper <i>Tringa glareola</i>	B	P	30	30		2013–17	5	1		47
Spotted Redshank <i>Tringa erythropus</i>	W	I	67	68		2012/13–2016/17	6	1		26, 84
Greenshank <i>Tringa nebularia</i>	B	P	1,100	1,100	+	1995	5	2		31
	W	I	810	920		2012/13–2016/17	6	1		26, 9
Kittiwake <i>Rissa tridactyla</i>	B	P	195,000 (170,000–250,000)	205,000 (175,000–255,000)		2015	4–SMP	2		61
Black-headed Gull <i>Chroicocephalus ridibundus</i>	B	P	130,000	140,000	+	1998–2002	4	1		61
	W	I	2,200,000 (2.1–2.2m)	2,200,000 (2.1–2.3m)	+	2003/04–2005/06	6	2		62, 63, 26
Mediterranean Gull <i>Ichthyaeetus melanocephalus</i>	B	P	1,200	1,200	+	2013–17	3	2		47
	W	I	4,000	4,000		2011/12–2014/15	6	2		26, 84
Common Gull <i>Larus canus</i>	B	P	48,500	48,500		1998–2002	4	1		61
	W	I	700,000 (670,000–720,000)	710,000 (680,000–730,000)	+	2003/04–2005/06	6	2		62, 63, 26
Ring-billed Gull <i>Larus delawarensis</i>	W	I	17	21		2012/13–2016/17	7	3		84
Great Black-backed Gull <i>Larus marinus</i>	B	P	15,000 (7,200–19,000)	15,000 (7,200–19,000)	-	2015	4–SMP	2		61
	W	I	76,000 (71,000–81,000)	77,000 (72,000–82,000)	+	2003/04–2005/06	6	2		62, 63, 26
Glaucous Gull <i>Larus hyperboreus</i>	W	I	155	165	+	2011/12–2015/16	6	2		26, 84
Iceland Gull <i>Larus glaucoideus</i>	W	I	330	355	+	2011/12–2015/16	6	2		26, 84
Herring Gull <i>Larus argentatus</i>	B	P	130,000	130,000	-	1998–2002	4	1	26	61
	W	I	730,000 (700,000–760,000)	740,000 (710,000–780,000)	+	2003/04–2005/06	6	2		62, 63, 26
Caspian Gull <i>Larus cachinnans</i>	W	I	125	125		2011/12–2014/15	6	2		26, 84
Yellow-legged Gull <i>Larus michahellis</i>	B	P	2	2		2013–17	3	1		47
	W	I	840	840		2011/12–2014/15	6	2		26, 84
Lesser Black-backed Gull <i>Larus fuscus</i>	B	P	110,000	110,000	-	1998–2002	4	1		61
	W	I	120,000 (120,000–130,000)	130,000 (120,000–130,000)	+	2003/04–2005/06	6	2		62, 63, 26
Sandwich Tern <i>Thalasseus sandwicensis</i>	B	P	12,500 (11,500–14,000)	14,000 (13,000–15,000)		2015	4–SMP	2		61
	W	I	53	65		2011/12–2014/15	6	2		26, 84
Little Tern <i>Sterna albigrons</i>	B	P	1,450	1,450		2013–17	4	1		82
Roseate Tern <i>Sterna dougallii</i>	B	P	100	100		2013–17	3	1		47
Common Tern <i>Sterna hirundo</i>	B	P	9,600 (7,550–11,500)	11,000 (8,900–13,500)		2015	4–SMP	2		61
Arctic Tern <i>Sterna paradisaea</i>	B	P	52,500	53,500		2000	4	1		61
Great Skua <i>Stercorarius skua</i>	B	P	9,650	9,650	+	1998–2002	4	1	27	61
Arctic Skua <i>Stercorarius parasiticus</i>	B	P	785 (535–1,550)	785 (535–1,550)		2015	4–SMP	2	28	61

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Common Guillemot <i>Uria aalge</i>	B	P	885,000	950,000		1998–2002	4	1		61
Razorbill <i>Alca torda</i>	B	P	140,000 (93,000–215,000)	165,000 (100,000–250,000)		2015	4-SMP	2		61
Black Guillemot <i>Cappphus grylle</i>	B	P	19,000	19,500		1998–2003	4	1		61
Puffin <i>Fratercula arctica</i>	B	P	580,000	580,000	-	1998–2002	4	1		61
Red-throated Diver <i>Gavia stellata</i>	B	P	1,250 (1,000–1,550)	1,250 (1,000–1,550)		2006	5	1		17
	W	I	21,500	21,500	+	2011/12–2014/15	6*	3	29	26, 9
Black-throated Diver <i>Gavia arctica</i>	B	P	215 (190–250)	215 (190–250)		2006	5	1		20
	W	I	560	560	+	2004/05–2008/09	6	3		62, 26
Great Northern Diver <i>Gavia immer</i>	W	I	4,350	4,400	+	2015/16	6*	3		26, 9
White-billed Diver <i>Gavia adamsii</i>	W	I	80	80	+	2010–12	6	2		26
European Storm-petrel <i>Hydrobates pelagicus</i>	B	AOS	25,500 (21,000–33,500)	25,500 (21,000–33,500)		1998–2002	4	2		61
Leach's Storm-petrel <i>Oceanodroma leucorhoa</i>	B	P	48,000 (36,500–65,000)	48,000 (36,500–65,000)		1998–2002	4	2		61
Fulmar <i>Fulmarus glacialis</i>	B	P	350,000 (195,000–680,000)	350,000 (195,000–680,000)		2015	4-SMP	2		61
Manx Shearwater <i>Puffinus puffinus</i>	B	P	295,000 (280,000–315,000)	300,000 (280,000–320,000)		1998–2002	4	2		61
Northern Gannet <i>Morus bassanus</i>	B	N	295,000	295,000		2013–14	4	1		53
Shag <i>Phalacrocorax aristotelis</i>	B	P	17,500 (13,500–20,500)	17,500 (13,500–20,500)		2015	4-SMP	2		61
	W	I	110,000	110,000	+	1998–2002	6	2		62, 26
Great Cormorant <i>Phalacrocorax carbo</i>	B	P	8,200	8,900		1998–2002	4	1	30	61
	W	I	62,000	64,500	+	2012/13–2016/17	6*	2		26, 9
Glossy Ibis <i>Plegadis falcinellus</i>	W	I	27	27		2011/12–2014/15	6	1		26
Eurasian Spoonbill <i>Platalea leucorodia</i>	B	P	29	29		2017	3	1	31	47
	W	I	105	105		2011/12–2014/15	6	1		26
Eurasian Bittern <i>Botaurus stellaris</i>	B	M	191	191	+	2017	5	1		47
	W	I	795	795		2017/18	5	2		26
Little Bittern <i>Ixobrychus minutus</i>	B	M	5	5		2013–17	3	1		47
Night Heron <i>Nycticorax nycticorax</i>	B	P	0–1	0–1		2013–17	3	1	32	47
Cattle Egret <i>Bubulcus ibis</i>	B	P	10–15	10–15		2017	3	1	31	47
	W	I	65	66		2011/12–2014/15	6	2		26, 84
Grey Heron <i>Ardea cinerea</i>	B	P	9,950	10,500 (10,000–11,000)		2013–17	5	1	33	79
	W	I	45,000	45,500		2012/13–2016/17	6*	2		26, 9
Purple Heron <i>Ardea purpurea</i>	B	P	0	0		2013–17	3	1	34	82

Species	Season	Unit	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Great White Egret <i>Ardea alba</i>	B W	P I	8–12 72	8–12 72		2017 2011/12–2014/15	3 6	1 2	31 26, 84	47
Little Egret <i>Egretta garzetta</i>	B W	P I	1,100 11,500	1,100 11,500	+	2013–17 2012/13–2016/17	3 6*	2 2	35 26, 9	82
Osprey <i>Pandion haliaetus</i>	B	P	240	240	+	2013–17	3*	2	36	47
Honey-buzzard <i>Pernis apivorus</i>	B	P	33–69	33–69		2000	5	2	37	5, 68
Golden Eagle <i>Aquila chrysaetos</i>	B	P	510	510		2015	5	1	33	33
Eurasian Sparrowhawk <i>Accipiter nisus</i>	B	P	28,500	30,500		2016	1–CBC/BBS	2	66	66
Northern Goshawk <i>Accipiter gentilis</i>	B	P	620	620	+	2013–17	3	2	47	47
Marsh Harrier <i>Circus aeruginosus</i>	B	P	590–695	590–695		2016	3–BBS	2	38	40
Hen Harrier <i>Circus cyaneus</i>	B	P	500	545		2016	5	1	81	81
Montagu's Harrier <i>Circus pygargus</i>	B	P	8	8		2013–17	3	1	47	47
Red Kite <i>Milvus milvus</i>	B	P	4,350	4,400		2016	3–BBS	2	11	41, 83
White-tailed Eagle <i>Haliaeetus albicilla</i>	B	P	122	123	+	2017	3	1	47	47
Rough-legged Buzzard <i>Buteo lagopus</i>	W	I	29	29		2012/13–2016/17	7	3	84	84
Common Buzzard <i>Buteo buteo</i>	B	P	61,500–85,000	63,000–87,500		2016	5–BBS	2	11	11
Barn Owl <i>Tyto alba</i>	B	P	4,000–14,000	4,000–14,000		2016	5*	3	39	74
Tawny Owl <i>Strix aluco</i>	B	P	50,000	50,000		2005	5	2	25	25
Little Owl <i>Athene noctua</i>	B	P	3,600 (2,350–4,900)	3,600 (2,350–4,900)		2016	2–BBS	2	65	65
Long-eared Owl <i>Asio otus</i>	B	P	1,600–5,300	1,800–6,000		2007–11	5	3	71	71
Short-eared Owl <i>Asio flammeus</i>	B	P	610–2,150	620–2,200		2007–11	5	3	27	27
Common Kingfisher <i>Alcedo atthis</i>	B	P	3,650–6,100	3,850–6,400		2016	1–WBS/WBBS	3	27	27
European Bee-eater <i>Merops apiaster</i>	B	P	1 (0–3)	1 (0–3)		2013–17	3	1	40	82
Wynneck <i>Jynx torquilla</i>	B	P	0	0		2013–17	3	2	41	47
Lesser Spotted Woodpecker <i>Dryobates minor</i>	B	P	600–1,000	600–1,000		2015	3	3	42	45
Great Spotted Woodpecker <i>Dendrocopos major</i>	B	P	130,000 (120,000–145,000)	130,000 (120,000–145,000)		2016	2–BBS	2	65, 83	65, 83
Green Woodpecker <i>Picus viridis</i>	B	P	45,500 (40,500–50,500)	45,500 (40,500–50,500)		2016	2–BBS	2	65	65
Common Kestrel <i>Falco tinnunculus</i>	B	P	30,000	31,000		2016	1–CBC/BBS	2	27	27
Merlin <i>Falco columbarius</i>	B	P	1,150 (850–1,450)	1,150 (890–1,450)		2008	5	2	22	22

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Hobby <i>Falco subbuteo</i>	B	P	2,050	2,050		2016	5-BBS	2	43	10
Peregrine Falcon <i>Falco peregrinus</i>	B	P	1,650 (1,500–1,800)	1,750 (1,600–1,900)		2014	5	1	44	78
Rose-ringed Parakeet <i>Psittacula krameri</i>	B	P	12,000	12,000		2016	5-BBS	2	45	85
Red-backed Shrike <i>Lanius collurio</i>	B	P	3	3		2013–17	3	1		47
Great Grey Shrike <i>Lanius excubitor</i>	W	I	98	98		2012/13–2016/17	7	3		84
Golden Oriole <i>Oriolus oriolus</i>	B	M	0 (0–2)	0 (0–2)		2013–17	3	1	46	82
Eurasian Jay <i>Garrulus glandarius</i>	B	T	165,000	170,000		2016	1-CBC/BBS	2		27
Magpie <i>Pica pica</i>	B	T	550,000	610,000		2016	1-CBC/BBS	2		27
Red-billed Chough <i>Pyrrhocorax pyrrhocorax</i>	B	P	330	335		2014–15	5	1		35
	W	I	1,250	1,250		2014/15	5	1		35
Jackdaw <i>Coloeus monedula</i>	B	P	1,450,000 (1.3–1.65m)	1,550,000 (1.35–1.75m)		2016	2-BBS	2		65
Rook <i>Corvus frugilegus</i>	B	P	885,000 (775,000–1,000,000)	980,000 (865,000–1,100,000)		2016	5-BBS	2		57
Carriion Crow <i>Corvus corone</i>	B	T	1,050,000	1,050,000		2016	1-CBC/BBS	2		27
Hooded Crow <i>Corvus cornix</i>	B	T	185,000	285,000		2016	1-BBS	2		27
Common Raven <i>Corvus corax</i>	B	P	9,500	10,000	+	2016	1-BBS	3		27
Waxwing <i>Bombycilla garrulus</i>	W	I	9,750	10,000		2012/13–2016/17	7	3		84
Coal Tit <i>Parus ater</i>	B	T	590,000	660,000		2016	1-CBC/BBS	2		27
Crested Tit <i>Lophophanes cristatus</i>	B	P	1,000–2,000	1,000–2,000		2007	5	2		23
Marsh Tit <i>Poecile palustris</i>	B	T	28,500	28,500		2016	1-CBC/BBS	2		27
Willow Tit <i>Poecile montanus</i>	B	P	2,750	2,750	-	2016	1-CBC/BBS	2	47	27
Blue Tit <i>Cyanistes caeruleus</i>	B	T	3,250,000	3,400,000		2016	1-CBC/BBS	2		27
Great Tit <i>Parus major</i>	B	T	2,200,000	2,350,000		2016	1-CBC/BBS	2		27
Bearded Tit <i>Panurus biarmicus</i>	B	P	695	695		2013–17	3	2		47
Woodlark <i>Lullula arborea</i>	B	P	2,300 (1,850–2,750)	2,300 (1,850–2,750)		2016	5-BBS	2	48	15
Skylark <i>Alauda arvensis</i>	B	T	1,500,000	1,550,000		2016	1-CBC/BBS	2		27
Shore Lark <i>Eremophila alpestris</i>	W	I	110	110		2012/13–2016/17	7	3		84
Sand Martin <i>Riparia riparia</i>	B	N	64,500–210,000	70,500–225,000		2016	1-WBS/WBBS	3		27
Barn Swallow <i>Hirundo rustica</i>	B	T	625,000	705,000		2016	1-CBC/BBS	2		27

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House Martin <i>Delichon urbicum</i>	B	P	470,000 (330,000–610,000)	480,000 (335,000–620,000)		2016	2-BBS	2		65
Cetti's Warbler <i>Certhia cetti</i>	B	M	3,450	3,450	+	2016	3	2		46
Long-tailed Tit <i>Aegithalos caudatus</i>	B	T	370,000	380,000		2016	1-CBC/BBS	2		27
Wood Warbler <i>Phylloscopus sibilatrix</i>	B	M	6,500 (6,000–7,050)	6,500 (6,000–7,050)		2016	1-BBS	3		6
Yellow-browed Warbler <i>Phylloscopus inornatus</i>	W	I	25	25		2012/13–2016/17	7	3		84
Willow Warbler <i>Phylloscopus trochilus</i>	B	T	2,050,000	2,300,000		2016	1-BBS	2		27
Common Chiffchaff <i>Phylloscopus collybita</i>	B	T	1,650,000	1,750,000		2016	1-CBC/BBS	2		27
Iberian Chiffchaff <i>Phylloscopus ibericus</i>	B	P	0–1	0–1		2013–17	3	1	49	82, 50
Aquatic Warbler <i>Acrocephalus paludicola</i>	P	I	3	3	+	2013–17	9	3		48
Sedge Warbler <i>Acrocephalus schoenobaenus</i>	B	T	220,000	240,000		2016	1-CBC/BBS	2		27
Reed Warbler <i>Acrocephalus scirpaceus</i>	B	P	130,000 (100,000–155,000)	130,000 (100,000–155,000)	+	2016	2-BBS	2		65, 83
Marsh Warbler <i>Acrocephalus palustris</i>	B	P	8	8		2013–17	3	1		47
Icterine Warbler <i>Hippolais icterina</i>	B	P	0–2	0–2		2013–17	3	1	50	82
Grasshopper Warbler <i>Locustella naevia</i>	B	T	9,750	12,000		2016	1-BBS	3		27
Savi's Warbler <i>Locustella luscinioides</i>	B	P	5	5		2013–17	3	1		47
Blackcap <i>Sylvia atricapilla</i>	B	T	1,600,000	1,650,000		2016	1-CBC/BBS	2		27
Garden Warbler <i>Sylvia borin</i>	B	T	145,000	145,000		2016	1-CBC/BBS	2		27
Lesser Whitethroat <i>Sylvia curruca</i>	B	T	79,000	79,000		2016	1-CBC/BBS	2		27
Common Whitethroat <i>Sylvia communis</i>	B	T	1,100,000	1,100,000		2016	1-CBC/BBS	2		27
Dartford Warbler <i>Sylvia undata</i>	B	P	2,200	2,200		2017	3	2	51	47
Firecrest <i>Regulus ignicapilla</i>	B	T	2,000	2,000	+	2016	3	3	52	46
Goldcrest <i>Regulus regulus</i>	B	T	675,000	790,000		2016	1-BBS	2		27
Wren <i>Troglodytes troglodytes</i>	B	T	9,750,000	11,000,000		2016	1-CBC/BBS	2		27
Eurasian Nuthatch <i>Sitta europaea</i>	B	T	250,000	250,000		2016	1-CBC/BBS	2		27
Eurasian Treecreeper <i>Certhia familiaris</i>	B	T	210,000	225,000		2016	1-CBC/BBS	2		27
Common Starling <i>Sturnus vulgaris</i>	B	P	1,650,000 (1,45–1.8m)	1,750,000 (1,55–1.95m)		2016	2-BBS	2		65
Ring Ouzel <i>Turdus torquatus</i>	B	P	7,300 (5,550–9,400)	7,300 (5,550–9,400)		2016	5-BBS*	2	53	80
Blackbird <i>Turdus merula</i>	B	P	4,850,000 (4.6–5.05m)	5,050,000 (4.8–5.25m)		2016	2-BBS	2		65

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Fieldfare <i>Turdus pilaris</i>	B W	P I	0–1 680,000	0–1 720,000		2013–17 1981–84	3 8	2 3	54	82 55
Redwing <i>Turdus iliacus</i>	B W	P I	24 650,000	24 690,000		2013–17 1981–84	3 8	3 3		47 55
Song Thrush <i>Turdus philomelos</i>	B	T	1,200,000	1,300,000		2016	1–CBC/BBS	2		27
Mistle Thrush <i>Turdus viscivorus</i>	B	T	150,000	165,000		2016	1–CBC/BBS	2		27
Spotted Flycatcher <i>Muscicapa striata</i>	B	T	38,500	41,500		2016	1–CBC/BBS	3		27
Robin <i>Erithacus rubecula</i>	B	T	6,650,000	7,350,000		2016	1–CBC/BBS	2		27
Bluthroat <i>Luscinia svecia</i>	B	P	0–1	0–1		2013–17	3	1	55	82
Common Nightingale <i>Luscinia megarhynchos</i>	B	M	5,550 (5,100–6,000)	5,550 (5,100–6,000)		2012	5*	2	56	39
Pied Flycatcher <i>Ficedula hypoleuca</i>	B	P	22,000–25,000	22,000–25,000		2016	1–BBS	3		27
Black Redstart <i>Phoenicurus ochruros</i>	B W	P I	58 400	58 400		2013–17 1981–84	3 8	2 3		47 55
Common Redstart <i>Phoenicurus phoenicurus</i>	B	P	135,000 (97,000–170,000)	135,000 (97,000–170,000)		2016	2–BBS	2		65
Whinchat <i>Saxicola rubetra</i>	B	P	49,500 (19,500–79,000)	49,500 (19,500–79,000)		2016	2–BBS	2		65, 83
European Stonechat <i>Saxicola rubicola</i>	B	P	61,000 (39,500–83,000)	65,000 (43,000–87,000)		2016	2–BBS	2		65
Northern Wheatear <i>Oenanthe oenanthe</i>	B	P	165,000 (115,000–220,000)	170,000 (120,000–220,000)		2016	2–BBS	2		65
Dipper <i>Cinclus cinclus</i>	B	P	6,350–19,000	6,900–20,500		2016	1–WBS/WBBS	2		27
House Sparrow <i>Passer domesticus</i>	B	P	5,150,000 (4.65–5.65m)	5,300,000 (4.8–5.75m)		2016	2–BBS	2		65
Tree Sparrow <i>Passer montanus</i>	B	T	225,000	245,000		2016	1–BBS	2		27
Duncock <i>Prunella modularis</i>	B	T	2,350,000	2,500,000		2016	1–CBC/BBS	2		27
Yellow Wagtail <i>Motacilla flava</i>	B	T	19,500	19,500		2016	1–CBC/BBS	2		27
Grey Wagtail <i>Motacilla cinerea</i>	B	P	33,500	37,000		2016	1–WBS/WBBS	3		27
Pied Wagtail <i>Motacilla alba</i>	B	P	495,000 (435,000–560,000)	505,000 (445,000–570,000)		2016	2–BBS	2		65
Meadow Pipit <i>Anthus pratensis</i>	B	P	2,250,000 (1.95–2.55m)	2,450,000 (2.1–2.75m)		2016	2–BBS	2		65
Tree Pipit <i>Anthus trivialis</i>	B	P	105,000 (66,000–145,000)	105,000 (66,000–145,000)		2016	2–BBS	2		65
Water Pipit <i>Anthus spinoletta</i>	W	I	205	205		2012/13–2016/17	7	3		84
Rock Pipit <i>Anthus petrosus</i>	B	P	34,000	36,000		1988–1991	1	3		27
Common Chaffinch <i>Fringilla coelebs</i>	B	T	4,800,000	5,050,000		2016	1–CBC/BBS	2		27

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Brambling <i>Fringilla montifringilla</i>	B W	P I	0–1 45,000–1,800,000	0–1 45,000–1,800,000		2013–17 1981–84	3 8	3 3		82 55
Hawfinch <i>Coccothraustes coccothraustes</i>	B	P	500–1,000	500–1,000		2011	5*	3		12
Bullfinch <i>Pyrrhula pyrrhula</i>	B	T	225,000	265,000		2016	1–CBC/BBS	2		27
Greenfinch <i>Chloris chloris</i>	B	P	760,000 (710,000–810,000)	785,000 (735,000–835,000)		2016	2–BBS	2		65
Twite <i>Linaria flavirostris</i>	B	P	7,800 (5,800–10,000)	7,850 (5,850–10,000)		2013	5	2		77
Linnet <i>Linaria cannabina</i>	B	T	530,000	560,000		2016	1–CBC/BBS	2		27
Common Redpoll <i>Acanthis flammea</i>	B W	P I	12 335	12 335		2013–17 2012/13–2016/17	3 7	2 3		47 84
Lesser Redpoll <i>Acanthis cabaret</i>	B	P	220,000	260,000		2016	1–BBS	3		27
Arctic Redpoll <i>Acanthis hornemanni</i>	W	I	9	11		2012/13–2016/17	7	3		84
Parrot Crossbill <i>Loxia pytyopsittacus</i>	B	P	65	65		2008	5	2		72
Scottish Crossbill <i>Loxia scotica</i>	B	P	6,800 (4,050–11,500)	6,800 (4,050–11,500)		2008	5	2		72
Common Crossbill <i>Loxia curvirostra</i>	B	P	25,000 (19,000–33,000)	26,000 (19,500–34,000)		2016	2–BBS	2		65
Goldfinch <i>Carduelis carduelis</i>	B	P	1,600,000 (1.4–1.75m)	1,650,000 (1.45–1.8m)		2016	2–BBS	2		65
European Serin <i>Serinus serinus</i>	B	P	0	0		2013–17	3	1		82
Siskin <i>Spinus spinus</i>	B	P	430,000	445,000		2016	1–BBS	3		27
Lapland Bunting <i>Calcarius lapponicus</i>	B W	P I	0–1 310	0–1 310		2013–17 2012/13–2016/17	3 7	1 3		82 84
Snow Bunting <i>Plectrophenax nivalis</i>	B W	T I	60 (48–83) 9,000–13,500	60 (48–83) 10,000–15,000		2011 1981–84	5 8	2 3		34 55
Corn Bunting <i>Emberiza calandra</i>	B	T	11,000 (9,050–13,000)	11,000 (9,050–13,000)		2016	5–CBC/BBS	2		18
Yellowhammer <i>Emberiza citrinella</i>	B	T	685,000	700,000		2016	1–CBC/BBS	2		27
Girl Bunting <i>Emberiza cirius</i>	B	T	1,100	1,100		2016	5	1	57	52
Reed Bunting <i>Emberiza schoeniclus</i>	B	T	255,000	275,000		2016	1–CBC/BBS	2		27

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Table 1. Population estimates of full species in categories A–C of the British List – Notes

1. Estimate comes from a bespoke calculation by N. J. Aebischer using the most recent survey information available from ongoing annual monitoring in Scotland and Wales, adjusted using the 2005 survey data (Sim *et al.* 2008) to account for areas not covered by ongoing monitoring, and data from the 2014 survey in England (Warren *et al.* 2015), extrapolated to 2016 using the average annual change since the previous survey.
2. A large reduction in numbers has occurred and this non-native species is believed to be on the way to extinction in the UK.
3. A mean of four males were present during 2010–14 (Holling *et al.* 2014a, 2017a), but the last male has not been seen since May 2016 (Holling *et al.* 2018) and the species is now believed to be extinct as a breeding species in the UK.
4. GB estimates based on the wintering estimates for the naturalised population divided by 3.
5. The NI estimate for Canada Goose is based on BirdTrack records since there is no published estimate for NI, applying the same method used for scarce winter visitors (method 7).
6. The NI estimate uses a count from Strangford Lough, which is believed to be the only feral population of Barnacle Geese in NI (H. Thurgate, S. Wolsey pers. comm.).
7. Dates for the different subspecies estimates are shown in table 2.
8. Note that the NI estimate (264 individuals, 88 pairs) is based on the latest published figure (Boland & Crowe 2008) and is known to be an underestimate. There are now flocks of at least 300 in Belfast in July and possibly 700–800 or more in the whole of NI (K. Mackie pers. comm.) but there is no definitive recent count or estimate to replace the published figure.
9. A feral pair bred in Essex or northeast London in 2017 (Holling *et al.* 2019).
10. The BBS extrapolation uses the UK anchor trend, which is thought to better reflect the UK trend than the England joint trend used in *APEP* 3. The large decrease in the population estimate since *APEP* 3 results from this change of estimation method rather than a substantial decline in breeding numbers: the species is believed to have been increasing in England since *APEP* 3.
11. This species is no longer considered by the RBBP, so the previous GB estimate from RBBP data has been updated by extrapolation using BBS.
12. The RBBP five-year mean is believed to be an underestimate and the population may fall closer to or within the range of 300–500 given by previous *APEP* papers. However, the previous estimate dates from 1968–72 and is of uncertain reliability so is replaced here with the more recent RBBP estimate to enable comparison with future RBBP monitoring.
13. The difference between the wintering and breeding estimates suggests that either (i) breeding is substantially under-recorded or (ii) there is either a large non-breeding population or a substantial influx from Europe during winter. RBBP recorded 67 breeding pairs in 2017 (Holling *et al.* 2019).
14. A single brood was recorded in 2014. It could have involved a hybrid pair, since males were not seen with the brood, although males were seen at the same site earlier in 2014 (Holling *et al.* 2016).
15. The GB estimate repeats the method used in *APEP* 3, and takes the wintering estimate minus birds wintering between Lincolnshire and Essex (assumed to be Dutch breeders), adjusted by a scale of 2.21 to calculate the number of breeding pairs. Note that the NI estimate (Leonard 2010) is an estimate of breeding females rather than breeding pairs.
16. The *APEP* 3 estimate is repeated rather than using more recent RBBP data; the latter are believed to be incomplete following more limited monitoring since 2011.
17. The GB estimate is based on a similar method to that used for *APEP* 3, based on 1988–91 *Atlas* data, but uses 2008–11 *Atlas* data. Note that Humphreys *et al.* (2016) gave some caveats and state that the estimates should be considered a minimum. The UK estimate makes the assumption that breeding density per occupied 10-km square in NI is the same as in GB.
18. RBBP figures show that there were seven nesting females in 2016 in the reintroduced population, but the five-year mean figure has been used rather than the most recent year, since it is unclear whether this level will be sustained.
19. Francis *et al.* (2020) give a range of 2,500–3,900 pairs as the estimate, but state that 3,900 is the best single estimate for the UK population and believe that the true figure may be higher.
20. A total of 6–11 singing males were reported during the national Spotted Crake survey in 2012 (Ausden *et al.* 2013), although RBBP subsequently reported 0–6 since some records were not submitted to BBRC and hence remained unverified. It remains unclear whether 2012 was a one-off or whether more regular undetected breeding attempts may occur.
21. The estimate of 28 singing males from the survey in 2012 (Schmitt *et al.* 2015) gives confidence that the RBBP data are likely to be complete or near-complete.
22. Burke *et al.* (2018) did not give an estimate for wintering Moorhens, so the UK figure uses the *APEP* 3 estimate for NI, based on data from 2004/05–2008/09.
23. The NI estimate comes from a survey in 2013 (Colhoun *et al.* 2015), which is added to the extrapolated GB estimate in order to produce the UK figure.
24. The previous estimate has been updated by extrapolation using the BBS trend since 1995. Note that the previous estimate covered the period 1980–2000 so the extrapolation may not account for changes that occurred in the 1980s.
25. The 2013 survey covered GB only, so the UK estimate presented here makes the assumption that the population change in NI matched the rate of decline observed in GB.
26. Note that although the *APEP* 3/*Seabird* 2000 estimate is repeated here, an error in the UK total in *APEP* 3 has been corrected (birds from the IoM were included in the UK total in *APEP* 3).
27. The sample from the SMP was not considered sufficiently robust to use the trend to update the population estimate and therefore the *Seabird* 2000 estimate is again repeated. Perkins *et al.* (2018) stated that there has been little overall change in the number of territories; they suggested a slight (but not statistically significant) increase in the area they covered (Orkney, Shetland and Handa).
28. Perkins *et al.* (2018) give an estimate of 554 (422–728) breeding pairs for Orkney, Shetland and Handa in 2015, with the area they covered holding around 90% of the population during *Seabird* 2000. The estimate presented here, based on SMP trends, would fall just inside the upper confidence interval given by Perkins *et al.* assuming similar declines across all colonies.

29. This estimate is repeated from Frost *et al.* (2019b), who suggested that it may be a substantial underestimate.
30. The previous estimate, from *Seabird 2000*, is repeated here. SMP trends since then suggest a decline, but these have not been used to produce an updated estimate owing to uncertainty about whether they are fully representative of both coastal and inland colonies, for which the trends are different.
31. Following rapid recent increases, the most recent available annual figure has been used rather than a five-year mean, since breeding numbers seem likely to be sustained or to increase further in the future.
32. A pair bred in 2017 in Somerset, the first record of breeding in the UK (Holling *et al.* 2019).
33. The UK estimate comes from the BTO's Heronries Census published in BirdTrends (Woodward *et al.* 2018) with the calculation accounting for both actual counts and sites not surveyed. Recent census coverage in NI has been near-complete so the actual counts from NI were deducted from the UK estimate to derive the GB estimate.
34. This species first nested in the UK in 2010 but nesting was not confirmed during 2013–17.
35. Now that this species is relatively common and widespread, breeding is likely to be under-recorded and this may be a substantial underestimate. A comparison with the wintering estimate suggests a breeding population of around 2,700 pairs or more, if the proportion breeding was similar to that for Grey Heron (but we do not have sufficient information to make this assumption).
36. The *APEP 3* estimate (200–250) was based on expert opinion rather than the RBBP five-year mean, which is likely to be an underestimate. Hence, although this estimate falls in the middle of the previous range, it is likely to be an underestimate and the population is believed to be still increasing. RBBP recorded 258 pairs in 2017 (Holling *et al.* 2019).
37. The previous estimate is repeated and is considered the best current estimate. The RBBP five-year mean of 39 for 2013–17 is at the lower end of this range and is believed to be an underestimate. Roberts & Law (2014) estimated 100–150 pairs; while their figures could be correct, it is felt that further survey work is required to confirm that this estimate is robust.
38. This uses the BBS trend to extrapolate from the last national survey, in 2005, which found 429 pairs (Holling *et al.* 2008).
39. The *APEP 3* figure of 4,000 pairs is believed to be an underestimate. Extrapolating using the BBS trend gives an updated estimate of 14,200 pairs but there are uncertainties about the reliability of using BBS for this crepuscular/nocturnal species. Expert opinion and information from ringing and nest record schemes suggests that the population falls somewhere between these two figures and hence a tentative estimate of 4,000–14,200 pairs is given here.
40. Two pairs nested in both 2014 and 2015 and three pairs in 2017 (RBBP).
41. Wryneck is judged to be extinct in the UK as breeding has not been confirmed since 2002 (Holling *et al.* 2019), although singing males are still recorded occasionally.
42. This species is difficult to find and breeding is believed to be under-recorded, so producing a robust population estimate is challenging. Casual recording suggests that the severe decline of this species has continued, so the revised estimate of 600–1,000 pairs (Holling *et al.* 2017b) is adopted.
43. The current estimate is based on an extrapolation from the *APEP 3* figure and reflects the decline recorded by BBS during this period. Clements & Everett (2012) and Clements *et al.* (2016) suggested that densities are much higher than previously thought in some areas and that 3,000–3,500 pairs should be a lower limit for the population, which is perhaps as high as 5,000 pairs. Further work will hopefully lead to a robust, revised population estimate.
44. Wilson *et al.* (2018) gave two estimates; this is the most conservative and the one considered to be their main estimate.
45. The *APEP 3* estimate from 2012 was updated using the BBS trend, reflecting a substantial increase over the four years to 2016.
46. This species is probably now extinct as a breeding bird in the UK (Holling *et al.* 2018).
47. RBBP data (196–678 pairs in 2016) suggest that the population may be lower than this estimate, but the species is probably under-recorded by RBBP. A survey being carried out in 2019 and 2020 may produce a better estimate.
48. The estimate from the 2006 survey was extrapolated using the BBS trend. Although the mean sample size (22 squares) is too low for a formal BBS trend, the data reinforces the expected pattern of a strong decline caused by the cold winters in 2008/09 and 2009/10 followed by a slight recovery. The extrapolated estimate is likely to be more reliable than repeating the 2006 survey estimate, carried out prior to the severe winter declines.
49. The estimate of 0–1 pairs assumes that the 2015 breeding record was most likely to be a one-off and assumes that singing males holding territory in most years (mean estimate of 2 (1–4) over the period 2013–17) are likely to be overshooting migrants. However, the recent records may be an indication that this species is in the process of colonising the UK.
50. This species remains an occasional breeder only. Two singing males were recorded in both 2015 and 2016 (RBBP).
51. The most recent national survey figure was 3,200 pairs in 2006 but numbers crashed during the severe winters in 2008/09 and 2009/10 (Clark & Eyre 2012). The 2017 RBBP total is considered to be a more reliable current figure, although note that it is based in part on county estimates, mostly within the core range in Hampshire.
52. Clements *et al.* (2017) suggested that the population is in excess of 4,000 singing males. However, this is based on extrapolation from core areas, not a full survey. Following the removal of Firecrest from the RBBP species list (Holling *et al.* 2019), and in the absence of evidence that breeding distribution is other than sparse away from core areas, the RBBP threshold of 2,000 is given as a minimum estimate. It is considered that the population is likely to be in excess of 2,000 pairs but that the data are not sufficiently robust to give a more precise estimate.
53. Note that the 2012 estimate includes a correction to account for detectability and the higher population estimate than *APEP 3* reflects this rather than a genuine population change. The BBS trend suggests little or no change since the 1999 survey, although the sample size during the early years of BBS was too low to report BBS trends.
54. The last confirmed breeding was in 2012 (Holling *et al.* 2017b).
55. One pair bred in 2016 (Ince 2018).
56. The estimate is the mean of 12 population estimates presented by Hewson *et al.* (2018), and the means of the confidence limits from these 12 estimates.
57. The estimate is the maximum estimate from the survey; this is considered to be the most accurate assessment of the population (Jeffs *et al.* 2018).

Table 2. Population estimates of subspecies or geographical populations. For key, see table 1.

Species	Season	Units	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Red Grouse <i>Lagopus lagopus hibernica</i>	B	P	0	200		2005	3	2		1
Red Grouse <i>Lagopus lagopus scoticus</i>	B	P	265,000	265,000		2016	1-NGC/BBS	3		27
'Dark-bellied Brent Goose' <i>Branta b. bernicla</i>	W	I	98,500	98,500		2012/13–2016/17	6	1		26
'Pale-bellied Brent Goose' <i>Branta bernicla hrota</i> (Nearctic)	W	I	1,550	31,000		2012/13–2016/17	6	1		26, 9
'Pale-bellied Brent Goose' <i>Branta bernicla hrota</i> (Svalbard)	W	I	3,400	3,400		2012/13–2016/17	6	1		26
Barnacle Goose <i>Branta leucopsis</i> (Greenland)	W	I	56,000	56,000		Spring 2018	6	1		26
Barnacle Goose <i>Branta leucopsis</i> (Svalbard)	W	I	43,500	43,500		2017/18	6	1		26
Barnacle Goose <i>Branta leucopsis</i> (naturalised)	W	I	4,350	4,700		2011/12–2014/15	6	2		26, 86
'Greenland White-fronted Goose' <i>Anser albifrons flavirostris</i>	W	I	11,500	11,500		2017	6	1		26, 9
'European White-fronted Goose' <i>Anser a. albifrons</i>	W	I	2,100	2,100		2012/13–2016/17	6	1		26
Common Eider <i>Somateria mollissima</i> (excl. Shetland)	B	P	34,000	35,000		2012–15	5*	2	1	26, 56
Common Eider <i>Somateria mollissima</i> (excl. Shetland)	W	I	77,000	81,000		2011/12–2014/15	5*	2		26, 9
Common Eider <i>Somateria mollissima</i> (Shetland)	B	P	2,100	2,100		2015	6	1	2	37
Common Eider <i>Somateria mollissima</i> (Shetland)	W	I	4,600	4,600		2015	6	1		37
Rock Dove <i>Columba l. livia</i>	B	P	1,000–5,000	1,000–5,000		1988–91	5	2		23
Feral Pigeon <i>Columba livia domestica</i>	B	P	455,000 (375,000–540,000)	460,000 (375,000–545,000)		2016	2-BBS	2		65, 23
Black-tailed Godwit <i>Limosa limosa islandica</i>	B	P	7	7		2013–17	3	1		82
Black-tailed Godwit <i>Limosa l. limosa</i>	B	P	46	46		2013–17	3	1		82
Common Guillemot <i>Uria a. aalge</i>	B	P	850,000	850,000		1998–2002	4	1	3	61
Common Guillemot <i>Uria aalge albonis</i>	B	P	34,500	100,000		1998–2002	4	1	3	61
Great Cormorant <i>Phalacrocorax c. carbo</i>	B	P	6,450	7,150		2015	4	2		61, 64
Great Cormorant <i>Phalacrocorax c. carbo</i>	W	I	55,500	58,500		2012/13–2016/17	4	3		26, 9, 64
Great Cormorant <i>Phalacrocorax c. sinensis</i>	B	P	1,550	1,550		2012	5	2		64
Great Cormorant <i>Phalacrocorax c. sinensis</i>	W	I	6,100	6,100		2012/13	5	3		64

Species	Season	Units	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Eurasian Jay <i>Garrulus glandarius hibernicus</i>	B	T	0	4,250		2016	1-CBC/BBS	2		27
Coal Tit <i>Periparus ater britannicus</i>	B	T	590,000	590,000	+	2016	1-CBC/BBS	2	4	27
Coal Tit <i>Periparus ater hibernicus</i>	B	T	0	74,000	-	2016	1-CBC/BBS	2		27
Wren <i>Troglodytes troglodytes indigenus</i>	B	T	9,750,000	11,000,000		2016	1-CBC/BBS	2		27
'Fair Isle Wren' <i>Troglodytes troglodytes fridariensis</i>	B	T	39	39		2013–17	3	1		47
'Hebridean Wren' <i>Troglodytes troglodytes hebridensis</i>	B	T	5,000–10,000	5,000–10,000		2007	5	2		23
'St Kilda Wren' <i>Troglodytes troglodytes hirtensis</i>	B	T	230	230		2007	3	2		46
'Shetland Wren' <i>Troglodytes troglodytes zetlandicus</i>	B	T	1,500–3,000	1,500–3,000		2007	5	2		23
'Shetland Starling' <i>Sturnus vulgaris zetlandicus</i>	B	T	10,000–20,000	10,000–20,000		2007	5	2		23
'Hebridean Song Thrush' <i>Turdus philomelos hebridensis</i>	B	P	500–2,200	500–2,200		2003	5	2		58
Dipper <i>Cinclus cinclus gularis</i>	B	P	6,350–19,000	6,350–19,000	-	2016	1-WBS/WBBS	2	5	27
Dipper <i>Cinclus cinclus hibernicus</i>	B	P	?	570–1,700	+	2016	1-WBS/WBBS	2	6	27
Duncock <i>Prunella modularis hebridium</i>	B	T	75,000–125,000	245,000–295,000		2016	5-CBC/BBS	3		23, 27
Yellow Wagtail <i>Motacilla flava flavissima</i>	B	T	19,500	19,500		2016	1-CBC/BBS	2		27
'Blue-headed Wagtail' <i>Motacilla f. flava</i>	B	P	0–1	0–1		2013–17	5-CBC/BBS	1		82
Pied Wagtail <i>Motacilla alba yarrellii</i>	B	P	495,000 (435,000–560,000)	505,000 (445,000–570,000)		2016	1-WBS/WBBS	2		27
White Wagtail <i>Motacilla a. alba</i>	B	P	2	2		2013–17	5	1	7	82

Notes

1. See table 1 for details of breeding calculation.

2. Derived from wintering population estimate, adjusted by a factor of 2.21.

3. Note that *U. aadg albonis* is calculated based on all Guillemots in Northern Ireland being *albonis*; Guillemots in SW Scotland north to, and including, Ailsa Craig are *albonis*; all Guillemots in England excluding Northumberland are *albonis*. All other Scottish birds and those in Northumberland are *U. a. aadg*.

4. Subspecies *britannicus* mostly found in GB but also occurs in extreme northeast of Ireland where it intergrades into *hibernicus*; the precise nature of zone of intergradation is unknown.

5. This is an overestimate as some Scottish birds are assigned to *hibernicus*.

6. Estimate is for NI but is an underestimate as *hibernicus* also occurs in Hebrides and parts of west coast of mainland Scotland.

7. The RBBP five-year mean is stated as three breeding pairs (Holling *et al.* 2019) but includes mixed pairs, which are excluded here.

Table 3. Population estimates of non-native species for which breeding has been confirmed in the UK since 2011. For key, see table 1. Note that estimates for Category C species are in table 1.

Species	Season	Units	GB estimate	UK estimate	+/-	UK date	Der	Rel	Note	Reference
Helmeted Guineafowl <i>Numida meleagris</i>	B	P	1	1		2010–14	3	3		44
Indian Peafowl <i>Pavo cristatus</i>	B	P	4	4		2010–14	3	3	1	44
Wild Turkey <i>Meleagris gallopavo</i>	B	P	1	1		2010–14	3	3		42, 44
Bar-headed Goose <i>Anser indicus</i>	B	P	1	1		2010–14	3	3		44
Emperor Goose <i>Anser canagicus</i>	B	P	0–1	0–1		2010–14	3	3		44
Black Swan <i>Cygnus atratus</i>	B	P	19	19		2010–14	3	3		44
Ruddy Shelduck <i>Tadorna ferruginea</i>	B	P	1	1		2010–14	3	2		44
Wood Duck <i>Aix sponsa</i>	B	P	3	3		2010–14	3	3		44
Muscovy Duck <i>Cairina moschata</i>	B	P	10	10		2010–14	3	3		44
Harris's Hawk <i>Parabuteo unicinctus</i>	B	P	2	2		2010–14	3	3		44
Eagle Owl <i>Bubo bubo</i>	B	P	2	2		2010–14	3	1		44
Monk Parakeet <i>Myiopsitta monachus</i>	B	P	18	18		2010–14	3	2		44

Note

1. Cheke (2019) suggests some local UK populations of this species could be considered self-sustaining.

Table 4. Population estimates for six species with notable breeding populations in the Isle of Man. For key, see table 1. Estimates are shown here for the five species for which separate IoM estimates were published in APEP 3, and also for Little Tern.

Species	Season	Units	IoM estimate	+/-	UK date	Der	Rel	Note	Reference
Ringed Plover <i>Charadrius hiaticula</i>	B	P	147 (135–160)		2007	5	1		16
Herring Gull <i>Larus argentatus</i>	B	P	7,100	-	1998–2002	4	1		61
Little Tern <i>Sterna albifrons</i>	B	P	18		2013–17	3	1		82
Hen Harrier <i>Circus cyaneus</i>	B	P	30		2016	5	1		81
Peregrine Falcon <i>Falco peregrinus</i>	B	P	22 (22–23)		2014	5	1		78
Red-billed Chough <i>Pyrrhocorax pyrrhocorax</i>	B	P	160		2014–15	5	1		35

Water Rails in the UK

– an estimate of the breeding population

Ian Francis and the Rare Breeding Birds Panel

Abstract There is good evidence that the breeding Water Rail *Rallus aquaticus* population in the UK is higher than reported. Estimates from county recorders during 2016 and 2017 were used to derive an updated national total, of between 2,500 and 3,900 breeding pairs or territories. Previous estimates and work from dedicated site surveys are considered and it is likely that the true figure is higher than the upper limit of that range, possibly by more than 10%. It is recommended that 3,900 territories should be adopted as the current UK population estimate.

The Water Rail *Rallus aquaticus* is a secretive species that is widespread across much of the UK. Its presence is usually revealed by loud, squealing vocalisations, uttered from within dense wetland vegetation. In common with many members of the Rallidae family, it is a difficult bird to census at any time of year, owing to its favoured habitat. Its territorial behaviour is poorly understood, unpaired single birds may call, and males and females may also duet, all of which may affect the interpretation of counts (Gilbert *et al.* 1998). For that reason, previous estimates of the breeding population in the UK have varied quite markedly and have been treated with caution.

The Water Rail was added to the Rare Breeding Birds Panel (RBBP) list from 2006 following a review, which considered that it could be rarer than previously thought, perhaps with a national population of fewer than 2,000 pairs or territories. Smith (2013) suggested a population of over 2,500 pairs, yet the RBBP totals recorded during the ten years to 2016 ranged between 972 and 1,628 breeding pairs. In

recent years, about a quarter of recording areas have provided some indication of estimated county populations, which account for an extra c. 1,200 territories, pushing the estimated UK population to over 2,500 territories, perhaps considerably more (Holling *et al.* 2018). This analysis uses a more thorough survey of such county estimates to derive an updated UK population total.

Methods

Many recorders provided estimates of county populations for the 2016 and 2017 breeding seasons, based on their knowledge of suitable sites. In total, 47 estimates were provided



36. An aerial view of Ham Wall, in Somerset, September 2015; the Avalon Marshes probably support as much as 10% of the UK breeding populations of Water Rails *Rallus aquaticus*.

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Table 1. Water Rail breeding population estimates in the UK. Note that where two figures from the present analysis are given, they relate to 2016 and 2017 respectively. Some totals are rounded.

Region and source	Estimate (pairs or territories)	Survey period	Comments
Britain & Ireland (Sharrock 1976)	2,000 (–4,000)	1968–72	‘Unlikely to exceed 4,000’
Republic of Ireland (Gibbons <i>et al.</i> 1993)	850–1,700	1988–91	Ireland (pairs) – not covered by this RBBP analysis
United Kingdom			
Gibbons <i>et al.</i> (1993)	450–900	1988–91	Britain (pairs)
Holling <i>et al.</i> (2018)	972–1,628	2006–15	annual variation over ten years
Musgrove <i>et al.</i> (2013)	1,100	2006–10	mean no. territories; likely underestimate
UK estimate, this analysis	2,500–3,900	2016–17	3,900 is best single figure
Scotland			
Forrester <i>et al.</i> (2007)	1,250–1,400	2007	see also Murray (2013)
Scotland estimate, this analysis	675–1,108	2016–17	see text
England			
Brown & Grice (2005)	1,000+		‘In excess of 1,000 pairs’
England estimate, this analysis	1,692–2,638	2016–17	see text
Wales			
Lovegrove <i>et al.</i> (1994)	100–150	1994	breeding pairs
Wales estimate, this analysis	53–79	2016–17	see text
Northern Ireland			
NI estimate, this analysis	8–10	2016–17	see text
IoM estimate, this analysis	1	2016–17	
Channel Islands, this analysis	3	2016–17	

from 79 recording areas. It is acknowledged that many sites are not properly surveyed for calling birds early in the season, and consequently some recorders felt unable to provide a considered estimate. Most county estimates were derived from an assessment of records of calling birds, although these are generally not based on call-playback, which is the recommended method (Gilbert *et al.* 1998; Brambilla & Jenkins 2009). In the absence of a dedicated national survey, those estimates are presented here to give a UK breeding population figure for 2016–17.

Results

Table 1 summarises previous estimates of the UK breeding population, derived from the sources listed. Further details by county are given in Appendix 1. The new estimated UK population figure of 2,500–3,900 territories is rounded up from the raw data.

There is no information sufficiently accu-

rate from which to derive any breeding population trend. In distribution terms, in Britain there was a 6% breeding range expansion from 1968–72 to 2008–11, compared with a 17% contraction in Ireland (Balmer *et al.* 2013). In Europe, the breeding population is estimated at 157,000–346,000 pairs by BirdLife International (2019) and the species’ IUCN Red List status is ‘Least Concern’. Trends in Europe are unclear, but a small overall decline is considered likely, and it is recognised that some large historical declines cannot be quantified (e.g. Brown & Grice 2005). As is the case for the UK, the European total seems likely to be an underestimate and this suggests that the UK accounts for only a small fraction of the European breeding population.

Discussion

Based on the results of this analysis for 2016–17, the UK breeding population of Water Rails was estimated to be 2,500–3,900 pairs/

territories. However, evidence from a small number of additional studies suggests that the true figure is likely to be higher than 3,900 pairs.

Alternative figures are available for some recording areas from the past two decades. Principally, these relate to dedicated call-playback or acoustic survey estimates for a few individual sites, always leading to substantially higher numbers than previously published figures. The increases revealed by these surveys support the contention that our revised estimate is realistic. Water Rails are widely distributed across the UK (see fig. 3 in Holling *et al.* 2018) and some important sites may support over 100 territories (based on past surveys summarised in Chown 2004). These include Poole Harbour (Dorset), the Inner Tay reedbeds (Perth & Kinross), Leighton Moss (Lancashire & North Merseyside) and Stodmarsh (Kent), while a 2018 survey of the Avalon Marshes (Somerset) recorded an estimated 423 pairs (Blacker 2019). Large-scale wetland restoration in some counties has surely influenced high local populations, but perhaps also increases the difficulties of making accurate and reliable counts.

It is plausible that the increased numbers typically generated by call-playback methods may apply widely to most sites and counties (Murray 2013). In our analysis, there were many examples where the original territory totals (based on submitted records) increased between two- and six-fold to the new estimated figure. For areas where call-response surveys have been used, the increase can be over ten-fold, but this is variable and samples are limited (Chown 2004). For some counties, such an increase would be implausible owing to lack of suitable habitat, but for others it seems quite possible. Assuming the wider applicability of correction factors based on call-playback surveys, our analysis suggests that the UK Water Rail population could even

approach 5,000 pairs, but the uncertainties involved make it unwise to adopt such a high figure with confidence.

Another approach that we investigated was to widen the date window to include all estimates and specific studies from the last 20 years. This produced a modified UK total of 4,275 territories, a little above our recommended figure. We opted not to use this because of the very wide date range, though it is likely that many older estimates may still be valid for given sites or counties. This species remains hard to detect, and little is known about how numbers at a given site vary from year to year, or the degree to which birds may breed in small patches of habitat that are either not surveyed or considered unsuitable by birdwatchers.

Murray (2013) presented evidence supporting the Scotland estimate in Forrester *et al.* (2007) and extrapolated some recorded density figures linked to Atlas distributions in 2007–11. This suggested 4,430–6,480 territories in Great Britain and 1,530–2,230 in Ireland. Such extrapolations are considered plausible, given the arguments presented above.

In our analysis, counties where the estimate was considerably higher than the recorded total include Dorset, Hampshire, Kent, Lancashire & North Merseyside, Norfolk, Somerset, Suffolk and Yorkshire in England; and Argyll, Borders, Highland and Perth & Kinross in Scotland (all with estimates of over 100 territories). The Clyde



Ian Francis

37. Water Rails can breed over extensive and inaccessible wetlands, making surveys difficult; Loch Kinord, Muir of Dinnet NNR, North-east Scotland, May 2007.

recording area is notable in that estimates for 2016–17 based on limited records lie in the range 13–15 territories, yet detailed acoustic surveys in the early 2000s revealed as many as 300 territories there (Forrester *et al.* 2007). This much higher figure was not used for our summary UK estimate, but it seems very likely that many of these sites will still hold birds. This reinforces the point that if evidence from different years and sites are used, the overall UK estimate would be higher still.

Recorded or estimated numbers in Northern Ireland seem low compared with the distribution, density maps and estimate in Gibbons *et al.* (1993). Water Rails appear to be widespread and numerous in the Republic of Ireland, and there is sufficient habitat to support much higher numbers in Northern Ireland, where under-recording may be significant. The species is not on the IRBBP list, and Hutchinson (1989) noted that it was much more widespread than was mapped in the 1968–72 *Breeding Atlas* and that ‘there are undoubtedly more than 1,000 pairs nesting in Ireland’.

Taking into account all the factors discussed above, we recommend that the higher figure in our estimate, 3,900 territories, should be adopted as the current population estimate for the UK. Given that the RBBP no longer considers this species and the fact that existing surveys do not cover this species effectively, it risks falling ‘between schemes’ in future. Further thought should be given to planning periodic sample surveys in representative areas, using recommended call-playback methods, to attempt to assess any substantial future changes and, especially, to detect any declines.

Estimates of wintering numbers

The number of Water Rails wintering in the UK was not considered in our analysis and there is no accurate estimate for the UK. The first Winter Atlas, covering the period 1981–84 (Lack 1986) made no population estimate; this was also the case in the recent analysis by Frost *et al.* (2019) and in published reports of the UK Wetland Bird Survey (WeBS). However, a winter population estimate for Scotland, of a minimum of 1,000–3,000 birds, was given by Forrester *et al.* (2007). Atlas maps indicate a more widespread

distribution in winter compared with summer, suggesting a much higher UK population in winter (though dispersal of breeding birds is likely to contribute to this). Our current understanding is that UK breeding birds are probably mainly resident but in winter there is substantial immigration from continental Europe (Wernham *et al.* 2002). Across the UK, there was a general overall increase in winter range from the 1981–84 *Winter Atlas* to the 2007–11 *Bird Atlas* (Balmer *et al.* 2013).

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Appendix 1. Country and county population estimates for breeding Water Rails, 2016–17.

Recording area: bold = recorder estimate provided for 2016 and/or 2017	Baseline: territories in 2016 RBBP report	Total or estimates from recorder, 2016	Total or estimates from recorder, 2017	Recording area: bold = recorder estimate provided for 2016 and/or 2017	Baseline: territories in 2016 RBBP report	Total or estimates from recorder, 2016	Total or estimates from recorder, 2017
England				Wales			
England, SW				Anglesey			
Avon	27	27	3	Breconshire	2	2	10
Cornwall		0	0	Caernarfonshire	2	5	3
Devon	13	13	25	Carmarthenshire	2	2	5
Dorset	13	184	184	Ceredigion	5	10	5
Gloucestershire	3	2	3	Denbigh & Flint	3	3	1
Hampshire	31	200	300	East Glamorgan	10	10	3
Isle of Wight	2	2	9	Gower	3	3	3
Isles of Scilly		0	0	Gwent	3	6	4
Somerset	40	70	600	Meirionnydd	2	0	20
Wiltshire	1	1	2	Montgomeryshire		0	0
England, SE				Pembrokeshire		0	3
Bedfordshire	6	6	17	Radnorshire	9	9	7
Berkshire	8	8	22	Scotland			
Buckinghamshire		2	6	Scotland, S			
Essex	9	9	9	Ayrshire	6	7	17
Greater London		0	10	Borders	81	81	250
Hertfordshire	8	20	5	Clyde	15	15	13
Kent	49	49	200	Clyde Islands	2	2	3
Oxfordshire	7	7	10	Dumfries & Galloway	19	25	50
Surrey	11	50	30	Lothian	2	2	7
Sussex	3	3	50	Scotland, Mid			
England, E				Angus & Dundee	5	11	4
Cambridgeshire	32	32	23	Fife	12	12	8
Lincolnshire	39	39	88	Moray & Nairn	1	50	50
Norfolk	57	57	125	North-east Scotland	9	80	80
Northamptonshire	2	2	12	Perth & Kinross	7	300	300
Suffolk	318	318	350	Upper Forth	7	7	4
England, C				Scotland, N & W			
Derbyshire	8	8	4	Argyll	26	26	100
Herefordshire	3	3	2	Caithness	2	2	1
Leics & Rutland	1	5	2	Highland	30	30	200
Nottinghamshire	24	24	23	Orkney	15	15	10
Shropshire		0	0	Outer Hebrides	1	10	10
Staffordshire	62	62	57	Shetland		0	1
Warwickshire	16	18	26	Northern Ireland			
West Midlands	3	3	2	Co. Antrim	6	6	5
Worcestershire	9	9	8	Co. Armagh		0	1
England, N				Co. Down	2	2	2
Cheshire & Wirral	63	63	55	Co. Fermanagh		0	0
Cleveland	24	30	18	Co. Londonderry		0	0
Cumbria	7	12	9	Co. Tyrone	2	2	0
Co. Durham	5	10	27	Isle of Man			
Greater Manchester	39	39	23	Channel Islands	0	0	3
Lancs & N Mersey	1	160	160	GRAND TOTAL			
Northumberland	27	27	23	Rounded up	1,391	2,431	3,836
Yorkshire	118	118	116		1,400	2,500	3,900

The tide is turning for lead ammunition

Deborah Pain, John Swift, Rhys Green and Ruth Cromie

Abstract Birds are poisoned by lead from ammunition, for example when waterbirds and terrestrial gamebirds ingest gunshot mistakenly for grit or food, or when scavenging and predatory birds ingest fragments of lead from gunshot or bullets in the flesh of their prey. In recent decades, awareness has grown that these risks extend to people who frequently eat game shot with lead ammunition, or are particularly vulnerable to the effects of lead, such as children and pregnant women. Despite global scientific consensus on the risks from lead ammunition, and the widespread availability of non-toxic alternatives, transition away from lead has been slow. However, there has been considerable progress in recent years and some shooting stakeholders have switched (or are switching) to the use of non-lead ammunition. In the UK, these changes are happening despite a conspicuous absence of political and regulatory action in the face of increasing evidence of the risks to wildlife and people. Government action is essential and urgently needed to remove the threat of lead poisoning to birds in the UK, and to remove this source of dietary lead contamination for humans.

The poisonous effects of lead on humans and other animals have been known for centuries. One hundred years ago, the famous American ornithologist Alexander Wetmore (1886–1978; he of the eponymous systematic order) published a paper in the US Department of Agriculture Bulletin about lead poisoning of waterfowl (Wetmore 1919). Wetmore reported numerous cases in which wild waterfowl died after swallowing lead gunshot that had fallen into wetlands when shotguns were fired. He also described the results of an experiment in which he fed lead gunshot pellets to ducks. He concluded that lead poisoning caused by eating shot was common and a ‘dangerous and usually fatal malady’.

Lead poisoning from ammunition sources affects waterfowl and terrestrial birds that ingest spent gunshot directly, and also scavenging and predatory birds that ingest lead from bullets and gunshot when feeding on injured or unretrieved animals after they have been shot or on viscera discarded by hunters. As lead bullets and gunshot pass

through the body of a shot animal, they typically leave numerous tiny lead fragments in their wake, so even game meat containing no immediately visible ammunition can contain substantially elevated lead levels (Pain *et al.* 2010). This presents risks not only for birds and other wildlife, but also for human consumers (Green & Pain 2019). While lead poisoning from ammunition sources kills large numbers of birds annually and causes substantial suffering, humans normally ingest and absorb far smaller amounts of lead from ammunition. Nonetheless, frequent consumers and groups especially vulnerable to the effects of lead, such as women of pregnancy age and children, are at risk of a range of sub-lethal health effects. The developing nervous system in children is particularly sensitive, with associated impacts on IQ (EFSA 2010). Elevated exposure of people to ammunition-derived lead is a worldwide issue, ranging from communities of sports shooters in the UK to indigenous peoples living in remote parts of the Peruvian



Peter Beesley

38. Red Kite *Milvus milvus*, Northamptonshire, August 2018. Some of the UK's most iconic raptors are among the species commonly affected by lead poisoning. Red Kites have been studied in the UK and found to ingest spent shot and become poisoned. Although no work has been done on Golden *Aquila chrysaetos* or White-tailed Eagles *Haliaeetus albicilla* in the UK, they are among the birds most frequently affected by lead poisoning in areas where they have been studied, including elsewhere in Europe.

Amazon (Cartró-Sabaté *et al.* 2019; Pain & Green 2019; Swift 2019).

In 2016, Ian Newton reported in *British Birds* (Newton 2016) on a conference held at Oxford University in 2014 that focused on the risks to both wild birds and human health from the continuing use of lead ammunition (Delahay & Spray 2015). He concluded that legislation was needed to replace lead ammunition for hunting with non-toxic alternatives. Newton's conclusion accorded with those of the Lead Ammunition Group (LAG)¹, a UK initiative to assess and address the risks to wildlife and people from lead ammunition, initially set up by the Department for Environment, Food and Rural Affairs (Defra) and the Food Standards Agency (FSA) in 2010. The final LAG Report, submitted to the then Secretary of State for the Environment, Elizabeth Truss, in May 2015, highlighted the need for an action plan, ideally driven by the shooting industry but, if necessary, by Defra. It concluded that there was no evidence that any feasible measures to reduce the exposure of wildlife and humans

to ammunition-derived lead would adequately control the risks, other than replacing lead shot with alternatives. Specifically, other measures could not ensure that small game entering the food chain would not have the elevated lead concentrations that present health risks to vulnerable groups. The report also concluded that existing regulations aimed at properly protecting wildfowl and wetlands had not been, and were unlikely to be, effective, and that these problems would increase in the medium and long term. The Secretary of State replied a year later, in May 2016, with the reply arriving the day David Cameron left Downing Street. She stated that the Government saw no need to take any further policy action (Truss 2016).

However, while the UK Government decided not to act upon the LAG's advice, evidence of the extent of the problem and the need for replacement of lead ammunition with non-toxic alternatives has continued to grow, and there have been many developments in both policy and practice in the UK and internationally.

¹ While the 'formal' advisory role of the LAG ceased after the UK Government responded, in 2016, to its final report, it continues to function as a group of experts that provides a clearing house for evidence and a forum for communication of that evidence (see www.leadammunitiongroup.org.uk).

Table 1. Selected milestones in documenting the risks to people and wildlife from ammunition-derived lead.

- **1959** A major study on lead poisoning wildfowl by Frank Bellrose in the USA (Bellrose 1959) stimulated further research and an eventual ban on the use of lead gunshot for hunting waterfowl in the USA.
- **1983** The Royal Commission on Environmental Pollution conducted a detailed assessment of risks from lead in the environment (RCEP 1983) and recommended that the UK Government should ban lead shot in circumstances where it is irretrievably dispersed in the environment as soon as alternatives are available.
- **1991** An international workshop on lead poisoning in waterfowl in Brussels (Pain 1992), with more than 100 participants from 21 countries, concluded that the only effective solution is the replacement of lead shot with non-toxic alternatives, and that such alternatives were already available and in use. This gave focus to new policy initiatives and was a precursor to the African-Eurasian Migratory Waterbirds Agreement (AEWA) decision that Parties to the agreement (including the UK) should endeavour to phase out the use of lead shot in wetlands by 2000 (AEWA 1999).
- **2008** An international conference convened by The Peregrine Fund in Boise, USA (Watson *et al.* 2009), brought together wildlife and human health professionals for the first time to discuss the implications of ingestion of lead from ammunition for both people and wildlife.
- **2014** An International conference on lead ammunition and human and wildlife health at Oxford University (The Oxford Lead Symposium) concluded that it was necessary for lead ammunition to be phased out (Delahay & Spray 2015).
- **2015** The UK Lead Ammunition Group submitted its final report to government recommending the need for additional actions to reduce the risks to humans and wildlife supported by substantial and detailed risk assessments (LAG 2015).
- **2017** A dossier proposing restrictions on lead in gunshot was prepared by the European Chemicals Agency in 2017 (ECHA 2017) with opinions on this dossier given by the Committee for Risk Assessment (RAC) and Committee for Socio-economic Analysis (SEAC) in 2018.
- **2019** A special issue of the journal *Ambio* was published in September 2019 (Kanstrup *et al.* 2019), updating information on the risks of lead ammunition to wildlife and people, together with some of the economic consequences of these risks and solutions.

Note: These milestones are rather UK/EU-focused and substantial additional literature has been published in the USA over this period. See also Cromie *et al.* (2019).

Table 1 illustrates a number of scientific milestones since Wetmore's 1919 paper. These build upon the many publications on this issue, spanning more than half a century. The most recent of these, a special issue of the journal *Ambio* (published in cooperation with the Royal Swedish Academy of Sciences), highlights the fact that lead poisoning has been reported in more wildlife species and places than previously recognised, and that large (and in the UK increasing) numbers of people are eating wild-shot game on a frequent basis and are thus exposed to elevated levels of lead (table 2). A paper in that special issue also estimates some of the costs to society of the continued use of lead ammunition,

associated with impacts on wildlife, people and the environment. While only a limited number of costs were included, these were estimated at a minimum of between €444 million and €1.3 billion in Europe every year (Pain *et al.* 2019a).

A summary of these costs is provided in table 3. Data were available to estimate only a selection of the costs, including the costs of replacing some of the birds that die of lead poisoning every year, and the costs to society of the risk of reduced IQ in children that ingest lead in game meat. Cost ranges were given for replacement costs for birds because, for raptors, the estimates ranged from more cost-effective to more expensive methods, i.e.

Table 2. Some key messages about impacts of lead ammunition from papers in the *Ambio* Special Issue on 'Lead in hunting ammunition' (Kanstrup *et al.* 2019).

Wildlife

- Poisoning from lead ammunition is likely to occur wherever lead ammunition is used and feeding birds are exposed to it.
- Many cases of poisoning were reported in new species, especially of predatory and scavenging birds that had not previously been studied.
- Sub-lethal effects from lead ammunition on wild birds were found at lower blood-lead concentrations than previously reported.
- Lead poisoning was estimated to kill one million wildfowl a year in Europe and cause sub-lethal effects in another three million.
- Research suggests that lead from ammunition affects, or is likely to affect, populations of wildfowl, terrestrial birds, raptors and scavengers.

Humans

- No blood-lead threshold has been defined below which negative effects of lead on health cannot be detected. It appears that effects on IQ per unit increase in blood-lead concentration are greater at low than high concentrations.
- The greatest source of lead to which most people are exposed (in the EU) is dietary.
- An estimated five million people in the EU frequently eat wild-shot game meat, exposing them to significant amounts of lead.
- Approximately ten thousand children in the UK and tens of thousands across the EU may be eating enough lead from wild game meat to affect their IQ.
- Several studies indicate an association between exposure to lead in early life and antisocial behavioural issues in later life. There are likely to be wider societal impacts associated with low-level exposure of children to lead, irrespective of the source.

Note: These key messages are based on Green & Pain (2019) and Pain *et al.* (2019b) and include both new estimates for human health and reviews and presentation of previous estimates by a range of authors, e.g. for wildfowl mortality. The *Ambio* Special Issue also includes much information on the solutions.

from supplementary feeding and translocation to breeding and reintroduction. The additive costs in table 3 are minimum costs since insufficient data were available to estimate the following: replacement costs for many of the bird species known to be affected by lead poisoning; costs of indirect mortality from lead poisoning (birds that die due to sub-lethal effects of lead poisoning, increased accidents or susceptibility to other diseases); increased incidence of chronic kidney disease and systolic blood pressure in adult humans; advocacy and enforcement costs; food wastage costs; and costs of lead poisoning to domestic livestock and other animals (see Pain *et al.* 2019a). Despite the limited data available, these estimated costs are considered to far outweigh the estimated costs of switching to non-toxic ammunition types. At present, some of these costs of

continued use of lead ammunition are borne by charitable and research organisations, government and EU funding sources (e.g. for species recovery projects), and society in general. The editors of the special issue of *Ambio* concluded that the much-needed transition to the use of non-lead ammunition has been piecemeal and too slow, and that future success requires that all sectors support evidence-based progressive policies and regulation (Arnemo *et al.* 2019).

There is worldwide scientific consensus on the risks arising from lead ammunition, and the need to replace it with non-toxic alternatives (Bellinger *et al.* 2013; Group of Scientists 2014; Andersen *et al.* 2018). However, as frequently happens, changes in practice and policy take far longer to achieve than is necessary. This is especially the case when vested interests, for a variety of reasons, wish to

Table 3. Summary of selected additive cost estimates to society of the continued use of lead ammunition across the EU and Europe. Costs are taken from table 5 of Pain et al. (2019a); see that publication for the basis of calculations and references for the data used. Cost estimates cover only a selection of species and cost areas for which sufficient data were available to make broad estimates. These figures should therefore be considered as minimum costs.

Cost area	Description	Annual cost (€ million): EU	Annual cost (€ million): Europe
Wildlife			
Replacement costs of birds estimated to die as a direct result of lead poisoning	Includes replacing 700,000 wildfowl (EU) or one million (Europe) of 16 species, four species of raptor (530–691 birds in the EU; 765–1,139 in Europe) and 232,402 released Common Pheasants <i>Phasianus colchicus</i> and Red-legged Partridges <i>Alectoris rufa</i> in the UK	133.4–565.4	182.4–895.4
Treatment costs of wildfowl	Costs for treating 1% of the 700,000 lead-poisoned wildfowl in the EU and the one million in Europe (listed above), and for treating 1% of the 2.1 million wildfowl in the EU and three million in Europe estimated to suffer sub-lethal welfare effects	28	40
People			
Reduced IQ in children	Minimum annual costs of risk of reduced IQ in children in the EU that frequently consume game shot with lead. Surveys from other countries suggest that this may be an underestimate, possibly by an order of magnitude.	40–104	Not estimated but >40–104
Environment			
Clean-up	Ammunition at shooting ranges – broad estimate	81–162	Not estimated but >81–162
Clean-up	Ammunition at hunting blinds with greatest contamination – broad estimate	c. 100	Not estimated but >c. 100
Other costs			
Research	Investigating lead poisoning; monitoring and surveillance	1	Not estimated but >1
Total estimated costs		383–960	444–1,302

avoid change. ‘Late lessons from early warnings’ by the European Environment Agency (EEA 2013) charts many such case studies,

including the removal of lead from petrol, where change was delayed until long after evidence showed that it would be for the good of

the environment and society in general.

Nonetheless, there have been significant advances both nationally and internationally in recent years. Effective and affordable non-lead ammunition has long been available. To date, 33 nations (including 23 EU countries) have passed national or regional legislation requiring the use of non-lead shotgun ammunition, but mainly for hunting in wetlands or hunting particular waterfowl species (Stroud 2015; Mateo & Kanstrup 2019). Denmark (1996) and the Netherlands (1993) are notable for having successfully banned the use of lead shot for all hunting (Avery & Watson 2009). Lead bullets are regulated in some German regions (Mateo & Kanstrup 2019); lead ammunition has been banned in the Stelvio National Park and Sondrio Province in the Italian Alps; and at specific locations in Austria and France pilot projects are under way where hunters are trialling non-lead ammunition (<https://bit.ly/35xhROG>). In order to protect the California Condor *Gymnogyps californianus* and other scavenging and predatory birds and wildlife from lead poisoning, California State introduced a ban on the use of all lead ammunition (gunshot and bullets) for hunting from 1st July 2019 (<https://bit.ly/2OtHLnf>).

Globally, signatories to several Multilateral Environmental Agreements have resolved to phase out the use of lead ammunition in certain places or where certain species are exposed. These include Parties to the Convention for the Conservation of Migratory Species (CMS; Stroud 2015). Although progress made as a direct result of the 2014 CMS resolution has so far been limited and deadlines have not been met (Cromie *et al.* 2019), it has raised the profile of the issue and the international need to resolve the problem. Most recently, the issue has made it onto the agendas of both the International Union for the Conservation of Nature (IUCN 2016) and the United Nations Environment Assembly (UNEP 2017), which encourage governments to raise awareness of this matter and/or promote and help implement previous resolutions. While these international processes are sometimes protracted, and implementation can take a long time, they nonetheless set an important international mandate and can be very effective for

national regulation. For example, legislation banning the use of lead gunshot in wetlands or for shooting waterfowl exists in many European countries as a result of an African-Eurasian Migratory Waterbirds Agreement (AEWA) resolution (AEWA 1999; table 2). This agreement continues to work to resolve the ongoing issue, for example by highlighting its global importance for birds and people as a major part of their communications on World Migratory Bird Day 2018 (<https://bit.ly/2OHRkxu>).

Significant progress is also being made at an EU level where, at the request of the European Commission, an EU-wide restriction on the use of lead gunshot for shooting in and over wetlands was proposed by the European Chemicals Agency (ECHA) under REACH (the EU's Regulation, Evaluation, Authorisation and Restriction of Chemicals; ECHA 2017). This was proposed chiefly to protect waterbirds and harmonise measures taken across the EU. While legislation exists in most EU countries restricting the use of lead gunshot over wetlands or for shooting waterfowl, both the nature of national legislation and its efficacy are variable. For example, in England, where it has been illegal to shoot wildfowl using lead shot since 1999, compliance studies consistently show that some 70% or more of locally sourced wildfowl have been illegally shot with lead ammunition (Cromie *et al.* 2015). Similar restrictions in North America have been effective because waterfowl hunting is carefully regulated there and the regulations are enforced. This is not the case in the UK. The ECHA restriction proposal has reached its final stages and a decision by Member States is believed to be imminent (as of winter 2019/20). In addition, an ECHA Investigation Report (ECHA 2018) found that there was a case for extending the restriction to all shooting, to protect both human health and predatory and scavenging birds, and the Commission subsequently mandated ECHA to prepare a restriction proposal on the availability and use of lead in ammunition (and fishing weights) used in both wetlands and other terrains (ECHA 2019). Should this happen and these restrictions be adopted, this would practically eliminate risks, with the exception of the historical legacy of deposited shot, in one fell swoop.

One curious anomaly of EU Regulation is that Maximum Levels (MLs) of lead permitted in traded meats are set for domestic meats such as beef, lamb, pork and chicken under EU Regulation (EC No 1881/2006), but no ML has been set for game meats, despite these being set for some other meats that are eaten infrequently. If a comparable ML was set for game, it is likely that it would be exceeded for much of the traded wild-shot game, often by an order of magnitude or more (e.g. Pain *et al.* 2010). However, food standards and safety agencies in various European countries, including Germany, Spain, France, Italy and the UK, have issued health advice highlighting the risks associated with exposure to lead in wild-shot game. Vulnerable groups, such as children and women of pregnancy age, are often advised to avoid such meat while other frequent consumers are advised to reduce their consumption (e.g. Knutsen *et al.* 2015, <https://bit.ly/34FJP0Z>). Meanwhile, The British Association for Shooting and Conservation (BASC) reported that, according to Mintel, sales of game meat rose by 5% in 2018, which was the fifth year in succession that the demand rose <https://basc.org.uk/get-healthier-in-2019-by-upping-your-game>. This is probably associated with initiatives that promote game consumption such as the Countryside Alliance's 'Game to Eat' (<http://bit.ly/2tTMXsJ>) and BASC's 'Taste of

Game' campaigns (<https://bit.ly/33ordkA>), and more recently the British Game Alliance (www.britishgamealliance.co.uk), which actively promotes game as healthy wild meat.

In 2016, when the UK Secretary of State decided that no change to current policy on lead ammunition was warranted (Truss 2016), despite substantial evidence of risks from lead ammunition, she acknowledged that there appeared to be poor compliance with existing Lead Shot Regulations and confirmed that 'Defra will look at how the existing Regulations on wildfowling can be better implemented'. Acknowledging poor compliance with existing law was unsurprising since Defra itself funded a compliance study, using approved methods, which found it to be low (Cromie *et al.* 2010). Three years on, no action on the part of the Government to improve compliance is evident, despite the increasing profile of this issue and knowledge that the effects of lead from ammunition are more far-reaching than previously realised. With respect to human health, advice on the National Health Service website is that it is best for pregnant women to avoid eating game that has been shot with lead pellets as it may contain higher levels of lead (NHS 2017).

Despite political and legislative inaction in the UK, action has nonetheless been taken by various ammunition-using stakeholders and sectors, including some shooters (personal

communications and shooting media), landowners, land managers, and retail organisations, which will help to reduce exposure to lead by people who choose to eat wild-shot game.

In the UK, awareness of the risks to human health, and the need to safeguard their venison markets, resulted in Forest Enterprise England requiring their staff to use non-lead ammunition for culling deer and boar



39. Lead pellets extracted from gizzard of a Whooper Swan *Cygnus cygnus*. The shot shown have been ground down to different degrees and solubilised lead will have been absorbed.

from 2016. The decision was made following successful trials of selected non-lead bullets and was based on clear evidence that lead from ammunition can contaminate carcasses – and that the organisation’s marketing position could be seriously damaged if they continued to put meat contaminated with lead into the human food chain when proven alternatives are available (<https://bit.ly/2qP9B4b>). Forest Enterprise Scotland is similarly moving rapidly towards using only lead-free ammunition to shoot deer and ‘feral pigs’ (we assume this refers to wild boar; <https://bit.ly/34C97wM>). The main drivers for this change are the concerns over food contamination with lead and protecting market supplies, and also harm to wildlife like wildfowl and raptors.

More recently, Waitrose & Partners, the UK’s largest retailer of game, announced its intention to phase out the use of lead shot on the estates from which they source game. By the 2020/21 season all of Waitrose & Partners game will be brought to bag without the use of lead ammunition (Barkham 2019; <https://bit.ly/35Jt98L>). Some other supermarkets seem set to follow suit.

The Game & Wildlife Conservation Trust, Countryside Alliance and BASC have recently highlighted that Waitrose’s ability to sell game *not* shot with lead reflects the availability and effectiveness of non-lead ammunition, with the commercial availability of steel shot cartridges with biodegradable shot cups being an important innovation. Those organisations reflected that there is new evidence on risks to wildlife and human health and that a further shift towards non-lead ammunition may result from the demands of the game market (Bell *et al.* 2019).

The moves by Forest Enterprise and some supermarkets are certainly positive, and will go some way towards reducing lead exposure for people who purchase game from the larger retail outlets; however, most of the frequent consumers of game are likely to eat locally sourced shot game, in particular employees, family members and others obtaining game directly from primary producers – shoots and shooting estates.

Lead poisoning from ammunition sources is truly a ‘One Health’ issue, affecting wildlife, people, and, occasionally, domestic animals

(Payne *et al.* 2013). The debate on the issue has moved on to highlighting the multiple benefits to be gained from a non-toxic ammunition future (Arnemo *et al.* 2019). As this future is increasingly being realised by ammunition-using stakeholders, political action is notably lagging behind. While voluntary transition to non-toxic ammunition is to be applauded, government action is essential and urgently needed to remove the threat of lead poisoning to birds and other wildlife in the UK, and to remove this source of dietary lead contamination for humans. Government needs to take decisive action for the tide to turn fully.

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The *BB/BTO* Best Bird Book of the Year 2019

British Birds and the British Trust for Ornithology announce the winner of the award for Best Bird Book of the Year. All books reviewed in *BB*, *BTO News* and on the BTO website www.bto.org/about-birds/book-reviews during the year 2019 were eligible for consideration for this award.

A total of 54 books were reviewed by *British Birds* and/or BTO during the year and were eligible for judging. No fewer than 31 made the initial shortlist and were available to look through on the day the competition was judged (although note that some much-talked-about publications from 2019 had not been submitted for review and were thus ineligible for consideration). As usual, the judging panel – with three representatives from BTO and three from *BB* – came together at the BTO annual conference at Swanwick, in early December 2019, to cast their votes for their top five from the shortlist. It was a surprisingly level field with no immediate clear winner to emerge from the shortlist, and it was a challenge for the judges to select just five books to award their points to. In the end, it was a tight finish; just one point separated the winner from second place, and these two books were just a few points clear of the rest of the pack.

Winner

The Blue Vesper: ecology and conservation of the Red-footed Falcon

Edited by Peter Palatitz, Szabolcs Solt and Peter Fehervari; MME BirdLife Hungary, 2018; reviewed in *BB* by Ian Carter (*Brit. Birds* 112: 415–416).

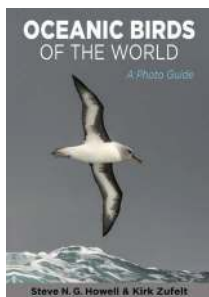
This year's winning book appeared in five of the six judges' top five, and the reasons for its selection were diverse. Visually attractive, it was praised for its design and layout as well as for its contents, and as an engaging species monograph – a genre that can be, at times, rather dry. For those with an interest in Red-footed Falcons ('The Blue Vesper'), this book is a no-brainer, but the judges also felt that the exceptional production value and engaging nature of the text, images, infographics and figures would appeal to a far wider audience than just those with a passion for raptors. The informal dialogue, comprehensive-yet-accessible maps and diagrams, and the beautiful photos printed on sumptuous paper all add to this book's appeal. In addition, this publication provides a useful reference for those working in the conservation and science communications sectors, and aiming to engage a wide audience with research. *The Blue Vesper* spans the divide between browsable coffee-table book and essential reference – it deals with everything from the species' breeding biology and habitat use to its conservation, migration, and wintering (including results of satellite-tracking work). Combine all of that with the fact that it deals with one of Europe's most attractive birds and it's easy to see why this book caught the judges' attention.



2nd **Oceanic Birds of the World: a photo guide**

By Steve N. G. Howell and Kirk Zufelt; Princeton University Press, 2019; reviewed in *BB* by Chris Kehoe (*Brit. Birds* 112: 765–766).

Steve Howell must be one of current ornithology's most prolific writers, and his latest publication maintains the high standards we've come to expect. The photographs in this guide are second to none, and the text is authoritative and current without being overbearingly complex. Cryptic populations of (potential) splits are dealt with, and the identification criteria are clearly

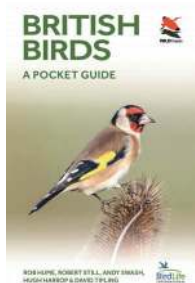
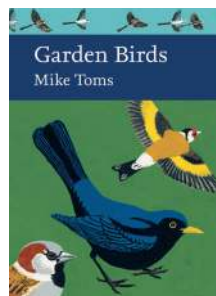


explained, but never are any of the species accounts bogged down by too much detail. All in all, the judges felt this was a book that would prove to be of huge value in the field (or should that be 'at sea') as well as an attractive publication to thumb through – and drool over – back on land.

3rd Garden Birds

By Mike Toms; William Collins, 2019; reviewed in *BB* by Mike Everett (*Brit. Birds* 112: 688–689).

The 'New Naturalist' series continues to deliver quality publications, and *Garden Birds* was one of two from the series in the judges' 2019 shortlist. Packed full of information from the author's own experience, from the BTO data archives, and distilled from the 900 references, this book truly offers novel and up-to-date information on birds that we assume we know so well. Plenty of graphs and figures help to convey the data and lift this 'New Naturalist' above many of its contemporaries.



4th British Birds, a Pocket Guide

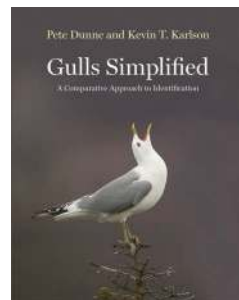
By Rob Hume, Robert Still, Andy Swash, Hugh Harrop and David Tipling; Princeton University Press, 2019; reviewed for BTO by Scott Mayson.

Though perhaps not a classic contender for a top-five finish, being in essence a slimmed-down version of an already existing title, the judges still felt this book held considerable value for beginner birders and those who don't necessarily want to deal with the trappings that come with some of the more detailed field guides on the market. The good-quality photos, clear comparisons between similar species and 'quick-reference' panels were all noted as particularly useful features of this book, and it appears that the photographic errors made in the original publication have now been rectified.

5th Gulls Simplified

By Pete Dunne and Kevin T. Karlson; Princeton University Press, 2018; reviewed in *BB* by Dawn Balmer (*Brit. Birds* 113: 56–57) and for BTO by Sarah Harris.

Although it is clearly aimed at the North American market, this book holds considerable interest to British birders. It offers a slightly different approach from many others on the subject, with extended photo captions and photos of mixed gull flocks. While the words 'gulls' and 'simplified' may not always sit comfortably together, this book nonetheless provides a useful gateway into the world of North American larids.



The following books all received votes from at least one of the judges and are mentioned below in alphabetical order of the first author.

A Sparrow's Life as Sweet as Ours

By Carry Akroyd and John McEwen; Bloomsbury, 2019; reviewed for BTO by Daria Dadam.

Climate Change and British Wildlife

By Trevor Beebee; Bloomsbury, 2018; reviewed for BTO by Claire Boothby.

Birds of Italy I: Anatidae–Alcidae

By Pierandrea Brichetti and Giancarlo Fracasso; Edizioni Belvedere, 2018; reviewed for BTO by Daria Dadam.

Gulls

By John C. Coulson; Collins, 2019; reviewed in *BB* by Martin Collinson (*Brit. Birds* 112: 414).

Crossbill Guide: Southern Portugal – from Lisbon to the Algarve

By Dirk Hilbers and Kees Woutersen; KNNV, 2018; reviewed in *BB* by Keith Betton (*Brit. Birds* 112: 55).

The Feather Thief

By Kirk Wallace Johnson; Windmill, 2019; reviewed in *BB* by Mike Everett (*Brit. Birds* 112: 413) and for BTO by the BTO's staff/volunteer book group.

Steller's Sea Eagle

By Vladimir Masterov, Michael Romanov and Richard Sale; Snowfinch Publishing, 2018; reviewed in *BB* by Ian Carter (*Brit. Birds* 112: 174) and for BTO by David Jarrett.

The Eagle Owl

By Vincenzo Penteriani and María del Mar Delgado; Poyser, 2019; reviewed in *BB* by Keith Betton (*Brit. Birds* 112: 692).

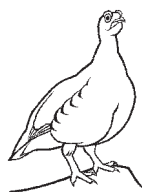
Ospreys: the revival of a global raptor

By Alan F. Poole; Johns Hopkins University Press, 2019; reviewed in *BB* by Ian Carter (*Brit. Birds* 112: 690–691).

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Obituaries

Peter Edward Davis (1928–2019)

On 28th October 2019, Wales lost its adopted son, Peter Edward Davis, the man most responsible for the resurgence of the Red Kite *Milvus milvus*, once found only in Wales as a British breeding species and regarded by many as the Welsh national bird. Although Peter's name is inextricably linked to the conservation story of this iconic Welsh species, his ornithological achievements and influences spread much wider.

He was born in Idle, near Bradford in Yorkshire, in October 1928, and grew up with

younger brothers Bill and Christopher. His father, Eric, was a bit of a rogue and left his mother, Lorna, when Peter was 12 and she was pregnant with Christopher. It appears that Eric had been running a second family, and one of Peter's great joys in the last few years of his life was finding out that he had a younger half-sister, Veronica, whom he met on several occasions. Sadly, another half-sister had already passed away. Despite this difficult upbringing, Peter was a good student and won a scholarship to Woodhouse

Grove School at Apperley Bridge. Following a brief spell in the Royal Air Force, an ex-servicemen's grant allowed him to attend higher education at the University of Leeds, where he graduated with a BA in Geography in 1951.

Peter's birdwatching career had started much earlier, as an egg-collector in his early teens who later went straight, a route probably taken by most birders of his generation. An enquiry to the BTO about bird ringing resulted in him being sent, by return of post, a supply of rings and instructions on fitting them and so, before the age of 18, he became a registered bird ringer in 1946. Rings were rationed at that time, due to post-war metal shortages, but around 1950 the 'Davis and [Dudley] Iles' partnership was regularly near the top of the national ringing-totals league! At the same time Peter also became a very active member of both the Leeds & District Bird Watchers' Club and the Yorkshire Naturalists' Union, and a frequent visitor to Spurn Bird Observatory.

In the summer of 1951, he took up the post of warden of Lundy Bird Observatory, where on 27th October 1952 he found an American Robin *Turdus migratorius*, the first of his four new species for Britain (*Brit. Birds*

46: 364–368). Peter's time on Lundy was not all idyllic, though; tragically, while surveying seabirds on a steep cliff, his then fiancée, Wendy Mitchell, slipped and fell to her death.

In April 1954, Peter became warden of Skokholm, where he met his wife to be, Angela Tame, a young graduate from Reading University, whom he married in 1955. During his three years on Skokholm, Peter carried out a detailed study of the breeding biology of European Storm-petrels *Hydrobates pelagicus*, which resulted in a comprehensive and highly authoritative paper in *BB* in 1957, which ran to over 30 pages, published over two volumes (*Brit. Birds* 50: 85–101, 371–384). Peter's paper remains one of the most detailed accounts of the species' breeding behaviour published to date.

In May 1957, Peter and Angela migrated north to Fair Isle, where they ran the Bird Observatory until the autumn of 1963. It was on Fair Isle that Peter recorded the other three of his British 'firsts' – Song Sparrow *Melospiza melodia*, on 27th April 1959 (also the first for Europe, *Brit. Birds* 52: 419–421); Sykes's Warbler *Iduna rama*, on 29th August 1959 (although not recognised as a full species for many years; *Brit. Birds* 102: 622–626); and River Warbler *Locustella fluviatilis*, on 24th September 1961 (*Brit. Birds* 55: 137–138). During their seven seasons on Fair Isle, the happy couple also bred successfully themselves, producing three children: Jeremy, Jillian and Paul.

In October 1963, the family moved south again when Peter took up the position of Migration Research Officer with the BTO, in Tring. He didn't take to working in an office but managed to stick it out for three years, and



Davis family collection

40. Peter Davis on Fair Isle in the late 1950s or early 1960s.

was then fortunate enough to be appointed Warden Naturalist (and soon Assistant Regional Officer) in the Nature Conservancy, based at Tregaron, in Ceredigion, starting in October 1966 under the supervision of then Regional Officer, Peter Walters Davies. The two Peters started work on the Red Kite, helping to fulfil an undertaking made by the Conservancy to the Kite Committee nearly ten years earlier, to look into the life history and requirements of this endangered species. In 1967, despite over 60 years of protection, there were still only 22 known breeding pairs of Red Kites in Wales (and Britain).

In parallel with the monitoring programme, and dovetailed with it, he began in 1967 to broaden and strengthen research into the life history and requirements of the Red Kite in Wales. Hesitant acceptance of his kite ringing, starting in 1968, turned to enthusiasm after one of the first marked juveniles was unexpectedly found in Oxfordshire the following autumn. Detailed investigations of the food and feeding behaviour, habitat requirements and management, and of the various aspects of breeding, culminated in a major paper on the species' ecology in 1973 (*Brit. Birds* 66: 183–224, 241–270). This paper drew attention to aspects that needed confirmation or further investigation, and in 1975 Derek Ratcliffe (then Chief Scientist of NCC) recommended that a contract be awarded to the Institute of Terrestrial Ecology, to carry out a full-time study on carrion-feeding birds in central Wales. Peter was seconded to do fieldwork for the project, under the supervision of Ian Newton, from 1975 to 1980. Several papers were published around 1980, mostly initiated by Ian Newton, and a few later publications continued up to 2002. The post involved a 'Good Life'-esque existence on the fringe of Cors Caron (Tregaron Bog) where the family was joined by several cows, sheep and chickens!

From 1981 to 1988, Peter returned to NCC, as ornithologist in the Wales Field Unit, mainly on hill bird surveys and advisory work, but still with time to cover his kite 'patch' in the spring. It was in the spring of 1982 that, as a young graduate student at Aberystwyth, I was first introduced to the man who was later to become my first boss and a massive inspiration, not just to me but

to many other ornithologists and birders of my generation. As Peter's fieldwork assistant on kites during 1986–94, one of my main responsibilities was to climb to all the kite nests to ring and tag chicks, etc. On the rare occasion that I struggled to climb a particular tree, Peter, in his quiet and measured manner, would mutter: 'I think that was one of the last trees I ever climbed?' – there were several such last trees! He was a brilliant mentor, with a healthy disrespect of bureaucracy and a relaxed view of health and safety; not unrelatedly, he was a fiendishly fast driver! Peter was a walking encyclopedia on everything birds, in the days long before the internet; but you had to ask because he was far too modest and kind to be boastful or braggish.

Peter and Peter Walters Davies both retired from NCC in 1988 and formed a private survey company, Wildlife Surveys (Wales), which undertook kite monitoring and research until 1994. In 1996 Peter was a founding member and trustee of the Welsh Kite Trust, which took over near-complete kite monitoring in Wales for a further 16 years. Although he retired as Kite Recorder at the end of 1999, he kept monitoring a few nests in his local patch each spring until 2012. In 2007 he received an MBE for his outstanding services to Red Kite conservation.

Peter's interests were not limited solely to birds. He was an authority on water mills, topographic postcards and house bricks! Often while out checking kite nests, he would rummage through old ruins looking for additions to his extensive brick collection. He was also an avid vegetable gardener.

Peter Davis wrote or co-authored several books – including *A List of the Birds of Lundy* (1954), *The Red Kites of Wales* (2005) and *The Birds of Ceredigion* (2010) – and over 150 scientific papers. He was bird recorder for Ceredigion (Cardiganshire) from 1967 to 1996 and also edited the 'Dyfed [later Ceredigion] Bird Report' during 1967–1988.

Peter was a gentle, kind and devoted family man who will be greatly missed. He is survived by his wife Angela, his children Jeremy, Jillian and Paul, brothers William and Christopher, half-sister Veronica, nine grandchildren and four great-grandchildren.

Tony Cross

Mike Peacock (1953–2019)

Mike Peacock died on Islay in early September following a brave fight against cancer; he will be greatly missed. Mike grew up in Nottingham and started birding in his teens, ringing with the South-West Notts Ringing Group and becoming involved with the Wash Wader Ringing Group in the 1970s. A visit to Cape Clear Island gave him the ‘island bug’, which developed further when he took up posts at Bardsey Bird Observatory (1975–76, then Assistant Warden in 1978 & 1979) and Fair Isle Bird Observatory (Assistant Warden in 1977).

He returned to Nottingham after Bardsey and received a horticultural qualification, which he used to good effect in agriculture. However, the island bug began to bite again and, in 1984, he moved north with his partner, Val, soon to be his wife, when she took up a nursing post on Fetlar, in Shetland. After time working as a fencing contractor and with the island’s crofters during the winter, and on bird surveys during the summer, he became the RSPB Warden on the island. He was involved in monitoring the last of the Fetlar Snowy Owls *Bubo scandi- acus*, and also the habitat improvements that helped to reverse the population decline of Britain’s remaining Red-necked Phalaropes *Phalaropus lobatus*. It was on Fetlar, in September 1985, that he and Val found

Britain’s first Chestnut-sided Warbler *Setophaga pensylvanica*.

His hard work and enthusiasm were soon recognised within RSPB and Shetland’s loss was Argyll’s gain. Mike and Val moved to Islay in 1988, where he took over responsibility at the Gruinart reserve. This led to a series of changes at Gruinart, with RSPB taking the farming back ‘in hand’, using RSPB staff rather than tenant farmers, and then moving the focus of the reserve from a single species (Barnacle Goose *Branta leucopsis*) to providing conservation benefits for a wider range of species. He drove forward the development of ‘the Floods’ at Gruinart, providing optimum habitat for many waders, principally Northern Lapwings *Vanellus vanellus* and Common Redshanks *Tringa totanus*, and elsewhere on the reserve ‘corners’ were made for Corn Crakes *Crex crex*. Through his encouragement and perseverance, further reserves were acquired by the RSPB on Islay, at Smaull and the Oa; elsewhere in the Inner Hebrides, he set up leases and management agreements with farmers and crofters to help Corn Crakes, Red-billed Choughs *Pyrrhonorax pyrrhonorax* and other species. With Malcolm Ogilvie, he also monitored the populations of Barn Owls *Tyto alba* and Hen Harriers *Circus cyaneus* on Islay for the Argyll Raptor Study Group.

Peter Roberts



David Jardine

41. Mike Peacock, ringing Red-billed Choughs *Pyrrhonorax pyrrhonorax* on Bardsey (in 1978) and Oronsay (in February 2007).

In 2000, Mike and Val moved from Islay to Oronsay, vicariously swapping roles with James and Sally How to allow them to raise their daughter on a larger island. On Oronsay, and the adjoining island of Colonsay, Mike's efforts on Corn Crake conservation saw the population rise from 32 calling males in 2000 to 86 in 2014. This effort and his work on Choughs was recognised when he was Highly Commended in the Species Champion section of the Nature of Scotland Awards (NoSA) in 2015. He and Val also received the NoSA Lifetime Achievement Award for their work to support a wide range of other species (including Irish Lady's-tresses *Spiranthes romanazoffiana* and mining bees *Colletes*).

In addition to his contribution to habitat management, an enduring legacy of Mike's

work was his nurturing and coaching of younger generations of conservation managers. Those taken under his wing in the last three decades are now making a difference throughout the country, and indeed worldwide, all the way from Denmark to Antarctica.

Mike's life was celebrated by his family and his many friends at an event at Gruinart in mid September, and the birds were present too – a White-tailed Eagle *Haliaeetus albicilla* (another species he had been involved in monitoring in recent years) flew past the graveyard at the end of the service. Mike is survived by his wife Val, and his sister and brother, Tina and Peter, and their families.

*David Jardine, Peter Roberts and
Dave Beaumont*

Notes

Ringed Plovers nesting on warehouse roof

On 17th July 2019, local birder Przemek Strzelecki found a pair of Ringed Plovers *Charadrius hiaticula* with four chicks on a warehouse roof at the eastern end of Shoreham Port, Sussex. The warehouse is less than 100 m from a shingle beach, which has in the past been a traditional site for Ringed Plovers to attempt to nest. Although regular observations were not possible, it was believed that the attempt was not successful.

Although a few Oystercatchers *Haematopus ostralegus* and three gull species use rooftop nesting sites in Sussex, this is the first occasion that Ringed Plovers have been found to do so. Greg Conway noted that

none were found using rooftops in the BTO 2007 national survey (Conway *et al.* 2008) and a search through both my limited library and the more powerful resource of Google has not revealed other instances of Ringed Plovers nesting on warehouse rooftops. I would be interested to hear whether this has occurred in other areas, and if so whether the attempt was successful.

References

Conway, G. J., Burton, N. H. K., Handschuh, M., & Austin, G. E. 2008. *UK Population Estimates from the 2007 Breeding Little Ringed Plover and Ringed Plover Surveys*. BTO Research Report No. 510, Thetford.

John Newnham, Sussex; e-mail j.newnham1@ntlworld.com

Editorial comment This note was posted originally on the ACRE forum for county recorders and editors, and no other records of Ringed Plovers nesting on flat-roofed buildings were received.

Recent reports

Compiled by Barry Nightingale and Harry Hussey

This summary of unchecked reports covers early December 2019 to early January 2020.

Headlines Even allowing for bias from one of our compilers, the Black-throated Thrush in Bedfordshire was undoubtedly the biggest crowd-pleaser – and there was another, briefly, in Clyde. Other unseasonal highlights included an elusive Lesser White-fronted Goose in Norfolk, Bufflehead and Ross's Gull in Cornwall, three more Eastern Yellow Wagtails and a Siberian Thrush in Ireland.

Cackling Goose *Branta hutchinsii* Long-stayers North Uist (Outer Hebrides), two to 4th January; Islay (Argyll), 18th December to 3rd January. Culloden, 14th–15th December, then Ardersier (Highland), 31st December. **Lesser White-fronted Goose** *Anser erythropus* Burnham Market, 14th and 18th December, then near Titchwell (Norfolk), 25th December. **Blue-winged Teal** *Spatula discors* Man Sands (Devon), long-stayer to 5th January. **Black Duck** *Anas rubripes* Strontian (Highland), long-stayer, 2nd January. **Ferruginous Duck** *Aythya nyroca* Seeswood Pool (Warwickshire), 23rd December to 5th January. **Lesser Scaup** *Aythya affinis* Long-stayers Stithian's Resr (Cornwall), to 5th January; Achill Island (Co. Mayo), to 5th January. Oxford Island (Co. Armagh), 31st December. **Steller's Eider** *Polysticta stelleri* Papa Westray (Orkney), long-stayer to 23rd December. **King Eider** *Somateria spectabilis* Belfast Lough (Co. Antrim), 21st December. **White-winged Scoter** *Melanitta deglandi* Musselburgh/Fisherrow (Lothian), long-stayer, 17th–27th December. **Black Scoter** *Melanitta americana* Long-stayers Lunan Bay (Angus & Dundee), 2nd–5th January; Cheswick/Goswick (Northumberland), to 6th January. **Bufflehead** *Bucephala albeola* Stithian's Resr, 1st January; Camel Estuary (both Cornwall), 2nd January.

Kentish Plover *Charadrius alexandrinus* Burnham-on-Sea (Somerset), 26th December. **Long-billed Dowitcher** *Limnodromus scolopaceus* Long-stayers in Cumbria, Devon, Northumberland and Co. Wicklow. South Slob (Co. Wexford), 31st December to 5th January. **Lesser Yellowlegs** *Tringa flavipes* Nosterfield (Yorkshire), 6th January.

Bonaparte's Gull *Chroicocephalus philadelphia* Killybegs (Co. Donegal), 8th December; Whitburn (Co. Durham), 8th December. **Ross's Gull** *Rhodostethia rosea* Portscatho (Cornwall), 1st January. **'Azorean Yellow-legged Gull'** *Larus micha-hellis atlantis* Kildavin (Co. Carlow), long-stayer, 27th–29th December. **Forster's Tern** *Sterna forsteri* Traught (Co. Galway), 11th–28th December.

Pacific Diver *Gavia pacifica* Youghal (Co. Cork), 24th December. **White-billed Diver** *Gavia adamsii* Waxham, four, 8th December; Hemsby (both Norfolk), 15th and 25th December; Bluemull Sound, 18th December; South Nesting, 24th December; Unst (all Shetland), 4th January.

Cattle Egret *Bubulcus ibis* Ham Wall (Somerset), 137 at roost on 20th December. **Purple Heron** *Ardea purpurea* Eagland Hill, long-stayer to 6th January, same Marshside (Lancashire & N Merseyside), 17th December.

Snowy Owl *Bubo scandiacus* Eday (Orkney), long-stayer, 31st December. **Gyr Falcon** *Falco rusticolus* North Uist, 26th December and 4th January.

Penduline Tit *Remiz pendulinus* Crossness (Greater London), 11th and 15th December. **Dusky Warbler** *Phylloscopus fuscatus* St Mary's (Scilly), 11th–29th December. **Siberian Thrush** *Geokichla sibirica* Duncormick (Co. Wexford), 8th December. **Black-throated Thrush** *Turdus atrogularis* Whipsnade Zoo (Bedfordshire), 11th December to 6th January; Hamilton (Clyde), 16th December. **'Eastern Stonechat'** *Saxicola maurus/stejnegeri* Hollesley Marshes (Suffolk), long-stayer to 5th January. Northwich (Cheshire & Wirral), 24th December to 6th January. **Desert Wheatear** *Oenanthe deserti* Eccles-on-Sea (Norfolk), 31st December to 6th January. **'Black-bellied Dipper'** *Cinclus c. cinclus* St Andrews (Fife), 22nd December.

Eastern Yellow Wagtail *Motacilla tschutschensis* Prestwick Carr (Northumberland), 14th December to 5th January; Sedgeford (Norfolk), 23rd December to 6th January; South Slob, 31st December to 4th January. **Olive-backed Pipit** *Anthus hodgsoni* St Mary's, 25th–27th December. **Buff-bellied Pipit** *Anthus rubescens* Sennen (Cornwall), long-stayer to 5th January.

Arctic Redpoll *Acanthis hornemanni* Voe (Shetland), long-stayer to 15th December.

My patch – Gipping Valley

Suffolk is a much sought-after county for birders, at times seemingly overshadowed by neighbouring Norfolk, but with enough headline birds to steal the limelight on a regular basis. Away from the coast, there is an under-watched valley that I used to walk around after school to get away from the homework and housework no teenager really wants to do. It was from this point on that I became more and more hooked on exploring my local area and getting out to see what was beyond my bedroom window.

The first area that I homed in on was Needham Lake, probably the most visited lake in Suffolk by the general public, famous for its ice creams and dog-walking footpaths. The familiar birds always stood out: Canada *Branta canadensis* and Greylag Geese *Anser anser*, Mute Swans *Cygnus olor*, Great Crested Grebes *Podiceps cristatus*, Black-headed Gulls *Chroicocephalus ridibundus* and Common Kingfishers *Alcedo atthis*. This list is far from any headlines, but those experiences took hold in a young kid's mind. Over the years, this lake has had Bewick's Swan *Cygnus columbianus*, Ferruginous Duck *Aythya nyroca*, Eurasian Bittern *Botaurus stellaris* and Great White Egret *Ardea alba*. Not bad for a small inland lake. Since it is so under-watched by birders, I'm sure that this list of scarcities is well short of what has actually turned up.

Having explored most of the areas around Needham Lake, I soon branched out

into other parts of the valley where I could look for birds. Around Needham Lake were a series of other lakes and scrubby areas, and farther down the valley I came across an area known as Pipp's Ford, which became the centre of my days on the patch. This area was made up of gravel-pits, woodland, areas of scrub and rough fields. On that first visit I clocked up 60 or 70 species on a summer's evening walk, some of them patch lifers; it was immediately clear that this area needed more time spending on it throughout the year. Soon I was down at Pipp's Ford most evenings after school, visits that were rewarded with patch lifers, notably passage waders (Black-tailed Godwit *Limosa limosa*, Ruff *Calidris pugnax*, Little Stint *C. minuta*, Jack Snipe *Lymnocyrtus minimus*, Wood Sandpiper *Tringa glareola* – and more), although, in typical Ben Moyes style, I was missing during the real patch gold moments: Black-winged Stilt *Himantopus himantopus*, Glossy Ibis *Plegadis falcinellus*, Eurasian Spoonbill *Platalea leucorodia*, Montagu's Harrier *Circus pygargus*, Black Kite *Milvus migrans*, Wood Warbler *Phylloscopus sibilatrix* (and more). However, there will always be one bird that tops all others I have had on my patch, the 'Black-bellied Dipper' *Cinclus c. cinclus* of October 2016. First found by a council worker in Needham Market, it spent 37 days on the river, mainly favouring a weir just upriver from Needham Market town centre, but did



Keith Hudson

42. Pipp's Ford, Suffolk, August 2016.



Ben Moyes

43. 'Black-bellied Dipper' *Cinclus c. cinclus*, Needham Market, Suffolk, October 2016.

make a day trip downriver to a small stream at Pipp's Ford, before returning to its original favoured area.

Realising that Pipp's Ford was a magnet for birds in the valley, I soon wanted to explore further, and found two more lakes, Sharmford Mere and Causeway Lake, farther south along the valley. Causeway Lake has not (yet) surprised me with something unusual among the Mute Swan family, Mallards *Anas platyrhynchos* and Great Crested Grebes, but Sharmford Mere has delivered winter records of Common Goldeneye *Bucephala clangula*, Smew *Mergellus albellus* and Goosander *Mergus merganser*, along with White-fronted Geese *Anser albifrons* (and, for once, I found them!) and Bittern. In the surrounding fields, the winter of 2017 brought two Cattle Egrets *Bubulcus ibis*, both very cooperative to the visitors that came to see them; one of them even did the decent thing and stayed until 1st January to kick off the 2018 patch year list in style.

It may come across that I have been an unlucky patcher in the Gipping Valley, but I have still had plenty of fist-clenching moments. These include discovering my first wintering Goosander, finally finding both Woodcock *Scolopax rusticola* and Jack Snipe after much effort in traipsing around the fields, to getting onto a Honey-buzzard *Pernis apivorus* drifting southeast over the valley on an early summer morning. There's always an added thrill when finding some-

thing good on your patch compared with finding something elsewhere in the country; it just has that added meaning, it's that extra bit special. Being inland, the opportunities of finding something rare are more limited, but it can never be ruled out. Some of Britain's best rarities have turned up inland, so if you don't look, you'll never be one of those lucky few that strike gold in their local area. One of my Dad's best birding finds happened to be from

our kitchen window, in a village on the outskirts of Stowmarket, right at the top of the Gipping Valley. Autumn was under way, and the washing up after another meal was in full flow; glancing out of the window, he was shocked to come face to face with a Short-eared Owl *Asio flammeus* cruising over the garden fence! How can experiences like that be topped? 'Where were you?' I hear you ask: not at the kitchen window, sadly. I was at school, education coming ahead of a magical owl encounter (although I have to admit to skipping Chemistry for that Black-bellied Dipper!).

All of the privileged sightings mentioned above were made even more special by being within 15 minutes of my house. They will never make the headlines that other patches do, but the best part of having a local patch is the enjoyment of discovering what lies just beyond the boundaries of your own garden fence, however common or rare, big or small, spectacular or otherwise. The more you visit, the more you fall in love with a more meaningful aspect of birding, just like I and many others I know have done.

Ben Moyes





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