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nature
a home

RSPB CENTRE FOR CONSERVATION SCIENCE

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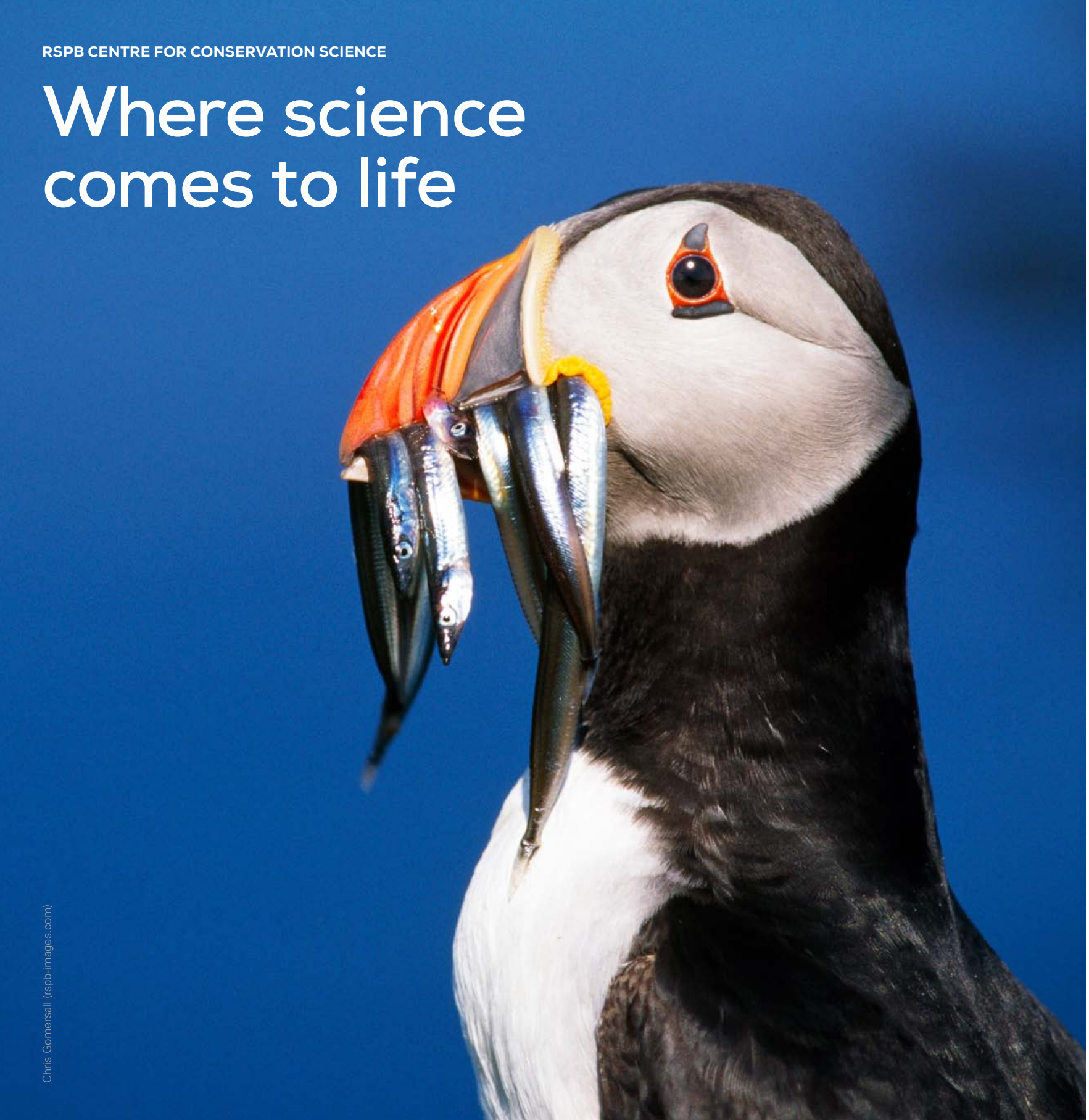
Where science comes to life



Chris Gomersall (rspb-images.com)

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Conservation rooted in know ledge

Introduction from Dr David W. Gibbons
Head of RSPB Centre for Conservation Science

Welcome to the RSPB Centre for Conservation Science. This new initiative, launched in February 2014, will showcase, promote and build the RSPB's scientific programme, helping us to discover solutions to 21st century conservation problems.

While the RSPB is well known for its wonderful, wildlife-rich nature reserves, and for its annual Big Garden Birdwatch, it is far less well known for the remarkable scientific work it undertakes behind the scenes, in the UK and overseas. Yet, in reality, our scientific programme is an amazing asset, matched by few other conservation organisations. Because our scientific work has had a low profile with the wider public, many are unaware of the depth and breadth of our scientific knowledge. And it is this knowledge that informs all of our conservation work. Be that the way we manage our reserves to make them better for wildlife, the advice we provide to others, or the policies that we adopt and advocate to change hearts and minds in favour of nature conservation.

As part of our new corporate strategy, Saving Nature, we have set ourselves several ambitious targets to meet by the end of this decade. Amongst these is one of which I am particularly proud: to become established as an internationally recognised centre of excellence in conservation science. While an independent review of RSPB's scientific programme in 2013 rated our science as 'outstanding' *(see box overleaf)*, there is still some way to go to meet this target. The launch of the RSPB Centre for Conservation Science is designed to put us on the right track.

The Centre does not have a single, physical location. Our scientists will continue to work from a range of RSPB's addresses, be that at our UK HQ in Sandy, at RSPB Scotland's HQ in Edinburgh, or at a range of other addresses in the UK and overseas. It does, however, have a virtual home – a website at **rspb.org.uk/science**. A crucial element of the launch of the Centre, the unveiling of this new website will give the conservation community better access to our scientific work. This is an important step in RSPB's history – only by sharing our science more openly can we hope that it will have the greatest impact on nature conservation.

To celebrate the launch of the RSPB Centre for Conservation Science, we have produced this special publication, illustrated with some of our most influential scientific work from the last decade. We have also launched a series of annual RSPB Conservation Science Awards. These will be presented to individuals that have shown excellence in the discipline, from talented doctoral students, to those well established in the field.

In order to give the Centre substance, and to ensure we meet our ambition, we will also develop and improve our science, for example by broadening the skills and expertise of our scientific staff. Over time, we hope that the Centre will raise the profile of our scientific work, making the RSPB an exciting place for talented conservation scientists to work, and attracting increased support from science funders. Taken together, these will help bring the RSPB greater conservation success.

RSPB's science rated as 'outstanding'

In early April 2013, Professor Sir John Lawton chaired a panel of experts who reviewed RSPB's scientific programme. Here, Sir John outlines his thoughts on the Science Review.

I was delighted to be asked to review the RSPB's scientific programme, not least because I had undertaken a similar review 15 years earlier, and was interested to see how things had changed. I think that it is desperately important for conservation organisations to ensure that their policies and practices are based on the best possible evidence, and consequently was pleased to see RSPB opening its science programme up to external review. I was greatly assisted with the review by my co-panel members, Professors David Macdonald and Val Brown, and Dr Jenny Gill.

Over a couple of days, we learnt – among other things – about the RSPB's role in the State of Nature report, and about its work to find solutions to recover the fortunes of threatened species – from skylarks, hawfinches and curlews, to migrants, vultures and pygmy hippos. We also heard about the RSPB's innovative seabird tagging work, the suite of experiments they have undertaken on their estate, their rainforest and climate change research, and the measurements they have made of the services provided by ecosystems. The review was meticulously run by RSPB staff, and the fifteen separate presentations we heard were excellent without exception.

My fellow panel members and I wrote a report of our review, which I was invited to present to RSPB's Council in early July. Our overarching assessment was summarised in the report as follows:

"The review group are unanimous in their view that the RSPB's Conservation Science Department is outstanding. The quality, depth and breadth of its research would be regarded as excellent in any large internationally competitive UK university".

We then went on to say that: "huge, very important and exciting research problems are being carried forward with great skill and imagination", and that "...the 'in house' Conservation Science Department is fundamental to the Society's mission".

We each individually thought we knew broadly what research was undertaken by the Department through our long association with RSPB. We were wrong. We found the shear breadth and depth of the work "staggering" (to quote one panel member at the end of the second day).

Needless to say, there is always room for improvement, so we made a series of recommendations for the future. We particularly felt that the RSPB's scientific work deserved to be better known, and that they should seek ways of communicating their science better. For example, they should make much more creative use of social media to publicise the amazing work done by the Department. We also felt that the RSPB should undertake more social science. Whilst biological research should remain fundamental to the society, we believe that economic analyses, conflict resolution, human behavioural studies, political science and governance are increasingly important in trying to find practical solutions to environmental problems. Finally, we thought that the science programme could sometimes be swifter of foot in the way that it works, because the fast-changing world of policy occasionally demands rapid responses. However, we accept that finding resources for such science could be challenging.

Professor Sir John Lawton

John Gooday

Andy Hay (rspb-images.com)

Why RSPB needs science

At its most fundamental, we need science to find practical solutions to the most pressing conservation problems, for example working out how to save a species approaching extinction, or to restore a rainforest that has been destroyed.

But we also do it to keep us focussed on the highest priorities, credible to Governments and other decision-makers, and successful – because conservation actions informed by scientific evidence are more likely to work than those based on guesswork.

The history of science at the RSPB

For over four decades, we have invested in science to help us identify and tackle some of the biggest problems facing birds and the environment.

Our first research officer was employed in the 1960s, with none of the technology our scientists enjoy today. By the 1970s, we had a small team whose pioneering work led to some early successes, including the recovery of the stone curlew (above) that was on the brink of extinction in the UK in the early 1980s. From these humble beginnings, our scientific programme has grown, along with RSPB as a whole.

The current science team comprises more than sixty scientists, as well as administrative and technical support staff, based at more than a dozen locations in the UK, and working across the globe. Most of these scientists have doctorates, and we have three Professors in the team. Each spring we employ a number of short-term staff to help us with our field projects, and in any one year we have affiliations with 15-20 PhD students (see page 66) and a growing number of Masters students. Overall, the RSPB currently invests about 6-8% of its conservation spend on its scientific underpinning.

Partnership

Most of our science is undertaken in partnership with other organisations (overseas, especially our BirdLife partners), and individual scientists in Universities and Research institutes. Partnership brings complementary skills to our own, as well as access to additional funding streams and other resources. Among our most important partners are those that fund our work, particularly UK Governments' Departments and Statutory Nature Conservation Agencies. As our partners and funders are so important to us, we provide a full list of them later in this report.

How RSPB does science

Over the last four decades, we have developed a model that our scientific work follows *(see overleaf)*.

Knowing the important problems

Our scientific work starts by identifying and prioritising the most important conservation problems for us to work on.

We identify current conservation problems through conducting and supporting monitoring schemes and surveys, many undertaken in collaboration with partners. For example, the internationally-renowned UK Breeding Bird Survey, a partnership between BTO, RSPB and JNCC, tells us which species of birds have risen or fallen in numbers over the last two decades. The recently published State of Nature report provides similar information for a much broader range of UK's wildlife.

Monitoring and surveys allow us to prioritise species that are most threatened, the sites that are most important to protect, and the environmental challenges that are most pressing.

Although strongly influenced by these biological conservation priorities, our scientific programme is not dictated solely by them, else we would be continually fire-fighting, focused only on the past rather than also on the future. Novel technologies, changing land uses, climate change, industrial developments and evolving government policies will all have impacts on nature in the future. Here, we seek to predict the likely impact of these changes, so that we can form a view on whether they are likely to be harmless or harmful to nature. This allows us to develop and advocate policies with confidence. Predicting the impacts of future change is a growing area for RSPB science.

Knowing the causes

Once we have identified the most important conservation problems, we need to discover their causes – to make a diagnosis.

Why has the range of the hawfinch declined so dramatically in the UK? Why are so many of our long-distance migrant birds that winter south of the Sahara in decline? Why have numbers of so many species of moths collapsed over the last few decades? All of these are conservation problems that need successful diagnosis to inform the development of solutions.

This part of our scientific model, which can involve a great deal of painstaking detective work, is often focused on single species. Typically, this involves intensive field-based studies of wildlife populations, to gain an understanding of their ecological requirements and the external pressures they face. For birds, this might involve locating nests, measuring breeding success and survival, and catching and marking individual birds to follow their lives in detail. Comparisons of different populations, perhaps over several years, can increase the chances of a successful diagnosis.

This work is resource hungry, and is rarely quick, yet has proven vital to the conservation of many species.

Where possible, we try to study groups of similar species, sometimes using existing monitoring information rather than gathering new data in the field. This can be more cost effective, but does not always reveal the detailed causes of the problem often required to develop management solutions. For example, our work showing that agricultural intensification in the European Union led to the collapse of its farmland bird populations was influential in advocating for policy change. However, it was detailed work on species that provided sufficient ecological and agronomic knowledge to identify specific remedial measures.

Knowing the solutions

Our diagnostic work suggests potential solutions that we can test.

Wherever possible, solutions are tested on a small scale, using well-replicated, and well-monitored field experiments. There are numerous examples: bare plots in winter wheat to benefit skylarks; delaying mowing and harvesting to reduce destruction of bird nests; grazing or burning vegetation to boost bird food invertebrate numbers; fences to reduce predation on breeding lapwings; an alternative drug for livestock to replace one which was killing vultures in India and Nepal; methods to stop adult albatrosses being caught on long-line fishing hooks, or juveniles being predated by non-native invasive rodents; and ways to restore logged tropical rainforest.

Testing solutions on a small scale is often critical to gain the confidence of environmental managers prior to wider implementation, not least because such tests commonly investigate the practical and economic feasibility. We are also increasingly measuring the impact of conservation interventions on a range of other ecosystem services.

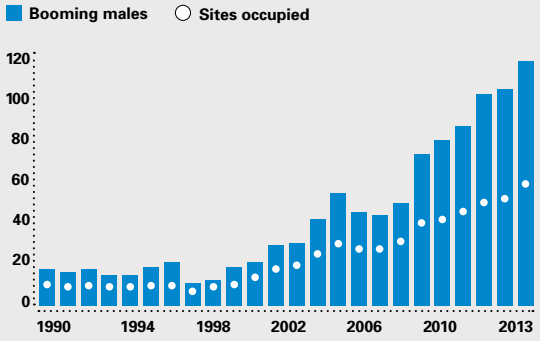
To assist this, RSPB scientists are enormously fortunate to have access to a magnificent estate – 220 nature reserves and a number of working farms in the UK, rainforest sites in Africa and Indonesia, and other conservation projects overseas. This estate is central to our diagnostic and solution-testing work, providing opportunities for scientific observation and experiment.

Knowing the action works

The ultimate success for RSPB's science is when the solutions emerging from our work are successfully translated into conservation action. It is not usually the role of RSPB scientists to implement or advocate conservation solutions. Typically, this is the work of others, whether land managers, advisors, policy makers or advocates, both inside the RSPB and in Government, business and other charities. It is, however, the role of our scientists to advise these people, and to monitor the effectiveness of their conservation interventions, and adapt and improve those interventions where necessary.

Our work on bitterns is a classical example. A decade or so ago, we discovered the cause of its precipitous decline in the UK, and developed a range of practical remedial solutions. The output of this science was translated into large-scale land management, both on and off our estate, resulting in an order of magnitude increase in the bittern population over the last fifteen years.

Number of bittern males and breeding sites occupied

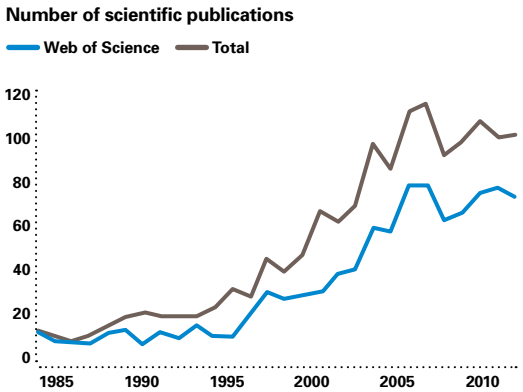


However, we only knew our intervention was successful because we monitored the response of the bittern population. Other good examples include our work, funded by Governments, to monitor the implementation of wildlife-friendly farming schemes in the UK's constituent countries, monitoring the impact of rodent eradications on seabird populations, and monitoring the impact of the removal of conifer forests from blanket bogs on vegetation, biodiversity and greenhouse gases.

Our scientific output

The ultimate measure of the quality of our scientific work – its impact on conservation – is difficult to measure, though we aim to do just that, in time. Meanwhile, our scientific output can be measured readily, and has risen dramatically since 1995.

Number of scientific publications



Over the last decade, from 2003-12 inclusive, RSPB staff were authors on 671 papers in the peer-reviewed scientific literature, with a further 292 scientific reports, theses, books and publications in other journals and conference proceedings. Over the same period, the average RSPB-authored paper was cited 21 times, with 51 papers being cited more than 51 times. A complete list of our scientific publications is available at **rspb.org.uk/science**.

Publishing in the scientific literature is very important to the RSPB. We see it as an important conservation tool; conservation actions are more likely to work when supported by the quality control of peer-reviewed publication. As a campaigning, cause-driven organisation, our scientific rigour and objectivity are often subject to challenge, and publishing our work in the peer-reviewed literature is a critical mark of the credibility and objectivity of our science.

While undertaking and publishing science is fundamental for us, science also supports our work in many less visible ways. For example, development proposals that threaten important sites are scrutinised to ensure the best possible science is used to assess the risks to wildlife.

Future science

While it is hard to predict the future, it seems unlikely that conservation problems will disappear. Consequently, there will always be a need for science to discover solutions. The RSPB's scientific programme has broadened and deepened enormously over the last few decades, and will no doubt continue to do so.

Here are ten conservation challenges that I think the RSPB Centre for Conservation Science will be well placed to address in the future collaborating with other natural and social scientists:

1. Improving our knowledge of the status of UK and UK Overseas Territories' wildlife
2. Understanding the causes of decline of UK's summer migrant birds
3. Improving the status of threatened species in the UK and overseas
4. Producing food, fibre, energy and infrastructure alongside wildlife
5. Guiding the restoration of degraded habitats and ecosystems
6. Understanding the impacts of, and helping wildlife adapt to, a changing climate
7. Understanding the impacts of environmental change in the oceans
8. Informing designation and management of protected areas on land and at sea
9. Understanding how people benefit from, and connect to, nature
10. Building capacity in conservation science

I hope you have enjoyed reading about our science as much as we have enjoyed doing it. To find out more about our science, please visit **rspb.org.uk/science**.

Dr David W. Gibbons
Head of RSPB Centre for Conservation Science

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A decade of science at the RSPB

Much of the rest of this report documents ten case studies of RSPB science from the last decade. We have chosen these studies as they demonstrate great science, and have had, or are likely to have, a major impact on conservation.

Gordon Langsbury (rspb-images.com)

No.1

Species monitoring and the State of Nature

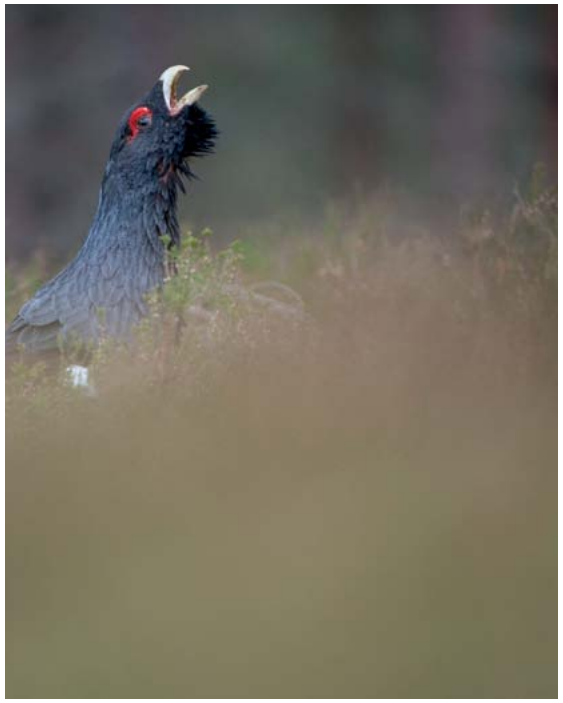
David Tipling (rspb-images.com)

Effective conservation relies on knowledge, and that begins with understanding the state of the natural world. Our monitoring work provides this knowledge, allowing us to identify conservation problems, set conservation priorities, measure the success of our conservation work, and report on the health of the environment.

The RSPB has long been at the forefront of measuring and reporting on the status of birds, both in the UK and further afield. Much of our work is in partnership, through schemes such as the BTO/JNCC/RSPB UK Breeding Bird Survey which, through harnessing the efforts of 2,500 volunteers, enables the production of robust population trends for over 100 species. We have been instrumental in setting up similar schemes in a number of other European, and more recently African, countries. Other multi-species schemes in the UK include the BTO/JNCC/RSPB/WWT Wetland Bird Survey, which is the principal scheme for monitoring changes in numbers of the UK's wintering waterbirds, and the Rare Breeding Birds Panel, which collects data on the UK's rarest breeding birds.

A number of our rare and range-restricted species, however, require bespoke monitoring approaches, and thus we lead on a programme of single-species surveys, the Statutory Conservation Agency and RSPB Annual Breeding Bird Scheme (SCARABBS), in conjunction with the national Government conservation agencies and others. Depending on their conservation priority, species are either surveyed annually (eg white-tailed eagle), every six years (eg capercaillie and hen harrier) or every twelve years (eg golden eagle and nightjar). A wide range of survey methods are used, with innovative species-specific approaches developed when required. For example, we developed a novel technique to estimate numbers of the endemic Scottish crossbill, which involved tape-luring and recording of all crossbill species' calls, and subsequent sonogram analysis.

These species surveys have revealed continuing declines of priority species, such as black grouse, or, for other species, have tracked their recovery in response to conservation specifically targeted at them, for example cirl bunting and bittern.



Mark Hamblin (rspb-images.com)

Sir David Attenborough speaking at the launch of the State of Nature report, May 2013.

The RSPB led the publication of the first State of the UK's birds report in 1999. Now having passed its 14th edition, and having inspired a legion of imitators across the world, SUKB continues to provide a summary of the latest monitoring results from the work of the RSPB and its many partners.

In recent years, the broadening of the RSPB's conservation programme led to our scientific staff leading an ambitious new project: the State of Nature report. Working with 24 partner organisations involved in monitoring of, and research into, the UK's wildlife, SoN sought to present data on the status of as wide a range of wildlife in the UK and its Overseas Territories as possible.

We collated trends in numbers of over 3,000 species, ranging from birds to bryophytes, and national red list assessments for over 6,000, enabling us to produce the first statistical synthesis of the state of our nature. The findings were sobering: 60% of species assessed have declined in abundance or distribution in recent decades, 31% severely so, and 13% of all species assessed are thought to be at risk of extinction from the UK.

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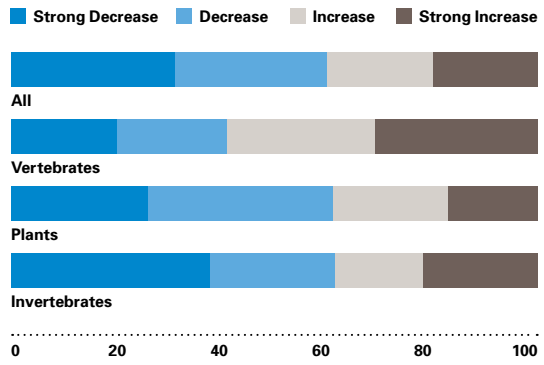
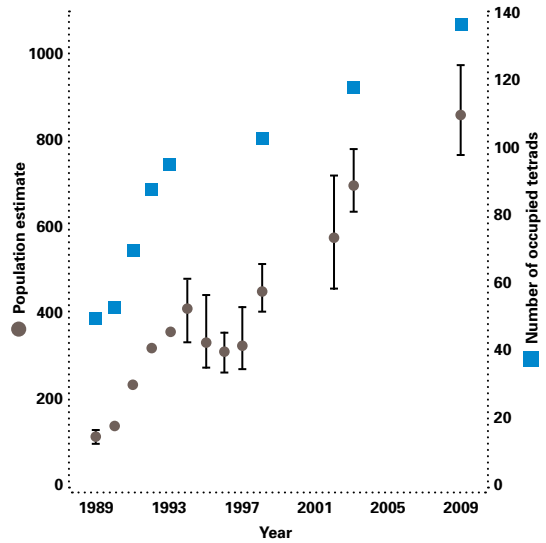
Species trends within different taxonomic groupings



The percentage of species increasing or decreasing over (up to) the last fifty years, across all 3,148 species assessed in the State of Nature report. The data are also presented separately for each of the three main taxonomic groups. Strongly increasing species doubled or more in numbers; strongly decreasing species at least halved in numbers.

The recovery of the cirl bunting



The rising trend in cirl bunting numbers in the UK. Grey circles are annual population estimates (number of breeding pairs, with 95% confidence intervals); blue squares are the number of tetrads (2km x 2km grid squares) occupied.

Work conducted under the SCARABBS programme is in partnership with, and co-funded by, the four statutory conservation agencies: Natural England, Natural Resources Wales, Northern Ireland Environment Agency and Scottish Natural Heritage. For more information about State of Nature please visit www.rspb.org.uk/stateofnature

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No.2

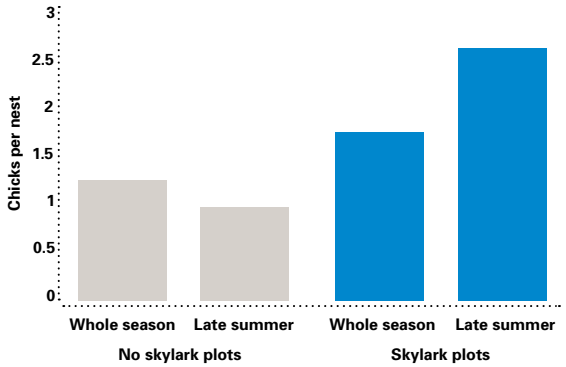
Farmland biodiversity and wildlife-friendly farming schemes

Tony Hamblin (rspb-images.com)

The UK farmland bird indicator now stands at its lowest ever level, with similar declines reported for other farmland wildlife. RSPB scientists have helped identify many of the causal relationships between changes in farmland management and wildlife population declines, allowing us to design and test potential solutions to these conservation problems.

Of the many changes in agricultural practice over the last half century, the switch from spring to autumn sowing has been particularly damaging to species like skylark that live in arable crops. Research we undertook in the late 1990s showed that autumn-sown cereals were inimical to skylarks, as they were taller and denser than their spring-sown counterparts at the same time of year, restricting access to nesting birds from mid-June when this multiple-brooded species produces most young. As a return to spring-sowing is unlikely for economic reasons, the *Sustainable Arable Farming for an Improved Environment* (SAFFIE) project tested small unsown patches (or 'skylark plots') as a potential conservation measure in autumn-cereals. By June, fields with plots held more territorial males and nests, and pairs raised an average of 1.5 more chicks per breeding attempt, than in cereal fields with no plots. Overall, introducing skylark plots into cereals increased the number of skylark chicks reared by 49%, without significantly affecting crop yield. These plots are now an option in a government-funded wildlife-friendly farming (agri-environment, AE) scheme in England, but unfortunately uptake remains far below that needed to reverse the skylark's decline.

The success of skylark plots

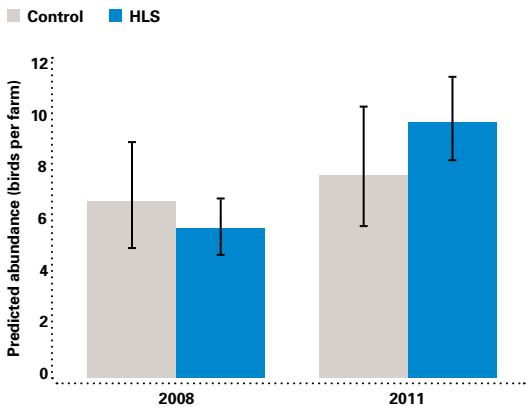


Mean number of skylark chicks raised per breeding attempt in fields with and without skylark plots throughout the breeding season (April – July), and during late summer only (June onwards) in the SAFFIE project.

Skylark plots at RSPB's Hope Farm, one of 35 sites to trial this measure in the SAFFIE project 2002-2006.
Andy Hay (rspb-images.com)

Great yellow bumblebees thrive on land managed for corncrakes in Scotland. Mike Edwards (rspb-images.com)

Predicted yellowhammer abundance



Change in abundance of yellowhammer (birds per farm) on Higher Level Stewardship (HLS) and control farms in West Midlands and the Cotswolds between 2008 and 2011. There was no significant difference between years on the controls farms, but a significant increase on HLS farms.

The loss of seed-rich wintering habitats has been a major cause of granivorous farmland bird declines in pastoral farming regions. Existing AE options failed to fully plug the late winter "hungry gap", but our research demonstrated that a widespread crop – rye grass – if allowed to set seed and left in situ, sustains large numbers of buntings throughout the winter. Seeded ryegrass is also now available as an AE option to farmers in England.

When measures are evidence-based, AE schemes are often seen as the best way to stem declines in farmland wildlife. Yet poor monitoring means evidence for their effectiveness is often lacking. RSPB scientists have monitored AE schemes in all four UK countries, mostly in partnership with government. Crucially, we have found that farmland bird numbers do respond positively to well-targeted AE schemes, such as Higher Level Stewardship in England, Northern Ireland's Countryside Management Scheme, and the Farmland Bird Lifeline in Scotland. In all three cases, there were large and rapid increases in the abundance of target farmland birds on farms in AE schemes, compared to those not in AE schemes.

Wildlife-friendly farming schemes targeted at birds also help other wildlife. For example, in north and west Scotland, on land where farmers were paid to manage with corncrakes in mind, there were also more great yellow bumblebees.

Many challenges lie ahead. We will continue to try to understand why species, such as the turtle dove are declining so rapidly; to develop our knowledge of wildlife groups, such as grassland invertebrates, where this is inadequate; and to find solutions for species where there currently are none (eg yellow wagtail). We will also continue to monitor the effectiveness of agri-environment schemes.

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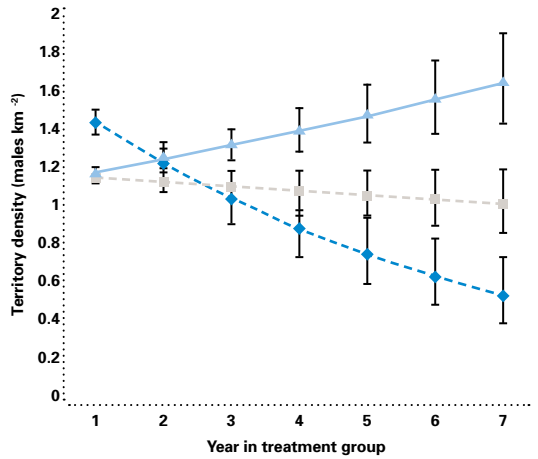
Scottish corn buntings and agri-environment schemes



Trends in corn bunting numbers on farms in NE Scotland that either: did not manage their land to help farmland birds (blue dashed line; – 14.5% per year); were part of a wildlife-friendly farming scheme designed to help farmland birds generally (grey dashed line; -2.0% per year); or were part of the Farmland Bird Lifeline (FBL), a scheme which was specifically designed to help corn buntings (blue solid line; + 5.6% per year). A key intervention in the FBL was delayed mowing of grass grown for silage in fields with nesting corn buntings.

This work was done in partnership with Defra, Natural England, Northern Ireland Environment Agency, Scottish Natural Heritage, Scottish Government, Welsh Government, Sustainable Arable LINK, and numerous other organisations and individuals. SAFFIE, Sustainable Arable Farming for and Improved Environment; a project with a range of research partners, including ADAS, BTO, CSL, CAER, GWCT and CEH and funding from government and industry.

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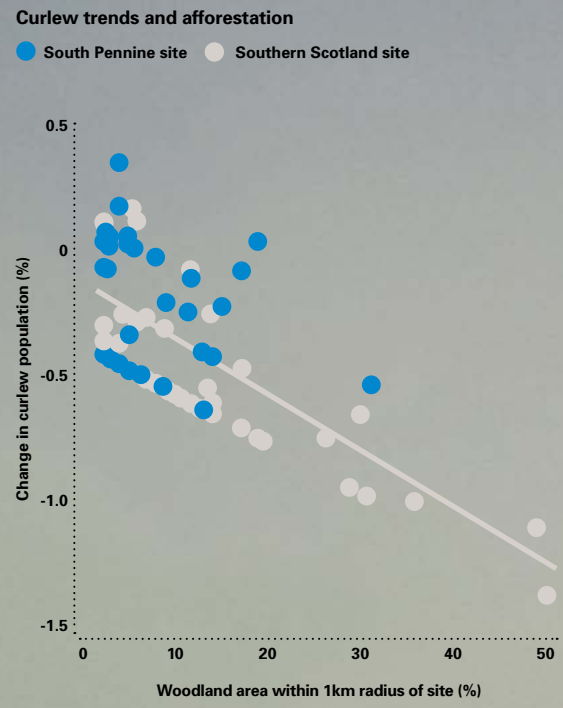
No.3

Conservation science in the uplands

In the UK uplands, our research programme focuses on the conservation needs of the internationally important assemblage of birds that breed there. This suite of species faces changing patterns and intensities of land use from agricultural grazing, commercial forestry, grouse moor management and energy generation, as well as the emerging threat of climate change.

Until the turn of the century, concern centred on the effects of increased sheep grazing pressure, and the conversion of heather-dominated habitat to grassland. Our research showed that most upland breeding birds, such as ring ouzels, are associated with grazing regimes that maintain heterogeneous mixes of dwarf-shrub and grassland vegetation cover, and that where the most intensive grazing pressure is relaxed, threatened species, like the hen harrier, can benefit quickly.

Expansion of commercial forestry has provided short-term benefits for some birds, with black grouse, for example, using young plantations. But maturation excludes moorland birds, and our research has shown that forestry rotations may play a big part in driving black grouse population trends across Scotland. Forestry also creates 'edge effects' on birds nesting in nearby open habitats, probably linked to increases in predation risk. These effects are very apparent amongst waders, and our finding that low productivity and population declines of moorland curlew are associated with greater areas of nearby conifer forest may in part explain the current wider decline of this species.



Influence of the area of conifer forestry surrounding curlew breeding sites on moorland, and the change in curlew population on that site over an 8 to 10-year period. On the vertical axis, zero equals no change in curlew population; positive values are increases and negative values are decreases.

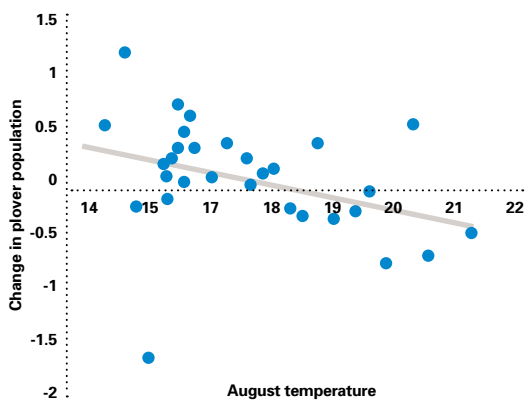
Andrew Parkinson (rspb-images.com)

Richard Revels (rspb-images.com)

Understanding these effects is crucial, as the UK uplands are coming under renewed pressure because there are plans to establish more forests to help mitigate climate change, as growing forests absorb carbon dioxide from the atmosphere. Consequently, our current work is examining the effects of new woodland creation on upland birds.

For some birds, including curlew, predator control such as that undertaken as part of grouse shooting management may ameliorate predation-based forest edge effects. However, beyond its association with illegal killing of raptors, a recent review we undertook documented growing evidence of many other environmental costs, as well as benefits, of intensive grouse moor management.

Effects of temperature on golden plovers



The influence of August temperature two years earlier, and the change between consecutive years in a golden plover population in the South Pennines. On the vertical axis, zero equals no change in plover population; positive values are increases and negative values are decreases.

Some upland birds occur in the UK at their southern range margins, making them especially susceptible to climate change, and our recent work has focused on understanding the mechanisms linking climate change to bird responses to try and identify potential ways that we might be able to help these species adapt. For example, we know that hot and dry weather in late summer reduces availability of craneflies, a key prey for many upland birds, in the following breeding season. Should summer temperatures continue to rise at the current rate, then golden plover populations could become extinct by the end of the century because of the loss of their favoured prey. However, our follow-up work has found that blocking of moorland drains can raise water levels and increase cranefly abundance, thus providing a technique which is both central to peatland restoration, and may increase the resilience of upland birds to future climate effects. We are now extending this work to the montane zone to assess whether climate change may explain recent declines in dotterel populations detected by the latest national survey.

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A typical upland landscape – a mixture of heather moorland, grassland, conifer forest and mountain. Andy Hay (rspb-images.com)

We are grateful to the James Hutton Institute, Natural England, Natural Environment Research Council, Scottish Natural Heritage, and the Sourhope Research Station for collaborative support and/or funding of this work.

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No.4

Pinewood ecology and management

Danny Green (rspb-images.com)

Laurie Campbell (rspb-images.com)

Ecological studies in pinewoods by the RSPB have largely focussed on its native pinewood reserve, Abernethy Forest, where interest has centred on two of its iconic pinewood birds: the capercaillie and the Scottish crossbill.

The capercaillie is one of Britain's rarest birds, having declined steeply in numbers from the 1970s to the 1,000-2,000 birds we estimated in the 1990s and 2000s. Work at Abernethy and in Deeside established that forest fences were a major cause of mortality because full-grown birds flew into them. Our testing of ways to make fences more visible, and removal of fences within 1 km of all leks (display sites) in Scotland, has probably saved this species from going extinct. However, there is still an issue of poor breeding success holding back recovery. More than a decade ago, we undertook an experiment that showed that crow abundance was associated with poor breeding success, and this led to on-going control of crows. Unfortunately, the expected improvement in breeding success did not materialise, perhaps because the suite of predators had changed. For example, pine martens colonised in the 1990s and are now taking many capercaillie clutches. Alternatively, aspects of habitat quality may also be poor and our research is investigating these potential effects.

RSPB conservation science and reserve staff burning experimental patches of heather at Abernethy Forest, to test the efficacy of burning for promoting Scots pine recruitment (Shaila Rao).

The Scottish crossbill is Britain's only endemic bird species. Our studies at Abernethy showed that Scottish crossbills were only one of three breeding crossbill species. The largest-billed species, the parrot crossbill, starts nesting in February before pine cones open, followed by the Scottish crossbill and then by the smallest-billed species, the common crossbill, which nests in April when cones open and access to seeds is easy. Over this period, crossbills switch from small closed cones to larger open ones to maximise profitability. Despite the possibility of mixed mating, each species largely mated with crossbills of the same size and call type, confirming they were behaving as separate species.

Although conservation of pinewood birds has been a priority, we have also studied the natural processes of ecological disturbance – like fire and large herbivores – that are important parts of the natural character of pinewoods which we are aiming to re-create at Abernethy. These disturbances can have impacts out of proportion to their frequency, changing rates of tree establishment, creating opportunities for specialised species, and perhaps benefitting key species like capercaillie.

In a series of field experiments, we showed that experimental burning and mowing, as well as cattle browsing and trampling, all led to increases in bilberry cover, a plant favoured by capercaillie broods. In addition, spider biomass – important in capercaillie chick diet – and capercaillie usage, increased after burning and mowing. Other trials on open heathland showed that using controlled fires as a management technique enhanced Scots pine seedling establishment by an order of magnitude. Slow-moving fires, achievable in certain weather conditions, were particularly advantageous to pine recruitment, and could become an important tool in Scots pine forest restoration.

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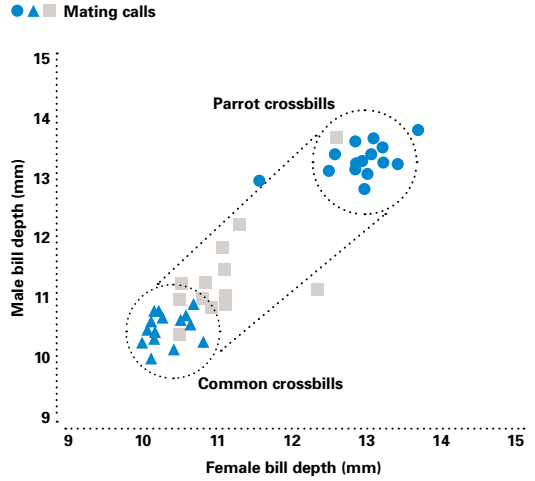
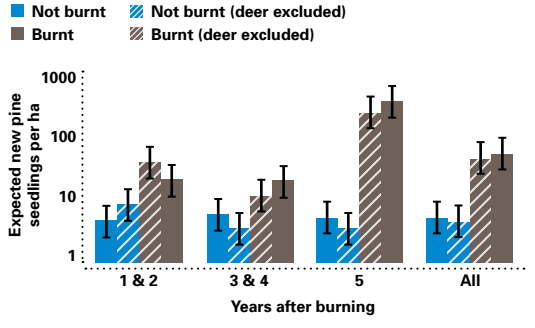
Assortative mating of male and female crossbills



Assortative mating of male and female crossbills in terms of bill size and calls. The ellipses enclose the 95% ranges for common and parrot crossbills. Different symbols represent different call types, which were usually the same for both members in a pair. Scottish crossbill calls are represented by grey squares. Two pairs fell outside the parallel lines and were regarded as mixed pairs.

Effects of burning on Scots pine seedlings



The effect of management burning on Scots pine seedling establishment at Abernethy Forest. Note the log scale. Grey bars: burnt; striped bars: deer excluded. The columns show estimates of likely numbers of new pine seedlings to be observed assuming that detection rate and seed-fall are uniform across treatments and years.

Our pinewood research has been funded by SNH, EU Life Fund, The Conservation Volunteers, Forestry Commission Scotland, and BP through the Scottish Forest Alliance. It was undertaken in partnership with CEH, GWCT, Forest Research, Forest Enterprise, Forestry Commission Scotland, the James Hutton Institute, the Natural History Museum and the Universities of St Andrews, Stirling and Edinburgh.

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No.5

Predation and lowland breeding wading birds

Danny Green (rspb-images.com)

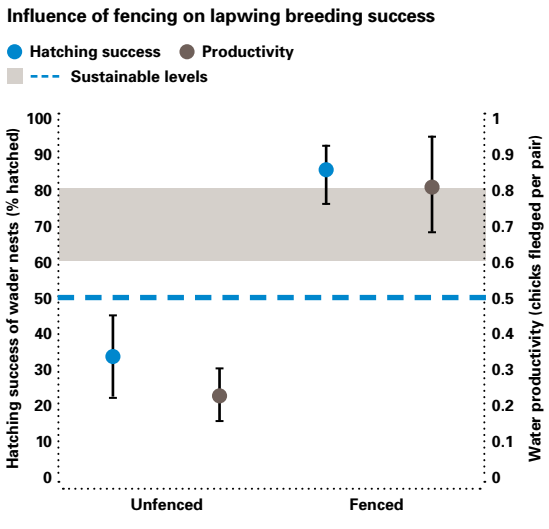
The science of predation is a complex and emotive topic, particularly when active management of predator populations is one solution. So why not just leave the predators and prey to find their own balance?

In this case, the prey are ground nesting waders, such as lapwing and redshank, whose historical declines, driven by habitat loss, have left them restricted in range and vulnerable to the activities of increasing numbers of predators. These predators are often hard-to-study, nocturnal mammals such as foxes, so the task of understanding and managing predation has been challenging. Breeding waders were once widespread in the countryside, and key to their restoration is minimising the impact of predation to maximise the productivity of remaining populations. This will ensure there are young birds to colonise newly restored sites.

In the early years of our research, the challenge was to provide robust evidence to confirm the role of predation in limiting breeding wader populations on reserves. We began work in 1996 with an ambitious eight-year experiment across eleven RSPB nature reserves, on which lethal control was carried out for four continuous years out of the eight.

Kevin Simmonds

Adult lapwing and recently hatched chick. Ray Kennedy (rspb-images.com)



Lapwing nest hatching success before and after fencing was constructed on four RSPB reserves (blue), and lapwing productivity (a measure of overall breeding success) before and after fencing was constructed on ten RSPB reserves (grey). The blue dashed line and grey shading indicate the levels of hatching success (50%) and productivity (0.6–0.8 chicks per pair) respectively, below which populations are likely to decline.

We found that predator control was only likely to have beneficial effects on the breeding performance of lapwings when the starting densities of predators were high. This finding has been central to the RSPB's vertebrate control policy on reserves ever since.

The advent of nest temperature loggers and miniature nest cameras, developed in-house, improved our ability to identify the predators, and showed us the importance of nocturnal mammals such as foxes and badgers as wader nest predators. A major RSPB review identified the need to test non-lethal solutions to predation, such as predator fencing and habitat manipulation. So, we undertook a large-scale experiment across ten RSPB nature reserves, and have shown that excluding foxes and badgers with fences dramatically increases nest survival and productivity in lapwings.

Our research has shown that the best way to manage habitats for breeding waders involves increasing the availability of wet features and ensuring the presence of short swards, but it is important to understand whether these types of management influence predation levels themselves. Fortunately, the distribution of wet features does not, as foxes do not use them any more than expected. A subsequent three-year experiment to manipulate wader distribution using known relationships between waders and habitat had limited success at reducing nest predation. Our studies of nest predation and habitat have indicated that larger-scale and longer-term effects are important for understanding patterns of predation.

Fox taking lapwing eggs from a nest at RSPB Brading Marshes nature reserve in 2013

Our future work will concentrate on impacts of predation at larger spatial and ecological scales, focussing on interactions between waders, their predators and other prey such as small mammals. We are now taking what we have learnt from predation studies on nature reserves, and applying it to landscape-scale studies of predation in the countryside. Our ongoing research ensures that we continue to be well placed to understand and advise on important issues, such as how large-scale land-use changes may influence predation in the future.

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The progress made in the study of predation of lowland waders would not have been possible without continued and dedicated support provided by Defra, the Natural Environment Research Council, the University of East Anglia and Natural England.

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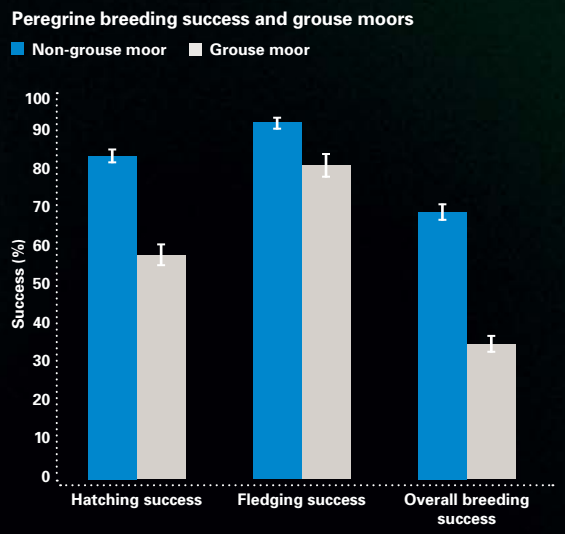
No.6 Persecution of raptors



Average hatching, fledging and overall breeding success (±1 standard error) for peregrines nesting on grouse moor (grey bars), and non-grouse moor habitat (blue bars) in Northern England. For fledging success, we only included nests that successfully hatched at least one chick. Differences between the habitat types for all three variables were significant.

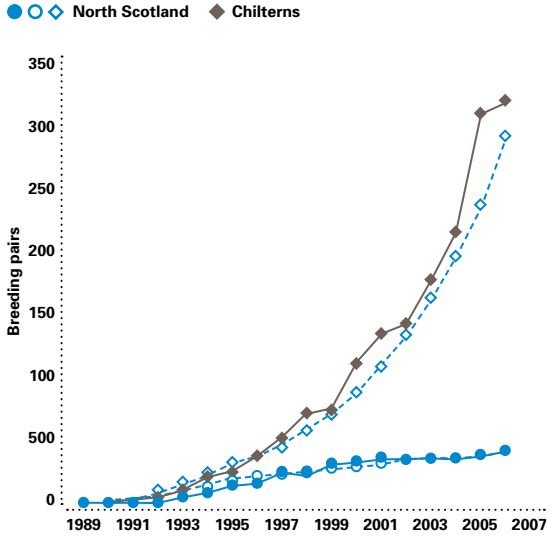
Raptors have been universally protected across the UK since 1954, but illegal persecution persists and often goes undetected. We challenge this illegality through education and advocacy, and by working in partnership with other stakeholders. Our position is based on scientific evidence that has shown how levels of persecution in the UK vary geographically, and the consequences of that persecution for individual species.

Our scientific work has consistently linked persecution with areas managed for grouse shooting. In the case of peregrines breeding in northern England, we have shown that the proportion of successful nests between 1980 and 2006 was 50% lower for pairs nesting on grouse moors, than pairs nesting in other habitats. Crucially, in successful nests, clutch and brood size did not differ between grouse moor and non-grouse moor areas, suggesting that food availability was not the problem. Instead, whole-clutch failures, indicative of persecution, contributed to the low breeding success on these grouse moors.

Peter Cairns (rspb-images.com)

Chris Gomersall (rspb-images.com)

Effects of illegal killing on north Scotland red kites



Growth of red kite populations (solid lines) in north Scotland (solid blue circles), and the Chilterns (solid grey diamonds), and two modelled trajectories for north Scotland. The first (open blue circles/dashed line) is based on observed estimates of productivity and survival. The second (open blue diamonds/dashed line) uses survival rates adjusted assuming there was no illegal killing.

The re-introduction of red kites to the UK has been a phenomenal conservation success, but despite this we have shown that the re-introduced population in north Scotland was still being limited by persecution. In 2006, 14 years after re-introduction, the population was only 41 pairs, compared to the Chilterns' population in England, which had reached 320 pairs over the same time period, and from the same number of released birds. Breeding productivity in north Scotland was higher than or equal to other faster growing populations, so poor breeding success was not responsible for the slow population growth. The continued effort by our conservation staff to individually mark and re-sight red kites meant we were able to estimate survival rates of kites from different populations. We showed that first-year survival was low, and second-year survival had declined over time in north Scotland, and this was enough to explain the poor growth of the population. In total, 103 red kites from north Scotland were found dead between 1989 and 2006, 40% being killed by illegal methods, mainly poisoning.

Our final example shows that golden eagle territories were more likely to become vacant between the 1992 and 2003 national surveys, in places where the number of known persecution events was higher. Other factors such as new commercial forestry, popular hill walking mountains (a surrogate for recreation), and the density of sheep and red deer (a surrogate for carrion abundance) showed no association with changes in territory occupancy, providing evidence for the role of persecution in determining the distribution of golden eagles.

Despite all of our scientific and conservation efforts, persecution persists across the UK, but our research has been successful in identifying areas where extra effort to change people's perceptions of raptors are needed. The RSPB continues to work in partnership with the police and other organisations to combat these illegal activities. An example is the work we do with partner organisations in the Langholm Moor Demonstration Project, in which we trial solutions (eg diversionary feeding of hen harriers to reduce their predation on red grouse) to minimise the conflict between raptor conservation and shooting interests.

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Our scientific studies of raptor persecution would not be possible without the contributions of Scottish Natural Heritage, The Welsh Kite Trust, Raptor Study Groups, the police, the RSPCA/SSPCA and the landowners, farmers and members of the public who assist us in our work. Our partners in the Langholm Moor Demonstration Project are Buccleuch Estate, Scottish Natural Heritage, Game and Wildlife Conservation Trust and Natural England.

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Ben Hall (rspb-images.com)

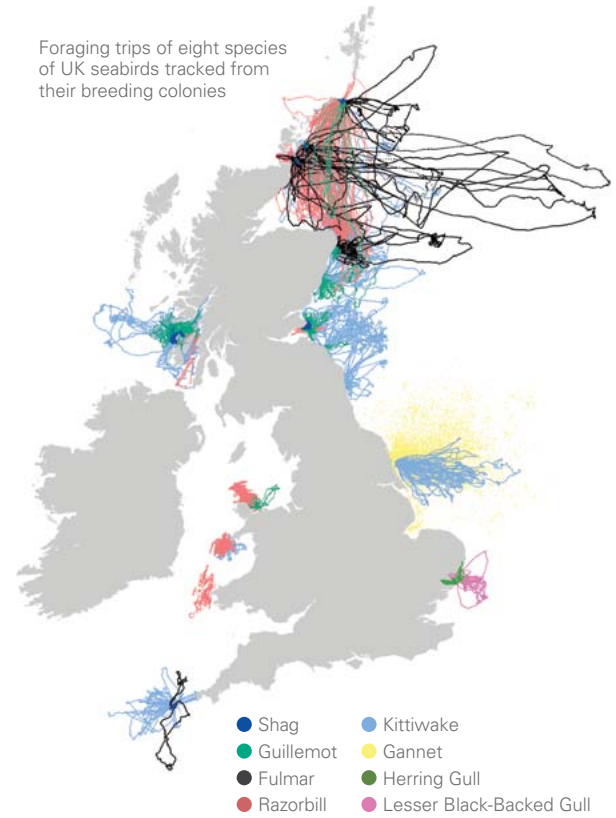
No.7
Seabird tracking

Mark Sisson (rspb-images.com)

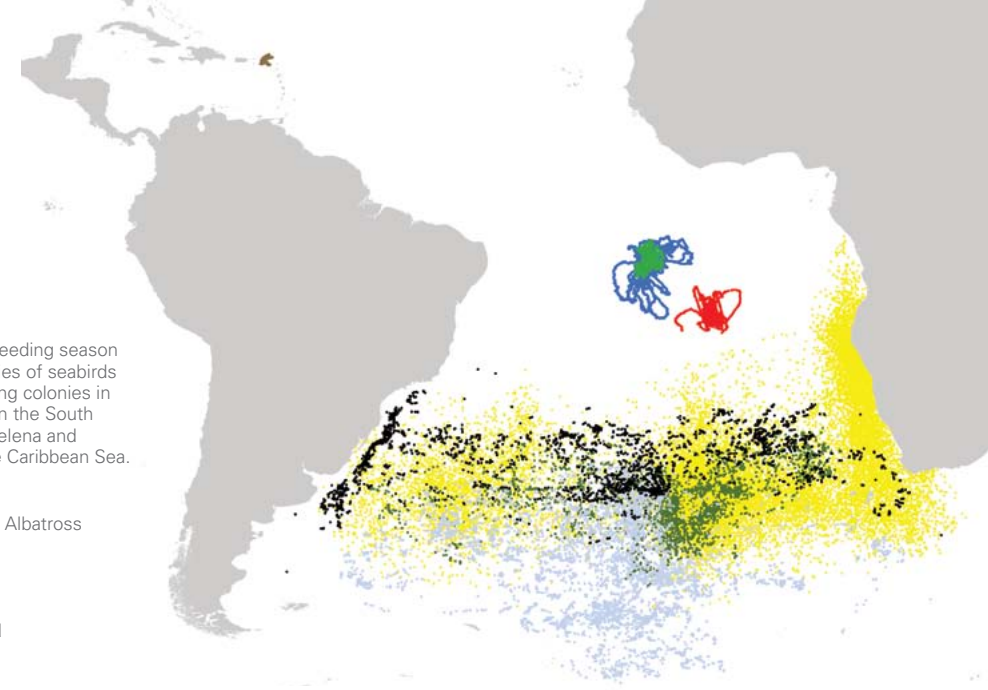
The UK and Overseas Territories support a large number of internationally important seabird species, many of which are in severe decline. Such declines are often due to threats that seabirds face whilst searching for food away from the breeding colony, but until relatively recently we had very little idea about seabirds' movements away from the colony.

The advent of satellite tags provided one of the first means to track seabirds remotely over large distances, but because of the heavy weight and high cost of the tags, they were only suitable for deployment in small numbers, and on the largest of seabirds. Nonetheless, from 2003, we satellite-tracked Tristan albatrosses from Gough Island in the South Atlantic, showing clear overlap of their foraging distributions with long-line fisheries off South America and South Africa. Fisheries bycatch of seabirds is widely recognised as a significant source of mortality that explains the decline of some species.

Foraging trips of eight species of UK seabirds tracked from their breeding colonies



RSPB scientist Ellie Owen holding an adult male shag recently fitted with a GPS tag on Colonsay, Scotland. Andy Hay (rspb-images.com)

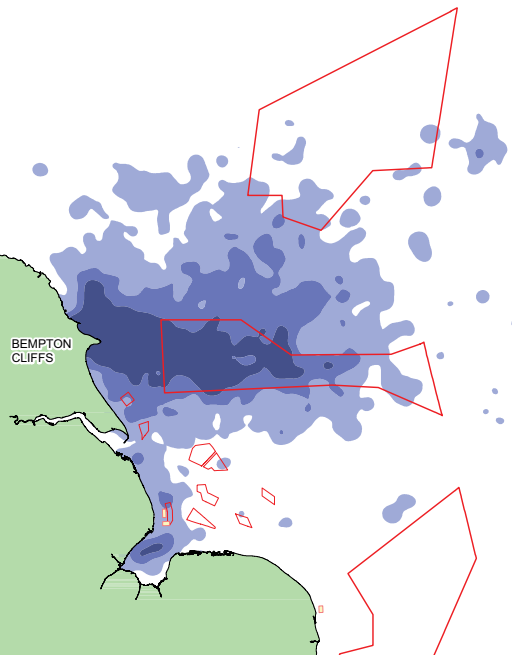


Foraging trips and non-breeding season distribution of eight species of seabirds tracked from their breeding colonies in UK Overseas Territories in the South Atlantic (Ascension, St Helena and Tristan da Cunha) and the Caribbean Sea.

- Spectacled Petrel
- Atlantic Yellow-nosed Albatross
- Sooty Albatross
- Tristan Albatross
- Brown Booby
- Ascension Frigatebird
- Masked Booby
- Red Billed Tropicbird

More recently, advances in the miniaturisation and mass-production of low-cost, lightweight, high-precision GPS tags, has enabled us to track the detailed movements of large numbers of seabirds, including some of the smaller species. This has provided new information on seabird foraging behaviour, both to assess the risks seabirds face from marine activities such as fisheries and offshore renewable energy development, and to identify foraging 'hotspots' for designation as marine protected areas.

Over the last few years, RSPB conservation scientists, working in collaboration with many partners, have established an ambitious programme of seabird tracking. Since 2010 we have tracked over 1,200 individuals of eight species from 25 colonies in the UK. This has shown clearly that some birds travel much further from their breeding colonies than previously thought. Razorbills and Guillemots nesting on Fair Isle regularly travel over 300km from their colony in search of food for their young, which brings them into potential conflict with marine developments which had been thought to be well out of range.



The overlap between boundaries of proposed offshore wind farms (in red) and the densities of foraging gannets tracked from their breeding colony at RSPB's Bempton Cliffs reserve in 2012 (the deeper the blue, the more gannets there were).

In the South Atlantic Overseas Territories, we have tracked petrels, frigatebirds, boobies and tropicbirds. While many of the species breeding at temperate latitudes appear to prefer certain foraging areas that have predictably high food availability, the tropical species tend to forage in many different directions from their colony, probably because the prey availability in tropical waters is much less predictable.

Overall, tracking seabirds with miniature loggers has enabled us to follow their fascinating journeys both during the breeding season – when the birds travel thousands of miles just to feed their chicks – and during the rest of the year, when some species undertake migrations around the entire Southern Ocean. In the coming years, combining the data provided by loggers with vessel monitoring data and bird-borne cameras will yield new insights. For example, we may be able to identify where interactions with fisheries occur, guiding our advocacy to stop accidental killing of seabirds, and where the foraging distributions of seabirds are likely to overlap with proposed offshore wind farms.

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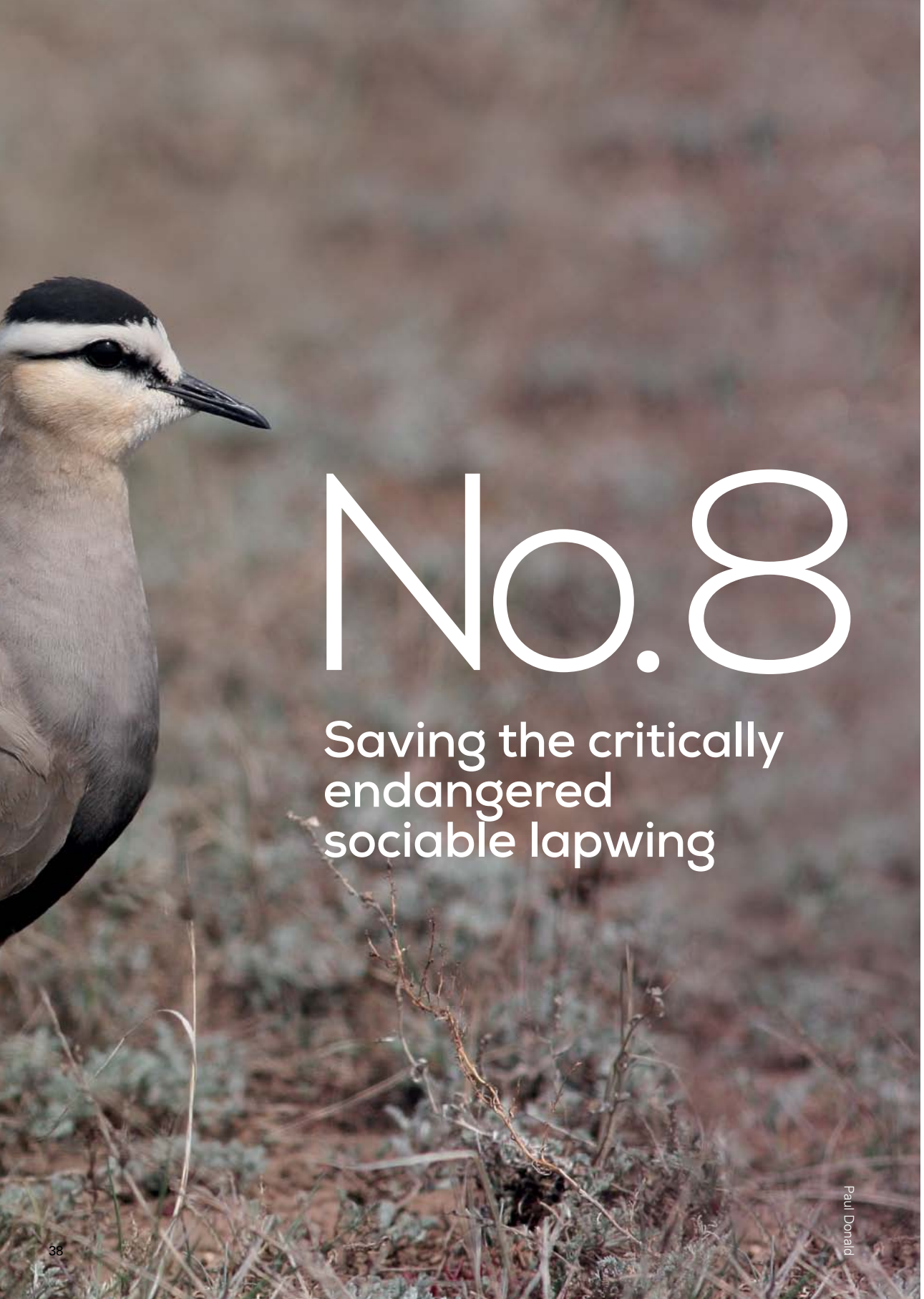


No.8

Saving the critically endangered sociable lapwing

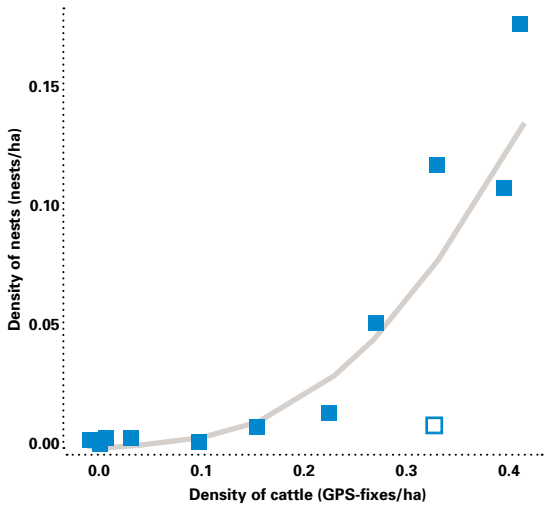
Paul Donald

The vast steppes of central Asia stretch from horizon to horizon and are virtually devoid of people. Why, then, are so many steppe species declining at an alarming rate? This was the conundrum that faced RSPB researchers in 2005, when we started what would prove to be one of the Society's longest and most intensive studies of a single species outside the UK.

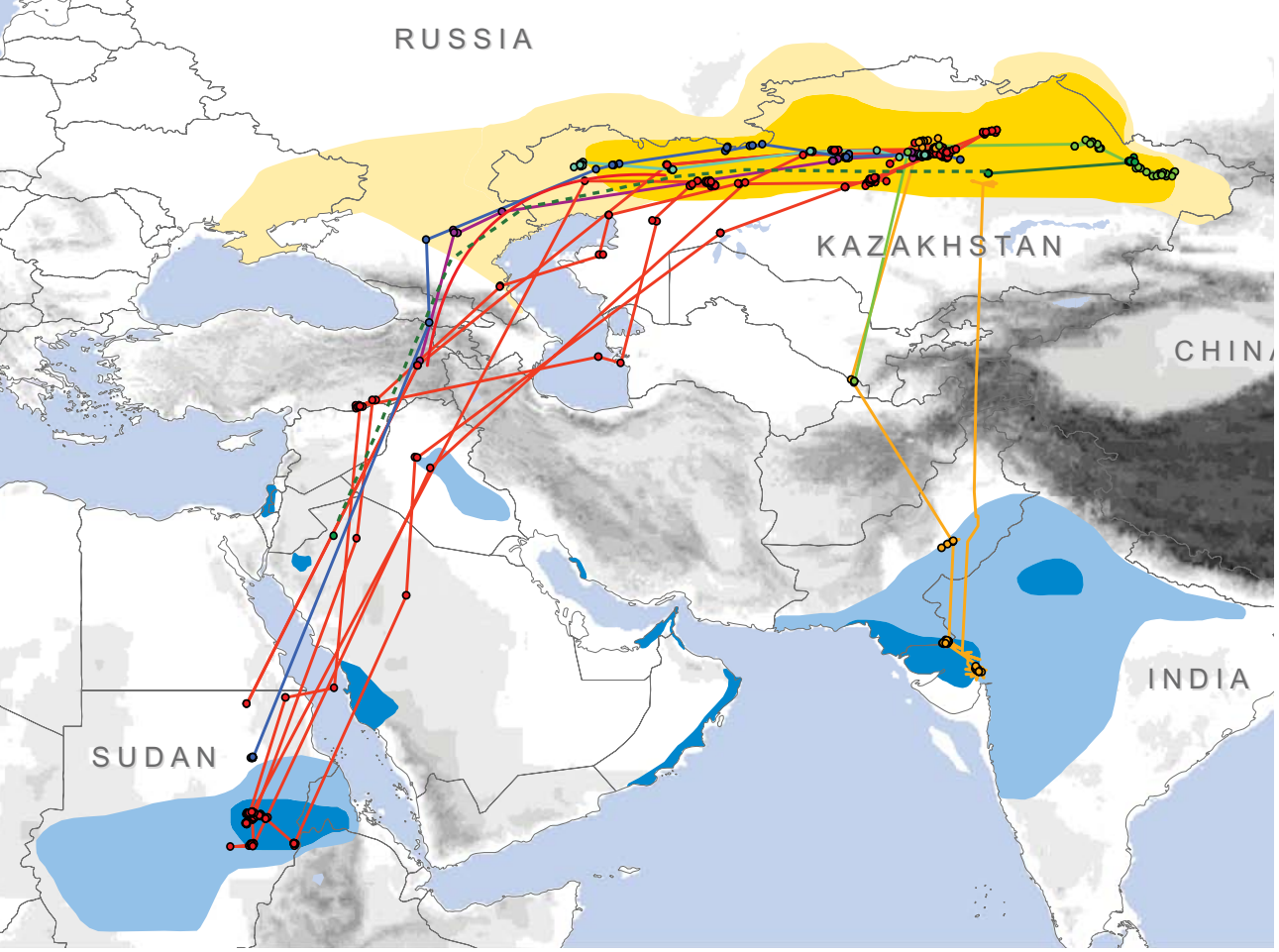
The sociable lapwing has suffered the most rapid decline of any of these steppe specialists and is now in the highest IUCN Red List threat category, Critically Endangered. Previous research had suggested that increased rates of nest trampling due to higher concentrations of domestic grazing animals was a possible contributor, but the species' ecology, distribution and migration were practically unknown. Working in a huge study site in central Kazakhstan, RSPB scientists have for the last nine years worked closely with staff of the Association for the Conservation of Biodiversity in Kazakhstan (ACBK), the local BirdLife representative in the country, and with a growing number of other organisations in the many countries the species visits throughout the year, to build up a clear picture of what has proved to be an exceptionally interesting species.

The first surprise was that with an almost unlimited area of pristine steppe to nest in, birds almost invariably nested within a kilometre or two of villages. Indeed, by fitting local cattle with tracking devices it was possible to show that sociable lapwings nest only in the areas where grazing pressure is heaviest. A number of other steppe species show a similar selection for very heavily grazed areas around villages. The most likely explanation is that species that require very closely grazed grass swards traditionally nested in the wake of the vast herds of saiga antelope that once roamed the steppe. These have largely disappeared due to poaching and the only closely-grazed steppe available is now in the immediate vicinity of villages. RSPB, ACBK and a number of other institutions are now working with the Government of Kazakhstan to restore saiga populations, and already there are encouraging signs of a recovery in numbers.

Sociable lapwing nest density and cattle density



Relationship between cattle density (the density of fixes from GPS collars on cattle in 100m annuli around villages) and the density of sociable lapwing nests. The open square represents an area where cattle went to drink but did not graze.



Distribution
- Breeding uncertain/extinct
- Current breeding
- Former wintering
- Wintering

A review of historical sightings, in combination with satellite tracking of individual birds, has enabled us to identify the breeding grounds, wintering areas and migration routes of sociable lapwings. Different colours indicate the routes taken by different satellite-tagged individuals

By monitoring well over a thousand sociable lapwing nests and fitting unique colour ring combinations to hundreds of birds, we now have a much clearer picture of the species' demography. Its preference for heavily-grazed areas supports previous suggestions that nest trampling might be a problem, and indeed trampling of nests was more common closer to villages. However, predation was lower close to human habitation and overall nest productivity, although highly variable between years, was on average higher closer to villages. In most years productivity was sufficiently high to maintain populations given a reasonable adult survival rate, but survival appears low compared to similar species and this is likely to be the main driver of decline.

Tracking birds along their migratory routes using a combination of satellite tags and field surveys has revealed a great deal about the amazing journeys this species makes each year and has revealed the locations of a number of key staging areas where a high proportion of the population gathers each year, often in large flocks (www.birdlife.org/sociable-lapwing/). Unfortunately, hunting pressure at some of these sites is known to be high and this is likely to be the single most important driver of recent declines. A number of initiatives are now underway to address this problem.

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This work was largely funded by Defra's Darwin Initiative. Additional funding was provided by Swarovski Optik (the BirdLife Species Champion for Sociable Lapwing) through the BirdLife Preventing Extinctions Programme, The Rufford Foundation, the African-Eurasian Waterbird Agreement (AEWA), the German Ornithological Society (DO-G) and the German Academic Exchange Service (DAAD).

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No.9

Saving South Asia's vultures from extinction

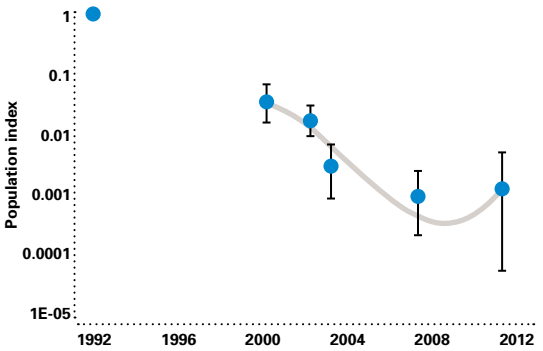
Mike Lane (rspb-images.com)

A decade ago, the cause of unprecedented declines in South Asia's vultures was discovered. Between 1992 and 2003, three species of *Gyps* vulture endemic to South and South-east Asia had declined by over 97% in India, with similar declines in neighbouring countries. In 2004, The Peregrine Fund and its partners in Pakistan showed that the non-steroidal anti-inflammatory drug (NSAID) diclofenac was killing many vultures there.

Diclofenac was used in millions of doses per year to treat ill and injured livestock throughout South Asia during the vulture declines. Vultures were exposed to diclofenac when they fed on carcasses of livestock that had died shortly after being given the drug. Diclofenac caused kidney failure in vultures. About three-quarters of dead vultures collected during the decline showed clinical signs of kidney failure, and all of these also had traces of diclofenac. All dead vultures that did not show signs of kidney failure, did not have traces of diclofenac.

RSPB's scientific staff co-ordinated research in India and Nepal to establish whether or not diclofenac was the main cause of vulture declines. Using mathematical models, we showed that less than 1% of livestock carcasses would need to be contaminated with lethal levels of diclofenac to cause the declines. When we sampled carcasses available to vultures between 2004 and 2005, we found that the level of diclofenac contamination was indeed sufficient to account for the declines.

Population trend of Oriental white-backed vultures



Population trend of Oriental white-backed vultures in India. Points are indices of population density relative to that in 1992 and are on a logarithmic scale where one division of the vertical axis of the graph represents a ten-fold change. Vertical lines are 95% bootstrapped confidence limits. The ban on veterinary diclofenac was introduced in 2006.

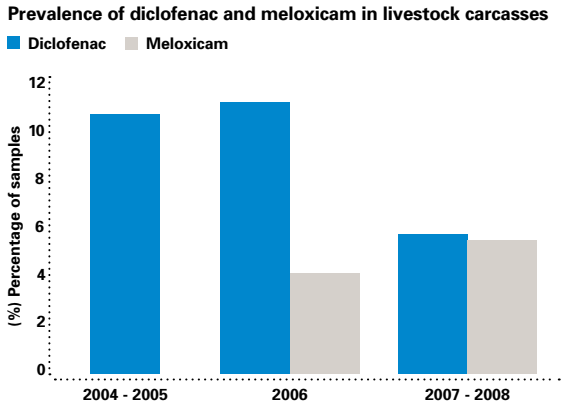
Erica Sommer

RSPB scientist Richard Cuthbert collecting chicks for the Vulture Conservation Breeding Centres

Testing done in collaboration with researchers in India, Namibia and South Africa, showed that the alternative NSAID meloxicam was safe for vultures. This important finding, together with our work to measure the importance of diclofenac in vulture declines, helped our conservation partners in the region to persuade the governments of India, Nepal and Pakistan to ban the veterinary use of diclofenac in 2006. Further, our research contributed to region-wide education programmes to make the problem of diclofenac and the need to switch to meloxicam widely known.

After the ban, we continued to monitor the prevalence of NSAIDs in livestock carcasses and veterinary pharmacies. Trends in vulture populations throughout the region were also measured. We found that diclofenac use fell steadily, but the drug has not yet disappeared. Meloxicam use has increased, as we had hoped. In line with this, vulture populations are declining less rapidly and, in some cases, even shown signs of slight recovery. We found that the misuse of human formulations of diclofenac for cattle is the main reason why diclofenac contamination in livestock remains a serious problem. These findings have been used to assess and improve the effectiveness of the project's advocacy and education programmes.

Our next priorities include testing of other veterinary NSAIDs; measuring the susceptibility of other declining avian scavengers to NSAIDs; and measuring the cost of the loss of the carcass-disposal service once provided by vultures. In addition, we will assist, monitor and evaluate the Vulture Safe Zones (VSZ) initiative, which aims to focus special conservation actions to remove diclofenac from areas where wild vulture populations remain and where captive-bred vultures from the highly successful Vulture Conservation Breeding Centres, operated by our partners in the region, will one day be released.



Trends in the prevalence of diclofenac and meloxicam in liver samples of livestock collected in India during three surveys: before the diclofenac ban in May 2004 – July 2005; just after the ban in May – December 2006; and well after the ban in January 2007 – December 2008. Meloxicam was not measured in the first survey.

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All of this work was done in partnership with RSPB's partners in SAVE (Saving Asia's Vultures from Extinction), a consortium of eleven partners, but particularly with our BirdLife partners, the Bombay Natural History Society and Bird Conservation Nepal. The research was funded by the RSPB, the UK Government's Darwin Initiative and SOS: Save Our Species.

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The use of the veterinary drug diclofenac in South Asia led to a catastrophic decline in numbers of *Gyps* vultures.
Chris Gomersall (rspb-images.com)

No.10

RSPB science supports global site-based conservation

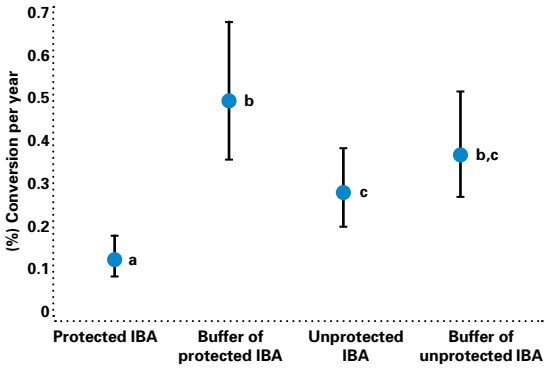
David Tipling (rspb-images.com)

The protection of key sites for biodiversity is recognised by the Convention on Biological Diversity as a central pillar of global conservation. But does site protection actually work? And, if so, where should protected areas (PAs) be designated? RSPB has been at the forefront of research to answer these questions.

Until recently, there were remarkably few assessments of the success of PAs, and many of these were methodologically flawed. Using a web-based tool to assess long-term land cover change using satellite images, we have produced perhaps the most exhaustive assessment of site protection ever undertaken, showing that protected Important Bird Areas (IBAs) across Africa have suffered far lower rates of habitat loss than unprotected IBAs. Furthermore, our analysis of EU bird populations showed that population trends, particularly for species of conservation concern, were more positive in countries with higher coverage of Special Protection Areas, providing the first scientific evidence that PAs designated through the EU Birds Directive are actually benefitting Europe's birds.

PA systems such as the EU Natura 2000 network are hence crucial for biodiversity conservation. Because of this importance, we dedicate considerable time to helping to improve the scientific evidence and scrutinising the science in Strategic Environmental Assessments and Environmental Impact Assessments when faced with development proposals that might affect PAs in the UK and elsewhere.

Rates of land conversion



Rates of land conversion (with 95% confidence limits) within and around protected and unprotected Important Bird Areas (IBAs) in Africa. Classes sharing the same letters did not differ significantly from each other.

The silver-spotted skipper butterfly and the Dartford warbler are species with expanding UK ranges that are much more likely to colonise Protected Areas than elsewhere.

Richard Revels (rspb-images.com)

Steve Round (rspb-images.com)

Although site protection clearly works, PAs are not always in the right places, and we have shown that global conservation value is heavily concentrated in a few small areas. For example, there is a poor overlap between the distribution of African protected areas and the ranges of the continent's most threatened species. Furthermore, as we found when analysing conservation funding, currently far too little is spent on site protection to do more than slow extinction rates. This makes it crucial that protective legislation is applied to the most important areas and species.

A further complication is that projected shifts in species' ranges in response to climate change might leave a static network of PAs in the wrong places. However, our climate envelope modelling with Durham University and Birdlife suggests that African bird species will continue to be well represented within the IBA network, even if climate change requires species to move between sites. In the UK, species are already shifting their ranges in response to climate change. Working with York University and many others, we have shown that PAs are crucial as species from a variety of taxa change their distribution around the UK. Even if their constituent species change, PAs will continue to provide vital resources for species to survive in landscapes with few other refuges.

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The various studies mentioned here were only possible with generous funding from Defra, Cambridge Conservation Initiative, the EU, NERC and the International Foundation for Science. They were the products of collaborations with Biomathematics and Statistics Scotland, BirdLife, Birdwatch Ireland, BSBI, BTO, Butterfly Conservation, Conservation International, CCW, European Birds Census Council, Institute for Environment and Sustainability – Joint Research Centre of the European Commission, Ligue pour la Protection des Oiseaux, Paris Natural History Museum, NE, CEH, New Zealand Department of Conservation, Rare Breeding Birds Panel, SNH, SOVON, UNEP-WCMC, WWF, Charles Darwin University and the Universities of Cambridge, Copenhagen, Durham, Exeter, Freiburg, Hawai'i, Oxford, Princeton, Sheffield, Sussex, Turin and York.

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Spotlight on our experts

Dean Bricknell (rspb-images.com)

Dr Jennifer Smart

SENIOR CONSERVATION SCIENTIST

Department
Conservation Science:
Species Monitoring and Research

Location
RSPB UK HQ Bedfordshire, and at home in Norfolk

Education
HND in Conservation Management, SAC Auchincruive, Scotland.
Degree in Ecology, University of East Anglia, Norwich.
PhD on sea level rise mitigation strategies for breeding redshanks, University of East Anglia, Norwich.

Time at RSPB
Eight years

Personal interests
Cycling – road racing, my dogs

What do you do? I manage a small team of RSPB staff and students – our work mainly focuses on problems facing breeding wading birds and what solutions we can put in place to improve the fortunes of those birds.

What kinds of problems face wading birds? Predators mainly. Wading birds nest on the ground, so they're very vulnerable to being eaten by other things. A lot of new technology has come along over the last four or five years that has helped us understand a lot more about the mammals that prey on waders. For instance, we've learned from night vision cameras and temperature sensors in nests that nocturnal predators are the biggest issue, especially foxes eating wader eggs.

Is there a solution to that? That's what we're working on. On our nature reserves, we're testing predator fences that keep foxes out of important bird nesting areas and seeing how that affects the number of chicks surviving. We've had particularly good results with lapwings – they do much better when they nest in areas protected by the fencing.

What is your favourite thing about your work? Getting out into the field, but I don't get to do it very often at the moment. I really enjoy working with students and new conservation scientists, helping them develop their skills. I have two students doing their PhDs right now who've been working with me for four years. It feels good to be bringing them on in their careers.

When did your interest in wading birds start? In 1998, while I was working as a countryside ranger. My ringing trainer took me to the Wash in East Anglia for a week of wader ringing. There were 25 of us camping in a potato shed. Our work was controlled by the two tides in the day, when the incoming water would push the birds up onto the saltmarsh. Very early in the morning we'd go out and catch waders to ring with canon nets – these fire a net over a group of birds. And at night we'd put out mist nets, which birds fly into.

We got very little sleep, but it was wonderful. Being out on the saltmarsh at night is magical. Sometimes phosphorescent plankton would come in off the sea, and we'd be wading through them. I met my future husband – Mark – that week, and my future PhD supervisor. It was a big turning point in my life.

What's keeping you busy right now? I'm on secondment at the moment, pulling together the materials needed for the RSPB Centre for Conservation Science launch – the web area and this publication. I've always been passionate about science communication. I really believe that you should be able to explain your science to anybody. I'm interested in the stories behind the science that mean something to people.

Eleanor Bentall (rspb-images.com)

"Preparing for the future"

Department
Reserves Ecology

Location
RSPB UK HQ, Bedfordshire

Education
Degree in Environmental Science, University of East Anglia, Norwich. PhD on the effects of raising water levels on food supply for breeding wading birds on lowland wet grassland, University of East Anglia, Norwich.

Time at RSPB
17 years

Personal interests
Travelling and seeing lots of good wildlife, writing articles and books on conservation

Dr Malcolm Ausden

PRINCIPAL ECOLOGIST

What do you do? Two main things really. I help ensure that the work we do on our reserves is based on good evidence and good science. And I use information gathered through experience on our reserves to help influence the way other landowners manage their land. A lot of my work looks at how we can help lessen the negative impact of climate change on our reserves and outside of them.

Can you give an example of where you're doing this right now? Wallasea Island in Essex. It's the biggest wetland recreation project of its type in Europe, and its design takes into account expected future rises in sea level. I was there yesterday helping make some tweaks to the design.

What were you tweaking? So, since July 2012, the material that will build up the island has been arriving. Four and a half million tonnes of the stuff. It's all coming from our project partners Crossrail as they dig out a new train tunnel under London. There are contractors on the island working to a 3D model of the reserve that our design team put together.

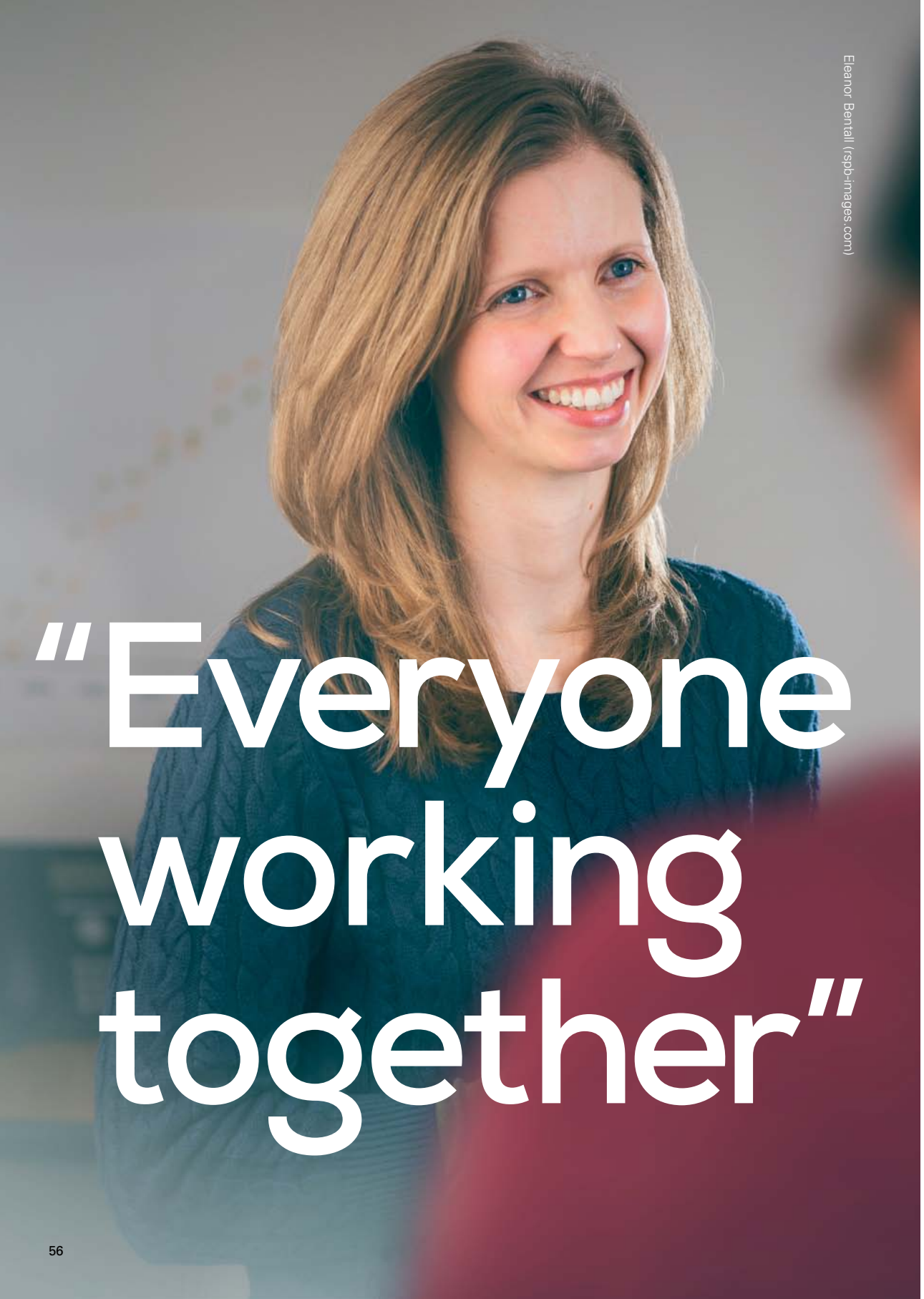
The digger drivers move backwards and forwards across the island, and the height of the blade that creates the land profile is controlled automatically by GPS to recreate the 3D model. This is great for getting most of the landforming done, but it means you end up with very uniform profiles. So we've been tweaking the design to put in additional islands and lagoons. We're just putting in a lagoon and an island for nesting spoonbills.

How do you know how to make a lagoon good for spoonbills? We went to the Netherlands to look at wetlands where birds like spoonbills and great white egrets breed. Spoonbills are very sensitive to predation by foxes, and disturbance by humans, so we've built this spoonbill lagoon at the end of the island, where there is the least chance of disturbance from people and foxes. In the Netherlands, spoonbills prefer one big island in a lagoon to several small islands, so that's what we've done. We've also created a little sheltered bay on one side of the island, and shallow areas in the lagoon where they can feed on shrimps and fish.

When will Wallasea be finished? As soon as next spring we could be seeing birds like avocets and little ringed plovers there. It should be a fully flourishing RSPB nature reserve by about 2020.

When did your interest in wildlife start? I've been into wildlife since I was very young. I had a patch in North London – some fields, a wood and a golf course. I used to spend all my time up there birding and identifying everything. That was most of my childhood. I like to keep learning though. For a big part of my adult life I set myself the task of learning a new taxonomic group every year.

What's your favourite thing about your work? Helping make a difference.



Department
Conservation Science: Species Monitoring and Research

Location
RSPB UK HQ, Bedfordshire

Education
Degree in Zoology, Glasgow University.
PhD on St Helena Plover, University of Bath (RSPB co-funded).

Time at RSPB
Two years

Personal interests
Being in forests or up mountains; exploring.

Dr Fiona Burns

CONSERVATION SCIENTIST

What do you do? I work on a range of projects with other organisations to try to understand how wildlife is changing and the reasons behind that. My first big project was the State of Nature report.

How did the process of putting together the State of Nature report work? A lot of co-ordinating and number crunching! The RSPB came up with the idea and proposed it to a range of people to start with. I had to find out who holds all the data about the different species' population trends, and then work out how we would gather all the information from the different organisations. It took a year and was a huge team effort.

What has the report achieved? We showed that more species are declining than increasing – 60% of the 3,000 species surveyed are in trouble. The findings are now being used in people's day-to-day work. We know we can't save birds by themselves, and this report was a really positive step towards everyone working together to save nature.

What was your favourite part of the process? The launch event. All the partners were there – more than 200 people – and we were all equal, regardless of the size of the organisation. Everyone was part of the same team. The event was held at the Natural History Museum Darwin Centre. David Attenborough gave a speech. It was great to see such a collective force for nature.

So what happens now? We're bringing together all the partners again to look at what changes in the environment have driven these declines in wildlife. It's obvious now that collectively we're not doing enough and there are things we should be doing more of or differently.

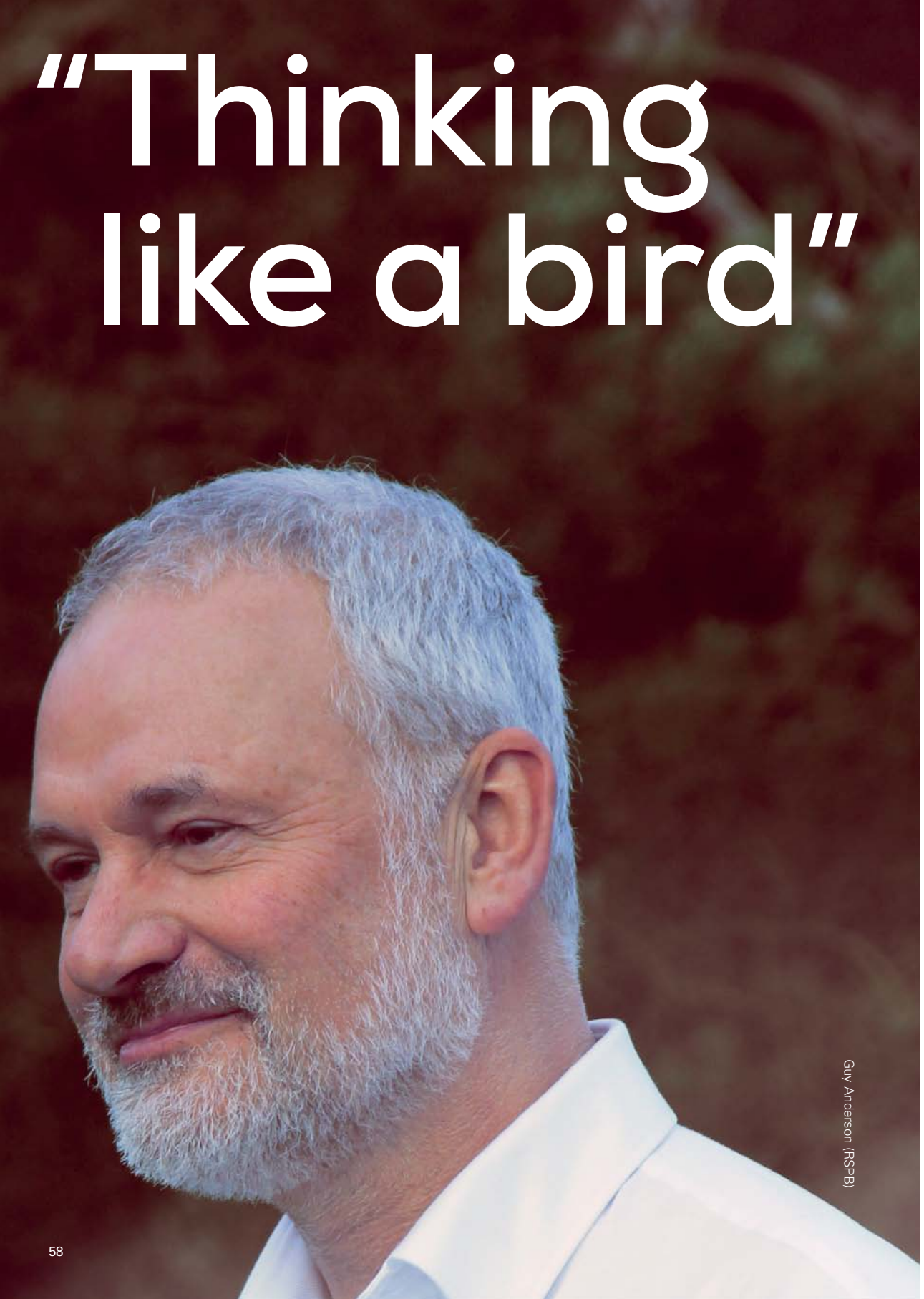
What's the best thing about your job? Working in partnership with lots of other organisations I get to meet lots of people who are as passionate about conservation as I am.

And where did your passion for wildlife begin? I've worked with birds for much of my adult life. I did my PhD on St Helena, where I was studying the declines in St Helena plovers. It's so beautiful on the island, and the people are so friendly. I rented a little house with fairy terns nesting in my garden.

Before St Helena, I spent a year in New Zealand working with kakapo, which was amazing. I was working on the uninhabited Codfish Island. The forest was full of life – at night sooty shearwaters would come crashing through the trees to get to their nests, and the male kakapo made an incredible sound – they dig bowls in the dirt and then inflate an air sack in their throat and boom into the bowls to attract females.

Looking forwards, what are you most excited about? Landscape-scale conservation. Finding out how we can have healthy ecosystems where humans and wildlife can live in balance. Imagining what that future would look like and wondering what we have to do to create that.

"Thinking like a bird"



Guy Anderson (RSPB)

Prof Rhys Green

PRINCIPAL CONSERVATION SCIENTIST

Department
Conservation Science

Location
Department of Zoology,
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Education
Degree in Zoology,
Cambridge University.
PhD on the effects of skylarks and field mice on sugar beet production,
Cambridge University.

Time at RSPB
31 years

Personal interests
Observing wildlife,
evolutionary psychology

What's your favourite thing about your work? It's the science – studying birds and discovering how they work. You start off not really understanding them, and then you learn about how they live, and what affects their ability to find food and breed. From there you work out how you can change the way they or their habitat is managed to make them more successful.

When did your interest in wildlife begin? From the age of three I was very interested in animals. But always wild animals. My relatives used to give me pets, but I wasn't interested in pets. I don't want to have a relationship with an animal, I want to understand how it works as another being.

Although scientists often say that they never anthropomorphise, I imagine what it's like to be a bird as part of my job. I don't see how you can think about how animals work unless you imagine what it's like to be one and what its difficulties are. The good ecologists I know think about the animals they study in that way.

Which species do you know best? Probably stone-curlews. I studied a lot of individuals for long periods over three-years. Nobody had been able to study them properly before because they're nocturnal, but I had been one of the first people to use radio tracking to study grey and red-legged partridges in the late 1970s, and the same technology allowed me to follow the movements of stone-curlews in the dark.

What did you discover about stone-curlews? We found that they like to feed in grassland that is grazed by rabbits or sheep – the vegetation is short, so they can see long distances, even at night, and the dung from the grazing animals attracts insects that stone-curlews can feed on.

To work out what they ate, I came up with a calibration method for studying their diet from their faeces. I borrowed some stone-curlews from London Zoo and kept them in my garden so I could feed them mixtures of things and count the remains in their faeces under a microscope. This allowed me to translate counts of the contents of wild bird faeces into estimates of what the birds had eaten.

What did you do with the knowledge you gained about stone-curlews? We discovered that two-thirds of stone-curlew nests are in arable crops where they're at risk of the eggs and chicks being destroyed by farming operations. Using our knowledge of stone-curlew foraging we could plan where to place special nesting plots where the birds' eggs and chicks would be safe from farming operations but still be within range of enough food.

How has conservation work changed in the last 30 years? The main thing is better technology. GPS tags will tell you where the bird is within a metre and the results arrive in your computer automatically. When I was tracking stone-curlews I had to use a hand-held aerial, a compass and map, triangulating its location from two different positions every hour throughout the day and night, and the results were only accurate to about 50 metres.

Tessa Cole

SENIOR RESEARCH ASSISTANT

Department
Conservation Science: Scottish Research

Location
RSPB Scotland HQ, Edinburgh, and Colonsay Island, Scotland

Education
BSc Biological Sciences with Zoology Honours, Edinburgh University.
MSc in Wildlife Management and Conservation, Reading University.
My dissertation investigated a landscape-scale solution to reducing the impacts of predation on waders at Berney Marshes, with the RSPB.

Time at RSPB
Three years

Personal interests
Hill walking, travelling and enjoying the arts

What do you do? I spend most of the summer leaning over cliffs catching razorbills, guillemots, kittiwakes and shags. I track their movements using GPS and dive logger technology to locate their most important feeding areas. This is valuable information when decisions are being made about where to put Marine Protected Areas and offshore windfarms.

What's been keeping you busy recently?
I've been writing a paper about seabird puke.

Seabird puke? While we're handling seabirds to fit tracking devices, they sometimes regurgitate and we study the samples. We have to digest them first, which is a lovely process of leaving them in a warm place for a few days in biological washing powder and waiting for the hard parts to separate from the horrible grey smelly stuff. The hard parts are fish bones. From those you can identify what fish the birds have been eating. Multi-colony seabird diet studies are rare, so what we're doing is quite unique. It's giving some interesting results.

What have you discovered? Well, it looks like there's an east-west divide in what some seabirds eat. Kittiwakes on the east coast of Scotland, are feeding mainly on sandeels, but the birds in the west seem to have a more generalist diet – they're eating cod, herring, sprats and flatfish, as well as sandeels. This could be part of the reason why the birds on the west coast are doing better and raising more chicks – we're investigating further.

What challenges do you face in your work?
I'm actually scared of heights. When I walk by a sea cliff, I don't like being near the edge. I really wanted to work with seabirds though. But when you're leaning over the cliff catching seabirds, you don't notice the waves crashing below. Sometimes I forget to breathe.

Why did you want to work with seabirds in particular? I originally wanted to be a primatologist. I left uni and went to work with primates in Africa, but then it hit me that I'd have to live in Africa for the rest of my life to do this job. I think the reason I was so interested in primates was their social behaviour – and it turns out seabirds have fascinating social behaviour too.

When I came back to the UK, I worked on Skomer Island recording seabird numbers. I got to sit opposite seabird cliffs with a telescope all day for four months observing their behaviour. Seabirds have very distinct personalities. There is drama on a daily basis in a seabird city. It's almost like watching a soap opera.

What fascinates you most about seabirds?
They lead two separate lives. For about three months during the breeding season they're on the cliffs, and the rest of the year they're out at sea. Those nine months of their lives have always been a mystery, as has their time away from the nest while foraging in the breeding season, but by applying the right tracking technology, we're able to find out where they go and what they get up to for the first time.

Funding and partnerships

Ben Hall (rspb-images.com)

Funding

The RSPB has a policy of keeping only a few months' running costs in its financial reserves. We must raise all of our annual expenditure on science every year and we depend on a range of sources for this funding.

Around three-quarters of the RSPB's income comes from the generosity of individuals (our members and supporters) and although this income can be predicted with some certainty, it is by no means guaranteed, and fluctuates. The RSPB must continue to pursue a wide variety of funding sources to continue our work and grant funding is a vital component of this. Many organisations (listed below) have funded specific science projects in the period 2003 – 2013 through, for example, research contracts and grants towards partnership projects. Many of those listed are also active partners in the research, or may have provided additional support and funds for wider conservation action.

- ACE UK
- African–Eurasian Waterbird Agreement (AEWA)
- African Bird Club
- Aggregates Levy Sustainability Fund
- Agricultural Industries Confederation
- Agri-Food and Biosciences Institute, Northern Ireland
- Anglian Water
- Argyll Bird Club
- Biodiversity Indicator Partnership
- Biotechnology and Biological Sciences Research Council
- BirdLife International
- BP through Scottish Forest Alliance
- Breckland District Council
- British Beet Research Organisation
- British Birdwatching Fair
- British High Commission, New Delhi, India
- British Ornithologists' Union
- British Potato Council
- British Trust for Ornithology (BTO)
- Brookfield Drinks Ltd
- Cairngorms National Park Authority
- Cambridge Conservation Initiative
- Charl van der Merwe Foundation through WWF South Africa
- Chester Zoo
- CJ WildBird Foods
- Club 300, Sweden
- Community Environmental Renewal Scheme
- Conservation International
- Conservation Volunteers (Natural Talent Apprenticeship Scheme)
- Countryside Council for Wales
- Critical Ecosystem Partnership Fund
- Crop Protection Association UK
- Crown Estate (via the Marine Stewardship Fund)
- Danish Development Assistance Programme (DANIDA)
- Darwin Initiative for the Survival of Species
- David and Lucile Packard Foundation
- Defence Estates, Ministry of Defence
- Department of Energy and Climate Change (DECC)
- Department for Environment, Food and Rural Affairs (Defra)
- Department for International Development (DfID)
- Department for Trade and Industry
- Disney Worldwide Conservation Fund
- English Nature
- Environment Agency
- Environment & Heritage Service, Northern Ireland
- Environment Wales
- Enviros
- European Commission – DG Environment
- European Commission – LIFE-Environment Programme
- European Commission – LIFE-Nature Programme
- European Commission – LIFE+ Information & Communication
- European Commission – LIFE+ Nature & Biodiversity
- European Commission (Seventh Framework Programme) – EuroGEOSS project
- European Commission – Environment and Natural Resources Thematic Programme
- European Commission – 'Tropical Forests' programme
- European Environment Agency
- European Union through the European Regional Development Fund (ERDF)
- ERDF – INTERREG IVB Atlantic Area Transnational Programme 2007–2013
- ERDF – INTERREG IVB North-West Europe Programme 2007–2013
- European Topic Centre on Biological Diversity
- Foreign & Commonwealth Office (FCO)
- FCO/DfID Overseas Territories Environment Programme
- Forest of Bowland AONB
- Forestry Commission
- Forestry Commission England
- Forestry Commission Scotland
- Forestry Commission Wales
- Mr Julian Francis
- Frankfurt Zoological Society
- French Global Environment Facility (FFEM)
- German Academic Exchange Service
- German Ornithological Society (DoG)
- German Ministry for the Environment (BMU), via the German development bank (KfW)
- Gulbenkian Foundation
- Hartley Anderson Associates Ltd
- Heritage Lottery Fund
- Home Grown Cereals Authority
- International Bear Association
- International Climate Initiative
- International Foundation for Science
- Jet Airways
- Joint Nature Conservation Committee (JNCC)
- Linking Environment and Farming
- Los Angeles Zoo and Botanical Gardens
- MacArthur Foundation
- Marine Scotland
- Mohamed bin Zayed Species Conservation Fund
- Moors for the Future
- Wm Morrison Supermarkets plc
- National Birds of Prey Trust
- National Research Foundation, South Africa
- National Trust
- Nationale Postcode Loterij, Netherlands
- Natural England
- Natural England – Action for Birds in England partnership
- Natural Environment Research Council
- Natural Resources Wales
- Northern Ireland Environment Agency
- Ornithological Society of the Middle East, the Caucasus and Central Asia
- Perth & Kinross Quality of Life Trust
- Pesticides Safety Directorate
- Pew Foundation
- Riverbanks Zoo and Garden
- Rufford Foundation
- Safeway Stores plc
- Sainsbury's Supermarkets Ltd
- Scottish Executive's Biodiversity Action Grants Scheme
- Scottish Government
- Scottish Mountaineering Trust
- Scottish Natural Heritage (SNH)
- Scottish Power
- Scottish Power Renewables
- Scottish and Southern Energy Generation Ltd
- SeaWorld & Busch Gardens Conservation Fund
- SITA Trust
- Size of Wales
- Snowdonia National Park Authority
- SOS (Save Our Species)
- Mr J Denis Summers-Smith
- Swarovski Optic
- Syngenta Crop Protection UK
- Tesco plc
- United Utilities
- University of Aberdeen
- University of Cambridge
- University of Durham
- University of the Highlands and Islands
- University of Leeds
- University of Liverpool
- University of St Andrews
- University of Stirling
- University of Zurich
- US Fish and Wildlife Service
- Vaderstad
- Vogelsbescherming Netherland
- The Waterbird Society
- Welsh Government
- Wildfowl and Wetlands Trust
- Woodland Trust
- Yorkshire Dales National Park Authority
- Zoo Basel

PhD training

The RSPB funds and supervises a wide range of PhD studentships each year. This is a valuable mechanism for undertaking important research, and demonstrates the RSPB's commitment to the training of new conservation scientists. The RSPB helped to initiate, and continues to help fund, the annual Student Conference on Conservation Science held at the University of Cambridge. Annually, from 2014 onwards, an RSPB Conservation Science Award will be presented to a PhD student from a UK university whose thesis makes an outstanding contribution to conservation science.

The following list shows PhD studentships involving the RSPB that were active between 2003 and 2013. RSPB staff have been involved in the supervision of all these and the majority were also supported by varying amounts of funding and other in-kind support from RSPB, in addition to funding, support and supervision from a wide range of our partners (see partnership list).

Research project	Student	University
The ecology of dotterel and the effects of climate change	Alistair Baxter	Aberdeen
Ecology of cuckoos and their hosts	Chloe Denerley	Aberdeen
Ecology of red kites	Danny Heptinstall	Aberdeen
Demographic and ecological approaches to understanding ring ouzel *Turdus torquatus* population declines	Innes Sim	Aberdeen
Seed predation of Scots pine	Fiona Worthy	Aberdeen
Conservation biology of the endangered St. Helena plover *Charadrius sanctaehelenae*	Fiona Burns	Bath
Productivity and population trends of northern lapwing *Vanellus vanellus* in Britain	Fiona Sharpe	Bath
The ecology of common redshanks breeding on saltmarsh	Elwyn Sharps	Bangor
Ecology, impacts and control of New Zealand pygmy weed *Crassula helmsii*	Clare Dean	Bournemouth
Mechanisms of geographic range limitation in the Ethiopian bush crow	Andrew Bladon	Cambridge
Ecology and conservation genetics of *Bombus distinguendus*, the great yellow bumblebee	Tom Charman	Cambridge
Does habitat connectivity promote range movement of habitat specialists?	Lizzie Green	Cambridge
Stone curlews and conservation management	Alison Johnston	Cambridge
Agriculture and biodiversity in India	Malvika Onial	Cambridge
Agriculture and biodiversity in Ghana	Ben Phalan	Cambridge
Effects of disturbance on stone curlews	Elisabeth Taylor	Cambridge
The conservation of birds on Gough island	Ross Wanless	Cape Town , South Africa
Important Bird Area programme in Sri Lanka	Chinthaka Kaluthota	Colombo, Sri Lanka
The ecology of corncrakes on Shannon callows	Anita Donaghy	Cork, Ireland
Investigating the causes of the decline of the urban house sparrow population in Britain	Kate Vincent	De Montfort
Population change in European birds and bio-climate models	Nathalie Doswald	Durham
Ecology and conservation of yellow wagtails on arable land	James Gilroy	East Anglia
Effects of disturbance on Dartford warblers	Giselle Murison	East Anglia
Managing water levels on wet grasslands for breeding waders; the use of shallow wet features	Sarah Eglington	East Anglia
Managing wet grassland landscapes: impacts on predators and wader nest predation	Becky Laidlaw	East Anglia
Climate change impacts on Northern lapwings *Vanellus vanellus*	Danielle Peruffo	East Anglia
Gas exchange over flow country peatlands using aerial sensing	Kathleen Allen	Edinburgh
The phenology of caterpillars and their contribution to the diet of hole-nesting birds across time and space	Jack Shutt	Edinburgh
Biodiversity and carbon flux of blanket bog	Alan Gray	Edinburgh
Disturbance in Caledonian pine forests	Mark Hancock	Edinburgh
Native wetland plants and water treatment	Maggie Keenan	Edinburgh
Causes of decline and conservation solutions for corn buntings in eastern Scotland	Allan Perkins	Edinburgh
Fire, forest structure and bog development	Sandra Pratt	Edinburgh
The impact of moorland burning on vegetation and greenhouse gas emissions	Emily Taylor	Edinburgh
Cuckoos, ground nesting birds and sustainable agriculture	Sara Zonneveld	Exeter
Seabird survival rates	Sarah Davis	Glasgow
Ecology of terns and kittiwakes on Coquet Island, Northumberland	Gail Robertson	Glasgow
Storm petrels on Shetland: ecology and disturbance	Hannah Watson	Glasgow

Research project	Student	University
Avermectin and dung invertebrates	Lisa Webb	Glasgow / Scottish Agricultural College
Impacts of non-inversion tillage on farmland	Heidi Cunningham	Harper Adams
Farmland birds in the Baltic republics	Irina Herzon	Helsinki, Finland
Habitat management for house sparrows in London	Jacqueline Weir	Imperial College
The ecology and conservation of the aquatic warbler	Justyna Kubacka	Jagiellonian, Poland
The composition and ecological function of birds in the agricultural landscape of Nyandarua, central Kenya	Paul Kariuki Ndang'ang'a	Jomo Kenyatta University of Agriculture and Technology, Kenya
Forest management and globally threatened birds	Dami Filibus Danjuma	Jos, Nigeria
Invertebrate assemblages in artificial bog pools	Jeannie Beadle	Leeds
Ecology and transmission of *Trichomonas gallinae* in the rapidly declining turtle dove *Streptopelia turtur* and co-occurring UK and African columbiformes	Rebecca Thomas	Leeds
Disease in urban house sparrows	Daria Dadam	Liverpool
Ecology and genetic structure of Montserrat oriole	Andrew Cassini	Madison, Wisconsin
Conservation of biodiversity in agricultural landscapes in Uganda: using birds as indicators	Dianah Nalwanga	Makarere, Uganda
The ecology and conservation of the Liben lark	Bruktawit Abdu	Manchester Metropolitan University
Ecology of great bittern in Belarus	Marina Dzmitranok	Minsk, Belarus
Implications of land use change for steppe birds in Kazakhstan	Johannes Kamp	Muenster, Germany
Assessing the impact of introduced mammals on island biodiversity	Sandra Hervias	Murcia, Spain
Monitoring habitat at key biodiversity sites in Africa using remote sensing: land cover change at Important Bird Areas in Eastern Africa	George Eshiamwata	Nairobi, Kenya
Meta-population dynamics of willow tits	Finn Stewart	Nottingham
Controlling ragwort without herbicides	Eleanor Sargent	Open University
The effects of low level farmyard manure application on soil invertebrates and the implications for breeding waders	Charlotte Horton	Open University/ Harper Adams
The role of food quantity and accessibility in stubble field management prescriptions for farmland birds	Simon Butler	Oxford
The ecology and conservation of imperial eagles in Bulgaria	Dimitar Demerdziev	Plovdiv, Bulgaria
Effects of nutrient levels on greenhouse gas emissions from lowland fens	Kieran Stanley	Queen Mary University of London
Ecology of crows in pastoral areas	Ian Adderton	Queen's University, Belfast
Factors contributing to declining populations and reproductive success of seabirds on Rathlin island	Lorraine Chivers	Queen's University, Belfast
Causes of decline in diving duck populations on Lough Neagh	Irena Tománková	Queen's University, Belfast
Effects of food abundance, sward structure and management on foraging by yellowhammers on agricultural grasslands.	Dave Buckingham	Reading
Assessing the cultural values of birds	Natalie Clarke	Reading
The ecology and conservation of the rare freshwater bryozoan, *Lophopus crystallinus*	Samantha Hill	Reading
Manipulating crop and field-margin vegetation structure for birds and food resources	Tony Morris	Reading
The breeding ecology of the spotted flycatcher in lowland England	Danaë Sheehan	Reading

Research project	Student	University
Managing agri-environment grass fields and margins for Orthoptera and farmland birds	David Smith	Reading
Ecology of corncrakes in Latvia	Oskars Keišs	Riga, Latvia
A micrometeorological study of the effects on greenhouse gas exchange of peatland restoration in the Flow Country of northern Scotland	Graham Hambley	St Andrews
Insects on farmland and their importance to granivorous birds	Jenny Bright	Stirling
Managed retreat on the Cromarty Firth	Amy Crowther	Stirling
An enclosures study of the effects on greenhouse gas exchange of peatland restoration in the Flow Country of northern Scotland	Renée Hermans	Stirling
The ecology of pine martens in Scotland	Laura Kubasiewicz	Stirling
Ecology and conservation of breeding lapwings in upland grassland systems: Effects of agricultural management and soil properties	Heather McCallum	Stirling
Management of forest restock plantations for black grouse	Jenny Owen	Stirling
Restoration of and management of wildflower-rich machair for the conservation of bumblebees	Nicola Redpath	Stirling
The ecology and conservation of endangered saproxylic hoverflies (Diptera, Syrphidae) in Scotland	Ellen Rotheray	Stirling
Remote sensing of wetlands	Crona O'Shea	Stirling
Conservation management of breeding lapwings in upland grassland systems	Emma Sheard	Stirling
Impacts of neonicotinoid use on invertebrates	Kate Basley	Sussex
The effects on water quality and aquatic carbon of peatland restoration in the Flow Country of northern Scotland	Paul Gaffney	University of the Highlands and Islands
Impacts of management on blanket bog flora	Lindsey Rendle	Wales, Newport
Population dynamics of red kites	Andrew Simkins	Wolverhampton
The ecology of British upland peatlands: climate change, drainage, keystone insects and breeding birds	Matthew Carroll	York (with Aberystwyth)
Climate change and the role of protected areas in colonisation	Jonathan Hiley	York

Partnerships

By working with a wide range of partners, the RSPB maximises the quantity and quality of conservation science that it can undertake. Underpinning much of this is the huge contribution made by thousands of birdwatchers in the surveying, monitoring and ringing of birds, within the UK and further afield. Their contribution, and the partnerships with them, are invaluable.
The following organisations and individuals were active partners in RSPB research during the period 2003 – 2013.

Aberdeen Centre for Environmental Sustainability
Aberystwyth University
Academy of Sciences, Belarus
Acorus Ltd
Aculeate Conservation Group
Adam Mickiewicz University, Poland
ADAS UK Ltd
African-Eurasian Waterbird Agreement Secretariat
Allerton Research and Education Trust
Alpenzoo, Innsbruck-Tirol, Austria
American Bird Conservancy
Amphibian and Reptile Conservation
Andhra Pradesh Forest Department
Anglia Ruskin University
Government of Anguilla
Anguilla National Trust
APB – BirdLife Belarus
AP Leventis Ornithological Research Institute, Nigeria
Aquatic Warbler Conservation Team
Ascension Conservation
Ashmolean Natural History Society of Oxford
State Government of Assam
Association of British Fungus Groups
Association for the Conservation of Biodiversity in Kazakhstan
National Audubon Society
Australian Animal Health Laboratory
Azov-Black Sea Ornithological Station
British Association for Shooting and Conservation
Bat Conservation Trust
Biodiversity and Nature Conservation Association, Myanmar
Biodiversity Indicator Partnership
Biological Records Centre
Biomathematics & Statistics Scotland
Biosfera, Cape Verde
Bird Conservation Nepal
Bird Conservation Society of Thailand
Bird Education Society, Nepal
BirdLife International
BirdLife Botswana
BirdLife Cyprus
BirdLife Malta
BirdWatch Ireland
Bombay Natural History Society
Botanical Society of the British Isles (BSBI)
Bournemouth University
Brandenburg State Agency for Large Protected Areas
Bretagne Vivante
British Antarctic Survey
British Arachnological Society
British Birds
British Bryological Society
British High Commission, New Delhi, India
British High Commission, Kolkata, India
British Lichen Society
British Museum of Natural History
British Mycological Society
British Ornithologists' Union
British Sugar
British Trust for Ornithology
British Wind Energy Association
Michael Brombacher
Brooms Barn Experimental Research Station
Buccleugh Estate
Buglife
Bulgarian Society for the Protection of Birds
Bumblebee Conservation Trust
Bumblebee Working Group
Burung Indonesia
Butterfly Conservation
CABI Bioscience
Government of Cambodia
Cambridge Conservation Forum
Cape Verde Government
Centre for Agri-Environmental Research, University of Reading (CAER)
Central Science Laboratory (CSL)
Chagos Conservation Trust
Charles Darwin University
Chough Study Groups
Chizé Centre for Biological Studies (CEBC-CNRS), France
Central Institute for Research on Goats – India
Centre for Ecology & Hydrology (CEH)
Colorado State University
Conchological Society of Great Britain and Ireland
Conservation Metrics
Conservation International
Conservation Society of Sierra Leone
Consortium for Conservation Medicine
Countryside Council for Wales
Cranfield University
Crown Estate
Czech Society for Ornithology
Defence Estates
Defence Training Estates North
De Montford University
De Wildt Cheetah and Wildlife Trust, South Africa
Denny Ecology
Department of the Environment, Food and Rural Affairs
Department of Environment, Montserrat
Department des Eaux et Foret, Morocco
Department of Agriculture and Rural Development, Northern Ireland
Department of Forest and Wildlife, India
Department of National Parks, Wildlife and Plant Conservation, Thailand
Department of National Parks and Wildlife Conservation, Nepal
Directorate of National Parks, Ministry of Forestry, Turkey
Doga Dernegi (Turkey BirdLife partner)
Doñana Biological Station
Durham University
Durrell Wildlife Conservation Trust
East Yorkshire Ringing Group
EC Joint Research Centre: Institute for Environment and Sustainability
ENCI Foundation, Netherlands
Endangered Wildlife Trust / Vulture Study Group, South Africa
Entotax Consultants UK
Environment Agency
Environment Systems
Erciyes University, Turkey
Ethiopian Wildlife & Natural History Society
European Bird Census Council
European Environment Agency
European Commission
European Food Safety Authority
European Topic Centre: Biological Diversity
European Union Environment Council
exeGesIS Spatial Data Management Ltd
Fauna and Flora International
Field Ornithology Group of Sri Lanka
Flag Ecology
Flemish Land Agency (VLM), Belgium
Food Animal Initiative, Wytham
Footprint Ecology
Forest Enterprise
Forest Research
Forestry Division, Sierra Leone
Francis Kirkham
Freshwater Habitats Trust (formerly Pond Conservation)
Friends of the Chagos
Friends of Nature, Nepal
G Spoor Associates
Game & Wildlife Conservation Trust (GWCT)
Gdansk Ornithological Station – Polish Academy of Sciences
Kai Gedeon
General Commission for Al Badia Management and Development, Syria
Ghana Wildlife Society
Grampian Ringing Group
Sir Alister Hardy Foundation for Ocean Science
Harper Adams University College
Haryana Forest Department, India
Hawk and Owl Trust
Hawk Conservancy Trust
Helmholtz Centre for Environmental Research (UFZ), Germany
Herbarium Bogoriense, Indonesia
Himalayan Nature, Nepal
Dr Mike Hounsome
Hungarian Academy of Sciences
Hungarian Ornithological and Nature Conservation Society (MME)
Hymettus
Dr Hugh Insley
Indian Council of Agricultural Research
Indian Poultry Diagnostics and Research Centre
Indian Veterinary Research Institute
Institute for Environment and Sustainability
Institute of Grassland & Environmental Research
Institute of Zoology, London
Institute of Zoology, Minsk
Instituto de Investigación en Recursos Cinegéticos – Spain
InterRegII
International Advisory Group for Northern Bald Ibis
International Centre for Birds of Prey
International Union for Conservation of Nature
Institute for Environment and Sustainability, Italy
Island Conservation
Island Ecology and Evolution Research Group
Istituto Nazionale per la Fauna Selvatica, Bologna
Jagiellonian University
The James Hutton Institute (and previously The Macaulay Land Use Research Institute)
Joint Nature Conservation Committee
Joint Research Centre of the European Commission
King's College London
Koshi Camp ,Nepal
Laboratoire D'Analyses et Récherches Vétérinaire D'Agadir, Agadir, Morocco
Lembaga Ilmu Pengetahuan (Indonesian Institute of Sciences)
Leicestershire and Rutland Wildlife Trust
Ligue pour la Protection des Oiseaux, France
Linking Environment and farming (LEAF)
Konrad Lorenz Institute
Makerere University Institute of the Environment and Natural Resources
Malloch Society
Government of Malta
Malta Museum of Natural History
Mammal Society
Manchester Metropolitan University
Manx Atlas Project
Marine Conservation Society
Marine Biological Association
Max Planck Institut für Ornithologie
Ministry of Defence
Montana State University
Montserrat Government
Montserrat National Trust
Government of Morocco
NABU (German Society for Nature Conservation)
National Aviary, USA
National Biodiversity Network
National Bird of Prey Trust
National Energy Foundation
National Environmental Research Institute, Denmark
National Geographic Society
National Institute of Agricultural Botany
National Institute of Water & Atmospheric Research, New Zealand
National Museums of Kenya
National Parks and Wildlife Service, Republic of Ireland
National Parks and Wildlife Service, Kenya
National Trust
National Trust for Nature Conservation, Nepal
National Trust for Scotland
National Trust of the Cayman Islands
National Zoological Gardens of South Africa
Natur Vårds Verket, Sweden
Natural England
Natural Environment Research Council
Natural History Museum, London
Natural History Museum, Nepal
Natural History Museum, Paris
Natural Research Ltd
Natural Resources Wales [formerly Countryside Council for Wales]
Naturama (Burkina Faso BirdLife Partner)
NatureKenya
NatureUganda
Neo Human Foundation, India
Neotropical Bird Club
New Zealand Department of Conservation
Nigerian Conservation Foundation
North of England Zoological Society, Chester Zoo
North Wyke Research
Northern England Raptor Forum
Northern Ireland Environment Agency
Norwegian Institute for Nature Research
Nottinghamshire Wildlife Trust
Nyiregyhaza College, Hungary
The Open University
The Organic Milk Suppliers Cooperative
Oriental Bird Club
Ornithological Society of Pakistan
Parc National de Souss-Massa, Morocco
Parc National des Oiseaux du Djoudj, Senegal
Paul-Cézanne University
People's Trust for Endangered Species
Penny Anderson Associates
The Peregrine Fund
Percy Fitzpatrick Institute of African Ornithology
Perthshire Black Grouse Study Group
Plantlife
Plymouth Marine Laboratory
Polish Society for the Protection of Birds (OTOP)
Portuguese Society for the Study of Birds (SPEA)
Poultry Diagnostics Research Centre, India
Preservation of small landscape elements in Limburg Foundation (IKL; Netherlands)
Princeton University
QPQ Software

Preservation of small landscape elements in Limburg Foundation (IKL; Netherlands)
Princeton University
QPQ Software
Queen's University, Belfast
Queen's University, Kingston
Rainforest Alliance
Rare Breeding Birds Panel
Rare and Endangered Species Trust, Namibia
Red Panda Network, Nepal
Research Institute for Regional and Urban Development (ILS; Germany)
Rhino and Lion Wildlife Conservation NPO
Rothamsted Research
Royal Botanic Gardens – Edinburgh
Royal Botanic Gardens – Kew
Royal Holloway, University of London
Royal Navy Birdwatching Society
Royal Veterinary College
Royal Zoological Society of Scotland
Russian Bird Conservation Union
St Helena National Trust
SCAN Ringing Group
Schmalhausen Institute of Zoology
Scottish Agricultural College
Scottish Association for Marine Science
The Scottish Chough Study Group
The Scottish Crofting Foundation
The Scottish Crop Research Institute
Scottish Environmental Protection Agency
Scottish Natural Heritage
The Scottish Ornithologists Club
Scottish Raptor Study Groups
The Seabird Group
Seernilayam, India
Shetland Oil Terminal Environmental Advisory Group
Shetland Ringing Group
Slender-billed Curlew Working Group
Severn Trent Water
Dutch Centre for Field Ornithology (SOVON)
Smithsonian Institute
Chris Smout
Sourhope Research Station
South African Department of Environmental Affairs and Tourism
South African National Antarctic Programme
Spanish Ornithological Society (SEO)
State Government of Haryana, India
State Government of West Bengal, India
Statistics Netherlands
Surrey County Council
Sustainable Arable LINK Programme
Swedish Environmental Protection Agency
The Conservation Volunteers (Natural Talent Apprenticeship Scheme)
The Government of Tristan da Cunha
Tropical Biology Association
Wildfowl & Wetlands Trust
Mr Jonathan Tipples
Treshnish Isles Auk Ringing Group
Tribhuvan University, Nepal
Trinity College Dublin
UK Overseas Territories Conservation Forum
UK Joint Services Mountain Training Wing
Ukrainian Society for the Protection of Birds
UN Food and Agriculture Organisation, Syria
UNEP World Conservation Monitoring Centre
Universities Federation for Animal Welfare
US Geological Survey
Vaderstad
University College London
The University of Aberdeen
The University of Auckland
The University of the Azores
The University of Bath
The University of Bangor
The University of Birmingham
The University of California Santa Cruz
The University of Cambridge
The University of Cape Town
The University of Castilla-La Mancha
The University of Chiang Mai
The University of Coimbra
The University of Copenhagen
The University of Cork
The University of Coventry
The University of Durham
The University of East Anglia
The University of Edinburgh
The University of Exeter
The University of Freiburg
The University of Glamorgan
The University of Glasgow
The University of Greifswald
The University of Hawai'i
The University of Helsinki
The University of the Highlands and Islands
The University of Leeds
The University of Leuven
The University of Lisbon
The University of Liverpool
The University of Manchester
The University of Minho
The University of Nairobi
The University of Newcastle
The University of Nottingham
The University of Oxford
The University of Plymouth
The University of Pretoria
The University of Princeton
The University of Reading
The University of Riga
The University of Rome
The University of St Andrews
The University of Sheffield
The University of Southampton
The University of Stirling
The University of Sussex
The University of South Wales
The University of Turin
The University of Wisconsin, Madison
The University of Wolverhampton
The University of York
URV (Czech Crop Production Research Institute)
Washington State University – USA
Dr Adam Watson
Mr Nicholas Watts
Wave Energy Centre
The Welsh Kite Trust
Welsh Raptor Study Group
The Wildlife Biological Resource Centre, South Africa
Wildlife Conservation Society Cambodia
Wildlife Conservation Society of Tanzania
Wildlife Institute of India
The Wildlife Trusts
The Wildlife Trust of South and West Wales
Wildlife Veterinary Investigation Centre
Wildwings Bird Management
Wiltshire Ornithological Society
Peter Wombwell
World Overview of Conservation Approaches and Technologies
The Woodland Trust
The Woodland Trust Scotland
WWF – International
WWF – Pakistan
WWF - US
WWF – Thailand
Yayasan KEHI
Yorkshire Dales National Park Authority
Zoobotánico Jerez, Spain
Zoological Society of London

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The RSPB is the country's largest nature conservation charity, inspiring everyone to give nature a home.

The RSPB is a member of BirdLife International, a partnership of conservation organisations working to give nature a home around the world.

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